ΠΑΝΕΠΙΣΤΗΜΙΟ ΑΙΓΑΙΟΥ
ΤΜΗΜΑ ΚΟΙΝΩΝΙΟΛΟΓΙΑΣ

Living with the Sea

Community fish stock management for conservation and cohesion:
A comparative study between Greece and Japan

Ζώντας με τη Θάλασσα

Κοινοτική διαχείριση ιχθυαποθεμάτων για περιβαλλοντική προστασία και κοινωνική συνοχή:
Μια συγκριτική ανάλυση Ελλάδας και Ιαπωνίας

Eirini Ioanna Vlachopoulou
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Διδακτορική διατριβή που υποβάλλεται στο καθηγητικό σώμα για την εκπλήρωση των υποχρεώσεων απόκτησης του διδακτορικού τίτλου στα πλαίσια του διδακτορικού προγράμματος του Τμήματος Κοινωνιολογίας του Πανεπιστημίου Αιγαίου.

Μυτιλήνη, 03 Μαΐου 2017

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2017

University of the Aegean

Department of Sociology

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Community fish stock management for conservation and cohesion: A comparative study between Greece and Japan

A dissertation presented by

Eirini Ioanna Vlachopoulou

to

the Department of Sociology,

School of Social Sciences

in fulfilment of the requirements

for the degree of

Doctor of Philosophy

in the subject of

Sociology

2017

University of the Aegean,

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Living with the Sea

Community fish stock management for conservation and cohesion: A comparative study between Greece and Japan

Abstract

The importance of sustainable fish stock management through the ecosystem and the participatory approaches is widely supported by contemporary science. The management of fisheries, based on the internal knowledge of the insular artisanal communities, which operate with traditional techniques and tools, is considered key to sustainable marine and coastal ecosystems worldwide. According to the participatory approach, the insular communities which rely on the targeted fish stock should play an active and central role in the process of regulating and protecting it. Adopting a system of community participation in the decision-making process would result in developing a more holistic and inclusive management scheme with improved outcomes for both conservation and community development, enhancing also the social capital within the community. In Japan, the local resource users are the principal decision makers and marine resource conservation is an integral part of resource use. Traditional management concepts are used for contemporary fish stock management, with central point the interaction between human activity and ecosystem management. These ecosystems maintain high productivity and biodiversity, coupled with human intervention. By contrast, in Greece, although there is extensive legislation on fisheries management, its enforcement is minimal. The marine habitats have been gradually deteriorating, resulting not only in the loss of a large proportion of fish stocks, but also in the reduction of the livelihoods of the local artisanal fishing communities. As the fishermen have minimal participation in the decision making processes, the management of the marine resources or the enforcement of the legislation, their needs and local knowledge are not being represented in the decision making process. This paper cross-examines a case study from each country (Shiretoko Peninsula, Japan, and Kalloni Bay, Greece) in order to determine the factors that can create a good environment for sustainable co-management that supports local community resilience.

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Εκτεταμένη Περίληψη στην Ελληνική

Η σημασία της βιώσιμης διαχείρισης των ιχθυαποθεμάτων μέσω της οικοσυστημικής και της συμμετοχικής προσέγγισης είναι διεθνώς αναγνωρισμένη από τη σύγχρονη επιστήμη. Η διαχείριση των ιχθυαποθεμάτων που βασίζεται στην παραδοσιακή γνώση των παράκτιων αλιευτικών κοινοτήτων, οι οποίες λειτουργούν με παραδοσιακές μεθόδους και τεχνικές, θεωρείται το κλειδί για την επίτευξη της αειφορίας των θαλάσσιων και παράκτιων οικοσυστημάτων παγκοσμίως. Σύμφωνα με τη συμμετοχική πρόσεγγιση, οι παράκτιες κοινότητες θα πρέπει να παίζουν ένα βασικό ρόλο στις διαδικασίες λήψης αποφάσεων αναφορικά με τα διαχειριστικά πλαίσια αλιείας, καθώς είναι οι κύριοι τοπικοί χρήστες και η κοινοτική ευημερία είναι άρρηκτα συνδεδεμένη με τη βιωσιμότητα των ιχθυαποθεμάτων.

Η παρούσα έρευνα εξετάζει και σύγκρινει τα πρωτεύοντα διαχειριστικά πλαίσια για την αλιεία τα οποία έχουν υιοθετηθεί σε δύο χώρες (Ελλάδα και Ιαπωνία), υπό ένα φακό Κοινωνικο-Οικολογικών Συστημάτων (Social-Ecological Systems) προκειμένου να εντοπίσει διαφορές και ομοιότητες μεταξύ τους, καθώς και τις πηγές τους. Η έρευνα εστιάζει στις κοινωνικές διαστάσεις της αλιείας, από την προστασία της απασχόλησης ως την κοινωνική ενδυνάμωση, καθώς και σε οικολογικές διαστάσεις, όπως η διατήρηση των θαλασσίων ενδιαιτημάτων και η εκμετάλλευση των ιχθυαποθεμάτων. Η μελέτη βασίζεται σε μια ανθρωποκεντρική προσέγγιση, υπογραμμίζοντας τα στοιχεία του θέματος που είναι έντονα συνδεδεμένα με τον ανθρώπινο παράγοντα, χωρίς ωστόσο να παραβλέπει τις οικολογικές παραμέτρους.

Ο πρωταρχικός σκοπός της έρευνας είναι να εντοπίσει τα χαρακτηριστικά στοιχεία του διαχειριστικού πλαισίου, να διαχωρίσει τα δυνατά από τα αδύναμα σημεία τους και να κάνει συστάσεις αναφορικά με τη βελτίωση του πιο αδύναμου συγκριτικά πλαισίου.

Προκειμένου να έρθει εις πέρας η έρευνα, χρησιμοποιήθηκε μια ερευνητική προσέγγιση συγκριτικής ανάλυσης, βασισμένη στην εξέταση δύο γεωγραφικών περιοχων μελέτης (Χερσόνησος Σιρετόκο, Ιαπωνία, και Κόλπος Καλλονής, Ελλάδα), προκειμένου να έρθουν σε αντιπαράθεση τα δύο διαχειριστικά πλαίσια, καθώς και η επίδρασή τους στις τοπικές κοινότητες. Η σπανίως

απαντώμενη στη βιβλιογραφία διεξαγωγή μιας διεθνούς σύγκρισης μεταξύ δύο ανεπτυγμένων χωρών, μία εκ των οποίων ανήκει στη σφαίρα της Δύσης και μία στης Ανατολής, βασίζεται στη χρήση μιας σειράς εργαλείων περιγραφικής αξιολόγησης, πολλά εκ των οποίων είναι πρωτοπόρα, προκειμένου να εξαχθούν συμπεράσματα αναφορικά με τα επίπεδα εφαρμογής των πλαισίων διαχείρισης αλιείας και να προσφερθούν πρακτικές λύσεις σε τυχόν προβλήματα.

Η μελέτη περιλαμβάνει μια εκτεταμένη βιβλιογραφική ανάλυση του θέματος της αλιευτικής διαχείρισης, παρουσιάζει το διαχειριστικό υπόβαθρο των δύο χωρών υπό εξέταση και αναλύει την ακολουθούμενη μεθοδολογία έρευνας πριν προχωρήσει σε παρουσίαση και αξιολόγηση των αποτελεσμάτων.

Στα αποτελέσματα εντοπίστηκαν σημαντικές διαφοροποιήσεις ανάμεσα στις δύο χώρες όσον αφορά την εφαρμογή του διαχειριστικού πλαισίου, με σημαντικότερες τις σχέσεις ανάμεσα στα επίπεδα διακυβέρνησης και αποκέντρωσης εξουσιών. Τα επίπεδα εμπιστοσύνης στις σχέσεις ανάμεσα τόσο στις κρατικές οντότητες και τους τοπικούς χρήστες των ιχθυαποθεμάτων, όσο και στα μέλη των ομάδων χρηστών μεταξύ τους, είναι εξαιρετικά υψηλά στην Ιαπωνία, αλλά πάρα πολύ χαμηλά στην Ελλάδα. Αυτή η ποιοτική διαφορά στις σχέσεις ανάμεσα στα ενδιαφερόμενα μέρη και κατά συνέπεια στο τοπικό κοινωνικό κεφάλαιο, είναι ένας από τους βασικότερους λόγους για τους οποίους η διαχείριση των ιχθυαποθεμάτων στην Ιαπωνία αποφέρει σαφώς καλύτερα αποτελέσματα από ότι στην Ελλάδα, καθώς επιτρέπει τη δημιουργία και επιτυχή διατήρηση συνεργασιών μεταξύ του κράτους και των κοινοτήτων, η οποία απουσιάζει σχεδόν εντελώς από την ελληνική περίπτωση. Η έλλειψη υποστήριξης από το κράτος καθώς και η απουσία δυνατοτήτων πρόσβασης σε εκπαίδευση και επιστημονική γνώση στην περίπτωση της Καλλονής, δημιουργεί σοβαρά ερωτήματα αναφορικά με τις δυνατότητες υιοθέτησης βιώσιμων αλιευτικών πρακτικών οι οποίες να εξασφαλίζουν τον τοπικό βιοπορισμό.

Στο Σιρετόκο έχει τεθεί σε εφαρμογή μία σειρά από πρωτοβουλίες που στοχεύουν στην ελάφρυνση της αλιευτικής πίεσης στο τοπικό οικοσύστημα μέσα από τη δημιουργία εναλλακτικών μορφών απασχόλησης. Διάφορες μορφές φιλικού προς το οικοσύστημα Αλιευτικού Τουρισμού, από την παρακολούθηση θαλάσσιας άγριας ζωής ως εκδρομές θαλάσσιου γαστριμαργικού τουρισμού, πραγματοποιούμενες από επαγγελματίες αλιείς, βρίσκονται στη διάθεση των επισκεπτών. Μέσα από τέτοιες πρωτοβουλίες, πολλές εκ των οποίων θα μπορούσαν να υιοθετηθούν στην Καλλονή μέσα από το κατάλληλο θεσμικό πλαίσιο, ενισχύουν την τοπική απασχολησιμότητα και μειώνουν την αλιευτική πίεση στα ιχθυαποθέματα.

Εν κατακλείδει, η δημιουργία δικτύων συνεργασίας ανάμεσα στα επίπεδα διακυβέρνησης και τις τοπικές αλιευτικές κοινότητες είναι ο βασικός παράγοντας για την επίτευξη τοπικής βιωσιμότητας. Μια απόπειρα δημιουργίας θεσμών συνεργασίας, για παράδειγμα μέσα από την ακαδημαϊκή κοινότητα, θα μπορούσε να δώσει την απαραίτητη ώθηση στην Καλλονή να στραφεί προς ένα μοντέλο αειφόρας οικοσυστημικής διαχείρισης.

Table of Contents

"It doesn't matter where you live around the world:
we are all connected somehow and
are impacted by what we do to the oceans"

Tommy Remengesau, President of Palau (2014)

Acknowledgements

First of all, I would like to thank my supervisor, Prof George O. Tsobanoglou for his assistance and support, without which I could not have completed this thesis, as well as the members of my supervising committee, Prof Panagiotis Grigoriou and Prof Dimosthenis Daskalakis. Furthermore, this project would not have been possible without the Matsuda Laboratory (松田研究室・松研), Graduate School of Environment and Information Sciences, Yokohama National University, and more specifically, Prof Hiroyuki Matsuda, who kindly invited me to join his laboratory and shared with me his vast knowledge, as well as several opportunities to conduct state-of-the-art field research, attend conferences, and become familiar with Japan and its culture. I would also like to thank all the members of the Lab, present and past, as well as the administration officers that welcomed me into their circle and helped me in every way they could to complete my task. Special thanks are due to Dr Darien Danielle Mizuta who motivated me to work harder and better, and who put up with my constant complaining and lack of organisation. Thanks for being my eternal co-author.

Of course, these acknowledgements would not have been complete if I did not explicitly mention Dr Mitsutaku Makino of the Japan Fisheries Research and Education Agency (formerly Fisheries Research Agency of Japan) and the members of the Management Group (管理グループ). Dr Makino played a vital role in the successful production of this thesis, by investing greatly in my transformation into a proper researcher. He was the reason I managed to win the MEXT Scholarship and spend two wonderful years in Japan; he was the link that helped me enter the Matsuda Lab; and he was there, right by my side, to support and encourage me throughout my quest to be awarded with the scholarship, to get accustomed to life in Japan, and to conduct my research that I grew to love so much. He always made me feel welcome and helped me through my difficult moments, even after my stay in Japan was over. The members of the Management Group and our Centre Chief, Dr Toyomitsu Horii, were kind enough to go out of their way in every opportunity to assist me with everything I required, and, quite often, to offer me their help even before I could ask for it. They helped me learn the language and the local customs; they showed me their beautiful country and taught me their culture; they worked and laughed alongside me and never once did I feel like an outsider in their company, not even at the very beginning when I was not able to speak Japanese.

In addition, the priceless contribution of Seishiro Sakita, Nagoya University, should be explicitly discussed. His presence before, during, and after the conduct of research in Lesvos

was the key for the successful completion of my thesis. He acted as a mediator between me and a range of informants; he shared with me a vast amount of data from his research and participated in mine; and he produced many important figures included in this thesis. His support was invaluable.

Moreover, I would like to give my heartfelt thanks to the Ministry of Education, Culture, Sports, Science and Technology of Japan (MEXT・文部科学省) and the Embassy of Japan in Athens for choosing me among so many great applicants to receive the MEXT Postgraduate Scholarship 2014-2016 (scholarship No 140535). Without the financial support, I would have been unable to conduct my research in Japan. In addition, the communities of Rausu, Utoro, and Shari in Shiretoko, and those of Kalloni and Gera in Lesvos deserve my special thanks for allowing me to collect data and working with me during the interviews, as well as everyone who participated directly or indirectly in the research.

Last but not least, I would like to thank my parents, Tasos Vlachopoulos and Theano Vlachopoulou, for their love, patience, and encouragement, as well as my very close friends, Anastasia Charalampidou and Mariana Kimura, for being around to give me a helping hand whenever I needed it –basically all the time. I love you.

Specific mentions are due to:

Masahito Hirota and family
Juri Hori
Keisuke Kaji
Takaomi Kaneko
Tania Muraoka
Sara Akemi Ponce Otuki
Shigeki Sasaki
Shigeko Usami
Vasilis Katsiotis
Katerina Kokkinou
George Korres
Elias Kourliouros
Apostolos Makaratzis
Dimitris Michailidis
Celia Vasilopoulou

牧野先生、松田先生、管理グループと松研の皆さん、大変お世話になりました。ギリシャでも日本でも、いつかまた世界のどこかでお会いしましょう。本当にありがとうございました。

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List of Figures

[1] All maps indicated with * have been created with the use of vectormaps.com.

List of Tables

List of Abbreviations

AFCC	Area Fisheries Coordinating Committee
AIMC	Archipelagos, Institute of Marine Conservation
APFIC	Asia-Pacific Fishery Commission
BG	Bulgaria
BH	Balanced Harvesting
CCRN	Community Conservation Research Network
CFP	Common Fisheries Policy
DK	Denmark
EA	Ecosystem-based Approach
EAF	Ecosystem Approach to Fisheries
EEC	European Economic Community
EEZ	Exclusive Economic Zone
EMFF	European Maritime and Fisheries Fund
EMT	Ecological Modernisation Theory
ERP	European Recovery Program (Marshall Plan)
ES	Spain
EU	European Union
FAO	Food and Agriculture Organisation (of the United Nations)
FCA	Fisheries Cooperative Association
FI	Finland
FMO	Fisheries Management Organisation
FPC	Fishery Policy Council
FYROM	Former Yugoslav Republic Of Macedonia
FR	France
GDP	Gross Domestic Product
GFCM	General Fisheries Council for the Mediterranean
GI	Geographical Indication
GR	Greece
HCMR	Hellenic Centre for Marine Research
IE	Ireland
IMBER-ADApT	IMBER-ADApT framework
IT	Italy

IUCN	International Union for the Conservation of Nature
IUU	Illegal, Unregulated, and Unreported (fisheries)
JP	Japan
LEK	Local Ecological Knowledge
LOSC	Law Of the Sea Convention
LT	Lithuania
MA	Millennium ecosystem Assessment
MUIMMP	Multiple Use Integrated Marine Management Plan
MPA	Marine Protection Area
MSY	Maximum Sustainable Yield
NEF	the New Economics Foundation
NGO	Non-Governmental Organisation
NL	Netherlands
NPO	Non-Profit Organisation
NRR	Natural Removal Rate
OECD	Organisation for Economic Cooperation and Development
PDO	Protected Designation of Origin
PGI	Protected Geographical Indication
PT	Portugal
SDG	Sustainable Development Goal
SES	Social-Ecological System(s)
SESA	Social-Ecological System Analysis
SSF	Small-Scale Fisheries
TAC	Total Allowable Catch
TEEC	Treaty establishing the European Economic Community (Treaty of Rome)
TEK	Traditional Ecological Knowledge
UK	United Kingdom
UN	United Nations
UNCBD	United Nations Convention for Biological Diversity
UNCLOS	United Nations Convention on the Law Of the Sea
UNEP	United Nations Environment Program
UNEP/MAP	United Nations Environment Program/Mediterranean Action Plan

UNEP-WCMC	United Nations Environment Program-World Conservation Monitoring Centre
UNESCO	United Nations Educational, Scientific, and Cultural Organisation
USA	United States of America
WFCC	Wide-area Fisheries Coordinating Committee
WNH	World Natural Heritage
WNHS	World Natural Heritage Site
WG	Working Group
WWII	World War II

Chapter 1
Introduction

1.1 Aim and objectives

This thesis explores and compares the primary fisheries management frameworks adopted in two countries (Japan and Greece) under a Social-Ecological Systems lens in order to identify differences and similarities and their sources. The study focuses on social aspects of fisheries, ranging from protection of livelihoods to community empowerment, as well as ecological points, including marine habitat conservation and fish stock exploitation. The research takes on an anthropocentric view, highlighting those aspects of the issue strongly related to the human factor, without neglecting however the environmental factor.

The primary objective of the thesis is to pinpoint the significant features of each management framework, discern their strong and weak points, and make suggestions towards the amelioration of the weakest framework.

1.2 Comparative case study approach and original contribution to knowledge

The study is structured upon a comparative case approach, utilising two location-specific case studies (Shiretoko Peninsula, Japan, and Kalloni Bay, Greece), in order to contrast the two distinctive frameworks and their impacts on the communities under examination. The conduct of an international comparison between two developed countries, one belonging to the *Western World* and one to the *Eastern World*, an approach rarely seen in the literature, aims at utilising a range of descriptive assessment tools, many of which are novel in themselves (SES Analysis, IMBER-ADApT framework), in order to draw conclusions at the level of fisheries management implementation and offer practical solutions.

1.3 Thesis composition

The thesis has been divided into 9 chapters, starting off with a general introduction on the scope of the research (**Chapter 1**), followed by a literature review on fisheries management (**Chapter 2**). Further on, the demographics, fisheries status, and management frameworks of the countries under examination are presented, beginning with Japan (**Chapter 3**) and followed by Greece (**Chapter 4**). In **Chapter 5**, the methodological framework and the background of the case studies

are presented extensively, along with the implementation of the methodology. **Chapters 6** and **7** constitute the main body of the analysis of the case studies, Shiretoko and Kalloni respectively. Finally, in **Chapters 8** and **9**, the results of the research are discussed and suggestions towards the improvement of the fisheries management framework are made.

1.4 General overview

The importance of the sea as an aspect of the human life has been prevalent throughout history. It has been the source of food and leisure, a force of nature to be reckoned with, and often a source of inspiration, linked with human culture, tradition and religion. Connections of humanity with the sea, including, but not limited to foraging, span back hundreds of thousands of years. As early as 165000 years ago, groups of the first *Homo sapiens*, going through a particularly harsh for the human species period of time in terms of weather conditions, survived on marine resources and developed some of the first exhibitions of culture, by collecting decorative sea shells (Marean et al., 2007; Marean, 2010).

Mediterranean people historically constructed the sea "as a non possessible space, but one in which and across which stately power legitimately could be asserted in the interest for stewarding its bounty" (Steinberg, 2001) (page 61). In "The Freedom of the Seas (*Mare Liberum*)" by Grotius (1608), he claimed the non-disposable common property of the sea as opposed to land. The marine realm should be without borders, freed of natural sovereignties and accessible to navigation (Cocco, 2013). The question is if this view of the world is still viable nowadays. The Grotian doctrine seems now outdated and its credibility collapses under the weight of the various near-shore and offshore maritime uses, from artisanal fisheries and marine recreation, to offshore oil and gas platforms to deep-sea fishing (Nyman, 2015). Nation-building processes and national histories rarely ascribe to the maritime sphere the same importance of the terrestrial one (Cocco, 2013), with the marine environments being "elusive places, often seen as a realm beyond society" (Longo and Clark, 2016) (p. 463). Recently, the services offered by the sea to humankind have taken a more economic perspective, being irreplaceable for economic growth in both developed and developing countries. Hegel celebrated the sea for its uttermost importance in the development of state, economy and European identity [(Hegel, 1821) as cited in (Cocco, 2013)]. This fact is especially true in the case of marine resources that have an evident commercial value, like fisheries.

As fish stocks provide humankind with multiple ecosystem services, vital for its survival, it is only natural that their management has concerned humanity since its rise. Fisheries are a significant food source accounting for 16.5% of the animal protein intake globally and for up to 20% in many regions (FAO, 2014c). However, specific fisheries products are also considered

gourmet delicacies, with their consumption being a symbol of high status, sought after by the global elite, as well as the middle class. One example of such a prized commodity is bluefin tuna (*Thunnus thynnus*), exploitation of the stocks of which has increased rapidly after global demand for the particularly fashionable trends of sushi and sashimi[2] soared (Bergin and Haward, 1996; Issenberg, 2008; Longo et al., 2015).

In addition, a large proportion of the global population relies on fisheries as income source. More than 57 million people were directly employed in the global fishing industry in 2012, an increase of over 60% since 1990 (FAO, 2014c). Furthermore, an even larger amount of people is employed in sectors that are related to and depend on fisheries, such as tourism and recreation. Many island states, especially the ones which are small in size and have limited population, are dependent on tourism which focuses on marine related highlights, such as snorkelling and scuba diving hotspots (UNEP-WCMC, 2006). Apart from diving tourism, ecotourism has also been rising significantly in the past decade, with growth rates which reach up to 30% annually (UNEP-WCMC, 2006). It is highly likely that reliance on fisheries for sustenance and employment will continue to increase as global population expansion persists and pressure on limited arable land grows (NEF, 2016).

Fish stocks also support biodiversity by maintaining the food chains, enhancing thus the resilience of the marine habitats they inhabit (Wisehart et al., 2012). Marine ecosystems are extremely vulnerable to disturbances in the food web, as multiple drivers may easily endanger the abundance of the various marine species. Currently, even though all levels of the food chains have been influenced by the continuous degradation of the habitats, it is mostly the populations of larger predators (sharks, tuna, swordfish etc) that have been deteriorating the most, as their breeding rates are much lower than those of the other species [see for example: Myers and Worm (2003) and (2005), and (Pauly et al., 2002)]. As the amount of predators declines, the lower steps of the food pyramid grow disproportionately and the food web equilibrium is disturbed, resulting in domination of species that previously formed the diet of the predators (Howarth et al., 2014). This disturbance in the food balance causes the rise of phenomena such as *jelly blooms*, overwhelming increases in jellyfish populations (Dong et al., 2010; Duarte et al., 2013; Graham and Bayha, 2007). It is being feared that, given the current marine situation, jellyfish populations will expand in such a way that will eventually conquer the Earth's oceans. However, habitat degradation is not the only reason for imbalance in the food chains. Because of human activity, another threat to local biodiversity has surfaced: introduction of invasive alien species. Through ballast waters or the opening of water ways, with most notable example the Suez Channel, many alien species are being

[2] Japanese ways of food preparation and serving. The most common main ingredients are fish, usually of high fat content.

introduced in habitats and take replace the local species, causing further imbalance in the already vulnerable local food chain (Wisehart et al., 2012). As a result, the maintenance of healthy and abundant fish stocks regulates the food chains, supporting thus biodiversity and habitat resilience.

Additionally, fisheries account for plethora of cultural amenities, among the vast array of other supporting services (UNEP-WCMC, 2006). Apart from their intrinsic and aesthetic value, fish stocks also play an important role in many cultural aspects, such as religion, education, social interactions, and most importantly, sense of place (Berkes, 2015). Near-shore communities, whose everyday life is interlinked with the sea, interact constantly with the fish stocks and rely on that relationship for not only their livelihoods, but also community cohesion and development (Haggan et al., 2006; UNEP-WCMC, 2006). Traditionally, fishing provided the cohesive driver for coastal communities, as they participated cooperatively in the preparation processes for the fishing seasons, in order to maintain the sector, affecting thus both the economic and cultural life of the people (Consolo, 1986; Longo et al., 2015). It is an often phenomenon for fishing communities to have developed religious rituals related to fisheries and the marine environment, along with art, folktales, language, and songs, as they consider such occupations central point of community life (Haggan et al., 2006; Longo et al., 2015).

As FAO (2005) graphically details,

> "small-scale fishing are faced with an array of serious problems, including overexploitation and depletion of resources, lack of alternative sources of employment, rapid population growth, migration of populations, displacement in coastal areas due to industrial development and tourism, pollution and environmental degradation and conflicts with large commercial fishing operations. However, small-scale fisheries are critical for food security and poverty alleviation in many countries."

Chapter 2
Literature Review

2.1 Definition of fishery

According to Fletcher et al. (2002), a fishery is defined as "a unit determined by an authority or other entity that is engaged in raising and/or harvesting fish[3]. Typically, the unit is defined in terms of some or all of the following: people involved, species or type of fish, area of water or seabed, method of fishing, class of boats and purpose of the activities."[4] Fisheries are separated into saltwater and freshwater, as well as into wild (*capture* fisheries) and farmed (*aquaculture* or *mariculture*). In terms of purpose of the activity, capture fisheries can be categorised as *recreational* (fisheries conducted for leisure purposes), *commercial* [or *industrial*: large-scale fisheries conducted usually by large industrial vessels (e.g. purse-seiners and trawlers) of high level of technology, for commercial profit from either the food industry or other sectors (e.g. fish feed) (World Fisheries Trust, 2008a)], and *subsistence* [or *artisanal*: small-scale fisheries conducted near the shore usually by members of coastal communities in small traditional vessels of low levels of technology, for subsistence and limited trade within close geographical proximity of the community (World Fisheries Trust, 2008b)].

This study focuses primarily on subsistence fisheries, with the terms *subsistence fisheries, small-scale fisheries,* and *artisanal fisheries* being used interchangeably.

2.2 Fisheries and employment

Coastal resources support directly or indirectly almost half the population of the planet that lives in coastal areas. However, all around the globe, the sources of coastal resources, the coastal ecosystems, are suffering from heavy use that results in significant losses in terms of social, ecological, and economic value (Berkes, 2015). With fish providing almost 1/6 of the global animal protein and more than 120 million people (*fisherfolk*) in the primary and secondary fishing sector, fisheries constitute one of the most significant coastal resources (FAO, 2014c; HLPE, 2014).

It has been estimated that marine fisheries provide an approximate 260 million jobs (full- and part-time; direct and indirect) worldwide, with about 2.5 million of which being

[3] The term *fish* includes any type of aquatic animal harvested, such as mollusks, crustaceans etc.
[4] This definition has been officially adopted by FAO.

located in the EU (Teh and Sumaila, 2013). About 44% of the more than 57 million people in the primary fishing sector are small-scale fishermen (Cisneros-Montemayor and Sumaila, 2010; FAO, 2014c; Teh and Sumaila, 2013); in some areas of the world, this rate exceeds even 90% of the total fishers. It is evident thus, that marine fisheries employment plays a significant role in the economies of several countries, and it has a wide capacity to improve the wellbeing of the people (Dyck and Sumaila, 2010; World Bank, 2009).

It is important to note though, that this relationship works both ways. Humans have the ability to cause a health decline of the marine ecosystems and, in turn, unbalanced ecosystems will have impacts on the wellbeing of humanity (Bundy et al., 2008). Fisheries employment affects the fish stocks; increased effort means increased stress upon the resource. As a result it is vital to monitor the levels of employment, without underestimating its potential to lead to overexploitation. In the case of small-scale fisheries, the indirect involvement of people (informal employment) in the fishing industry is extensive; yet, it is not included in any official employment estimates. Family labour and women's participation is neglected at the national and international governance level (Marciniak and Jentoft, 1997; Teh and Sumaila, 2013).

2.3 Impact of overfishing on fish stocks and other drivers of change

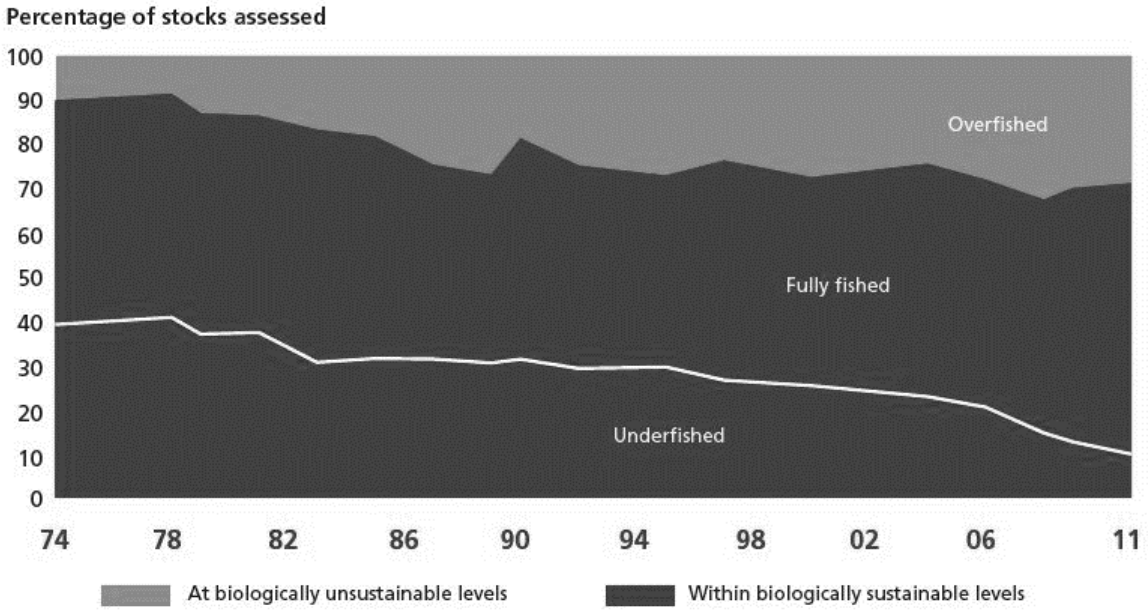
Fish stocks, in contrast with the dominating belief of the late Industrial Revolution[5] as vividly expressed by T. H. Huxley (1884), are far from inexhaustible; they are highly vulnerable to change and suffer from anthropogenic impacts and ecological disturbances (WWF, 2015).

Several drivers of change affect fish stocks, ranging from climate change to tourism. Climate change has severe impacts on our world's oceans, with a vast array of after effects. For example, sea water temperature is rising, causing multiple shifts in species distribution and disturbances in trophic chains (WWF, 2015). Ocean acidification has similar effects, causing reductions in marine ecosystem productivity and ecological shifts (Nellemann et al., 2008). Marine pollution –including every kind of pollution, from oil spills and sewage to eutrophication and marine litter- takes a have toll on marine ecosystems, by directly killing species, decreasing food sources and nursery grounds, and degrading environmental health (Nellemann and Corcoran, 2006). Furthermore, tourism infrastructure causes species and habitat destruction and marine pollution, among others (WWF, 2015). Extracting activities

[5] Second Industrial Revolution or Technological Revolution (1870-1914).

(offshore oil and gas platforms, mining), apart from their direct contribution to climate change through methane and CO_2 emissions, cause species disturbances and contamination, loss of sensitive habitats, and pollution (WWF, 2015). However, possibly the most prominent driver of change is overfishing.

According to the Food and Agriculture Organisation of the United Nations (FAO), 28.8% of the global fish stocks are depleted or overexploited and 61.3% are fully exploited, with the stocks fished at biologically unsustainable levels increasing continuously until 2008 (32.5%) and then decreasing slowly to a 28.8% in 2011 (fig. 2-1) (FAO, 2014c).



Notes: Dark shading = within biologically sustainable levels; light shading = at biologically unsustainable levels. The light line divides the stocks within biologically sustainable levels into two subcategories: fully fished (above the line) and underfished (below the line).

Figure 2-1: Global trends in the state of world marine fish stocks, 1974-2011. Source: FAO (2014c).

Overall, exploitation of marine resources to levels beyond sustainability deprives nations of economic benefits from fisheries (FAO, 2009c; NEF, 2016), which, according to the World Bank (2009), reach US$50 billion annually (US$2.2 trillion for the period 1974-2008). To make things worse, an estimated US$14-35 billion are directed annually to the global fishing fleet (mostly large-scale) as subsidies, enabling continuation of overfishing, despite the fact that the current fleet is already more than 2 times larger what the ocean can support (Sumaila et al., 2010; Sumaila et al., 2013; Nellemann et al., 2008; WWF, 2015).

With the introduction of industrialized methods of fishing, artisanal fishers, the supporting pillar of the near-shore fishing communities, are being displaced by the large-scale

fishing sector (Clark, 2006). Industrial fisheries consist of large vessels that aim at mass harvesting of fish stock with limited selectivity. Most of the enterprises that run such fisheries are vertically integrated, including all stages of production in a single vessel. They perform *accumulation harvesting*, as Longo et al. (2015) name these highly profit-driven operations. The relentless harvesting of fish stocks by large-scale fisheries operations drive artisanal fishers that perform selective, small-scale fishing or *livelihood fishing* to a corner, by endangering their sense of employment security and urging them to abandon generations-old traditions and mental connections with the target fish stocks in order to attempt to become competitive and safeguard their subsistence source (Longo et al., 2015). Accumulation harvesting is deemed to be one of the major drivers for fish stock depletion nowadays (Nellemann et al., 2008), hurting thus directly the local fisheries-reliant communities.

Many maritime countries around the globe face issues that derive from fish stock depletion, with the countries of the Mediterranean Sea being among the ones that experience a major decline in the income level of their artisanal communities, as they have a long tradition of fishing activity (UNEP-WCMC, 2006). In Greece for example, even though the fishing industry contributes only about 0.3 - 0.4% of the Gross Domestic Product (GDP), it is pivotal for the socio-economic cohesion of many nearshore areas, especially the islands, as they are inhabited by fisheries dependent population (FAO, 2006; Tzanatos, 2006). However, the artisanal communities of Greece, like the artisanal communities world-wide, are facing another significant problem apart from competition with industrialised fishing activity; Illegal, Unregulated, and Unreported (IUU) and destructive fishing practices are among the most significant drivers of change for the marine and coastal ecosystems all around the globe. Furthermore, according to the latest evidence and researches almost 80% of the primary catch species are being overexploited and, at the same time, towed fishing gear is responsible for 95% of the harm (UNEP, 2011). What is more, it is impossible for the current level of scientific knowledge to implement the tools of fisheries science on small fish stocks or stocks that are targeted by artisanal fishers and are used for subsistence (Defeo et al., 2007). Taking into account that the United Nations (UN) Code of Conduct for Responsible Fisheries (FAO, 1995) advises that "best scientific evidence available should be used to evaluate the state of fisheries resources" when considering new fisheries management options, meaning utilisation of robust stock assessments, appropriate data, and comparison with reference points in order to fulfil the objectives of fisheries management (Pilling et al., 2008), small-scale stocks are highly unlikely to be managed in a sustainable and viable way.

The degradation of the marine habitats caused by destructive fishing activities and the absence of an integrated marine planning scheme, cause disturbances in the food chains and, as a result, non-commercial species are threatened as well (Defeo et al., 2007; Nellemann and Corcoran, 2006). It is widely known that many fisheries globally have been depleted due to overexploitation (Butcher, 2004; FAO, 2014c; Jackson et al., 2001; Rosenberg et al., 2005) and despite the fact that some local stocks are managed in a successful and thus sustainable way [see for example: (Hilborn, 2007)], overall fisheries management has failed (Bundy et al., 2008; Myers and Worm, 2003; Pandolfi et al., 2005; Pauly et al., 1998; Tsikliras et al., 2013a).

2.4 Fish stocks as common property resources

Despite the fact that fisheries have been a major aspect of humanity since its early days, fish stocks and their interlinkages with the Human System (i.e. communities, society and economy) became the focus of the Social Sciences only recently. It is noteworthy that during the 1883 International Fisheries Exhibition in London, the famous biologist Thomas Huxley stated in his inaugural speech that it is impossible for open sea fish stocks to be exhausted as their numbers are so great that human impact can be considered negligible (Huxley, 1884). This statement showed the limits of the then experts' knowledge of both the biological parameters of the fisheries, as well as the human capacity for fisheries overexploitation, especially in contrast with the fact that fish stocks were already on the verge of collapse and the United States were researching the causes of the halibut fishery decline (Goode and Collins, 1887).

It was only in the recent years that the Social Sciences took an interest in fisheries, with Economics having the main role. Since the introduction of the idea of the *Tragedy of the Commons* (Hardin, 1968), the perception of the people towards the fish stocks has been altered significantly. Hardin (1968) claimed that in cases of open-access resources like fisheries, ever increasing competition among the users will inevitably deplete the resource. He compared open-access resources with a pasture open to all, where herdsmen will be motivated to increase continuously the number of animals they keep in the common land, as the positive outcomes for himself from the addition will outweigh the negatives that derive from overgrazing, as the negatives are shared by all the herdsmen that share the field. Applying this narrative to the case of a fishery, each user of the stock is compelled to fish increasingly, pursuing their own self-interest, reducing thus the amount of fish available to other users continuously, until the limited amount of catch is depleted (Hardin, 1968). According the logic of the Tragedy of the Commons, people only care about themselves and their immediate families and such selfish

actions and motivations lead to tragedies when individuals interact with the environment (Longo et al., 2015). Hardin's view clashed with the then popular laissez-faire ideas and Adam Smith's *invisible hand* (1776) which supported that individual choices will ultimately be guided by the market to serve the public interest.

Nevertheless, the concept of the Tragedy of the Commons, despite being the dominant framework in fisheries management, has failed not only to explain the socio-ecological dynamics and processes in the ecosystems, but also to take into consideration the historical context in which humanity started to overexploit the marine resources and continues to do so (Longo et al., 2015). Ideas similar to Hardin's were being developed at around the same time as the Tragedy of the Commons by economists like H. Scott Gordon and Milner Schaeffer; they introduced social aspects in what would become the base for the creation of the Maximum Sustainable Yield (MSY) theory, which will be explained later. Schaeffer (1957) (p. 680) claimed that "free access to the fishery by all citizens and the obtaining of the possible economic yield are mutually exclusive". Through this statement, Schaeffer emphasised the importance of private rights in order to effectively manage a common resource like a fishery. Hardin also agreed with the notion that private rights could stop the collapse of the commonly exploited resource, even though he acknowledged that private property of a commons might not always result in socially just outcomes (Longo et al., 2015).

Another view of the idea of private rights over a commons can be seen at the role of the state. The state would be eligible to own the commons, exempting and/or regulating users from accessing the resource. External institutions are necessary to enforce regulation as the users will regulate themselves voluntarily. It is thus the role of the state in the concept of the Tragedy of the Commons to adopt top-down management frameworks for a broad spectrum of resources, bypassing the local users and closing off the resources (Ostrom, 1999). The theory neglects social interactions and interrelations between the human and the natural factor, assuming that human behaviour towards the resources are dictated by nature itself rather than social circumstances and institutional conditions (Longo et al., 2015; McCay and Jentoft, 1998).

Hardin's doctrine, on which most current management schemes are based, fail to recognise humans as an integral part of the resource systems (Bundy et al., 2008). Rather, local users have often succeeded –with or without support from institutions- to autonomously manage common resources, as empirical research has shown [see for example: Bennett and Clerveaux (2003) and Defeo et al. (2016)]. When examining fisheries from this viewpoint, namely the relationship of the resource with its users, the fact that theories which neglect such

interactions are severely lacking, becomes evident. Fisheries are one of the most profound cases of common-pool resources, as they have been defined by Ostrom et al. (1994):

> "A natural or man-made resource from which it is difficult to exclude or limit users once the resource is provided, and one person's consumption of the resource units makes those units unavailable to others."

Ostrom, in contrast with Hardin, supports that resource users are perfectly capable of self-organising and self-regulating (Ostrom, 1990). In order to successfully manage a commons, the stakeholders need to be able to organise in various scales and different governance levels simultaneously; each node should be able to create and enforce regulation in a specific geographical area under its jurisdiction. Even though the 'tragedy' still occurs in open-access systems, such a *polycentric* system is capable of mitigating and finally eliminating the problem of the commons (Ostrom, 1999). Hardin's model may apply to cases of open access, but there is wide agreement within the academic circles that it does not do so in cases of community management (Berkes, 2015).

It is important to acknowledge that natural systems are never devoid of social institutions and that the notion of *open access* does not apply to any resource in reality; rather, there is always some form of human influence, be it tradition, political arrangement, economic rule, etc. (Dietz et al., 2003; Ostrom et al., 1999). Furthermore, in the current capitalist system, common property resources have been commodified to a point that their value can only be accounted in terms of capital accumulation and does not include their non-monetary values, such as sustenance (Longo et al., 2015). Therefore, in an open-access management framework, the users of a fishery will overfish their target species and then move on to another one. In the words of Mitsumata (2013) (p. 42): "A commons will be utilized only as long as it has commercial value, although it has various and irreplaceable values. Should it experience a significant decline in that value, it will either fall into neglect or be redeveloped for other purposes." It is important to note that, as Longo et al. (2015) (p. 143) mention, "The tragedy [of appraising a stock merely for its commercial value] is not the result of harmful intentions of fishing individuals or aquaculture firms, per se, but rather of a socioeconomic system predicated on constant growth, that values profit over sustaining ecological health and meeting human needs." Ecosystems though, do not exist merely for the sake of providing humans with ecosystem services; they have an intrinsic value for which they should maintained also for the generations to come (Bundy et al., 2008).

2.5 Fisheries management approaches

As the fish stocks, in their vast majority, are perceived as common property resources, they are being mismanaged. The absence of well-enforced, high quality property rights results in negative profits for the fishers and declining stocks (Arnason, 2009). Common property resources cause excessive fishing efforts, fisheries overexploitation, decreasing profitability and fishers' income, as well as low contribution to GDP, and threats to the sustainability of the human development and the fish stocks (Arnason, 2009). As is depicted in Fig. 2-2, when a fish stock is governed by common rights, the optimal fishing level is e^*. At that point, the rate of profits to biomass is maximised. However, that point is unattainable in a common property resource regime, as the fishers continuously increase their fishing efforts in order to achieve the maximum immediate gains possible, even in the expense of their future gains (Arnason, 2009; Hardin, 1968; Ostrom et al., 1994; Ostrom, 1999). Under such a regime, the equilibrium would be at e_c, a point which exceeds by far the Maximum Sustainable Yield (e_{MSY}) and at which the fishing effort is increased too much, causing both a significant decline in the fishers' income, as well as a decrease of biomass, jeopardising thus, the sustainability of the fishery.

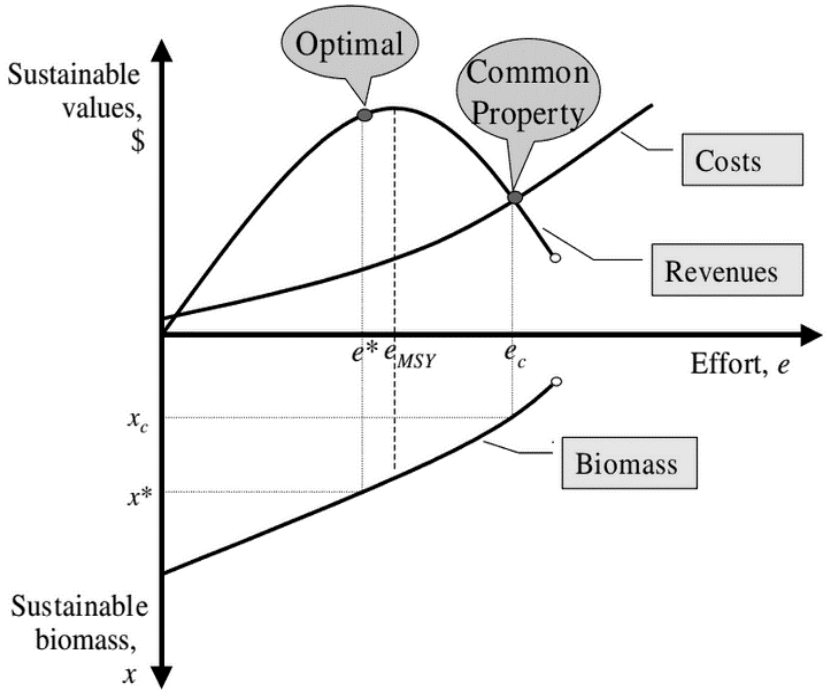


Figure 2-2: The sustainable fisheries model. Source: Arnason (2009).

The MSY theory, despite its obvious drawbacks, is still dominant in the global fisheries management scene, not unlike its predecessor, the Tragedy of the Commons. The idea that there is a standard amount of fish that can be taken from the stock indefinitely, without

repercussions, surely sounds inviting (Punt and Smith, 2001). Supported as this idea is by several decades of fisheries science, it has become quite popular among policy makers around the world. A large proportion of fisheries scientists, however, have voiced objections about its effectiveness. Critiques focus mostly on the fact that MSY deals with each fish stock separately (single-species fishery models), without taking into consideration interrelations with other stocks and the levels of fishing gear selectivity. As Roberts (2008) (p. 341) explains, "In the real world, there is no such thing as a fixed MSY yield to target." It is the size and density of the stock that matter rather than any other parameter. Furthermore, the fish stocks are judged in terms of current size, without considering past abundance (Larkin, 1977; Punt and Smith, 2001). Fisheries however, are very complex systems that cannot, and should not, be broken down to tiny nodes which are far from capable to represent reality. Yet, all major national and international fisheries are governed by variations of the disputed MSY theory; a theory that was adopted initially for the sole political purpose to protect the US salmon fisheries from exploitation by the Japanese after World War II (Finley, 2011)[6].

The MSY theory is not the only theoretical approach to fisheries that has been heatedly debated within the scientific community. Many ideas have been proposed in order to achieve sustainability in fisheries; fishing gear selectivity has been prevalent for quite some time. The notion that fishers should employ specific gear that targets specimen of specific species, size, and sex, has gained many supporters, as they advocate for the principle to let the fish grow to sexual maturity and reproduce [see for example: Sissenwine and Shepherd (1987)]. Basically, selectivity encourages capture of older specimen that have had the opportunity to reproduce, rather than fish of younger age and size. Even this approach, however, has been faced with severe opposition. Recently, prominent fisheries scientists have been turning their attention towards a theory that contradicts selectivity: *Balanced Harvesting*.

Balanced Harvesting (BH) claims that strong selectivity tends to alter the trophic structures of the marine ecosystems by removing specimen in a way that balances the impact of fishing across all levels of the stock, as well as across all species of the ecosystem (Breen et al., 2016; Garcia et al., 2012). Even BH has its opposition however; its critics claim that it addresses only ecosystem structure and food acquisition. Other objectives like socio-economic aspects are not touched at all by BH (Froese et al., 2016).

[6] After World War II, Japan, deprived of food resources, sought with the support of General MacArthur, who was the commander of the occupying forces, to resume Antarctic whaling. The US, in an attempt to prevent the Japanese from exploiting the salmon fisheries of Northern Pacific, adjacent to the whaling grounds, negotiated a convention for Northern Pacific fisheries management that was based on the *Abstention Principle* – namely the principle which dictates that if a fish stock is fully exploited by a nation, all other nations will abstain from using it – utilizing the MSY in order to define the term *fully exploited.*

2.6 Self-regulation and co-management

It is not only marine management perceptions, but rather ecology in its whole that is experiencing simultaneous changes. As Berkes (2015) (p. 8) notes, ecology is currently going through "three paradigm changes: (1) a conceptual shift from reductionism to a systems view of the world; (2) a paradigm change in the way shared resources are theorized and managed; and (3) a shift from expert-based, technical management, to a broader, participatory governance."

It is becoming ever more widely accepted that in order for any management approach to succeed, engagement of the users is vital. Until recently, policy focused on the design and implementation of a uniform set of rules or management plan, which would be imposed centrally and would affect the common – pool resources as a whole, rather than developing individual management plans based on the Local Ecological Knowledge/Traditional Ecological Knowledge (LEK/TEK) of the local users for each marine ecosystem and the specific needs of the communities and the habitats under examination (Alder et al., 1994; Neis, 1995; Sumaila et al., 2000; Ostrom et al., 1994; Ostrom, 1999). According to Ostrom (1999), this approach, compared to the outcomes of vast empirical research, fails at three fundamental points. First of all, the theoretical background for a central management plan, views the resource users as free-riders, whose exclusive goal is to maximise their immediate gains, without allowing for cooperation with other users in order to maximise their long-term benefits, unless an external force (i.e. the central government) forces them to do so. At the same time, the government officials are perceived as if they are only aiming at maximising the well-being of the citizens and they are able to design policies by analysing long-term patterns. In addition, the design of an effective management plans is considered an easily achieved goal, as long as it is performed by objective analysts, unrelated directly to the fish stocks. Lastly, organisation itself is considered to be attainable only from the top – down (Ostrom et al., 1994; Ostrom, 1999).

Nowadays, however, many players in the international policy arena tend to see in this sharing of management responsibilities the solution to the problems that the near-shore population of the world is facing from the depletion of the marine resources. Many countries have adopted forms of marine resource community based management as parts of their community capacity building strategies and many non-stately actors are providing know how and support to communities that are willing to move on to a more sustainable way of managing the local fish stocks. Globally, there is an extensive shift from exclusive state control over

natural resources to more inclusive forms of management, with stakeholders from a range of groups (local communities, NGOs, researchers, etc.) joining the efforts for sustainable resource use (Matsuda et al., 2009).

This new form of organisation, based on shared responsibilities and diffusion of regulation and control, is a form of *co-management*. Co-management has been defined in many ways, as it is a flexible term, incorporating various forms and levels of organisation, as well as multiple different management arrangements. Most definitions focus on the sharing of responsibilities between the state and the users [see for example: Matsuda et al. (2009) and Persoon et al. (2005)]. The most prominent definition is that of OECD (1998) [as cited in OECD (2007)]: "Co-management is a process of management in which government shares power with resource users, with each given specific and responsibilities relating to information and decision-making."

In relation to fisheries, co-management takes a more specific shape. According to Raakjær Nielsen et al. (2003), fisheries co-management is "a mechanism to give people within the fishing communities a chance to influence their own future in order to cope with the impacts of globalization; competing use of freshwater and coastal environments; and other fisheries-related communities" [as cited in Jentoft (2005)].

This management regime type cannot be used at the national level as it works on a case-by-case way, targeting only a specific habitat or ecosystem. Nevertheless, the inclusion of the resource users and other stakeholders in the decision-making process has several advantages. First of all, the incorporation of LEK in the planning phase has the capacity to increase significantly the efficiency of the management framework, as it allows for utilisation of several knowledge sources (scientific knowledge, local understanding, tradition, etc.) about the system under examination, multiplying thus the known parameters for the targeted resource. The local users, apart from having developed a deep understanding of the ecological processes in their area, they also comprehend fully the social norms of the community and appropriate behaviour (Ostrom, 1999). The knowledge that the fishers and the generations of ancestors before them have gathered by living and working in the area cannot be substituted by scientific research, even though the two complement each other. In addition, by including the local stakeholders in the decision-making process and the following regulation implementation and enforcement, a significant reduction of costs for the authorities is orchestrated. Firstly, the fishers can undertake the task of rule enforcement, monitoring the fishery and controlling the local activity, instead of the state spending valuable resources to do

so (Jentoft, 2005). Additionally, actors with *insiders' knowledge* are more likely to develop regulation appropriate for the specific case (Ostrom, 1999). This approach also contributes highly to the enhancement of local social capital by developing bonds between the fishers, the community members, the authorities and the rest of the stakeholder groups (Tsobanoglou, 2008; Wilkinson and Pickett, 2009), which legitimises the processes, increasing thus conformance levels (Ostrom, 1999), as will be detailed later on.

Co-management, however, does not mean advantages only for the authorities. The stakeholders involved in co-management have responsibilities and rights, the latter being management rights. Owning these rights acts as a powerful motive for engagement in arrangement for the local users. Furthermore, co-management regimes act as a forum for discussion among the involved parties and, by clearly defining rights and responsibilities, it can act as a means to mitigate conflict. Lastly, co-management creates a *conservation ethic*, as it brings stakeholders together in order to share the responsibility of managing sustainably the fishery (Charles, 2001).

Even though it is no panacea, co-management can greatly increase empowerment, responsibility, and legitimacy of sustainable management regimes (Jentoft, 2005), as it incorporates the fundamental principle of *adaptive management.* Adaptive management assumes that information is always incomplete and bases its measures on repeated feedback learning originating from continuous trial-and-error knowledge production processes in traditional communities (Berkes et al., 2000; Berkes, 2015).

2.7 Local Ecological Knowledge (LEK)

During the past two decades, the global fisheries resources have been declining significantly. Even though modern science has been doing significant effort to collect data and devise management plans that aim in resource management sustainability, still the resources are degrading. As the resource growth rates plunge further into the negative scale, scientists have started to look for alternative solutions. Fisheries have been a major food source and employment sector since thousands of years ago. Yet the fish stocks have never before experienced such drastic changes before. In many cases around the world, the same stocks have been targeted by the same people for generations, and they were still able to support the coastal fishing populations. As the fact that the stocks targeted by generations of local artisanal fishermen have been largely stable became evident, modern scientists begun to research further the possibilities that arose through the utilization of traditional fishing methods.

The knowledge, fishing methods and tools that have been passed down from generation to generation and have been accumulated over the ages forms the so-called *Local Ecological Knowledge*. Fishing methods that have proven successful through years of trial and error, fishing spots that have traditionally yielded important catches, an understanding of the ecosystem processes through lifetimes of observation, the knowledge of human activities that constitute drivers of change, both positive and negative, for the local habitats and the needs of the local social-ecological system in order to flourish, are all part of the body of knowledge that comprises the body of LEK. LEK cannot be perceived as a mere accumulation of observations and facts, but it is rather a continuously evolving body of knowledge, built through human interaction with the environment, that has the capacity to adapt according to the changes in the ecosystem and the society (Berkes et al., 2000). It is evident thus, that multigenerational LEK constitutes a cost-effective means to develop a deeper understanding of the targeted resources (Berkes, 2015).

LEK has been utilised by the scientific community for several purposes. Among these, species population and ecology is possibly the most common. The majority of the studies on this topic focus on present and past abundance, spatial distribution and migratory movements. Usually, the species under examination are flagship animals or stocks of significant commercial or cultural value, i.e. marine mammals, endangered marine species, and stocks of high commercial value. More specifically, whale stock abundance and spatial distribution according to LEK, can be found in Carter and Nielsen (2011), Huntington and The Communities of Buckland (1999), and Mymrin et al. (1999) (beluga whales), as well as in Noongwook et al. (2007) (Bowhead whales). Current condition and abundance of flagship animals can be found in Dowsley and Wenzel (2008), Keith et al. (2005) and Lemelin et al. (2010) (polar bears), as well as Moore (2003) (seals), Sousa et al. (2013) (manatees), Johannes and MacFarlane (1991) and Rajamani and Marsh (2010) (dugongs). However, the vast majority of LEK literature focuses on species with high fishing and commercial value. For example, some of the traditionally targeted species that draw both local and scientific attention include cod (Ames, 2007; Gosse et al., 2003; Murray et al., 2008; Rosenberg et al., 2005), goliath grouper (Aguilar-Perera et al., 2009; Cavaleri Gerhandinger et al., 2006; Cavaleri Gerhandinger et al., 2009), herring (Jones, 2007; Thornton et al., 2010), tuna (Moreno et al., 2007; Venkatachalam et al., 2010) and crustaceans (Eddy et al., 2010; Olsson and Folke, 2001). Despite the fact that most studies have a single-species focus, there are studies that follow a more inclusive approach, either by exploring the locally targeted fish stocks as whole, or by examining the health of the

target habitat. Examples of the former can be found in various researchers with a geographical focus, such as in Bender et al. (2014) and Silvano et al. (2006) (Brazil), Knutsen et al. (2010) (Norway), Lavides et al. (2009) (Philippines), Boomhower et al. (2007) (Venezuela) and Vlachopoulou et al. (2013) (Greece).

Despite the popularity of LEK as an information source for a vast amount of studies, there is still a gap between LEK and science. The integration of LEK as a trustworthy source of data and the consequent use of traditional management methods as an alternative to industrialized tools have yet to become the norm. Only sporadically is LEK considered an equivalent to scientific knowledge, mostly in cases of data-poor fisheries, despite the fact that several studies have revealed the advantages of taking LEK aboard the management boat. Especially in countries with a state-centred management regime, as in most countries of the global North, this disconnection between local knowledge and science-based management is all the more evident, as they tend to favour industrialized mass fisheries over fishing traditions (Fernandez-Gimenez et al., 2006). Nevertheless, deploying an array of knowledge sources, including LEK, is a one-way street to achieve sustainability in fisheries management (Berkes, 2015). Fisheries management based on the internal knowledge of the local artisanal communities, which operate with traditional techniques and tools, is considered the key to sustainability and protection of the marine and coastal ecosystems around the globe (Neis, 1995; Sumaila et al., 2000; Nellemann and Corcoran, 2006; UNEP-WCMC, 2006).

2.8 Collaboration, participation, and collective action

Implementing and utilising co-management tools, however, is not an easy task. It requires wide collaboration among actors and a local driver for collective action. Fisheries co-management constructs new social roles and thus, social work is a prerequisite (Jentoft, 2005). At both individual and the collective level, empowerment must occur; capacity building, participatory democracy, and institutional design -institutional mechanisms that enable user groups and stakeholders to affect the management, in general participation in the decision-making process- are vital for the sustainability of co-management. Institutional mechanisms that enable user groups and stakeholders to affect the management, Adequate organisation and empowerment of a community coupled with a co-management approach create a feedback cycle, as co-management promotes empowerment, and in its turn, empowerment promotes co-management (Jentoft, 2005; Pomeroy and Kuperan Viswanathan, 2003).

It is noteworthy that participation of a variety of local stakeholders has the potential to improve significantly the legitimacy of management. As a result, investments in the relationships governing the decision-making process have great potential in adding value to the targeted fisheries by developing sustainable resource management techniques, easily acceptable by the fishers (Isham, 2000; WorldFish Center, 2007). Social structures affect three important parameters of the development of sustainable fisheries: information sharing, transaction costs and effectiveness of collective action (Cheong, 2004; Isham, 2000). Increasing social capital in fisheries management affects positively the community income in many ways, both directly and indirectly. More specifically, it increases natural capital through sustainable use of the common resource, increasing thus the income of the fishing households and allowing for more households to enter the market (Cheong, 2004; Isham, 2000; Islam and Dickson, 2007; WorldFish Center, 2007).

By establishing local partnerships and developing social capital, local communities are enabled to subserve their collective interests and attract attention from the national level (Tsobanoglou, 2008; Wilkinson and Pickett, 2009). The basic principle of the *Third Sector*, namely the Social Economy, in which local partnerships belong, is not the maximisation of profits; instead, it is based on local growth and development (Tsobanoglou, 2008). The Third System functions differ significantly from those both of the public and the private sectors as it encompasses elements of the two, as well as introducing the idea of volunteering. Most importantly, it is structured upon relations of networking and also provides the interacting parts with the benefits of immediate interplay, creating thus working relationships of trust (Tsobanoglou, 2008; Wilkinson and Pickett, 2009). The services that derive from such a system are characterised by high quality and large variety (Roustang, 1987; Tsobanoglou, 2008). In addition, the Third System enhances local employment and affects private consumption by promoting local produce and services, highlighting the economic benefits a local community may gain from this kind of approach (Tsobanoglou, 2008).

However, a community cannot achieve the goal of complete self-organisation and self-regulation by itself. Intervention and regulation from the state is necessary, as the state itself should form the supporting pillar for the creation of the Third Sector (Tsobanoglou, 2013). Additionally, complete localisation of the production of both material products and services is virtually impossible, in order to reach sustainability. Interaction with multinational enterprises is deemed vital for the development of entrepreneurship within a local community; such interactions may result in spill-overs of knowledge and technology. Contribution from various

agents, such as the state, multinational enterprises, NGOs and local communities, is pivotal for the planning and realisation of growth policies and investment plans, otherwise there will be obvious underdevelopment of rural areas (Tsobanoglou, 2008; Tsobanoglou, 2013).

2.9 Social capital in small-scale fishing communities

Multiple researches have shown that social capital plays a major role in the well-being of small-scale fishing communities [see for example: Grafton (2005) and Gutiérrez et al. (2011)]. In the term *social capital*, all the "collective processes needed to effect positive change" (Wiber et al., 2009) (p. 173) are included. The notion of social capital is complicated and has not been put down yet; there are several definitions, each of which focuses on a different aspect of social capital (Adam and Roncevic, 2003). This study relies mostly on the perception of social capital as the outcome of the totality of the networks, norms, values, and trust developed through interaction of actors within the civil society. The relevant definition by OECD states that social capital is made of "networks together with shared norms, values and understandings that facilitate co-operation within or among groups" (Keeley, 2007) (p. 103) and has been based on Robert Putnam's (1993) narrative which focuses on social capital as a means to promote co-operation between not only individuals, but also groups of actors. This view of social capital differs from Pierre Bourdieu's (1986) setting where social capital inherently facilitates inequality because it relies on the idea of maintaining social class; as well as from James Coleman's (1988) interpretation of the same phenomenon as a neutral resource, the outcomes of which depend on its use. Putnam on the other hand, perceives social capital as a positive force, necessary for the promotion and maintenance of democracy as it is based on reciprocity and trust (Putnam, 1993); and he thinks that overall, social capital is declining (Putnam, 2000). This interpretation of social capital is further supported by Francis Fukuyama (1995; 2001), who believes that successful development requires social capital; and in order to build social capital, solid legislation and the existence of political institutions are necessary.

The links between the fisheries stakeholders are the driving force behind the small-scale fisheries economies. It is exactly these links, which constitute the social capital of the SSF communities though, and more specifically the inherently contained *trust*, that enables the community members to function. According to Pretty and Ward (2001), trust plays an important role in assisting actors to predict others' behaviours, which in turn reduces information costs as well as deviant behaviours. Therefore trust is a cornerstone in building a framework with effective rule enforcement and monitoring. In this context, a spirit of

reciprocity, or the exchange of favours, is established, creating a feedback circle; reciprocity strengthens trust and trust requires reciprocity. Networks and norms are the natural outcome of such an arrangement (Bennett and Clerveaux, 2003).

Social capital derives from collective action and fosters cooperation and compliance, internalising externalities and promoting efficiency (Bennett and Clerveaux, 2003). In the case that interaction between actors is prolonged and repeated, then cooperation is more likely to occur (Molinas, 1998). Consequently, SSF communities, which oftentimes consist of a relatively small number of individuals or families, resident in the same location for generations, are a prime environment for the development of cooperation and social capital (Bennett and Clerveaux, 2003). The development of social capital has in turn, the potential of promoting social cohesion, leading thus to community capacity building (Jentoft, 2005; Pateman, 1970; Pomeroy and Kuperan Viswanathan, 2003; Tsobanoglou, 2008; Tsobanoglou, 2013).

Social capital in fisheries communities worldwide, however, has been declining, with social institutions, norms, and organisations collapsing due to a continuous decrease in fish stocks and a similarly continuous increase in fisheries regulation (Isham, 2000).

2.10 Summary

In this chapter, the definition of the fishery was presented, with special focus on small-scale fisheries, the central focus of this study. Furthermore, the connection of fisheries with employment was analysed, offering a deeper understanding of the importance of fisheries for the coastal communities and the society in general. Consequently, challenges for the viability of fish stocks were described, in particular overfishing, along with an introduction to mainstream fisheries management approaches under the common property resource lens that led to an explanation of the issues of self-regulation and co-management. A central point of co-management is the use of Local Ecological Knowledge, which was explained in length, along with collaboration, participation, and collective action, all of which are factors in the construction of social capital, especially in the case of small-scale fisheries. Overall, this chapter presented the fundamental literature on issues that constitute focal points in the process of achieving sustainable fisheries management, opening the way for the presentation of the general institutional frameworks of the countries were the case studies of this research are located.

Chapter 3

Japan

3.1 Overview of Japan

3.1.1 Geography, demographics, and environmental conditions

Japan is a mountainous insular country, characterised by high volcanic activity, composed by Hokkaido, Honshu, Kyushu, and Shikoku islands, as well as the Ryukyu (Okinawa) Island Complex, and washed by the Sea of Japan, the Sea of Okhotsk, the north-western Pacific Ocean, the Philippine Sea and the East China Sea (fig. 3-1) (Popescu and Ogushi, 2013). It constitutes the 60th largest country in the world, the 6852 islands that make up its territory covering a little less than 378000km^2 (Makino, 2011), with a population of over 125million (Popescu and Ogushi, 2013). It is located in the northern hemisphere, the majority of its territory belonging to the temperate zone, experiencing four seasons per year and high precipitation and humidity (Yamamoto, 2004a). Approximately two thirds of the Japanese territory are covered by mountains, allowing for limited space availability for human activity such as housing, agriculture, and industrial production (Yamamoto, 2004a).

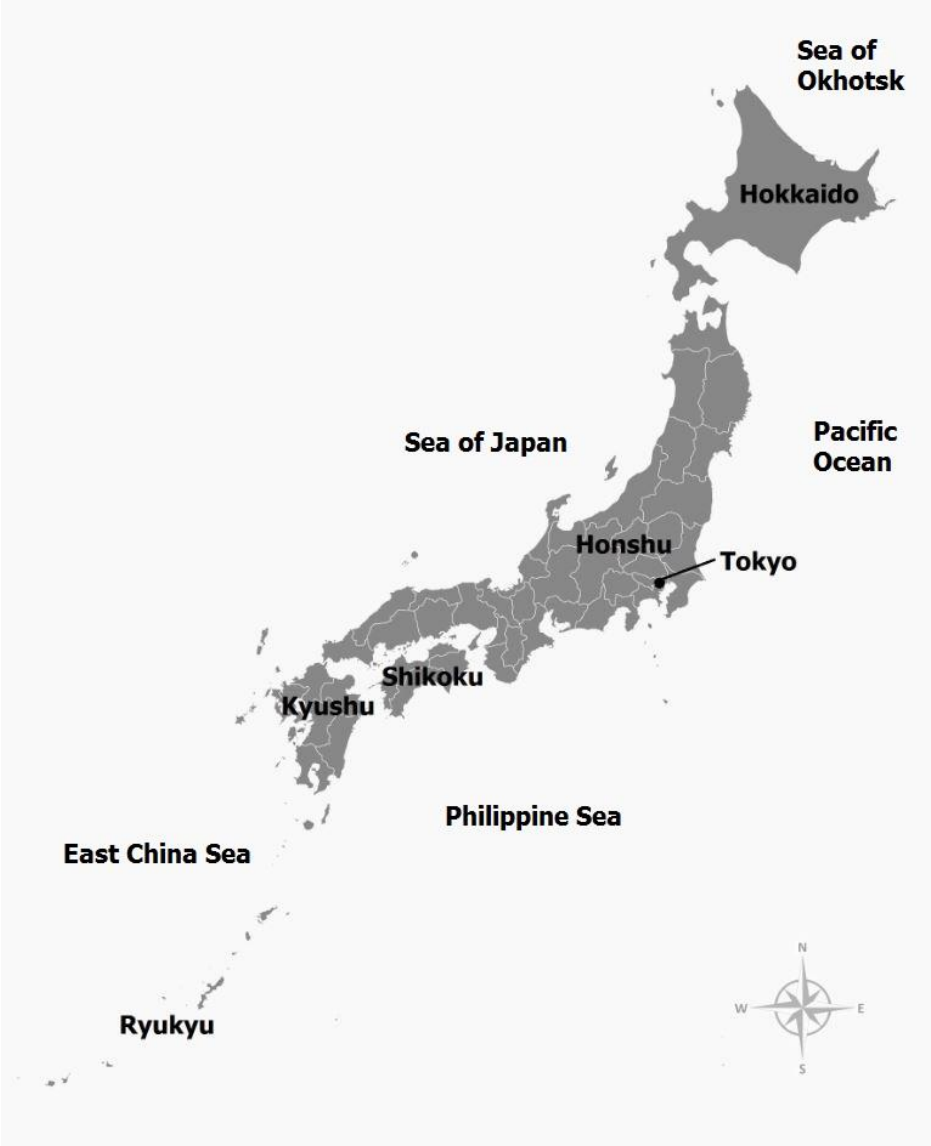


Figure 3-1: Map of Japan.

Due to the high volcanic activity, many earthquakes and tsunamis occur within the Japanese territory, causing major damages to human property and often resulting in the loss of human lives (Yamamoto, 2004a). Only 4.9% of the area is flat, and most of it is located along the 29751km long coastline. The Japanese Exclusive Economic Zone (EEZ) -200 nautical miles from the coast- covers 4050000km^2 (about 11 times the size of the land area) and is ranked as the 6th largest in world, while the territorial waters cover 430000km^2 (fig. 3-2). The archipelago extends for over 3000km and because of its north to south orientation, it covers a range of climatic zones, from subarctic to temperate and subtropical. Several warm and cold currents flow along the coastline -with Kuroshio and Tsushima being the most important warm ones, and Oyashio and Liman the largest cold ones-, which support a very rich marine biodiversity with a wide array of

commercial species (Makino, 2011; Ocean Policy Research Foundation, 2004; Popescu and Ogushi, 2013; Yamamoto, 2004a).

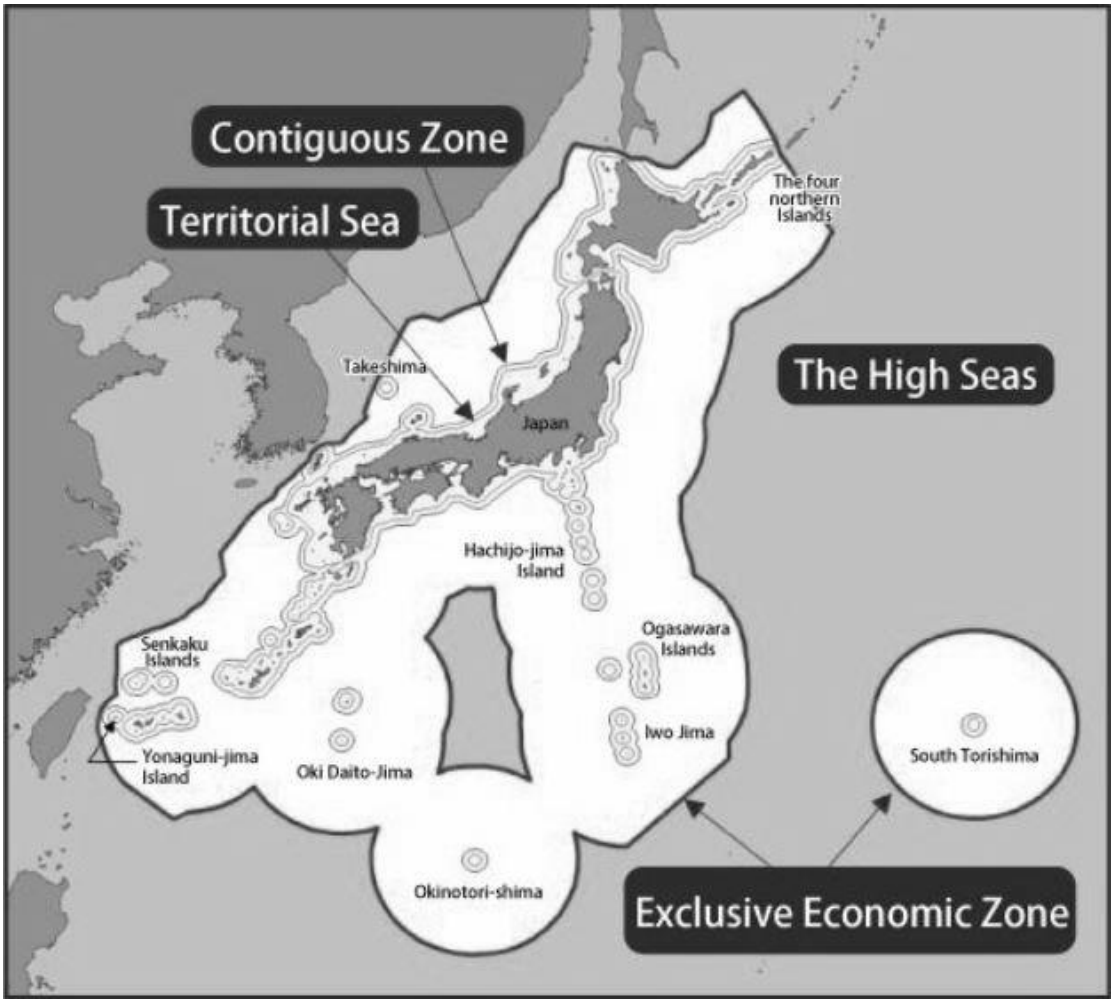


Figure 3-2: Jurisdictional waters of Japan.
Source: Popescu and Ogushi (2013).

The population of Japan is over 125million and 75% live in the metropolitan areas of the largest cities (Tokyo/Yokohama, Nagoya, Osaka/Kobe, Hiroshima and Fukuoka); an average population density of 343 inhabitants/km^2 makes Japan one of the most densely populated countries in the world (Popescu and Ogushi, 2013; Wilhelm and Makino, 2004). Japan is a highly homogenous country with 98.5% of the population being of Japanese nationality (0.5% are Koreans, 0.4% Chinese and the rest other nationalities), and the major religions are Shintoism (79.2% of the population) and Buddhism (66.8% of the population) – a large proportion of the population are followers of both religions. The aging population (26.59% are 65 years of age or older, with average life expectancy of 84.74 years) exhibits a negative growth rate of -0.16%,

causing concerns about the employment future of the nation, even though the current unemployment rate is 6.9% (Central Intelligence Agency, 2016).

3.1.2 Political and economic background

Japan is a parliamentary constitutional monarchy, with the Emperor (current emperor Akihito since 1989) as the head of state and highest legislative body the Parliament (in Japanese *kokkai*), divided into upper and lower house, with 242 and 480 seats respectively (Central Intelligence Agency, 2016; Popescu and Ogushi, 2013). The government has pursued close cooperation with the industrial sector over a span of 70 years, and coupled with a strong work ethic, high technology, and a minimal defence allocation of 1% of the GDP, the Japanese economy has advanced significantly, achieving in 2015 a GDP of US$4.658trillion (Central Intelligence Agency, 2016). The limited mineral resources of the country have now been almost fully exploited and Japan is dependent on imported raw materials, especially fossil fuels, as in 2011, after the devastating East Japan Earthquake and tsunami all the nuclear reactors have been shut down[7] (Central Intelligence Agency, 2016; Yamamoto, 2004a). Additionally, necessary imports are not limited to mineral resources, but the Japanese state has to import also food for human consumption, with rice being the only surplus product produced (Yamamoto, 2004a).

From the 1960s until the 1980s, Japan exhibited remarkable economic growth, which has slowed down since the 1990s after the end of the *bubble economy*[8] in the late 1980s. Since 2008, the Japanese economy has fallen into recession four times, and the government increased expenditure every time in order to stimulate the market. However, the Great East Japan Earthquake and tsunami plagued the country, disrupting the fragile balance of the economy. Even though Japan has largely recovered from the aftermath of the catastrophe, the wider Fukushima area that was most affected is still suffering. In 2013, the newly elected Prime Minister Shinzo Abe attempted a turn in the traditional form of the Japanese economy, aiming at a more open and flexible arrangement. Two nuclear reactors were restarted and in 2015, Japan took a step towards a more open and competitive economy, seeking new export opportunities by signing the Trans-Pacific Partnership (Central Intelligence Agency, 2016).

From a purchasing power parity point of view, Japan is the fourth largest economy in the world (as of 2015). However, the large government debt (over 230% of GDP) is still and issue that

[7] The Sendai nuclear reactor, located on Kyushu Island, Kagoshima Prefecture, is the only nuclear reactor nationwide that went back in operation after the 2011 East Japan Earthquake. In April 2016, the Kumamoto Earthquake occurred 72 miles away from the reactor, but, despite strong pressure from the public, the Sendai nuclear reactor stayed operational. (Source: The Telegraph, 18 April 2016)

[8] In the late 1980s, the real estate and stock market prices in Japan were very inflated, forming an economic bubble which burst in the early 1990s.

has to be answered. Moving towards that direction, the Japanese government has been slowly attempting a tax rate increase, with an initial goal to reach 10% by 2015. Due to adverse impact on the GDP, however, the increase has frozen at the current 8% (from 5% prior to 2014) until 2017. Furthermore, the significant demographic decline due to aging population and low birth rate are posing further obstacles for the Japanese economy (Central Intelligence Agency, 2016).

3.1.3 Japanese food culture, fish and seafood

The infamous Japanese food culture, stemming from the core ideas of Zen and Shinto as expressed by Dougen, who introduced Zen into Japan, and Motoori Norinaga, major Shinto thinker, has always been a part of Japanese cultural life, connecting the human realm with the deities and enabling the achievement of enlightenment through the appreciation of the simplicity and completeness of Japanese food (Ashkenazi and Jacob, 2000). The traditional Japanese cuisine included hardly any meat or dairy products until the mid-19th century, as the killing and consumption of terrestrial animals was considered impure and had been banned by Emperor Tenmu in 676AD (Kumakura, 2010; Otsuka, 1996). It was only during the Meiji era (1868-1912) that meat consumption, especially beef, was incorporated in the Japanese diet and became popular (Gadda and Gasparatos, 2009).

As a paradigm shift in the Japanese eating habits is evident throughout the country, the people are increasing their consumption of meat (Gadda and Gasparatos, 2009). Although fish still accounts for the majority of the national animal protein intake, Japanese consumers have a nowadays a significant positive pre-committed demand for both fish and beef that is relatively inflexible to price and income adjustments (Tonsor and Marsh, 2007). However, meat functions as a substitute product for fish, and as its increase in popularity has accelerated abruptly recently, especially in urban areas, it has been pushing demand for fisheries products downwards, and affecting negatively the prices of fisheries products, further inhibiting thus the income levels of fisheries communities like Rausu. The effect of the decrease in prices became evident during the interviews, as the vast majority of the participants expressed growing concern about the future of the fishing industry if this declining trend continues.

Nonetheless, fish eating habits are an inherent part of Japanese tradition; per capita seafood consumption in 2008 was 61.5kg, indicating a vast preference towards fisheries products by Japanese people as part of their food culture (Makino, 2011; Makino and Matsuda, 2011) (table 3-1).

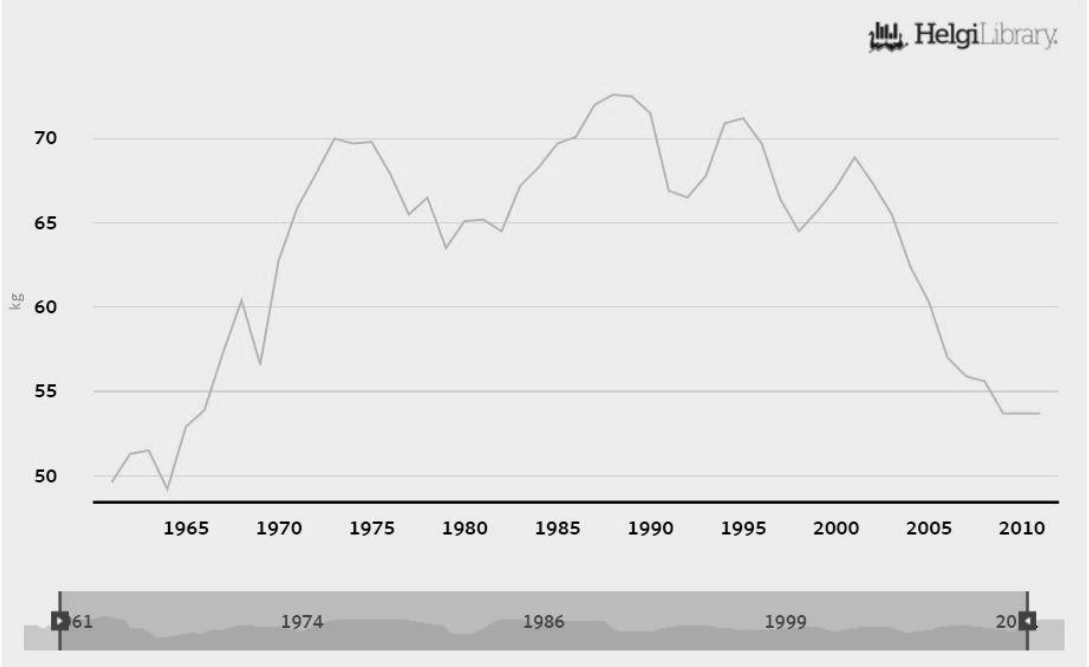


Table 3-1: Fish consumption per capita in Japan in kg. Source: Helgi Library (2016).

An array of cooking methods are deployed in order to increase satisfaction from consumption of fishery products. The most common methods to prepare and serve fish are raw fish (*sashimi*), grilled (*yakizakana*), boiled (*nizakana*), dried (*himono*), and deep-fried (*tempura*) (Makino, 2011). Each cooking method utilises different species and requires different qualities. For example, in the preparation of *sashimi*, which constitutes one of the most high-praised preparation methods in Japan, the freshness of the fish is pivotal. As a result, high-grade, extremely fresh fish are reserved for *sashimi*, rather than other types of preparation. There are also special tools used exclusively for each preparation method, like particular kitchen knives for the careful preparation of raw fish for *sashimi* or *sushi* (rice with vinegar, topped with raw fish, shellfish, or other fishery product) (Kumakura, 2010).

Finally, there are also connections between traditional celebrations in Japan and the consumption of certain seafood. For example on the Day of the Ox (*Ushi-no-hi*), a summer celebration without a set day, the traditional meal consists of eel. The reason behind this arrangement is that on the Day of the Ox people should consume food that starts from the same syllabic as the Japanese word for 'ox' (*ushi*). As eel in Japanese is called *unagi*, the dish has become a popular delicacy for the aforementioned celebration.

3.2 State of Asia-Pacific fisheries

The Asia-Pacific region is one of the most important areas for fish production globally. The local capture fisheries production reached an approximate 48.7million tonnes in 2010, over half the global production, with an estimated value of US$48.3billion (Abbey, 2014). 7 out of the 10 largest capture fisheries producers globally are operating in the region.

In the Northwest Pacific, China, Japan, Russia, and South Korea are the major competitors for a range of commercial capture fisheries, and every year, the total production of the region increases (table 3-2).

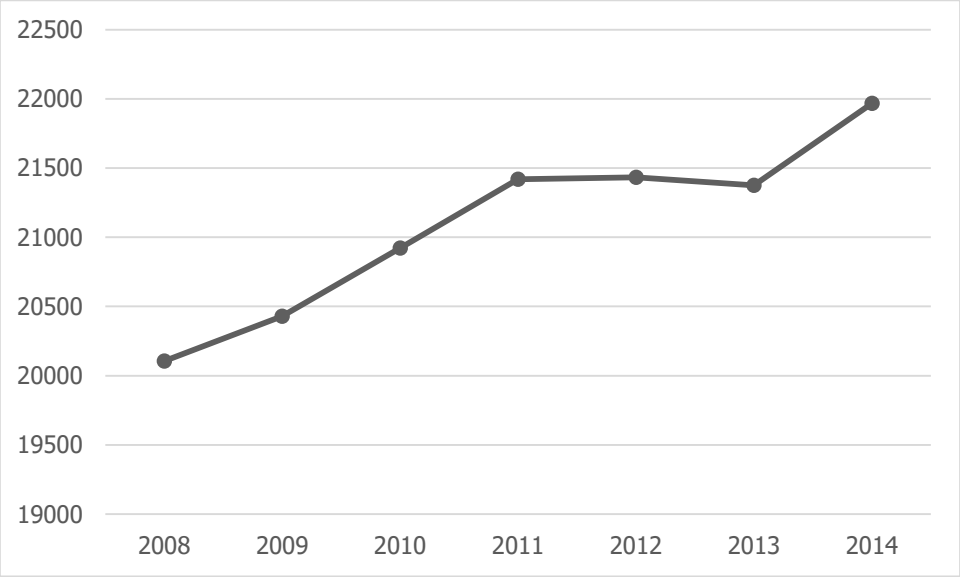


Table 3-2: Capture fisheries production in the Northwest Pacific in thousand tonnes. Adapted from FAO (2014b).

In 2007, Japan was the second major importer of fishery products (after China), with US$13.2billion worth of imports, mostly from China (US$3billion) and US$1.7billion worth of exports. Increasing popularity of Japanese cuisine and progressing economic growth in the Asia-Pacific region have been pushing exports of Japanese fisheries products upwards, with major commodities being pearls, salmon, mackerel, sea cucumber, walleye pollock and scallop (FAO, 2009a).

3.3 State of Japanese fisheries

Japan is one of the leading countries in terms of both production and imports of fishery products globally (Popescu and Ogushi, 2013). Fisheries represent 0.2% of the national GDP and in 2007, 66.7million Japanese people were employed in the sector, 4.2% of whom were in the primary industry and 87% of the total fishers (186000 people) are coastal fishers, operating in over 5000

small fishing communities (Makino, 2011). The economic structure of the Japanese marine fisheries forms a pyramidal shape; a large amount of small-scale fishing households form the bottom of the pyramid a few large-scale enterprises form the top (Yamamoto, 2004b).

Fisheries play a central role in Japanese food security and contribute significantly to the local economies. Their wide distribution contributes also to the preservation of the local traditions and culture related to the sea and its products, ranging from festivals and fish-based local cuisine to religious rituals and customs (FAO, 2009a). Quite often, important processes for the fishing industry are connected to cultural events. For example, in many locations sectoral fishing rights are decided by lottery which takes place during specific festivals (*matsuri*). Another example would be the relationship between religious rituals and institutional needs for the adequate management of the resource. More specifically, the *opening of the season*, namely the end of the annual seasonal closure, is often announced with a cleansing ritual, connecting thus the institution (seasonal closure) with religion (cleansing ritual) and increasing conformation with the rules (Wilhelm and Makino, 2004).

Despite its importance, employment in the fishing sector, especially the small-scale one, has been exhibiting continuous decline; in 1953, the people occupied in the industry were 4 times those of 2007 (Makino, 2011). Multiple factors have played a role in this significant reduction, with climate change, overexploitation of fisheries stocks, and aging of the fishers being probably the most prominent (Kaeriyama, 2008; Kishi et al., 2010; Murota, 2013). Thus, because of this lack of economic diversity, it has become increasingly difficult for the resilience of such coastal communities to be maintained in the long term (Berkes, 2015).

3.3.1 Environmental characteristics of Japanese fisheries

Apart from the general issues, such as overfishing, that the coastal communities are faced with, they also have to overcome several additional handicaps, the most important being the remoteness of their locations. Such peripheral communities suffer from permanent and severe isolation, limiting the employment choices and opportunities to activities directly related to the local natural environment [see for example: Henderson et al. (2001)]. Japanese fishing communities in particular have been experiencing economic decline much harsher than urban centres, as the national government has been promoting industrialisation and urbanisation policies since the 1960s (Fujita and Tabuchi, 1997). Furthermore, a gradual shift towards decentralisation has deprived the local communities from important governmental funds, forcing them to turn to local initiatives to sustain their economies (Shikida et al., 2010). As a result, it is difficult to establish new activities

that could be necessary for the survival of the coastal communities by providing the community members with additional income and opportunities for development.

Furthermore, the geographical location of Japan plays a significant role in the way its fisheries are been handled. Japan is an insular country, surrounded by highly productive seas, and its fishing sector has, consequently, a large advantage in terms of production. At the same time, however, there is significant competition for the same resources. The neighbouring countries, almost all of which are major capture fisheries producers, compete with Japanese fishers over the stocks surrounding the insular country. In the North, Russian fishers use the resources of the Sea of Okhotsk; in the West, China and South Korea venture into the Sea of Japan and the East China Sea (fig. 3-1). This type of competition even leads to tensions between the states, as in the case of the fish stocks off the South Kuril Islands (see section 5.4.1).

Similarly to the global situation, Japanese fisheries also face changes related to climate change, especially water temperature rise. Along the Japanese coastline, fish species has been observed to move northward seeking colder environments, as water temperature rises, causing a shift in species distribution.

3.3.2 Socio-economic characteristics of Japanese fisheries

The Japanese fisheries system is one of the oldest and best-established fishery co-management regimes (Grafton, 2005). Since the 8th century AD, the focal point of Japanese fisheries management was localisation; the resource users were the primary actors in the management (Makino and Matsuda, 2011). Communal fishery management was institutionalised during the Yedo period (1603-1867) and fishing was reserved exclusively for local coastal fishers [Ishii (1939) as cited in Murota (2013)].

The whole system changed rapidly after the Meiji Restoration until World War II (WWII), with the adoption of extensive regulation, as well as the establishment of fisheries institutions. These institutions included the introduction of a centralised fishing license system after the nationalisation of the seas of Japan in 1875, which aimed to resolve the conflict between small-scale fisheries and the newly introduced mechanised trawlers (Yamamoto, 2001), to the establishment of the Bureau of Fisheries within the Ministry of Agriculture and Commerce in 1885 (Makino, 2011). In addition, a significant amount of legislation was also introduced during that period, with the most significant the Fishermen's Union Regulation (1886) and the Meiji Fishery Law (1901) (Japan International Fisheries Research Society, 2004; Yamamoto, 1995) (table 3-3).

However, in 1945, Japan lost the WWII and was consequently occupied by the Allied Forces. The Western occupation again radically changed the Japanese circumstances, including the

fisheries system (Japan International Fisheries Research Society, 2004). One of the most significant developments was the adoption of the Fisheries Cooperative Associations Law in 1948, under which the structure of the fishing communities' workforce was finally institutionalised (Yamamoto, 1995). Furthermore, in 1949, the new Fisheries Law was introduced, replacing the Meiji Fisheries Law that was in effect until that time. Nonetheless, the Fishery Law of 1949 focused on a more democratic arrangement of the fisheries system, and maintained the concept of the limited entry regime, albeit in a more inclusive framework, where the members of the Fisheries Cooperative Associations (FCAs) play a more active role in the allocation of the fishing rights (Makino, 2011). The Fishery Law of 1949 is still in effect until today.

1868	Meiji Restoration
1875	Nationalisation of the seas of Japan
	Introduction of centralised fishing license system
1885	Establishment of the Bureau of Fisheries within the Ministry of Agriculture and Commerce
1886	Introduction of the Fishermen's Union Regulation
1901	Introduction of the Meiji Fishery Law
1910	Amendment of the Meiji Fishery Law
1945	Japan loses WWII and is occupied by the Allied Powers
1948	Introduction of the Fisheries Cooperative Associations Law
1949	Introduction of the Fisheries Law
1951	Introduction of the Fisheries Protection Law
1952	Restoration of sovereignty
1962	Establishment of Marine Park System
1971	Introduction of the Marine Fisheries Resource Development Promotion Law
1990	Establishment of the Exclusive Economic Zone
1996	Introduction of the Law concerning the Conservation and Management of Marine Life Resources
1997	Introduction of the Total Allowable Catch (TAC) system
2001	Introduction of the Basic Law on Fisheries Policy
	Establishment of Wide-Area Fisheries Coordinating Committees
2007	Introduction of the Ocean Basic Act

Table 3-3: Historical overview of Japanese fisheries. See Appendix II.

The economic structure of the Japanese fisheries at the household level is one of the major drivers behind the evolution of national fishery system. The Japanese fisheries are exhibit the so-called *dual structure of a fishery*. Fishers originally operated on an own account basis. As soon as they have accumulated enough capital to invest in a larger fishing vessel, they seek additional labour, and they become enterprises. The new employee (also a fisher) becomes a fish labourer. In this

process, the fishery households undergo the process of *differentiation*[9]. In contrast with the West, fishers who operate on their own are quite common in Japan, as is in Asia in general. The fishers who operate on their own constitute small-scale fisheries, while the enterprises are industrial ones (Yamamoto, 2004b).

The current fisheries management regime in Japan, is based upon decentralisation and participation of fishermen in the decision-making process, enforcement and monitoring (fig. 3-3). Major fishing villages have their own FCAs and membership in the FCA is obligatory to anyone who intends to fish in the coastal areas, as the FCAs hold strong priority on the fishing rights for the area under their jurisdiction (Japan International Fisheries Research Society, 2004; Makino, 2011; Wilhelm and Makino, 2004). The members of the FCAs establish the majority of fishing regulations in their jurisdictional area and they enforce and implement their regulations. Virtually every fisher is member of an FCA, mostly because otherwise they would not be allowed to engage in fishing activity (Makino et al., 2004). This arrangement originates from the nature of the Japanese rights for resource use; the most common type of right for resource use is a right of common use (*iriai*) (Lim et al., 1995), which means that people are not allowed to own the resource by themselves but they can use it cooperatively. This type of right differs from co-ownership, as the *iriai* is only effective if someone lives in the area of the resource. If they move out of the area of the resource, access to the right of common use is lost (Yanagi, 2013).

Nonetheless, the FCAs are responsible for the adoption of adequate management measures, and in order to do so, they require scientific input. Thus, research institutions provide them with scientific information and conduct constant evaluations of the stock levels of major resources and the marine environment state. Furthermore, the FCAs are part of a complex decision-making system that spreads from the very local level to national governance. At the prefectural level, elected members of the FCAs comprise the Area Fisheries Coordinating Committees (AFCCs), which operate as consulting bodies to the prefectural government (Japan International Fisheries Research Society, 2004). The AFCCs also elect members that compose the Wide-Area Fisheries Coordinating Committees (WFCCs) which advise the central government on the coordination of resource use and the management of highly migratory species (Makino and Matsuda, 2005) (fig. 3-3).

[9] *Differentiation* in the labour market occurs when self-employed professionals (in this case fishers) become enterprises (by investing in infrastructure – in this case large fishing vessels) and at the same time, other professionals of the same occupation (previously self-employed) become employees of the newly founded enterprises.

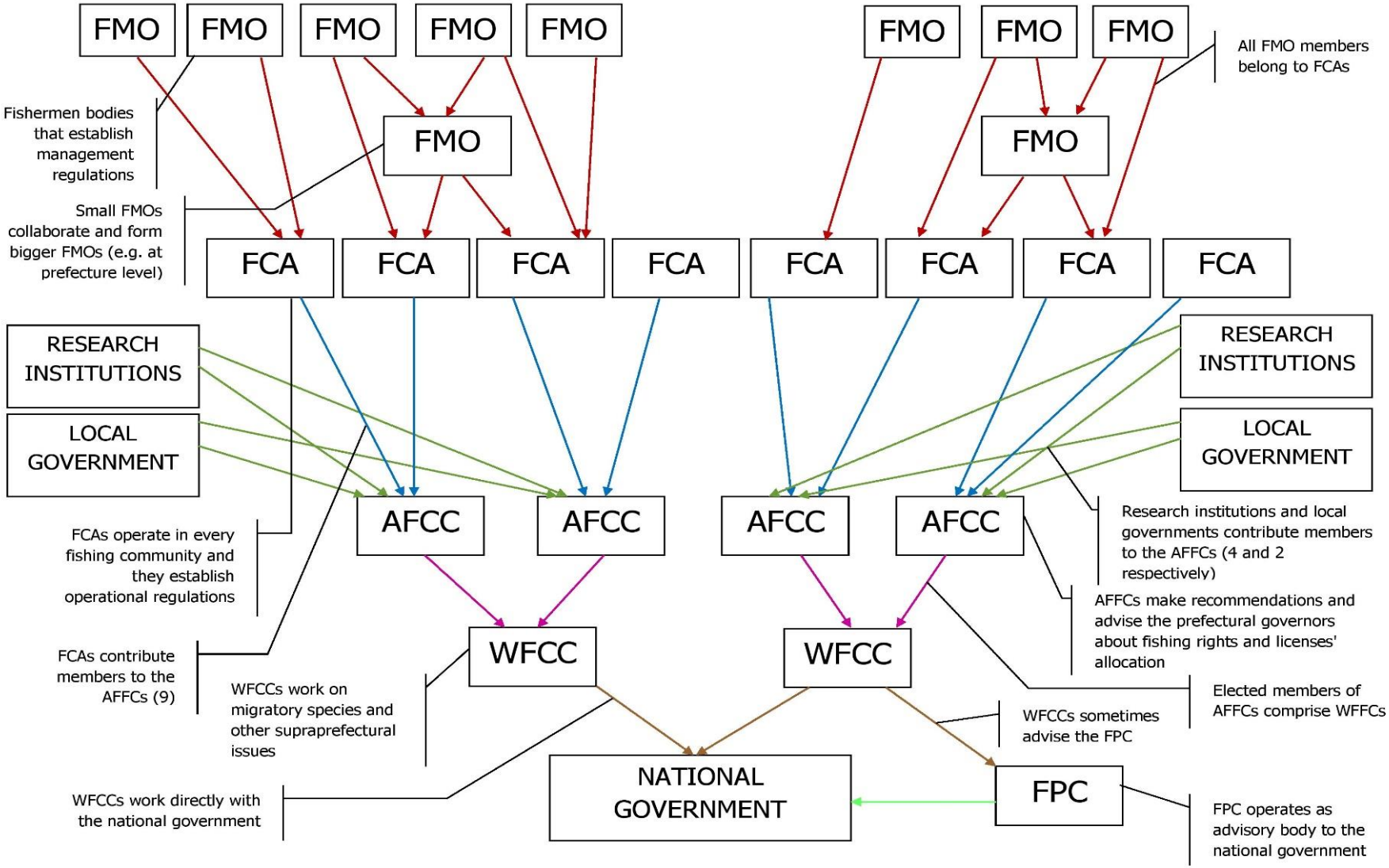


Figure 3-3: Fisheries management coordination in Japan.
Produced by Eirini Ioanna Vlachopoulou, 2015.

Apart from the production of regulations, the FCAs have several of other functions. According to the FCA Law (Article 11), FCAs may engage in various economic activities, such as fish marketing, granting credit, issuing insurance, supplying products, ice-making, processing, running cold storage, and guidance, as well as in non-economic activities such as lobbying, environmental protection, member education, consultation and resource management (Japan International Fisheries Research Society, 2004). In addition, a group of local fishermen (usually within the same FCA) may also form an autonomous Fisheries Management Organisation (FMO) to implement specific measures against the overexploitation or degradation of the marine environment (Japan International Fisheries Research Society, 2004; Makino, 2011) (fig. 3-3). The development of an FMO is consistent with the Japanese notion of *fisheries resource management* (*Shigen Kanrigata Gyogyo*) and reflects that in Japanese fisheries management, the fishermen are the main actors and the main decision-makers (Makino, 2010).

As the fishing right (right of common fishery or common-of-piscary right) is authorised to each FCA every five years, it forms a collective right of the Association members. As such, the fishing right also forms a *de facto* right of every individual member. Along with the right, the FCA members also shoulder significant responsibilities towards the conservation of the fish stocks and the marine environment (Japan International Fisheries Research Society, 2004). In order to fulfil their responsibilities, each association holds regular meetings of its members, during which they set their regulations and make important decisions. The most significant operational characteristic of the FCAs is the prevailing emphasis on consensus-based or deliberative democracy among members. Decisions are often required to be unanimous in order to be adopted, especially for issues considered of vital importance (Murota, 2013). By seeking consensus through the unanimity of the vote, the FCAs also minimise the risk of future conflicts.

In Japan, the participation of fishermen in the decision-making process as well as the enforcement and realisation of conservation plans is being researched. The traditional concept of *Satoyama*, dating back to the 17th century AD, which illustrates the notion of "landscapes as a dynamic mosaic of managed socio-ecological systems producing a bundle of ecosystem services for human well-being" (Japan Satoyama Satoumi Assessment, 2010) (p. 13) has been adjusted for marine and coastal ecosystems, forming the *satoumi* framework. The main difference between satoyama and satoumi stems in the type of landscape; satoyama puts emphasis more on the terrestrial aspect, even though it includes some aquatic ecosystems (e.g. canals), while satoumi focuses on aquatic/marine ecosystems – *landscapes* versus *seascapes*. According to Matsuda (2010), the satoumi are "coastal landscapes that have been formed and maintained by prolonged interaction between humans and

ecosystems". The key concept in the satoumi framework is the interaction between human activity and ecosystem management (United Nations University Institute of Advanced Studies Operating Unit Ishikawa/Kanazawa, 2011). Prolonged human activity within the coastal ecosystems irrevocably results in higher biodiversity and productivity. In this narrative, the notion that if the relationship between human activity and ecosystems is properly managed, then the relationship is mutually beneficial, is the focal point and affects significantly national policy-making (Japan Satoyama Satoumi Assessment, 2010).

The satoumi framework has strong ties with traditional management methods and LEK, embracing generations-old practices of the Japanese people. As an example, on Himeshima Island, Oita Prefecture, the local fishermen cooperative association utilises the principles incorporated in the *Kisetsu Sadame*, a document which includes traditional resource management rules, dating back to 1904 (United Nations University Institute of Advanced Studies Operating Unit Ishikawa/Kanazawa, 2011). As mentioned earlier, *iriai* is central part of those traditions; local knowledge that conserves the satoumi seascapes (Kumamoto, 2000).

It is thus a natural consequence that the local resource users are the principal decision makers and marine resource conservation is an integral part of resource use (Makino and Matsuda, 2005). Through years of trial and error, viable management plans which depend highly on the fishermen themselves have been adopted and implemented. However, the resource users are not the sole actors in the decision making process and its implementation, as the local authorities and national governments play a significant role in delivering the necessary legislation on fishing rights and resource conservation. After all, neither the local users alone nor their organisations are able to function effectively without governmental cooperation (Dolsak and Ostrom, 2003; Pomeroy and Berkes, 1997). In addition, educational institutions provide support to the decision makers in the form of scientific information and administrative advice (Makino and Matsuda, 2005). The Japanese experience has provided the academic community with several outcomes which can be used for the amelioration of the capture fisheries management plans in other areas. In order for Community Based Fisheries Management to succeed, it is necessary that the fishermen conceive the stocks as their own, as they adopt a more positive attitude towards management and conservation (Yamamoto, 1995). Nevertheless, research institutions and governments continue to play major roles in the co-management framework (Makino and Matsuda, 2005).

The Japanese fisheries management system exercises a decentralised co-management framework between the local fishers and the state, rather than compulsory top-down regulation, or

market-oriented management with efficient utilisation of property rights by rational users. Rights and responsibilities are mainly shouldered by the user with support from the government. Yet, the management transaction costs – the largest disadvantage of co-management approaches - are shared between the government and the local fishers (Makino, 2010).

3.3.3 Challenges for the Japanese fisheries

Even though the Japanese fishery system is highly organised and has undergone decades of successful operations, there are still challenges that need to be overcome. According to Matsuda et al. (2009), there are 3 important points that the management system has failed to address:

(i) With the current system of exclusive rights allocated to FCAs, there is limited space for deviating activities. More specifically, recreational fishing is overly regulated, with only limited cases where free fishing or angling is allowed for recreational reasons.

(ii) The management procedures are still not fully transparent, raising thus questions about their outcomes.

(iii) Despite the vast scientific input and the adoption of management measure, there is still a lack of objective benchmarks or numerical goals in management plans. The measures put emphasis on commercial species and are adopted according to the needs of the respective FCAs, and this fact, couple with the absence of conservation benchmarks fails to fully protect the habitats.

3.4 Summary

This chapter explored Japan, the country were the first case study is located, through a range of lenses, specifically, geography, demography, environment, politics, economics, and culture, always in a connection to fisheries and the sea. Consequently, the state of Asia-Pacific fisheries was presented, in order for the environmental and socio-economic context of Japanese fisheries that followed, as well as the existing challenges for management to be better understood. In the next chapter, the Greek case is presented, following a similar pattern as this chapter.

Chapter 4

Greece

4.1 Overview of Greece

4.1.1 Geography, demographics and environmental conditions

Greece is a mountainous peninsular country with ranges extending into the seas, forming island complexes and peninsulas, bordering with Turkey, Bulgaria, Former Yugoslav Republic of Macedonia (FYROM), and Albania, and washed by the Aegean, Ionian and Mediterranean Seas (fig. 4-1). It is a member of the European Union (EU) and constitutes the 96th largest country in the world, with approximately 2000 islands and 4000 islets, 227 of which are inhabited, taking up about 7500km of the total of 13676km of the country's coastline (Central Intelligence Agency, 2016). The country covers about 132000km^2 and has a population of little less than 11million (Hellenic Statistical Authority, 2016a). As it is located in Southern Europe, in the northern hemisphere, the Greek climate is temperate, characterised by hot and dry summers and mild and wet winters, experiencing four seasons per year. Furthermore, Greece suffers from severe earthquakes and a few historically active volcanoes exist within its territory, even though eruption in the recent centuries have been very limited (Central Intelligence Agency, 2016).

Figure 4-1: Map of Greece.

Despite the fact that Greece has signed and ratifies the Law of the Sea Convention (LOSC) at Montego Bay (UNCLOS III), which means that it maintains the right to expand its territorial waters to 12nm from the coast, it has not exercised that right as Turkey, with which Greece shares marine borders, would consider such an action a *casus belli.* As a result, the Greek territorial waters are limited to a mere 6nm from the coast (Syrmos, 2002). Additionally, the majority of the Mediterranean members of the EU, including Greece, have not claimed fishing grounds or an EEZ (fig.4-2) (Rätz et al., 2010).

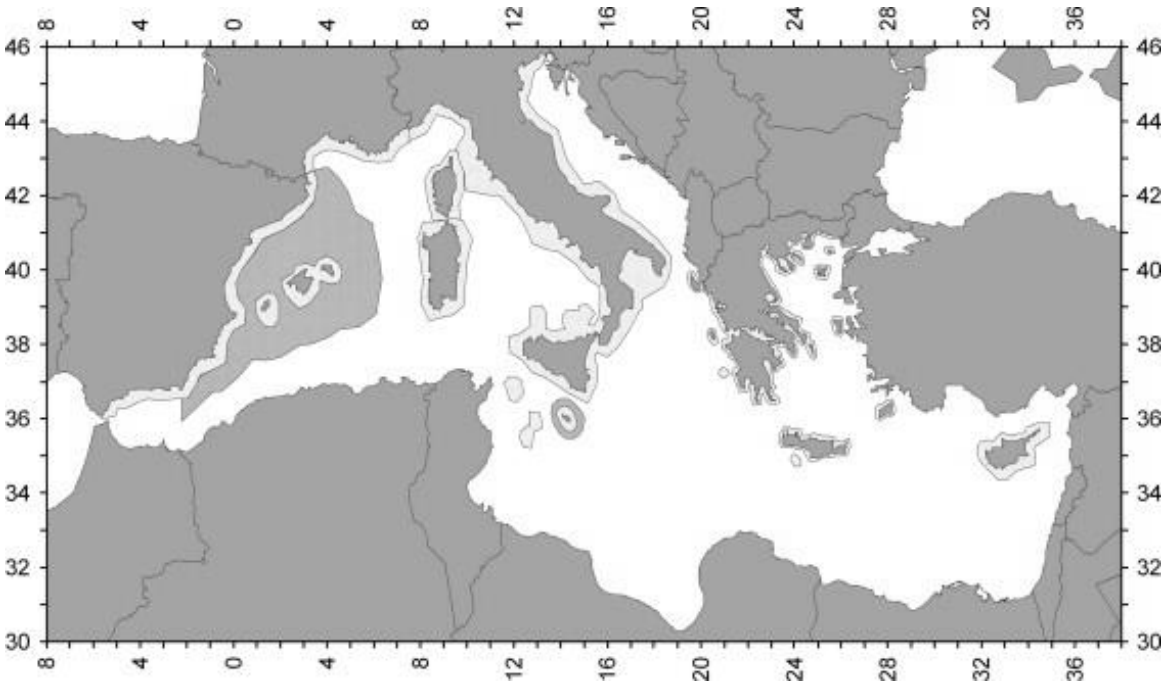


Figure 4-2: Mediterranean EU member states' territorial waters and fishing zones.
Source: Rätz et al. (2010)

The Greek coastline is characterised by a relatively narrow shelf, which results in a strong seasonal cycle of the sea water characteristics (salinity and temperature), and circulation partly determined by the general circulation of the Mediterranean Sea (Hellenic Center for Marine Research, 2005). The ecosystem is defined by its complex multi-species nature and the low productive capacity of its waters (Hellenic Center for Marine Research, 2007). The Greek seas host a variety of commercial species, with small pelagic species dominating (Hellenic Center for Marine Research, 2007).

Approximately 78% of the 11million of the Greek people live in urban environments, with about 4million living in the wider metropolitan area of the capital, Athens and the population exhibits an annual rate of urbanisation change of 0.47% (Central Intelligence Agency, 2016; Hellenic Statistical Authority, 2016a). Greece is a highly homogenous country, with the Greek ethnic group constituting 93% of the population, and the prevailing religion being Christianity; 98% of the religious followers follow the Eastern Orthodox Church (Greek Orthodoxy) (Central Intelligence Agency, 2016). However, during the past years, the country has been facing rapid and radical changes in its structure due to the ongoing Syrian refugee crisis. Greece is one of the major entrance points to the EU for the waves of refugees, with over one million people having crossed its borders since the beginning of 2015, the majority of which remain within the national borders (UNHCR, 2016).

4.1.2 Political and economic background

Greece (or *Hellenic Republic*, as is the conventional name of the country) is a parliamentary republic, with highest legislative body the unicameral Hellenic Parliament (in Greek *Vouli ton Ellinon*), made up of 300 seats (Central Intelligence Agency, 2016). The Greek economy has traditionally followed a capitalist model with an extensive public sector (accounting for approximately 40% of the GDP) and tourism sector (18% of the GDP). After the country entered the Eurozone, it experienced rapid growth, averaging 4% annually for the years 2003-2007, based mostly on EU aid that reached 3.3% of the GDP (Central Intelligence Agency, 2016). However, in 2009, facing severe deficits and deteriorating public finances, the economy collapsed, entering a long-term financial crisis. Several bail out programmes followed, but still, due to strong political pressure and failed political strategies, the country is still deep into recession and the financial indicators show no signs of recovery (Central Intelligence Agency, 2016; Vamvoukas, 2012). Greece is going through a major crisis in terms of finance lasting over 8 years, affected severely by the current global *Great Recession* as it has been entitled by Jenkins et al. (2013). Compared to 2007, the Greek economy has shrunk by 26.4%, resulting in a significant decline in living standards (EUROSTAT, 2015).

Despite the country's mineral resources (petroleum, lignite, iron, marble, salt etc.) and its extensive capacity of renewable energy sources, it has not been able to capitalise on its advantages and a prolonged unproductive energy policy has held the country's potential back (Central Intelligence Agency, 2016; Vlachou, 2001). Currently the country exhibits degrowth rates of the GDP, even though the trade balance and national debt have been slowly improving (Central Intelligence Agency, 2016).

The country suffers severely by favouritism and clientelism in the public sector, harbouring thus a culture of secrecy and sentiments against transparency (Machias et al., 2016).

4.1.3 Greek food culture, fish and seafood

Since the ancient times, fish and seafood in general have been a stable of the Greek cuisine. In Classical Greece (500-338BC), the most common animal protein sources were fish, both fresh and salted, and poultry. Red meat was rather scarce, and eaten mostly during celebrations or after sacrifices to the gods[10] (Wahlqvist et al., 1991). Even though contemporary Greeks still adhere to a diet largely similar

[10] Consumed meat in ancient Greece was usually goat's meat. Oxen were working animals, and the people refrained from consuming them. However, the most common sacrificial animal would be cattle; it was a common occurrence to eat beef after a sacrificial ceremony.

to the ancient Greek one (a diet based on legumes, cereals, fruits, vegetables, cheese, and olive oil), a significant increase in meat consumption as compared to fish is now evident.

However, fish and seafood are still a popular meal choice for the Greek people, with Greece having an annual per capita fish consumption rate of 19.6kg (NEF, 2016) (table 4-1). There are multiple ways of fish and seafood preparation available; among the most popular cooking methods for fish are frying (*tiganita*), baking in the oven usually with tomato sauce (*plaki*), boiling in a bouillabaisse soup (*kakavia*), marinating (*marinata*), and grilling (*psita*) [see for example Stergiou et al. (2011)]. Seafood on the other hand, depending on the species could be served, among others, sundried (*liasto*), if it is octopus for example, grilled (*psito*), or even raw/alive (*fresko*), in the case of shellfish. Multiple factors play an important role in the choice of seafood for consumption in the Greek market; freshness, seasonality, and size are the most significant.

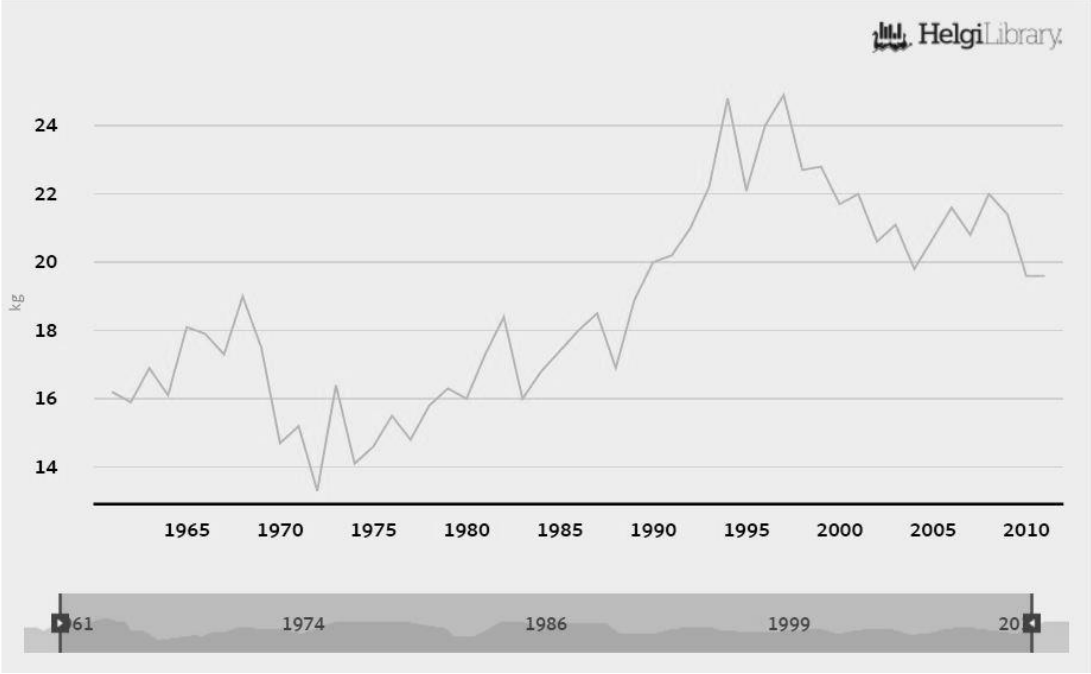


Table 4-1: Fish consumption per capita in Greece in kg. Source: Helgi Library (2016).

There are several connections between fish consumption and the dominant Greek Religion, Orthodoxy, as for example on March 25th, the Annunciation to the Blessed Virgin Mary, when the traditional meal consists of deep fried cod with a condiment made of garlic.

4.2 State of fisheries in the Mediterranean Sea and the EU

The Mediterranean Sea is the largest semi-enclosed sea of Europe, bordered by 21 countries –both European and not, with a coastline that spans for 46000km (fig. 4-3) (Hellenic Center for Marine Research, 2007; UNEP/MAP, 2012). With a narrow continental shelf and high biodiversity [5.5-7% of the global marine fauna according to Relini (2003)], despite being oligotrophic and having the low productivity levels (Bosc et al., 2004), the Mediterranean Basin is a very unique network of marine ecosystems of significant value in terms of ecosystem services, valued for over 26 million euro annually (UNEP/MAP, 2012).

The northern coast of the Mediterranean Basin is dominated by EU member states; the European waters of the Mediterranean are very rich and productive, able to provide steady long-term fish supply and support many coastal livelihoods (NEF, 2016). Fisheries in the Mediterranean have traditionally been largely small-scale, nearshore fishing activities, especially compared to Atlantic fisheries, with a variety of fishing gears and tools targeting a vast array of species (Konidis and Papakonstantinou, 2013). The lack of an industrialised production system, the large number of vessels, and the numerous landing sites are characteristics of the Mediterranean fisheries (Lleonart and Maynou, 2003). Despite the fact that fisheries contribute a minimal amount to the economies of the member-states (quite often accounting for less than 1% of the respective GDP), it supports hundreds of thousands of livelihoods, directly or indirectly (Mylonopoulos, 2002). As a result, the EU has been monitoring fishing activity and the resource condition of its territorial waters since 1970 in order to implement the most adequate management measures possible (Mylonopoulos, 2002). Nevertheless, the current situation in the Mediterranean Sea is far from good.

Figure 4-3: Map of the countries that border the Mediterranean Sea.
Modified from worldatlas.com.

The Mediterranean Sea is one of the most overfished and damaged by destructive fishing, overcapacity, and poor compliance to the law regions of the world (Greenpeace, 2006; NEF, 2016; UNEP, 2011). During the past two decades, European catches have been exhibiting a steady annual rate of decline of 2% (1993-2013), across the majority of fish stocks, especially demersal ones (see for example, tables 4-2 and 4-3) (NEF, 2016). Currently, with 78% of the Mediterranean fish stocks fully exploited, and the total of exploited, overexploited, and collapsed stocks percentage reaching 84%, the EU produces far less fish than the amount it consumes, and depends on imports to satisfy the local demand (NEF, 2016; Sherman and Adams, 2010; Tsikliras et al., 2010).

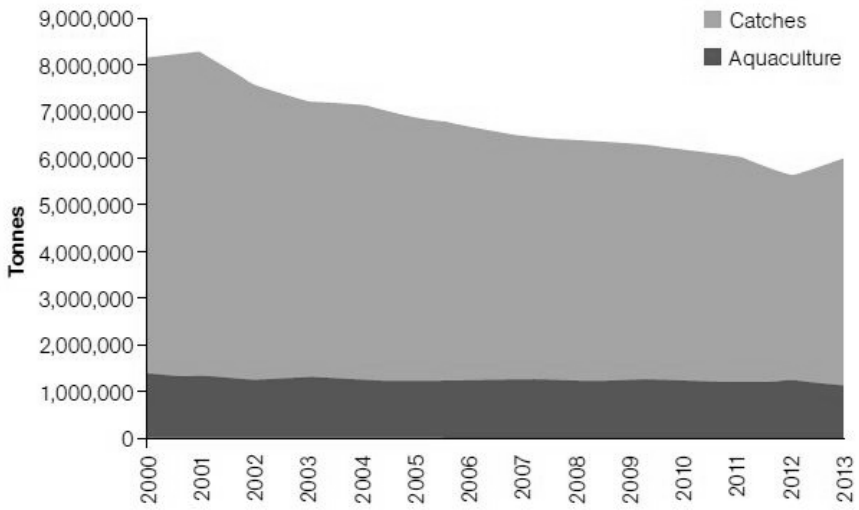


Table 4-2: EU27 fisheries catches and aquaculture, 2000-2013.

Source: NEF (2016).

A transformation in the management of the marine resources is necessary in order to achieve sustainable fisheries production without compromising the economic benefits fishing brings to the local communities as well as the national economies. That is the reason why the European Union, having vital interests at stake in the Mediterranean Sea, adopted measures to combat this ever growing problem. Specifically, the Common Fisheries Policy (CFP), especially through its reform in 2012[11], aims to introduce socially, economically, and environmentally sustainable fisheries management plans in the Basin, in order to assist the marine ecosystems' recover, as well as reduce the EU dependence on fish imports (European Commission, 2009; EUROSTAT, 2016).

[11] The reformed CFP came into force on January 1, 2014 EUROSTAT, 2016. *Agriculture, forestry and fishery statistics 2016 edition,* Luxembourg: Publications Office of the European Union.

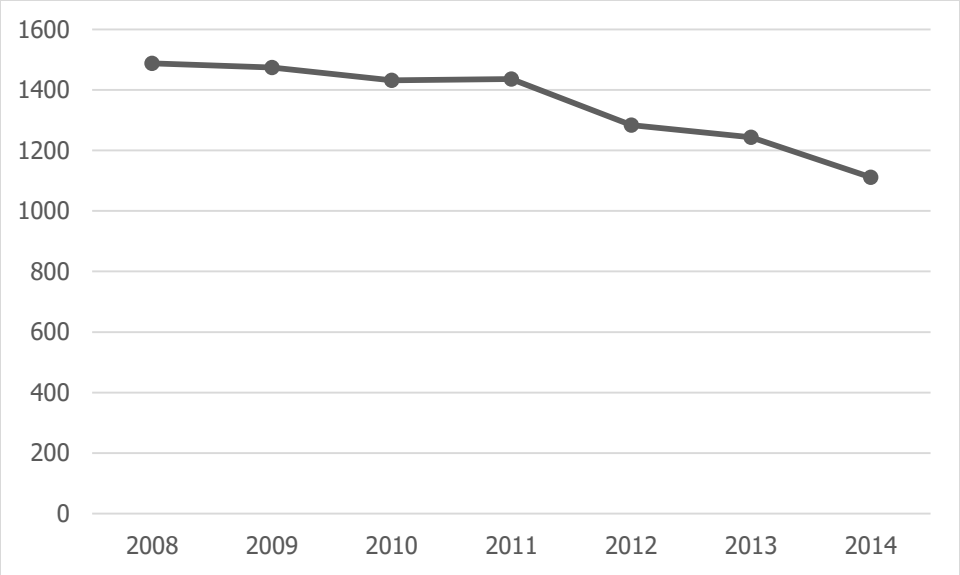


Table 4-3: Capture fisheries production in the Mediterranean and Black Seas in thousand tonnes. Adapted from FAO (2014b).

European legislation about fisheries is extensive, yet most of it is contained in the CFP. The main objective of the CFP is to "ensure exploitation of living aquatic resources that provides sustainable economic, environmental and social conditions", and upon this aim, the member states build their own regional 'individualised' objectives, which usually focus on conservation of the fish stock, the fishery, and the related employment (Lleonart et al., 1999; Pilling et al., 2008). The CFP has been amended two times, the latest one being in December 2013. As of January 2014, the new CFP has been pushing towards a more sustainable approach on EU fisheries management with the aim for all EU stocks to being fished at MSY and for discards[12] to have been eliminated by 2020. The new CFP also requires from the members states to follow transparent processes regarding fishing opportunities allocation, as well as to take environmental and social criteria into consideration (Crilly and Esteban, 2013; NEF, 2016).

Fisheries management measures in the Mediterranean Sea have always tended to focus on fishing effort. Additional popular tools consist of technical regulations and spatial-temporal closures, as well as promotion of fishery product traceability and trade control (Bonzon, 2000; Pilling et al., 2008). However, all the aforementioned management measures and tools, usually do not apply to small-scale fisheries, despite the fact that in many areas of the European Mediterranean Sea, the latter

[12] Discards are the practice when fish smaller than the minimum landing size are caught and then thrown back into the sea, in their vast majority dead, in order to avoid sanctions.

are the majority of fishers. Economic analyses of small-scale fisheries are severely lacking and yet, the small-scale fishers often attempt to take management in their own hands by adopting self-regulations and enforcing local control of the activity (Pilling et al., 2008). Data collection and stock assessments for species targeted mostly by small-scale fishers happen only occasionally, usually for the sake of specific projects and show no continuity (Lleonart et al., 1999; Lleonart and Maynou, 2003).

4.2.1 The Common Fisheries Policy (CFP)

The predecessors of the CFP, the first set of fisheries regulations, were adopted by the then European Economic Community (EEC) during the ratification of the Treaty of Rome[13], yet it was only in the 1970s that they were implemented, utilised especially in negotiations with non-EEC countries. In accordance with the progress made during UNCLOS and the adoption of LOSC, in 1976, the EU expanded its fishing grounds from 12nm from the coast to 200nm (Table 4-4).

1958	Adoption of the first fisheries regulation through the Treaty of Rome
1970	Implementation of the first EU rules
1976	Extension of fishing waters from 12nm to 200nm from the coast
1981	Greece entered the EU
1983	Adoption of the CFP
1986	Spain and Portugal entered the EU, effectively doubling the number of EU citizens employed in the fishing sector
1992	First review of the CFP showed overinvestment in vessels, decreasing landed catches, and overfishing
1994	Establishment of the EU fisheries fund PESCA
1995	Introduction of permit system to regulate fishing effort, and TACs
2009	The CFP was opened for public debate
2014	Revised CFP came into effect, focusing on the elimination of discards, protection of endangered stocks, and adoption of the MSY

Table 4-4: Historical overview of the CFP. See Appendix III.

The CFP in its entirety was adopted in 1983, but the process of updating it continued through the years, with several milestones, including the entry of Spain and Portugal in the EU, which doubled the number of EU citizens working in the fishing industry (Hegland, 2009). The member-states implemented various management measures through the CFP, ranging from fishing permit systems

[13] The Treaty establishing the European Economic Community (TEEC), signed on March 25, 1957 by the founding members of the European Economic Community (EEC), Belgium, the Netherlands, Luxembourg, France, Italy and West Germany.

to TACs (Mylonopoulos, 2002). Yet, in 2009, the urgent need to bring the Policy closer to the citizens made the EU open the CFP for public debate. After the debate and multiple assessments of the current fish stock and marine habitats of the EU territorial waters, in 2014 the new updated CFP, which focuses among others on the elimination of discards, the protection of endangered stocks, and the adoption of MSY was enforced.

Through the CFP, the EU used to offer funding schemes to support the fishing sector through subsidies for the amelioration of the fishing fleet; this route of action focused on technological advantages and improvement of fishing gear selectivity. At the same time it gave to fishers that want to withdraw from the industry the option to get financial support, provided that they destroy their vessels to ensure that they will be decommissioned.

Nevertheless, during the past few years, the CFP has been undergoing significant changes, aiming at its reform which came into effect in 2014. The reformed CFP has several objectives which differ remarkably from its previous form. Now the goals are to achieve a fishing level of MSY through the implementation of an ecosystem-based fisheries management framework, and to reduce fleet capacity without the provision of subsidies (Coehlo et al., 2011; Tsikliras et al., 2013b).

However, the Member States are still the sole responsible entities for the implementation of the European legislation and a significant number of serious infringements is reported to take place often throughout the Mediterranean Basin.

4.3 State of Greek fisheries

Greek fisheries, similarly to the general Mediterranean trend, comprise mostly of small-scale fishers, meaning fishers that operate in small vessels, close to the shore, with a minimal number of crew members[14] (Tzanatos, 2006).

Compared to the rest of the EU, Greece, as all of the south-eastern part of the continent, has proven quite more vulnerable to issues in the fishery sector, particularly IUU (Greenpeace, 2006; Swan, 2005). After Greece entered the European Union in 1981, the fisheries industry experienced phenomenal growth, peaking in 1994 (Table 4-5) (FAO, 2009b). Yet since that time the annual quantity of Greek fisheries landings has been steadily dropping in spite of a rapid evolution of technology contributing to overexploitation of the fish stocks (FAO, 2009b; Hellenic Republic, 2007; Waycott et al., 2009).

[14] Usually no more than 2 people operate on board the same small-scale fishing vessel.

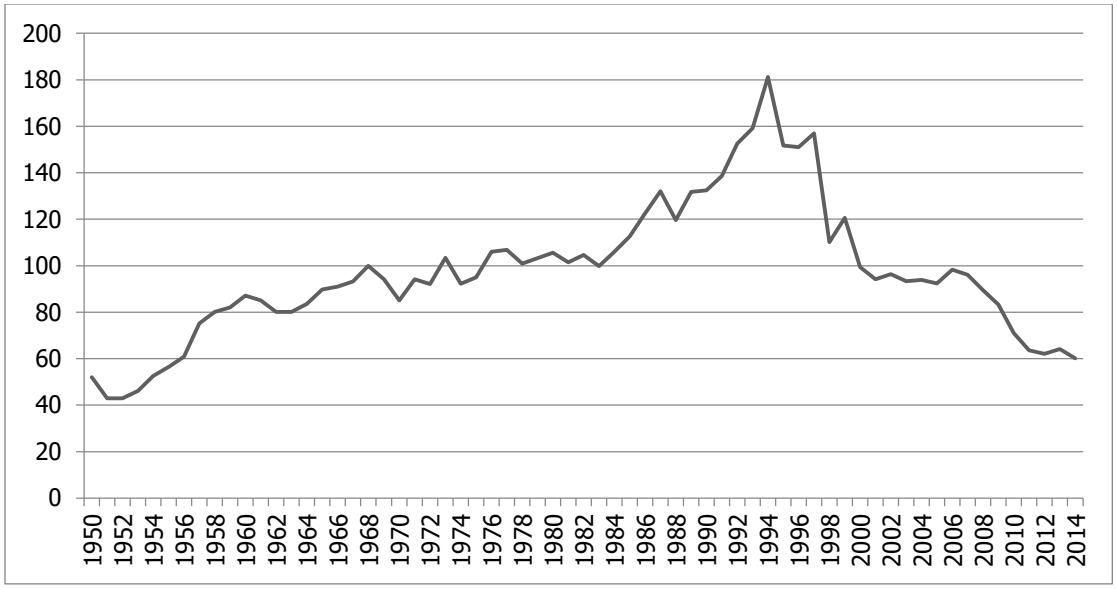


Table 4-5: Annual fishery capture production in Greece in thousand tonnes.
Adapted from FAO (2009b) and (2014a).

Nowadays, the combination of EU policies and large-scale catch technologies are increasingly displacing small-scale fishers, as well as generating competition amongst fishing groups, e.g. professional, artisanal, and recreational fishers (Anagnopoulos et al., 2000; Hellenic Republic, 2007; Stergiou et al., 1997; Tzanatos et al., 2006), creating thus conflict between industrial and artisanal fisheries. Research reveals several indications that the Greek fishing industry has been left unattended for too long, with lack of conformation to the EU laws; implementation of fragmented management plans with no cohesion; lack of law enforcement; and connectivity gaps between the levels of governance (Vlachopoulou et al., 2013). As the state, and most importantly, fisheries management are highly centralised, the local actors are rarely involved in the decision-making, the regulatory process, and/or the control of the national waters, even at the very local level. As a consequence, the current status quo does not seem to change, even though the quality of life of the small-scale fishers and their families has been exhibiting clear signs of deterioration, from reduced catches despite increased effort, to declining income (Tsobanoglou, 2007; Vlachopoulou et al., 2013). Several coastal areas are going through significant socio-economic and demographic changes; for example in the Eastern Aegean Sea region, the local communities are experiencing a decline in traditional marine-based livelihoods (Tammi and Kalliola, 2014).

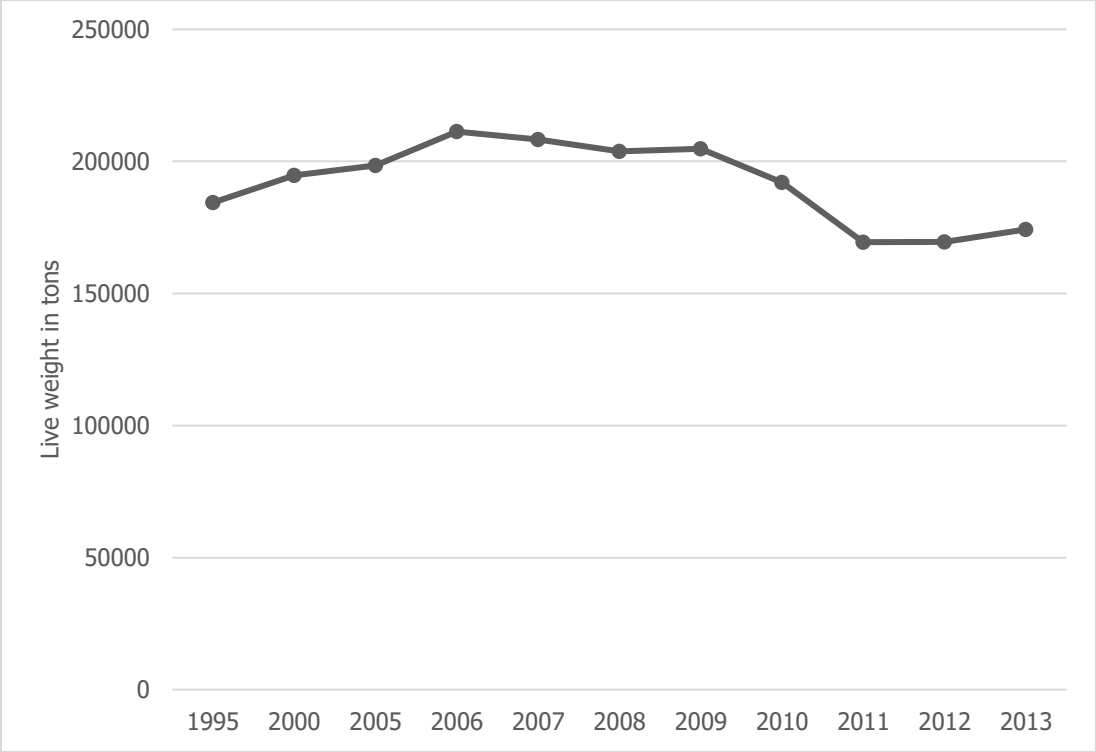


Table 4-6: Total fisheries production in Greece (catch and aquaculture) in tonnes of live weight (1995-2013). Adapted from EUROSTAT (2010) and NEF (2016).

As shown in table 4-6, there has been a noticeable declining trend in the national catches during the past decade; even the slight recovery during the years 2011-2013 is mostly due to the increased production of aquaculture, rather than the result of a recovery in the output of marine capture fisheries. As 65% of the Greek fisheries are overfished and 32% are fully exploited, although there seem to be no depleted stocks, the expansion of fisheries overexploitation in the country is particularly wide, happening across habitats, taxa, and sizes. In some cases, collapsed and overexploited stocks exceed even 90% of the total, as in the cases of Peloponnese and the Dodecanese island complex (as of 2007) (Tsikliras et al., 2013b).

Similarly to the case of the Mediterranean fisheries in general, assessments of the Greek fish stocks targeted by small-scale fishers have been sporadic and species-specific, without particular continuity (Tsikliras et al., 2013b).

4.3.1 Environmental characteristics of Greek fisheries

Greece is an insular country, with many peripheral regions relying significantly on fisheries not only for employment, but also for social cohesion (Tsobanoglou and Vlachopoulou, 2013). Small-scale

fisheries are widespread along the Greek coastline, in their majority fragmented and operating individually.

Overall, Greek fisheries exhibit indications of extensive overexploitation, with some commercial species having reached a point where recovery in the short term seems impossible. IUU fishing activity is widespread, further undermining the health of the stocks and destroying vulnerable ecosystems (Vlachopoulou et al., 2013).

Especially in the regions that share maritime borders with other countries (Eastern Aegean Sea, Ionian Sea), there is strong competition with fishers of non-Hellenic nationality, particularly with the Turkish. The Turkish fleet often fishes within the Greek territorial waters, causing conflict with the Greek fishers. There have been several cases of reported breaches by Turkish vessels, and fishers often mention even skirmishes with Turks, especially in the international waters between the two countries.

4.3.2 Socio-economic characteristics of Greek fisheries

Despite the long tradition of utilisation of the marine resources, it was only in the 1910s that institutionalisation of fisheries begun in Greece. In 1914, with the support of an Italian expert, the Ministry of National Economy founded the Fisheries Sector; it was the first official institution, charged with organisation and management of the Greek fisheries (Mylonopoulos, 2002).

After the Asia Minor Catastrophe, a wave of skilled fisheries professionals came to Greece as refugees from Asia Minor, contributing significantly to the modernisation of the Greek fishing fleet, mostly with the introduction of the trawler and the purse seine (Laimos, 1968). In 1939, all the fisheries related activities came under the jurisdiction of the newly established Fisheries Organisation, which was consequently abolished (1941), and substituted by the Fisheries Directorate and the Directorate of Technical Fisheries Organisation, once more within the Ministry of National Economy (Mylonopoulos, 2002).

During the late 1940s, the first fisheries research centre was established under the name *Hellenic Hydrobiological Institute*, by the Academy of Athens, only to have it re-established as the *Institute of Oceanographic Fisheries Research* (currently *Hellenic Centre for Marine Research - HCMR*. At the late 1950s, because of the implementation of the *Marshall Plan*[15], the reconstruction of the Greek Public Sector

[15] The European Recovery Program (ERP), implemented by the US to assist in the rebuilding of Western Europe after WWII.

demanded the abolishment of the Directorate of Technical Organisation of Fisheries and the re-establishment of the Fisheries Directorate under the new Ministry of Industry (Mylonopoulos, 2002).

This trend of establishment and then abolishment of fisheries institutions continued through the years, with several local, regional, and national bodies going down that path. The Fisheries Directorate and its successors (the Fishery Sector; the Fisheries Secretariat) were moved from Ministry to Ministry (Ministry of National Economy; Ministry of Industry; Ministry of Agriculture; Ministry of Economy, Competitiveness, and Shipping; Ministry of Rural Development; to name a few), and there was a time period of less than a year (2011) when it was part of a specific Ministry (Ministry of Maritime Affairs, Islands, and Fisheries). Nowadays, it is placed under the jurisdiction of the Ministry of Rural Development and Food (General Secretariat for Sustainable Fisheries) (fig. 4-4) (EMFF, 2015).

1914	The Fisheries Sector of the Ministry of National Economy is established
1922	Asia Minor Catastrophe
1939	Foundation of the Fisheries Organisation
1941	Abolishment of the Fisheries Organisation and foundation of the Fisheries Directorate and the Directorate of Technical Organisation of Fisheries
1947	Establishment of the Hellenic Hydrobiological Institute
1949	Establishment of the GFCM
1952	Implementation of the GFCM
late 1950s	Abolishment of the Directorate of Technical Organisation of Fisheries and trasfer of the Fisheries Directorate to the Ministry of Industry
1970	Adoption of the Greek Fisheries Code
1981	Greece entered the EU
1983	Adoption of the CFP

Table 4-7: Historical overview of Greek fisheries facts. See Appendix III.

The current fisheries management regime is based on the Fisheries Code (*Alieftikos Kodikas*) which was adopted in 1970. The Fisheries Code includes all the legal processes, the background, and any other useful information regarding the legal aspect of fisheries. Several pieces of legislation have been adopted since the implementation of the Fisheries Code, adding to the latter, in an attempt to complete the legal code of conduct for all types of fishing vessels operating in the Greek waters, as well as the tools and methods used for professional fishing, aquaculture, and recreational fisheries. The Greek legislation provides that national bodies (Port Police - the Coastguard) are responsible for

the enforcement of the law, controlling and monitoring the fishing activity, giving fines and punishing cases of infringements (Mylonopoulos, 2002).

It is noteworthy that, up to this day, clear description of the profession of a fisher has not been developed by the Greek state. As stated in the official Profile of the Fisherman (Konidis and Papakonstantinou, 2013) (p. 4),

> "The fisherman profession is not clearly defined by the Greek national legislation since according to the Law 1361/1983 (O.J. A, 66) a natural person who can be issued with a professional fishing licence, can be any type of farmer (including agriculture farmers, livestock producers and fishermen) who are members of an agriculture union. There have been several efforts made to define the criteria based on which a natural person can be declared as fisherman but until today there has never been any relevant circular presented by the Greek Ministry for Agricultural Development and Food."

According to the current legislative framework, membership in a fisheries association is sufficient condition to acquire a professional fishing licence. In case the individual owns their own vessel, they need to have it registered as a professional fishing vessel in order to be allowed to use it for professional fishing activities (Mylonopoulos, 2002). Any type of modification of the licence, renewal, and cancellation require the provision of a certificate of membership from the fisheries association. As the law allows for the professional fishers to undertake a supplementary job, it is an often phenomenon for the fisheries professionals to maintain an alternative income source, usually in agriculture or tourism. Nevertheless, it is the responsibility of the fisheries association to judge whether an individual with a supplementary income source may become a member or not, and thus, sometimes individuals with other main professions (usually people of social status) or members of their household acquire membership and compete against professional fishers (Konidis and Papakonstantinou, 2013).

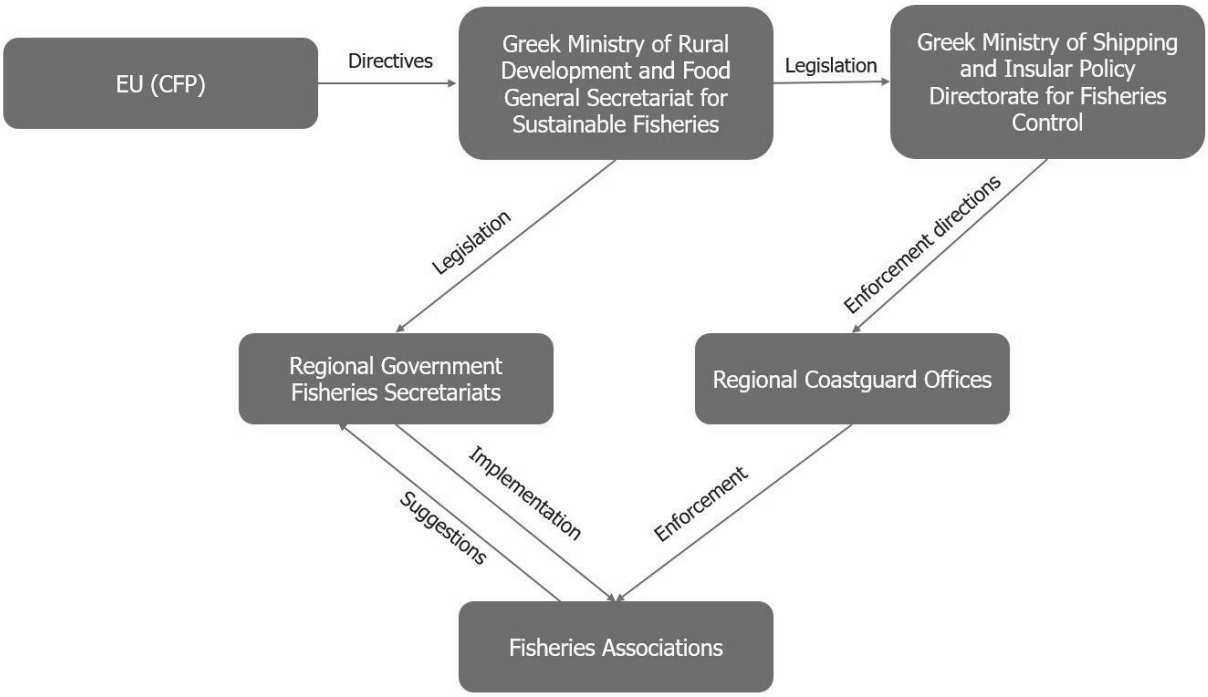


Figure 4-4: Organisational structure and interactions of fisheries bodies in Greece.
Produced by Eirini Ioanna Vlachopoulou, 2016.

In general, the organisational structure of the fisheries bodies is based on a one-way, top-down approach, with the EU giving directions to the Greek Ministry of Rural Development and Food through the CFP, which turns them into legislation and passes it down to the regional fisheries secretariats and, through the Ministry of Shipping and Insular Policy, to the Coastguard. The regional secretariats are responsible for the implementation of the legislation at the local level, while receiving feedback from the fisheries associations in order to improve cooperation. On the other hand, the Coastguard is responsible for control and enforcement of legislation; they inspect the vessels, monitor the activity, and impose sanctions when necessary.

4.3.2.1 Greek fishing fleet

Despite its low tonnage (5% of the total EU fleet), the Greek fishing fleet is the largest one in the EU in terms of absolute vessel numbers (Machias et al., 2016), making up 21% of the total EU fleet (fig. 4.4).

Figure 4-5: EU fishing fleet in 2008. Left: Number of vessels. Right: Tonnage. Adapted from EUROSTAT (2010).

Still, the number of vessels, which exhibited a rapid rate of increase following the entry of Greece in the EU, has been declining continuously since 1994. The count of inshore vessels was 4194 in 1982, and had almost doubled (8418) by 1991, only to fall down to 5691 in 2007, while offshore fisheries accounted for 990 individual vessels in 1982 and only 638 in 2007 (Tsikliras et al., 2013b). This decline stems from the EU regulations towards fleet capacity reduction, with the objective to reduce pressure on the marine ecosystems through fishing effort decrease; this trend has pushed the Greek fisheries into a prolonged phase of contraction and has been gradually rendering them all the more unsustainable (Stergiou et al., 2007; Tsikliras et al., 2007).

4.3.2.2 Greek fisheries and participation

In contrast with the aforementioned cases, in Greece, the fishing industry has been left unattended and, although there is extensive legislation on fisheries management, its enforcement is minimal (Vlachopoulou et al., 2013). The marine habitats have been gradually deteriorating, resulting not only in the loss of a large proportion of fish stocks, but also in the reduction of the livelihoods of the local artisanal fishing communities (Special Secretariat for Planning Applications & 3rd Community Support Framework, 2007; Waycott et al., 2009). As the fishermen have minimal participation in the decision making processes, the management of the marine resources or the enforcement of the legislation, their needs and local knowledge are not being represented within the decision makers (Tsobanoglou and Vlachopoulou, 2013). Therefore, there is space for the introduction of both the

ecosystem and the participatory approaches in order to increase employment and income as well as to achieve sustainable exploitation of fish stocks (UNEP-WCMC, 2006).

Apart from the enforcement of the fisheries legislation, there is also urgent need for the adoption of a holistic approach in fisheries management. As the condition of the marine environment gradually worsens with the depletion of fish stocks and the degradation of marine habitats expanding rapidly, both the provisioning and the regulating as well as the cultural services that the marine ecosystems provide for the Greek fishing communities and the general population are disappearing. The various stakeholder groups are making suggestions about the route of action that should be taken by the central government, but there is no collaboration among themselves and limited to non-existent engagement in action (Theodorakis, 2013; Vlachopoulou et al., 2013). By promoting education of the stakeholders and supporting research on the socio-economic aspects of fisheries management, the local knowledge can diffuse to other areas, creating a spill-over effect from the bottom up and adapting policy-making to the actual needs of both the local communities and the marine and coastal ecosystems.

As research has shown, the local authorities, and mainly the coastguard, lack the necessary staff and equipment, and sometimes even the will to control adequately the area under their jurisdiction (Tsikliras et al., 2013b; Vlachopoulou et al., 2013). Additionally, cases of IUU fishing are increasing, reaching up to 65% of recorded SSF catches at places (Katsanevakis et al., 2011; Tsikliras et al., 2007). Embracing some kind of co-management would allow for the fishers to protect and tend to their income source –the resource that they rely on. The significance of public participation in regulation and enforcement is widely accepted; as illustrated by UNEP-WCMC (2006), "stakeholder participation in decision-making is effective in addressing the alteration and loss of marine and coastal ecosystems and their services". Adopting such a system of community participation in the decision-making process would have various results for the local communities, apart from achieving conservation goals. Importantly, it would contribute significantly in enhancing the social capital of the community, an ingredient of extreme importance for the development of the periphery. Fisheries could act as a collective symbol in the midst of all the interactions in the community under examination; the community, having strong traditional bonds with the newly established symbol, would experience a coiling effect, urging them towards collective action (Tsobanoglou, 2012).

4.3.2.3 Greek fisheries and the Greek economic crisis

The fragmented Greek fisheries, amidst the chronic problems that they have been facing, are now being further damaged by the Greek economic crisis. Fisheries management has been suffering from the implementation of inadequate measures, illegal and destructive fishing practices, and even the continuously declining fishing effort has been unable to halt the degradation of the marine resources (Tsikliras et al., 2013b).

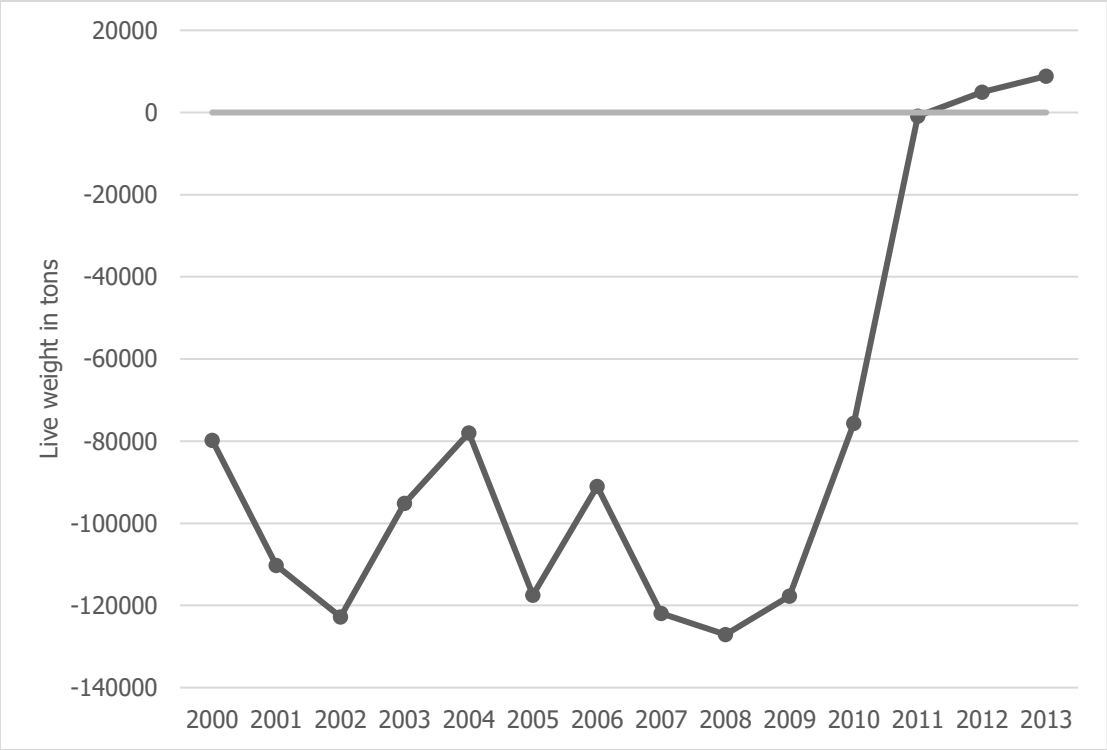


Table 4-8: Fisheries trade balance (exports minus imports) in tonnes of product weight (Greece, 1995-2013). Adapted from NEF (2016).

Even though, due to the structure of the Greek fishing fleet (many vessels with a limited crew members, largely self-employed), there is widespread misreporting of catch amounts (Machias et al., 2016). As a result, there is no clear image of the exact state of the fisheries sector; however, there are indications that in terms of trade balance, Greek fisheries are doing better than in the past, as can be seen in table 4-8. For the first time, during 2011, the fisheries trade balance became positive. This fact though, could quite possibly be due to the fact that imports in general are exhibiting overall declining trends because of the recession (table 4-9).

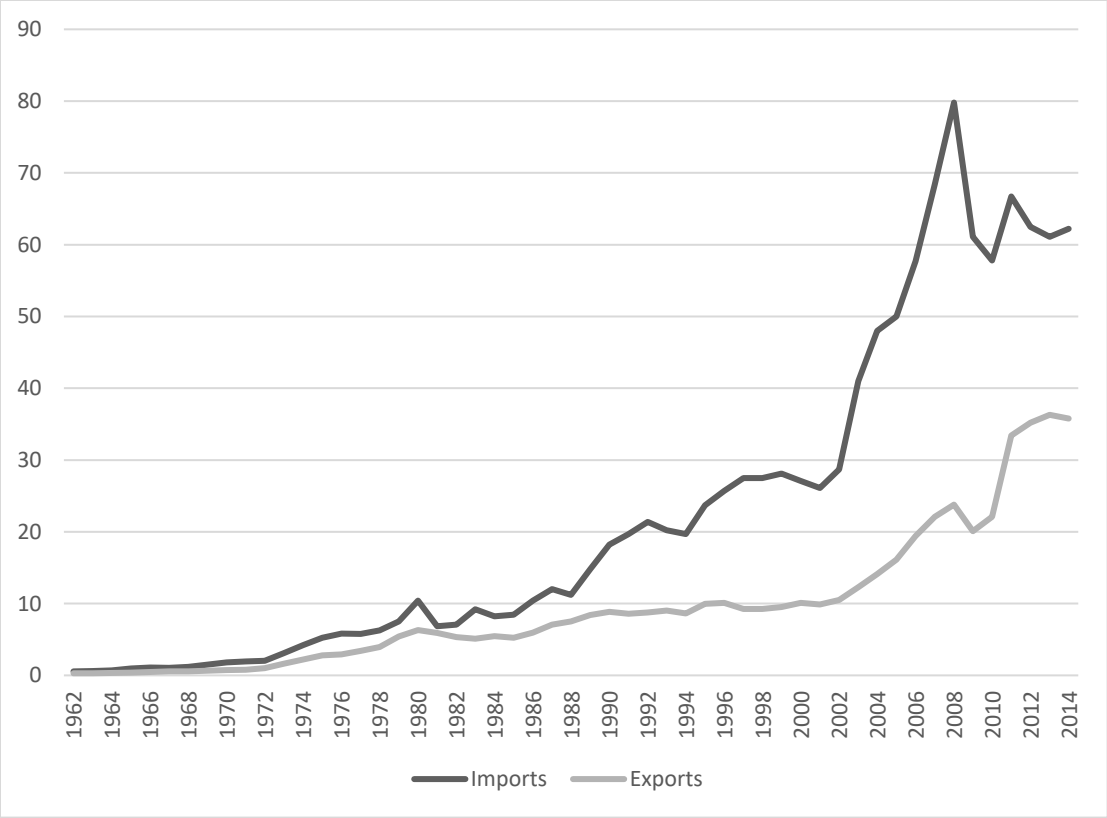


Table 4-9: Greek import-export trends (1962-2014). Adapted from Simoes and Hidalgo (2016).

4.3.3 Challenges for the Greek fisheries

There are several bleak points in Greek fisheries, ranging from a fragmented national management framework, limited participation in the decision making processes, ecological shifts, and the aftereffects of the financial crisis.

The majority of fisheries policies that have been adopted were based on contexts that differ significantly from the specific circumstances in Greece. Despite the fact that Greek fisheries are characterised by information deficiencies and are based largely on small-scale production, the current frameworks of operation are based on experiences 'imported' from abroad and implemented externally (through the CFP, for example) (Machias et al., 2016). It is vital therefore, to turn to more inclusive policies focusing at the local level, in order to adopt better case-by-case solutions that will enjoy public acceptance and legitimisation.

Furthermore, the fishing industry suffers from aging population and lack of adequate training, along with limited infrastructure (landing sites, fishing shelters), rendering the sector unable to

compete adequately with the large-scale EU fleet and exhibiting low economic performance (EMFF, 2015; Hellenic Center for Marine Research, 2005).

4.4 Summary

Following the chapter that presented Japan, this chapter explored Greece, the country were the second case study is located, through a range of lenses, specifically, geography, demography, environment, politics, economics, and culture, with a focus on fisheries and the sea. Consequently, the state of the Mediterranean fisheries and the connection with the EU and the Common Fisheries Policy were presented, in order for the environmental and socio-economic context, particularly the ongoing economic crisis, of Greek fisheries that followed, as well as the existing challenges for management to be better understood. Having concluded the introductory topics, the methodological framework of the research is analysed in the next chapter.

Chapter 5
Theoretical Framework and Methodological Approach

5.1 Environmental Sociology

Environmental Sociology is one of the most contemporary and thriving branches of Sociology, established and growing rapidly since the 1970s. Environmental Sociology deals with *ecological* problems, namely issues related to the environment, impacting negatively on both human and non-human life as well as other aspects of life, caused by human actions, and the resolution of which required collective action (Dunlap, 2015).

The initial focus of the discipline was air and water pollution, slowly moving on to newer issues like ozone depletion, toxic wastes, and, most importantly, climate change. Even though Environmental Sociology has embraced and produced a range of theoretical frameworks, the Marxist idea of the *metabolic rift*, as it has been interpreted by Foster et al. (2011), is the one that highlights the fact that capitalist consumption and production are inherently unecological. It is based on Marx's conception that there is a rift in the metabolic interaction between human and nature, originating from capitalist production (Marx, 1981). Labour acts as the medium between human and nature, "a process by which man, through his own actions, mediates, regulates and controls the metabolism between himself and nature." (Marx, 1964) (p. 109). According to Metabolic Theory, "Human beings transform nature through their production, but they do not do so just as they please; rather they do so under conditions inherited from the past (of both natural and social history), remaining dependent on the underlying dynamics of life and material existence" (Foster, 2013) (p. 8).

However, other recent trends in Environmental Sociology offer a completely different view of the relationship between capitalism and the environment. It is important to note that, as Longo et al. (2015) (p. 24) say, "in modern times, the socio-ecological interactions and exchanges are fundamentally tied to capital production and accumulation. Human social systems exchange with, work within, and draw on ecological systems in the process of producing and maintaining life and sociocultural conditions." Through this prism, the unbreakable connection between society and nature is evident, especially in modern societies. The focal point of the utterly radical, compared to traditional Environmental Sociology, Ecological Modernisation Theory (EMT) is exactly how industrialised

societies deal with ecological crises (Redclift and Woodgate, 2010). The central point in EMT, as expressed by Mol (1995), is that the only way to overcome the environmental crisis is through further modernisation of the society and, importantly, its institutions. Mol bases his argument on the hypothesis that modernisation irrevocably means that society matures and gradually adopts *ecological rationality*. It is central in EMT that reflexivity permeates all states of late modernity as mature societies are prone to pinpoint and attempt to address inherent problems through self-examination (Redclift and Woodgate, 2010). This idea about societal reflexivity is based upon the Theory of Reflexive Modernisation as supported also by several non EM theorists, like Beck et al. (2003) and Giddens (1990).

Empirical research widely supports the claims of EMT, as a variety of individual capitalist actors, ranging from industries to governments, have taken action in order to achieve sustainability [see for example: Mol and Spaargaren (2000)]. Therefore, EMT, backed up by empirical research, promotes the narrative of a "green capitalism", bringing together the forces of the market with the pursuit of sustainability (Dunlap, 2015).

Nevertheless, critics of EMT point out that in many modern nations, unecological ideals reign supreme among not only the market actors, but also the institutions, forcing upon society "a process of ecological *demodernization*", as mentioned explicitly by Dunlap (2015) (p. 801). This fact is particularly evident in the case of climate change denial, especially in the US.

EMT, along with an array of disciplines, belonging but not limited to Environmental Sociology, such as world-systems analysis [see: Grimes and Kentor (2003) and] and Environmental Justice [see for example: Mohai et al. (2009)], have risen from the urgent need for a new approach in the understanding of environmental social science, as it has been expressed by William R. Catton and Riley E. Dunlap (1978; 1979; 1980) to lead to a new narrative in the field; a *new ecological paradigm* (Catton and Dunlap, 1980).

5.1.1 Marine Sociology

In parallel with Environmental Sociology, Marine (or Maritime) Sociology developed distinctly and expanded, focusing on the "interrelationships between social and marine systems" (Longo and Clark, 2016) (p. 464). The vast majority of marine social science research is based on resource management, economics issues, and public policy [see for example Hundloe and Arneson (2002)], with a more limited exploration of the topics of culture, public attitudes, and political processes (Longo and Clark, 2016).

Marine sociological research spreads on a range of topics related to the seas and oceans, with particular focus on issues of global change. Climate change and its impacts, for example take up a large proportion of the studies conducted in the field. Carbon dioxide accumulation; increasing water temperature; sea level rise; and ocean acidification have been prominent issues for sociological research, as well as interdisciplinary approaches, with ocean acidification having also been declared as one of the *planet boundaries*, an indicator system that aims at maintaining 'safe' existence of humanity in the earth-system environment (Rockström et al., 2009a; 2009b).

Human induced global change, especially in the case of the oceans, can and has been widely interpreted as a metabolic rift in the life cycles of the marine environment globally, affecting negatively not only the health of the ecosystems, but also the ecosystem services provided to humankind, disrupting the balance between the systems through the ever existing connectivity (Österblom et al., 2016).

Connectivity and complexity in these systems are highlighted by the socio-ecological intersection within the marine systems, making the need for an integrative approach even more evident (Longo and Clark, 2016). Still, there has been no consistent sociological study of marine systems as of yet, especially utilising the aforementioned new ecological paradigm – even though there has been significant research done on several aspects of the wider maritime sociology sector (Hannigan, 2017).

5.2 Ecosystem-based Approach to Fisheries and Social-Ecological Systems

According to the United Nations Convention for Biological Diversity (UNCBD) (United Nations, 1992), the Ecosystem-based Approach (EA) is "a strategy for the integrated management of land, water, and living resources that promotes conservation and sustainable use in an equitable way." (De Young et al., 2008) (p. 3). For the implementation of the aforementioned definition in the fisheries sector, we should take into consideration the complexities that afflict the sector. According to (De Young et al., 2008) (p. 7), these complexities consist of:

1. "Multiple and conflicting objectives,
2. Multiple groups of fishermen and fishing fleets and conflicts among them,
3. Multiple post-harvest stages,
4. Complex social structures and socio-cultural influences on the fishery,
5. Institutional structures and interactions between fishermen and regulators, and
6. Interactions with the socioeconomic environment and the larger economy (Charles, 2001)."

As a result, FAO, in an attempt to incorporate the limitations of fisheries into the concept of EA, states that "an Ecosystem Approach to Fisheries (EAF) strives to balance diverse societal objectives, by taking account of the knowledge and uncertainties of biotic, abiotic and human components of ecosystems and their interactions and applying an integrated approach to fisheries within ecologically meaningful boundaries." (De Young et al., 2008) (p. 3).

Currently, conservation and management attempts rarely take into consideration the complexity and multi-level nature of fisheries. And, even though there are multiple documented cases of local-level conservation and management, still significant gaps in knowledge exist, which result in an urgent need for new policy insights (Berkes et al., 2014). The most significant issue with the existing conservation initiatives is the lack of policy linking between ecosystem health, livelihoods and other socio-economic goals.

This research draws upon Elinor Ostrom's vision of the Social-Ecological Systems (SES) theoretical framework (Ostrom, 2009), in order to analyse thoroughly the case studies under examination. The study is conducted as a Social-Ecological System Analysis (SESA), according to the guidelines provided by the Community Conservation Research Network (CCRN) (Berkes et al., 2014).

The basic idea of SESA is based on the Millennium Ecosystem Assessment (MA) (Millennium Ecosystem Assessment, 2005) and focuses on the explicit description and analysis of the linkages between the *human system* (society, communities economy etc.) and the *natural system* (habitats, ecosystems etc.). These linkages form a two-way feedback cycle, as in every conservation initiative there are interactions between the two systems. SESA takes into consideration the fact that many of these linkages have their roots and can be explained through local and/or traditional knowledge, legislation, social norms and management institutions (Berkes et al., 2014).

SESA largely overlaps with EAF, as it incorporates the basic considerations for management initiatives in the fisheries sector. FAO stresses that

1. EAF must take place in the context of societal and/or community objectives, which inherently reflect human aspirations and values.
2. As EAF takes into account interactions between fisheries and ecosystems, this includes a wide range of complexities relating to human behaviour, human decision-making, human use of resources, and so on.
3. Implementing the EAF is a human pursuit, with implications in terms of the institutional arrangements that are needed, the social and economic forces at play, and the carrots

(incentives) and sticks (e.g. penalties) that can induce actions compatible with societal objectives.

While SESA embraces the basic principles of EAF, as well as its considerations, it goes beyond being a general management idea, to introducing tangible analytical frameworks and implementing EAF in practice. On a case by case stage, SESA can be used as a tool to evaluate the unique characteristics of the specific SES under examination and assist the researchers in the development of case-specific proposals, which incorporate both the natural and the human systems. Apart from EAF, SESA embraced important conservation and human wellbeing points from several other frameworks, like the 17 Sustainable Development Goals (SDGs) (United Nations, 2015). By encompassing the EAF concept, SESA promotes the SDGs by definition. More specifically, the most fundamental aspects of EAF are sustainability of fish stocks coupled with societal objectives, such as poverty alleviation and food security. These objectives are clearly stated in the SDGs as well; several of the goals have strong social notions and exhibit complex interrelations, like the pursuit of economic growth (SDG 8), and responsible production and consumption (SDG 12), which promote sustainable societies and communities (SDG 11) (United Nations, 2015). The previous 3 SDGs, coupled with the one focusing on life below water (SDG 15), bring coastal communities to the forefront, drawing attention to issues of resilience and sustainability (United Nations, 2015).

Furthermore, SESA takes into account the precautionary principle, by assessing the interlinkages between the various compartments of the examined cases and by promoting continuous re-evaluation and adjustment of the management actions, in accordance with (FAO, 1996) (p.8),

> "Management according to the precautionary approach exercises prudent foresight to avoid unacceptable or undesirable situations, taking into account that changes in fisheries systems are only slowly reversible, difficult to control, not well understood, and subject to change in the environment and human values. […] Precautionary management involves explicit consideration of undesirable and potentially unacceptable outcomes and provides contingency and other plans to avoid or mitigate such outcomes. Undesirable or unacceptable harvesting capacity, loss of biodiversity, major physical disturbances of sensitive biotopes, or social or economic dislocations. Undesirable conditions can also arise when a fishery is negatively influenced by other fisheries or other activities and when management fails to take action in the face of shifts in the external conditions affecting, for example the productivity of the fish stocks."

It is important to keep in mind that ecosystems are widely interconnected, as well as extremely complex. For that reason, when analysing SES, it is helpful to consider some general principles, the four informal laws of ecology as formulated by Commoner (1971):

i. *Everything is connected to everything else.* All ecosystems are characterised by inner interconnections, which provide them with balance.
ii. *Everything must go somewhere*. Energy and matter are preserved; they are indestructible. This law has particular importance in the case of waste.
iii. *Nature knows best*. Human interventions in ecosystems that cause significant alterations in the structure of the systems are highly likely to prove harmful.
iv. *There is no such thing as a free lunch*. All gains come at some costs (Longo et al., 2015).

5.3 Methodological framework

This study has been based on two research templates, (1) Social-Ecological Systems Assessment as defined and implemented by Berkes et al. (2014) and (2) IMBER-ADApT Framework (from here on mentioned as IMBER-ADApT) as developed by Bundy et al. (2015).

5.3.1 Social-Ecological Systems Analysis methodology

The methodology followed in this study is based on the "Guidelines for Analysis of Social-Ecological Systems" as have been presented by Berkes et al. (2014) for CCRN. The fundamental idea behind SESA is to link the *human system* (the economy, the society, and the communities) with the *natural system* (the ecosystems), in order to highlight the interrelationships between the two, and, most importantly, to emphasise the concept that "integration of humans in nature is important because in any conservation effort, there are interactions and 'feedback' between ecological (biophysical) and social (human) subsystems" (Berkes et al., 2014) (p. 2).

Applying an SES lens means exploring the relationships between the two systems in every social level, from management to LEK/TEK, and to the norms and rules that dictate the interrelations. The SES lens focuses on three factors: (1) multiple scales, (2) multiple levels, and (3) resilience, as described in Berkes et al. (2014) (p. 3-4):

1. *Mulriple scales:* "'Scale' refers most often to time and to space, specifically whether an event occurs over a short or long time (temporal) scale, or whether an activity takes place over a small or large space (spatial) scale."

2. *Multiple levels:* A 'level' is "basically a specific point along a scale (or a 'unit of analysis' within a scale)." Levels are most often used in reference to governance.
3. *Resilience:* "to be able to maintain the overall function and structure of a system of humans and nature, despite unexpected shocks to that system."

Another aspect that is very important when employing an SES lens is Governance, i.e. a system of rules, institutions, organisations and networks set up "to steer societies towards preventing, mitigating, and adapting to global and local environmental change" (Biermann et al., 2009). In order to have a successful SES case, "governance arrangements that (1) match complex social-ecological systems, (2) adapt as these systems change over time, and (3) help steer these systems towards sustainability" (Berkes et al., 2014), are necessary. Furthermore, the presence of multi-level institutions and partnerships between the state and non-state stakeholders, shared social processes and learning, and an appreciation of knowledge and different perspectives as considered vital in the quest for good governance (Berkes et al., 2014).

By utilising the SES lens, we can explore the four key meanings of conservation, namely (1) the meaning of conservation, (2) the governance of conservation, (3) the motivation for conservation, and (4) the outcomes of conservation, as shown in the figure below:

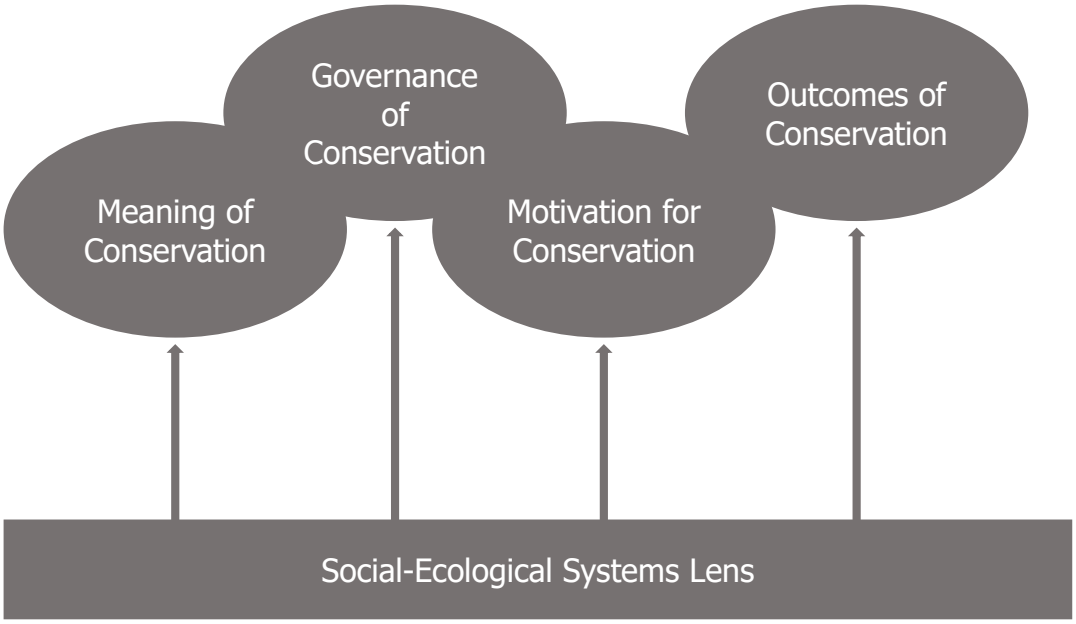


Figure 5-1: Themes of conservation. Adapted from Berkes et al. (2014).

1. *Meaning of conservation:* Both stewardship and conservation are treated as actions, deriving from every level of governance (local – e.g. community action; regional, national and international

– e.g. adoption of policies) to achieve sustainability of livelihoods and resources in the long term. In order to be able to compare different cases however, we need to understand how stewardship and conservation are perceived in each case, i.e. to define the *meaning of conservation*.

2. *Motivation for conservation*: The people who are likely to be or get involved in conservation and stewardship initiatives and how high their motivation level is, as well as the links between motivation and livelihood concerns need to be explored.
3. *Outcomes of conservation*: Monitoring of the impacts of conservation initiatives and human-driven activities will assist in evaluation of the success of the SES.

All the aforementioned points are summarised and inserted in a graph, the template of which can be seen below:

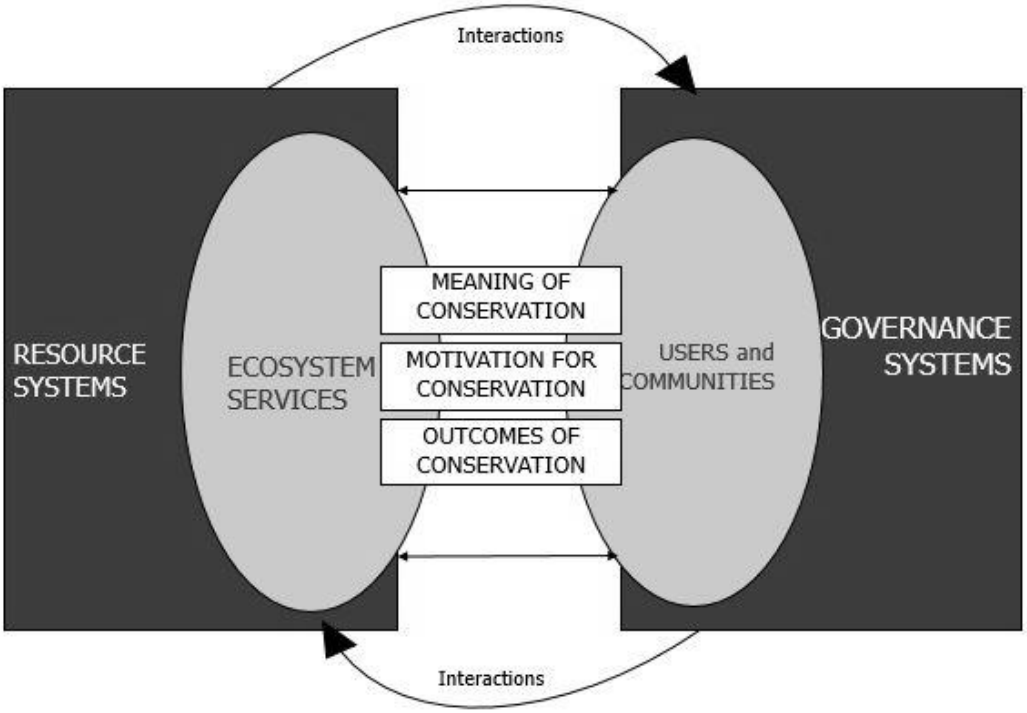


Figure 5-2: Social-Ecological Systems Analysis template framework. Adapted from Berkes et al. (2014)

5.3.2 IMBER-ADApT Framework

In this time of global change, challenges driven by human and natural stressors need to be explored and combatted. Mitigation and adaptation to change need cooperation among the different governance levels and the various stakeholder groups in order to adopt appropriate case by case responses (Bundy et al., 2015). The IMBER-ADApT is a decision tool that allows researchers, decision

makers, managers and local stakeholders to (1) "make decisions efficiently; (2) triage and improve their responses; and (3) evaluate where to most effectively allocate resources to reduce vulnerability and enhance resilience of coastal peoples to global change" (Bundy et al., 2015).

IMBER-ADApT aims at creating a database with case studies from all over the globe, which, by exhibiting impacts of global change in the marine territory and exploring the interrelations between the natural and human systems, may function as a compass for developing adequate adaptation and mitigation strategies (Bundy et al., 2015). The framework orbits on wild and cultured fisheries that face multiple simultaneous pressures, ranging from climate change to human impacts and overfishing and is based on interactive governance theory and a systems thinking approach about interlinkages between the human and natural systems (Bundy et al., 2015; FAO, 2011; Kooiman et al., 2005).

The basic points of the theory behind IMBER-ADApT, according to Bundy et al. (2015) are the following three:

1. "explicit recognition that the delineation between human and ecological systems is artificial and arbitrary (Berkes and Folke, 1998)"
2. "the relationship between humans and the environment is complex, bi-directional and occurs at different, but interrelated, spatial and temporal scales."
3. "it is within these interactions where governability of issues, such as climate change, are situated, but it is also where solutions and opportunities to address governance challenges may be found."

IMBER-ADApT consists of three components, namely *description*, *appraisal*, and *typology*. By combining the detailed information provided by the *description* and the assessment done in the *appraisal*, the researcher reaches the *typology*, which constitutes the stage where the case studies are categorised into different types (fig. 5-4 (a)). The component of *description* explores the systems (ecological, social, governing) of the case study that are affected by the change, as well as the effects, responses and outcomes (Bundy et al., 2015; Chuenpagdee and Jentoft, 2013; Ostrom, 1990). The descriptive component has been crystallised into the graph below:

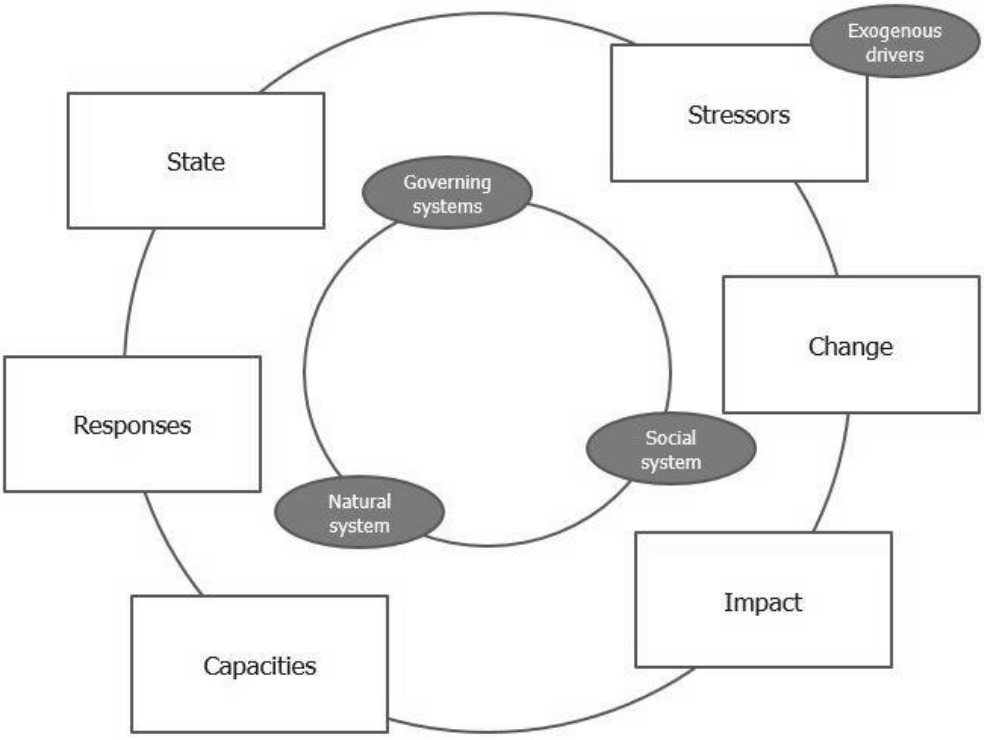
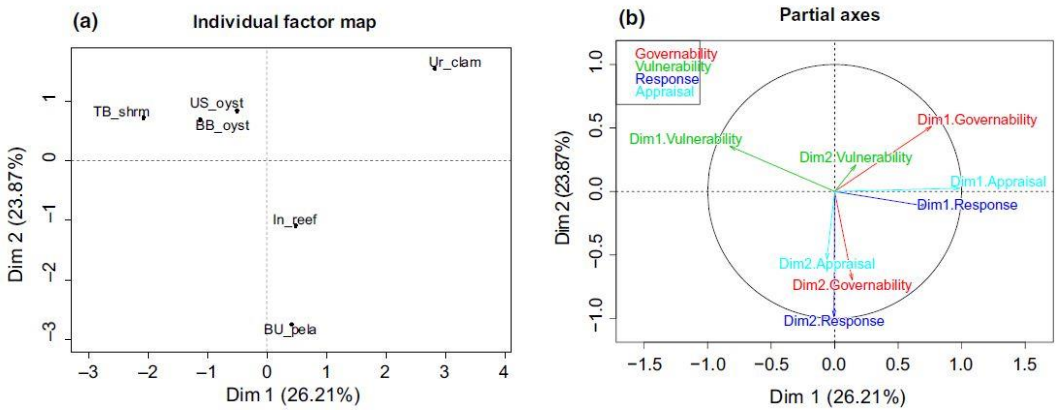


Figure 5-3: Steps of the descriptive component of IMBER-ADApT.
Adapted from Bundy et al. (2015)

After completing the *description*, the framework moves on to the *appraisal*, or the evaluation of the mitigation and adaptation responses, and how these responses are affected by different drivers and factors (and which), as well as the uncertainties and risks in the response implementation (Bundy et al., 2015). Finally, after the case studies have been coded and delivered in the standard form (see Appendices IV-V), the IMBER-ADApT will implement a method of interpretation of the cases in order to map them in an evaluation diagram [see fig.s 5-4 (a) & (b)]. For more detailed information on the typology component, see Bundy et al. (2015).



Figures 5-4: IMBER ADApT typology construction with identification of groups of case studies with similar features of vulnerability, governability, response, and appraisal.

(a) 3 clusters of case-studies represented in two dimensional space

(b) Association of the four classes of questions (governability, vulnerability, response, appraisal) with the two dimensions of the Multiple Factor Analysis (MFA).

Source: Bundy et al. (2015).

5.4 Case studies

5.4.1 Shiretoko Peninsula, Hokkaido, Japan

The first case study is the peninsula of Shiretoko on Hokkaido Island, Japan. Shiretoko is located on north-eastern Hokkaido, bounded on the northwest by the Sea of Okhotsk. On the eastern side, the Nemuro Strait in the Pacific Ocean moves parallel to the land of Shiretoko (Shimizu, 2009) (fig. 5-5).

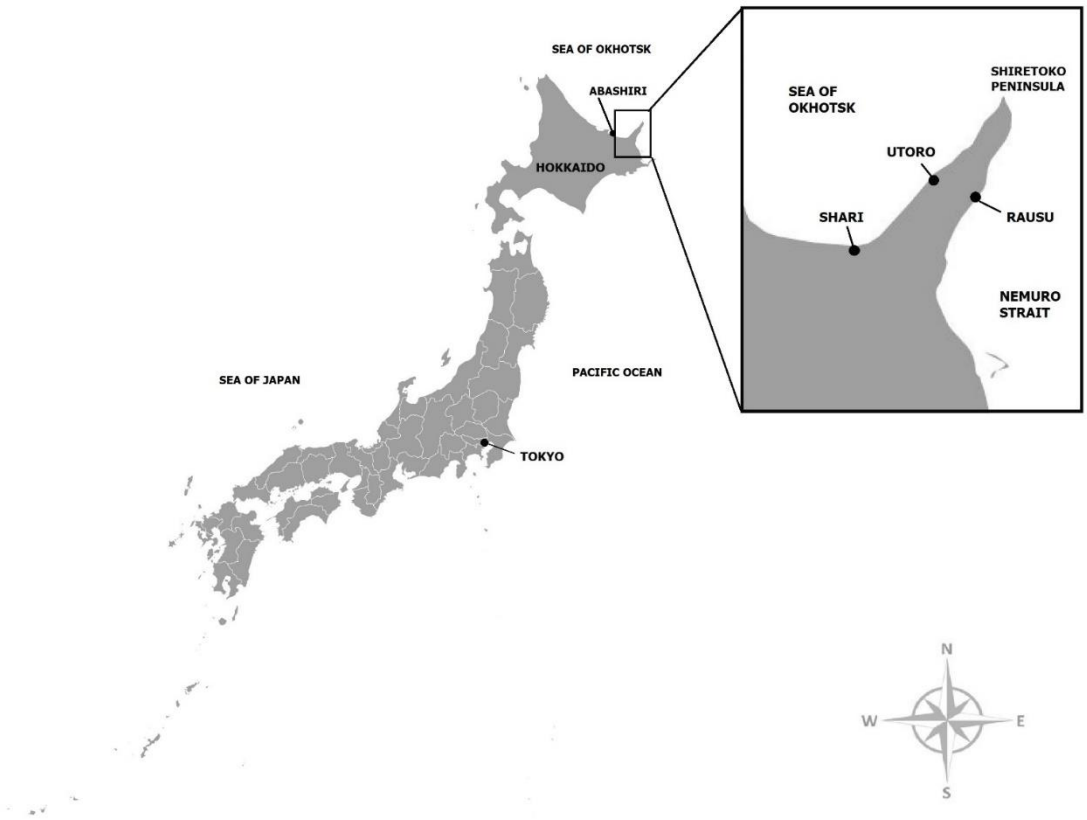


Figure 5-5: Map of Shiretoko, Japan.

Across the Nemuro Strait lies Kunashiri Island, one of the South Kuril Islands – or *Northern Territories* as they are called in Japan, *Hoppou Ryoudo-* and the closest one to Japanese territory. Sovereignty of Kunashiri Island has been disputed since the end of WWII, when the Kuril Islands were occupied by Russia, displacing the local Japanese population (Elleman et al., 1998; Mack, 1997).

The residents of Shiretoko originate not only from the Kuril Islands, but from many other locations as well, such as mainland Japan and indigenous Ainu settlements. Shiretoko is divided into two districts, Shari District on the west side of the peninsula and Menashi District on the east. Shari District is the largest one in terms of both land area (736.97km^2) and population (13051 people as of 2010) (table 5-1); furthermore it includes two of the major Shiretoko towns, Shari and Utoro (Shari Town, 2016). On the other hand, the relatively smaller district of Menashi includes only one major town, Rausu; it covers 397.88km^2 and hosts 5884 people (as of 2010) (table 5-1) (Rausu Town, 2016). From the coast of Rausu District, the Norther Territories are visible.

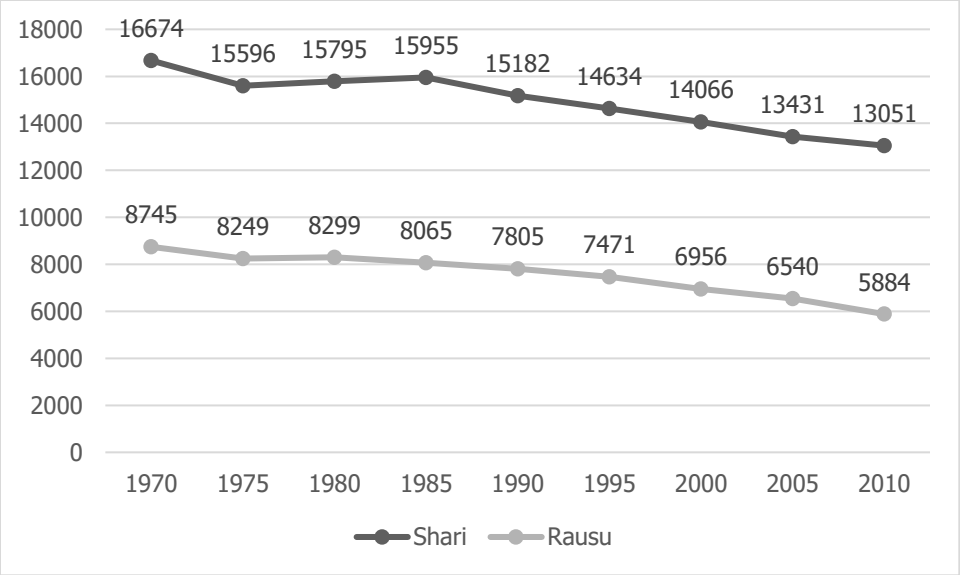


Table 5-1: Changes in the population of Shari (including Utoro) and Rausu from 1970-2010. Data from the Japanese population censuses.

The whole peninsula is highly reliant on agriculture, fisheries, and tourism, boasting exceptional productivity, especially fishery and dairy products, as well as unique nature and biodiversity, with a large part of its territory constituting the world famous Shiretoko World Natural Heritage Site (Rausu Town, 2016; Shari Town, 2016). Unfortunately, as can be seen in table 5-1, the area of Shiretoko is suffering from steady depopulation rates, mostly due to aging and the younger generations moving to large urban centres.

5.4.2 Kalloni Bay, Lesvos, Greece

The second case study is the island of Lesvos, Northeastern Aegean Sea, Greece, with a particular focus on Kalloni Bay (fig. 5-6). Lesvos is located in Eastern Greece, very close to the border with Turkey, just a few kilometres away from the city of Ayvalik, Asia Minor (Anatolia). At its narrowest point, the distance between Lesvos and Turkey is only 5.5km.

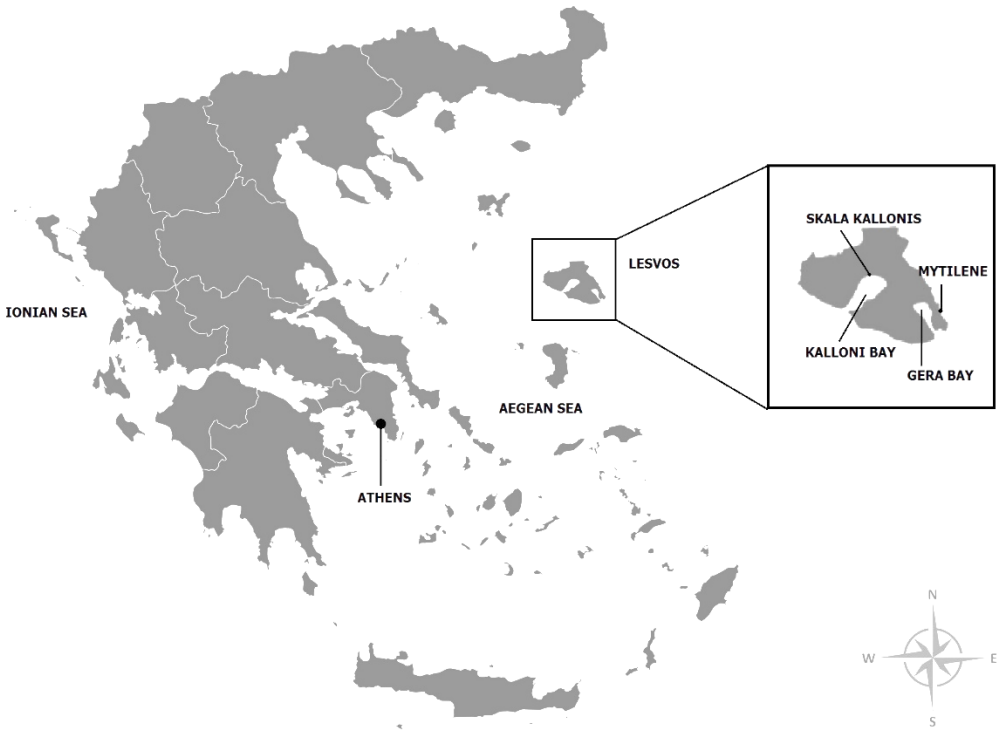


Figure 5-6: Map of Lesvos, Greece.

Lesvos is the 3rd largest island of Greece, occupying approximately 1632.8km^2, with a coastline of 370km^2. It constitutes the Lesvos County -along with the islands of Lemnos and Agios Efstratios- and is the capital of the Northern Aegean Prefecture (Dafni Network, 2012; Kizos and Koulouri, 2006).

The local economy is based on tourism, agricultural production (mostly olive oil), animal husbandry, fisheries, and manufacture of traditional products (ouzo and soap) (Kizos and Koulouri, 2006). Population dynamics have been fluctuating over the past decades, exhibiting though an overall slightly declining trend (tables 5-2 and 5-3).

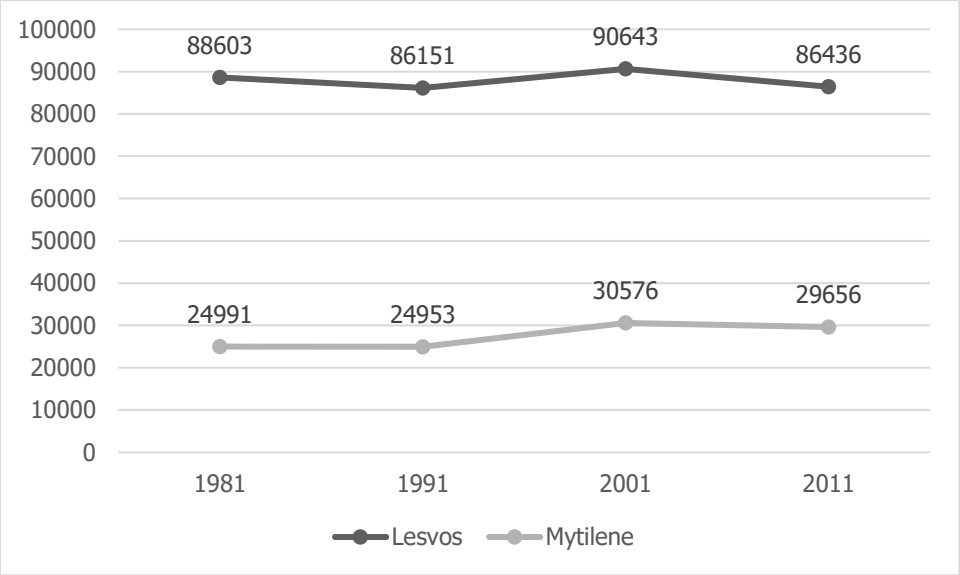


Table 5-2: Changes in the population of Lesvos island and the town of Mytilene from 1981-2011. Data from the Greek usual resident population censuses.

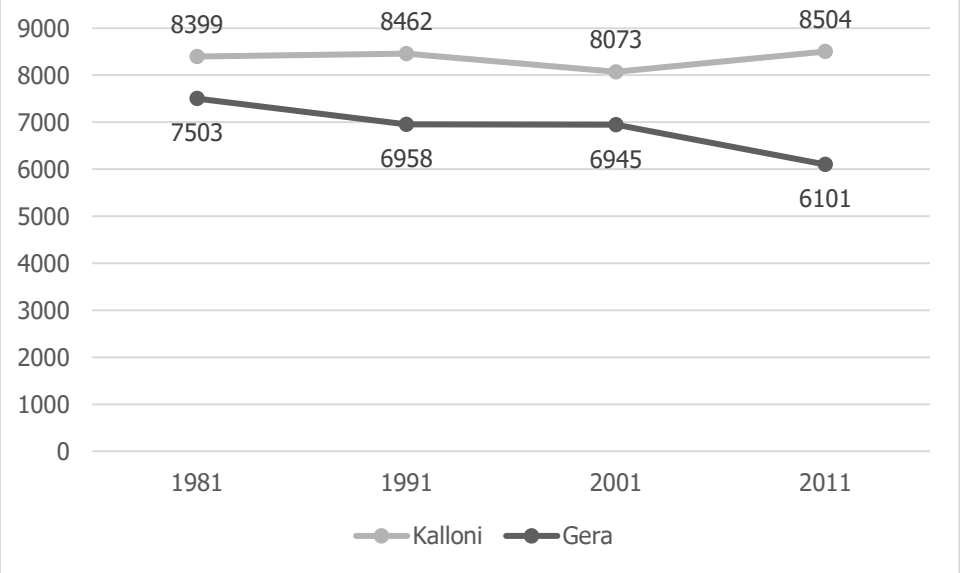


Table 5-3: Changes in the population of Kalloni and Gera from 1981-2011. Data from the Greek usual resident population censuses.

5.5 Implementation of methodology

5.5.1 Approach

Multiple methods were employed for the completion of this research. Initially, a general literature review on drivers of change for fisheries and the fish stocks as common property resources, as well as

a review on the socio-economic importance of fisheries for society and the local communities (employment, social capital, etc.) and local capacity for response to change. However, as the project is case-based, the majority of the empirical research methods utilised were qualitative; interviews, archival record research, direct observation, and participant observation collection, as defined by Yin (1994). The main research tools used were semi-structured open-ended interviews, unstructured open-ended interviews, small group discussions, and personal observation, as defined by Corbetta (2003) and Yin (1994).

5.5.2 General literature review

The general literature review explored the ways in which overfishing affects the fish stocks and then examined fisheries as common property resources by looking into various theories of management of the commons. In addition, the most important fisheries management approaches were reviewed, along with the respective critiques. Furthermore, the social aspects of fisheries management, namely co-management, Local Ecological Knowledge, employment, and social capital were investigated.

Finally, the geography and demography of the two countries compared, and the details of their respective fisheries sectors were a large part of the literature review, providing useful insight on the background of the two case studies.

5.5.3 Case study literature and archival review

The case study literature presents the geography and demography of the study areas, especially the relations between the local communities and the fishing sector; the marine environment; the cultural, socio-economic and political situation; and the local practices related to fisheries. All the aforementioned information is deemed necessary in order to accommodate a comparison between the two distinctive cases and grant insight about differences and similarities to the reader.

The coordination framework for fisheries management in each country is explored, along with relevant legislative and institutional background, in order to enable a deeper understanding of the case studies. Available archival data about fisheries and marine environmental conditions is used to highlight important aspects of the study.

5.5.4 Qualitative stakeholder interviews

The qualitative data on which this thesis was based, was collected through semi-structured and non-structured interviews of an open-ended nature (Yin, 1994) with participants from a range of stakeholder groups (fisheries, local government, scientists, local community, non-profit organizations (NPOs) and non-governmental organisations (NGOs), market professionals). The interviewer arranged appointments with the informants and engaged them in conversation on the topic, only partially navigating the conversation. The interviews were conducted in a way that reflected the individuality of each informant. There was a list of questions that were used as an outline, but the interviews were not strictly formed around the questions. In some cases (mostly during the interviews with the communities of western Shiretoko), due to language barrier problems, a pre-set set of questions was employed and the answers were translated from Japanese into English by Japanese native speakers. Nevertheless, each informant was seen as a different case and the researcher tried to explore each case in as much depth as possible (Corbetta, 2003; Yin, 1994).

The majority of the informants had been informed about the research, its aims and goals, and sometimes even about its contents, prior to the interview. The intervention of common acquaintances was pivotal, as the informants developed a more relaxed attitude of relative trust towards the researcher, enabling the successful completion of the interviews. Often, the informants would engage in conversation in small groups of up to five people (informants and researchers).

The interviews were conducted in the native language of the informants, either Greek or Japanese, and whenever it was deemed necessary, translations into English were done by native speakers (Japanese).

5.5.5 Direct observation

The researcher participated in several fieldtrips to the case study areas, as well as relevant infrastructure locations (e.g. professional fish markets, fisheries research centres, etc), during which, apart from the interviews, had the opportunity to observe the way the subjects function within their environment. The author gained insight on the daily routine and working conditions of the fisheries and related professionals, available infrastructure etc.

Furthermore, the researcher had the chance to participate and/or observe activities related to fisheries, such as fish auctions and cultural events, invited by the informants themselves, gaining thus insight on the integral aspect of fisheries for the fishing communities.

5.5.6 Comparative analysis

This research is based on a comparative analysis which utilises the concepts of the idiographic approach, to form what Jasper (1987) calls *idiographic comparative analysis*. The idiographic approach attempts to explain and specify; to assist the understanding of phenomena that could often be characterised as subjective. With the utilisation of aspects taken from the idiographic approach to construct the idiographic comparative analysis, this study analyses the two case studies, each one separately in order to understand the way in which the systems of each case study operate and their defining factors. Then the two systems are compared to each other in order to pinpoint not only the similarities, but most importantly the differences between the two. After the various variables or factors have been compared between the two cases and their differences have become evident, the research will have reached its conclusion.

5.6 Obstacles to research

The researcher faced several concerning the data collection. All the study areas in both countries, consist of relatively small towns and villages, where strangers are rare, tourists aside. The researcher was considered an outsider and only with the assistance of common acquaintances it was possible to convince the locals to participate in the interviews. Especially in the Greek case, the original case study had to be changed as the local connections fell apart and the project was impossible to finish. The fact that the researcher is a Greek native speaker allowed for a discreet presence, as there was no need for interpretation during meetings and group discussions. Additionally, familiarity with the local culture assisted the understanding between the researcher and the locals.

However, in the Japanese case, the author had to learn the local language and familiarize with the culture in order to achieve working relationships with the informants, despite the latter being relatively more open to collaborations than their Greek counterparts.

Furthermore, particularly in the case of Greek, sufficient data, both in terms of natural science and social science, are extremely scarce and difficult to attain. As a result, the research had to rely mostly on the data acquired through the qualitative research methods applied for this study, which could not be crosschecked and validated through comparison with pre-existing datasets and studies. A certain degree of uncertainty is evident throughout the study, however, the research has a largely exploratory character, attempting to utilise alternative data collection methods as the case study is data-poor.

5.7 Publications of research

Parts of the research for this thesis have been published in journals, edited books, and conference proceedings, and have been presented in several conferences, congresses, and symposiums. For more detailed information on prior publications, see Appendix VII.

5.8 Summary

This chapter made brief historical review of the emergence of Environmental Sociology and the consequent development of Marine Sociology, the central theoretical context of this study. Consequently, it presented the methodological framework, starting off with the Ecosystem-based Approach to Fisheries and the Social-Ecological Systems Analysis to set the ground for the tools used, namely the SESA methodology and the IMBER-ADApT framework. Lastly, the case studies were presented, as well as the technical details of the methods used to collect and conceptualise the data (literature review, interviews, observation, and comparative analysis). Finally, the obstacles faced by the researcher and prior publications of the research are mentioned. In the next chapters, using the methodology presented in this chapter, the case studies are introduced more deeply, explored, and analysed.

Chapter 6
Social-Ecological Systems Analysis of the Shiretoko World Natural Heritage Site

6.1 Shiretoko World Natural Heritage Site

During the past 15 years, the general view of resources management, as in the case of fisheries, has experienced a paradigm shift. Resource managers have moved from a classic tragedy of the commons view (Hardin, 1968) to a more holistic management approach, with an emphasis on the role of the human dimensions within the system. It is now widely accepted that conventional fisheries management has proven unsuccessful, not only in ecological, but also in socioeconomic terms (Berkes, 2003; Charles, 2001; Pitcher et al., 1998). During this time span, academic interest has turned to the local level, recognising its potential to turn this narrative shift from a theoretical approach into reality. There are multiple cases of local communities which have initiated conservation activities under different institutional and socio-political circumstances (see for example Armitage (2008)), but quite often with positive results.

This chapter documents experiences in the Shiretoko World Natural Heritage Site (WNHS), where local initiatives transformed the area into an example of community conservation success, catalysed in particular by the local fisheries sector. This case is particularly interesting as it is all built upon the notion of stakeholder participation in the decision-making processes with extensive collaboration among the users' groups. In this case, local fishermen were supported by the state and academic actors in the form of advice and knowledge sharing, but the fishermen were the primary decision-makers and exerted significant power over the establishment and development of the heritage site.

The Shiretoko site is located in north-eastern Hokkaido Island, the northernmost island of Japan. Shiretoko was nominated for the title of World Natural Heritage by the Japanese Government in 2004, and was awarded the title the following year by UNESCO and IUCN, after lengthy negotiations and implementation of strict conservation and management initiatives (see The Shiretoko Approach). The Shiretoko WNHS covers approximately 71100ha, including 22400ha of Marine Protected Area (MPA) (fig. 6-1).

According to the UNESCO World Natural Heritage program, the management approach developed in the Shiretoko heritage site constitutes a best-practice case for local stewardship with multiple advantages that could be utilised in other cases globally. This chapter focuses mainly on the fisheries sector actors involved in the emergence and success of the Shiretoko heritage site, examines the actions and strategies (e.g., fisheries co-management) that led to conservation success in this case, and reflects on the strengths and weaknesses of the Shiretoko experience more generally using a social-ecological systems lens (see Chapter 5).

6.2 Social-Ecological context

The Shiretoko WNHS is constituted by the inland and marine territory in and around Shiretoko Peninsula, Hokkaido. The marine territory of the Heritage Site extends up to three km from the coast (Sakurai, 2013) (fig. 6-1).

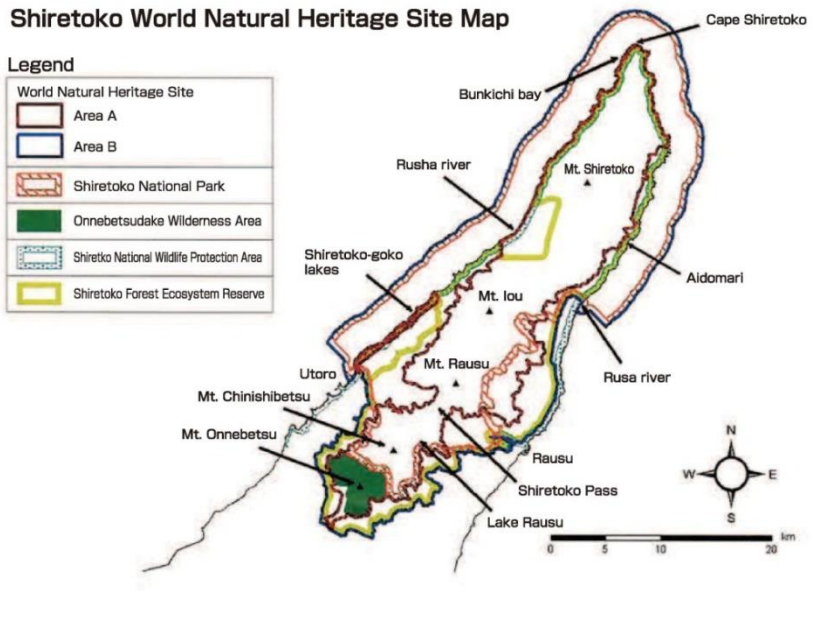


Figure 6-1: Shiretoko World Natural Heritage Site map. Source: Ministry of the Environment of Japan (2009).

This subarctic ecosystem, which constitutes the most southern point where the seasonal sea ice reaches the land (fig. 6-2), is characterized by high biodiversity and it forms the habitat for various endangered species, ranging from large terrestrial predators, such as the brown bear (*Ursus arctos,* in

Japanese *higuma*), and terrestrial and marine mammals, such as the Yezo deer (*Cervus nippon yezoensis*, in Japanese *ezoshika*) and the Steller's sea lion (*Eumetopias jubatus,* in Japanese *todo*), to birds of prey, such as the Blakiston's fish-owl (*Ketupa blakistoni*, in Japanese *shimafukurou*), and fish, including various anadromous salmonids, like masu salmon (*Oncorhynchus masou masou*, in Japanese *sakuramasu*) and chum salmon (*Oncorhynchus keta*, in Japanese *sake*) (Ministry of the Environment of Japan, 2009; Miyazawa and Makino, 2012). In addition to the endemic species, several migratory species, ranging from cetaceans, such as sperm whales (*Physeter macrocephalus*, in Japanese *makkoukujira*), to birds of prey, like Steller's sea eagles (*Heliaeetus pelagicus*, in Japanese *oowashi*), among others, feed and rest in the area (IUCN, 2005). There are continuous, vital interactions between the terrestrial and the marine ecosystems in the area under examination, mostly due to the fact that anadromous species (salmonids) moving upriver in order to spawn, become prey to the local terrestrial predators (brown bears, fish-owls, eagles), thus creating a very distinctive environmental background (Makino and Sakurai, 2012).

Figure 6-2: Drift ice around Utoro. Photograph © Eirini Ioanna Vlachopoulou, 2015.

In addition to the flora and fauna, the local area has been a site of human activity since the prehistorical ages. Based on excavated clay pots, shell mounts and prey bones, settlers are presumed to have ventured into Shiretoko from Siberia, forming the unique Okhotsk culture, a maritime civilization that inhabited Shiretoko from the 6th until the 12th century AD (Hudson, 2004) (fig. 6-3). During the 13th and 14th century, the Ainu civilization developed in the area, and descendants of that indigenous population still live in Shiretoko (Ministry of the Environment of Japan, 2009). The Ainu culture begun as a traditional hunter-gatherer society, depending highly on fisheries for its sustenance,

and today several preserved archaeological sites confirming the societal structure of the initial Ainu communities remain and are utilised as local tourist attractions (Makino, 2011). During the Edo Era (1608-1868) settlers from southern Japan that had moved to Hokkaido Island, began to suppress the indigenous people who still had no concept of government, based on the increasing nation-wide commercialization of their fishing activities (Mitsuda and Geisler, 1992). All the civilisations that developed in the area relied heavily on fisheries for their sustenance.

Figure 6-3: Fisheries remnants from the Okhotsk Civilisation era. Moyoro Shell Mound Museum, Abashiri. Photograph © Eirini Ioanna Vlachopoulou, 2015.

Even though the local population in Shiretoko has been relying on subsistence fisheries for centuries, it was only in 1790, and with the intervention of the rulers of mainland Japan, that fishing was commercialised with the establishment of a fishery market (Makino, 2011; Shari Fisheries History Editing Committee, 1979). Still, it was only the near-shore fisheries that were marketed, until the Meiji Restoration in 1868, when Hokkaido became part of the Japanese territory officially. At this time, cod and halibut off-shore fisheries markets were initiated (Ministry of the Environment of Japan, 2009) and fisheries became a central aspect of life in the Shiretoko area (table 6-1).

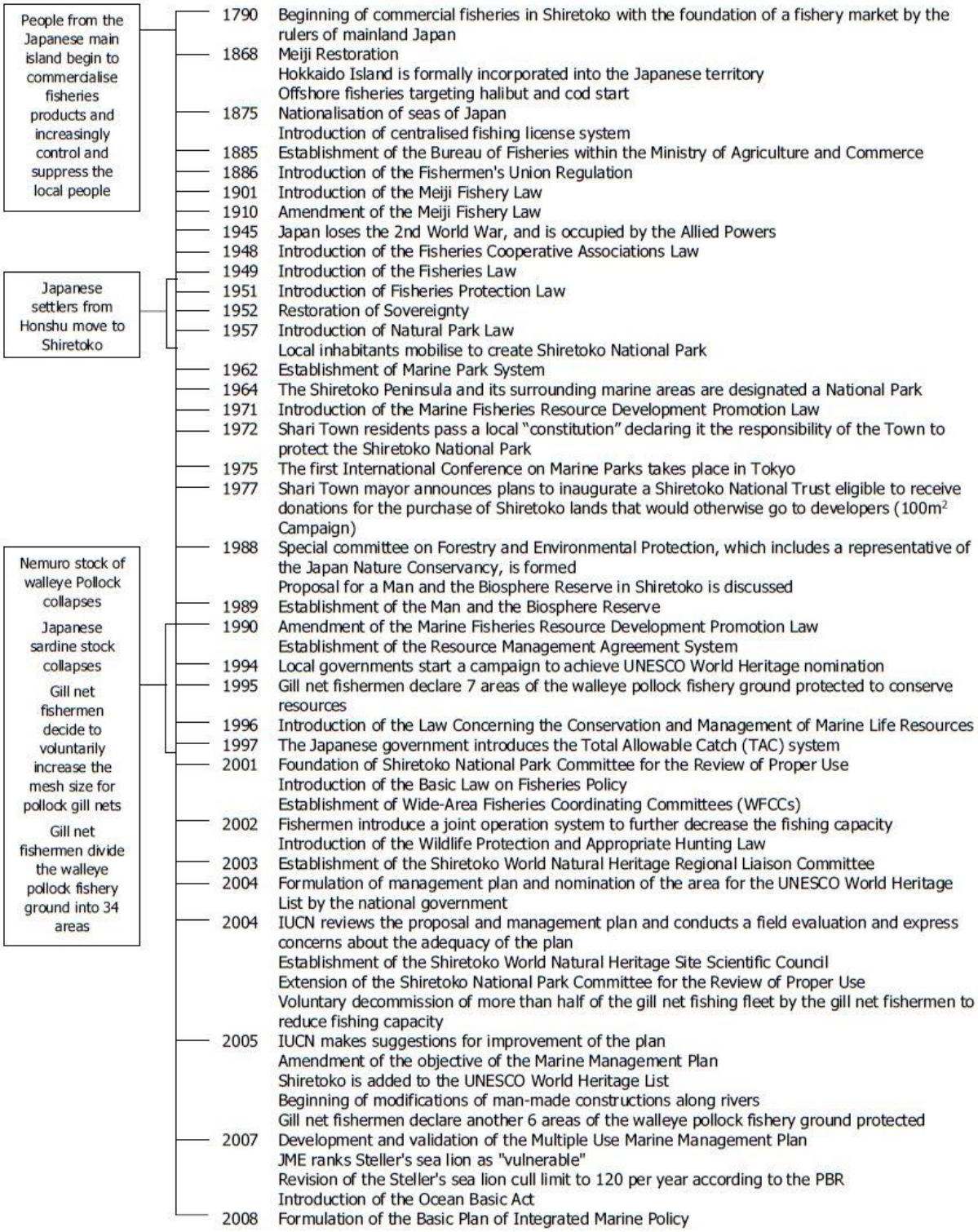


Table 6-1: Historical overview of the Shiretoko WNHS.

Produced by Eirini Ioanna Vlachopoulou, 2015.

The Shiretoko marine ecosystems have been influenced not only from local human activity, such as fisheries, but also from global climate change. Since the 1990s, many commercial species, such as walleye pollock (*Theragra chalcogramma*, in Japanese *suketoudara*), masu salmon and common squid (*Todarodes pacificus*, in Japanese *surumeika*), have shown declining trends (Nagata and Miyakoshi, 2013; Sakurai, 2013). On the other hand, human effort (e.g. hatcheries and cultivation) has enhanced the numbers of a variety of important stocks, such as chum salmon and kelp (*Laminariales* spp., in Japanese *konbu*) (Nagata and Miyakoshi, 2013; Sakurai, 2013). In addition to fisheries resource depletion, the local marine habitats are also suffering from temperature rise, which, in the Sea of Okhotsk, has resulted in the deterioration of the seasonal ice volume (Sakurai, 2013), and has led to changes in fisheries practices.

Figure 6-4: Fishing traps in Abashiri City Port. Photograph © Eirini Ioanna Vlachopoulou, 2015.

6.2.1 Climate change and local responses: Fisheries target switching

A significant function of the Shiretoko WNHS management is climate change adaptation and mitigation. In 2008, IUCN and UNESCO urged the Japanese Government to take steps towards the adoption of a Climate Change Strategy for the Shiretoko area, focusing on two main points: (1) short- and long-term climate change impact monitoring; and (2) adaptation and mitigation management strategies (Makino and Sakurai, 2012; UNESCO and IUCN, 2008). As mentioned earlier, the seasonal

phenomenon of the sea ice is what makes Shiretoko such a productive marine ecosystem. However, during the past 50 years, apart from the sea ice volume, the annual duration of the sea ice coverage has also been steadily decreasing (Makino and Sakurai, 2012; Sakurai, 2013). According to the data of the Meteorological Agency of Japan, the decadal average of sea ice coverage has decreased by approximately 22% since the 1950s (Makino and Sakurai, 2012). As is evident from the table 6-2 below, there is a decreasing trend in the annual sea-ice coverage, coupled with drastic increase in the year-to-year variation. During the 1950s, the decadal average was 95.8 days, while in the 2000s it had decreased to only 74.6 days per year.

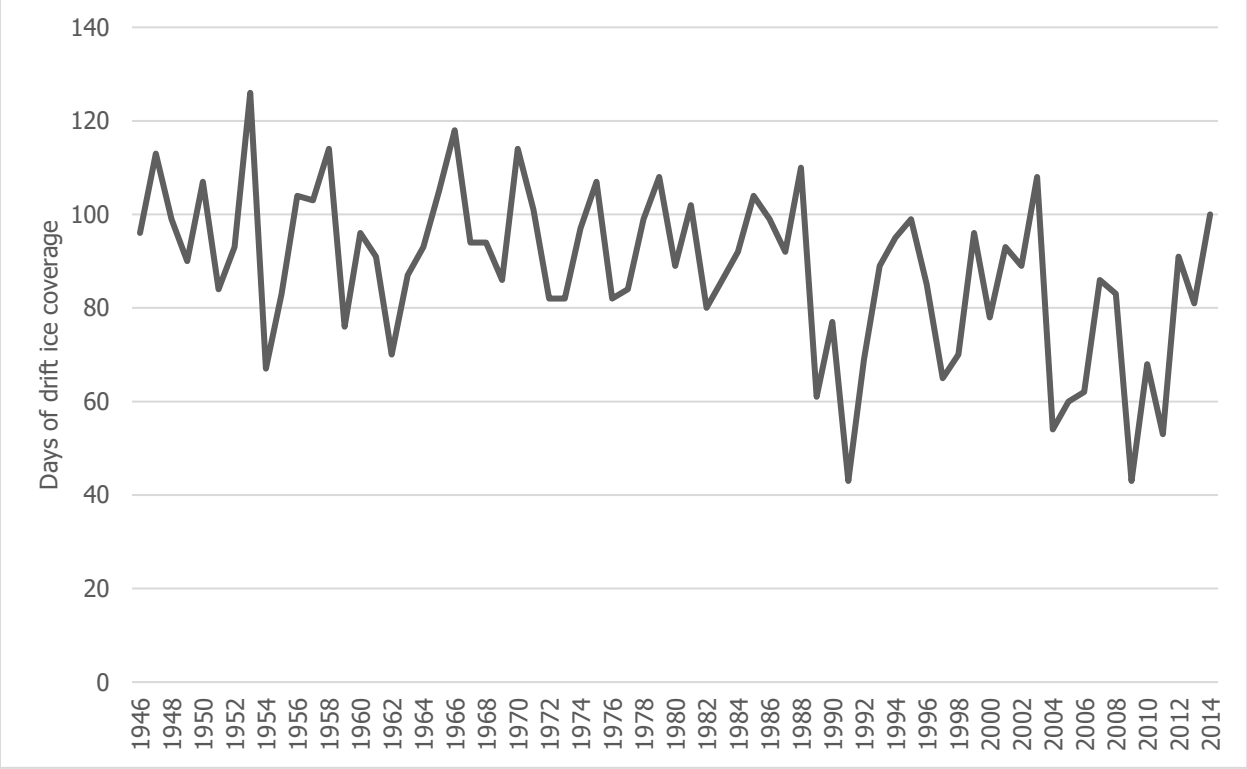


Table 6-2: Annual drift ice coverage at Abashiri Local Meteorological Observatory (1946-2014).
Produced by Eirini Ioanna Vlachopoulou, 2015.

This deterioration of the sea ice volume and coverage has had an adverse effect in the local ecosystem balance, as multiple species, many of which being species of significant commercial value, depend on the sea ice for their survival. As an example, the numbers of chum salmon, one of the main target species for the Shari Town Fisheries Cooperative Association (FCA) (need to spell this out), have been decreasing (Kaeriyama, 2008; Kishi et al., 2010; Makino and Sakurai, 2012). Furthermore, the highly prized *Oni-Konbu* kelp (*Saccharina japonica*) have been shrinking in size and their shape is

gradually changing, assimilating temperate water kelp species (Makino and Sakurai, 2012). Other species, such as Japanese amberjack (*Seriola quinqueradiata*, in Japanese *buri*), are believed to have been migrating to colder waters (Fisheries Agency and Fisheries Research Agency, 2010). Yet, there are species which have proven to be resilient to climate change, such as walleye pollock and pacific saury (*Cololabis saira*, in Japanese *sanma*) (Ito et al., 2010; Sakurai, 2009). Nevertheless, due to the changes in the sea ice, the abundance of some species has been increasing to the point that the local fishermen expect them to substitute the current main catch target fish stocks. Profound examples of such species would be the Japanese common squid and pacific herring (*Clupea pallasii*, in Japanese *nishin*) (Makino and Sakurai, 2012; Megrey et al., 2007; Sakurai, 2006; Rosa et al., 2011). Already, the Rausu FCA, following their long tradition of maintaining intra-member income equality, has been promoting voluntary fishermen switching from declining species and non-profitable gears to healthy stocks and profitable fishing methods. Every five years, the gears and stocks are assessed and alternatives for switching are proposed. Furthermore, in the meantime, the fishermen may decide by themselves to propose a switch in target species, as several of them did two years ago, moving from walleye pollock (set nets) to squid jiggling, as the latter stock was considered healthier and thus more profitable.

6.3 The Shiretoko Approach

In this section the emergence and success of the Shiretoko heritage site in fostering a transformative change in social and ecological conditions are examined. In doing so the author reflects in particular on the strategies and approaches in fisheries resource management that helped to catalyse this success.

In the context of immediate threats to the health of the local environment (e.g., climate change, changes in species distribution and availability) and the well-being of the communities in Shiretoko in the 1990s, solutions towards an effective ecosystem-based management framework were sought. Based on the lessons and experiences with the common decentralised Japanese fisheries management system, the Shiretoko area stakeholders developed a unique model for ecosystem conservation. This model is referred to now as the Shiretoko Approach (Makino, 2011).

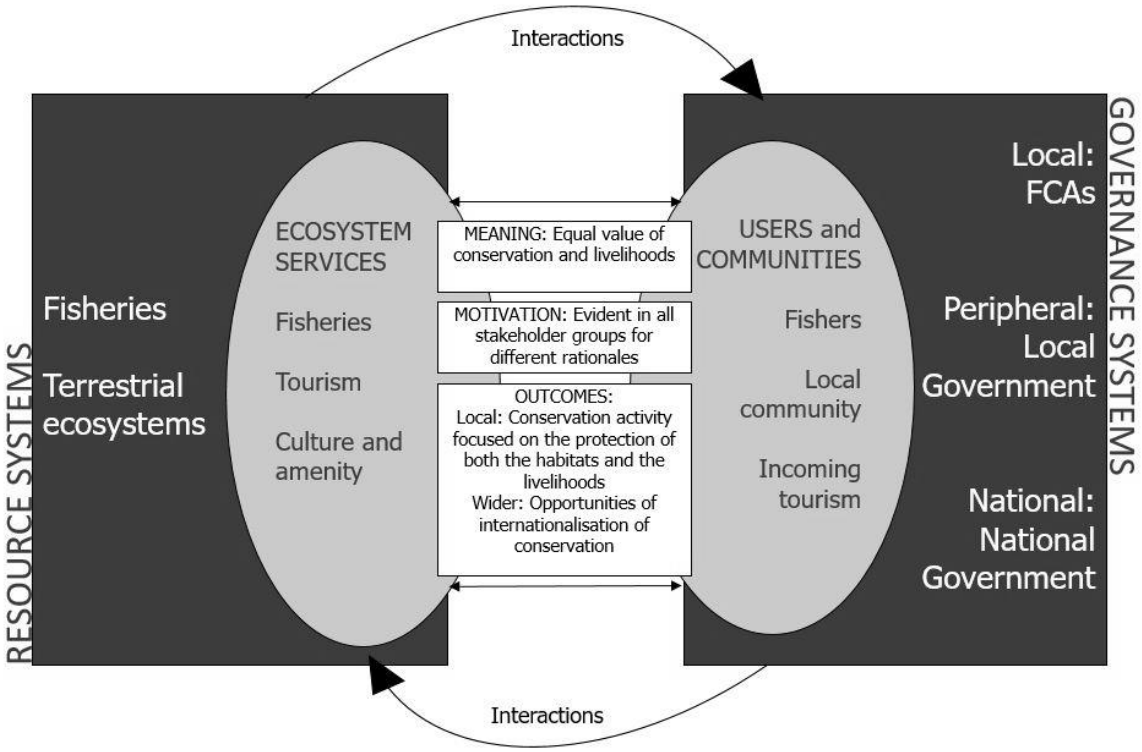


Figure 6-5: SES Analysis of the Shiretoko Approach.
Adapted from Berkes et al. (2014).

Generally, self-governance of fisheries systems, due to the multitude of stakeholders involved in the decision-making process may prove to be inefficient and time-consuming. This is certainly common in cases where conflict is widespread among the members of decision-making bodies. In addition, decision-making, monitoring and control are limited within many fishery management systems, while the only stakeholder groups participating in those activities are typically state fisheries agencies and fishermen's groups. However, in the Shiretoko case, a different path was followed. Even though the basic idea of fisheries self-governance – that is the direct involvement of fishermen in decision-making (Townsend et al., 2008) - has been adopted, the local partners took it one step further.

In Shiretoko, the fishermen are the primary decision-makers. The governmental and non-governmental bodies operating in the area play only an advisory role. Nonetheless, the fishermen take into serious consideration the research outcomes and scientific advice provided by the supporting research institutions. Although they are responsible for the adoption and implementation of fish stock regulations, they value scientific input highly in order to ensure the validity of the decisions that they make, as in the case of the mesh size increase. During the 1990s, the fisheries around Shiretoko started

to decline rapidly. Even though the Japanese government declared the establishment of the EEZ in its waters, considerable parts of the fish stocks are still at low levels (Uchida and Makino, 2008). One of the most commercially important fish stocks for Shiretoko, the Nemuro stock of walleye pollock collapsed, followed shortly after by the collapse of the Japanese sardine (*Sardinops melanostictus*, in Japanese *iwashi*) stock. Following this turn of events, the Shiretoko walleye pollock gill net fishermen, having realized the direness of the situation, decided to take community action. This action consisted of a voluntary increase in mesh size from 91 to 95mm, according to scientific advice provided by the local research station, and the division of the walleye pollock fishery ground into 34 areas, based on local knowledge and expertise. In 1995, the fishermen declared seven areas protected among the 34 walleye pollock fishery areas in order to conserve the spawning stock (Makino, 2010). The fishermen continued their efforts to conserve the local stocks by attempting to reduce the fishing capacity, and introducing a joint operation system in 2002. By the end of 2004, already half of the local fishing fleet had been decommissioned (Makino, 2011).

Examining the Shiretoko case through the SES lens, we can see that the stakeholders' motivation for conservation is very high, for various reasons (fig. 6-5). Initially, the fishermen, holding a long tradition of self-implemented conservation actions, take pride in the protection of the local marine environment, upon which their livelihoods depend. Furthermore, the local community, supported by the local and national governments, see the Shiretoko habitat as an area worth protecting, for they have direct benefits from incoming tourism.

"Fishermen have always protected the sea because they have always lived there"

T.O., fisher

As shown in figure 6-5, there is a feedback cycle of interactions between the Shiretoko natural resource systems and its governance framework. The local community and stakeholders, supported by the local and national governments, manage the local ecosystems and adjust their practices according to the changes in environmental needs. At the same time, they ensure that livelihoods are protected, as they consider environmental conservation and local development as equally important notions.

The Shiretoko Approach has managed to incorporate the fisheries management system in a holistic or ecosystem-based framework that also takes into account the terrestrial parameters of the area (Makino et al., 2009). As multiple terrestrial species are piscivorous, conservation conducted in one area inadvertently affects others (for example, salmon population management affects food availability for brown bears and birds of prey). Thus, any decisions regarding either the marine or the

terrestrial aspect should always be taken with consideration to the other. Moreover, as tourism has been developing rapidly since the nomination of Shiretoko as World Heritage Site, the terrestrial and marine aspects cannot be separated. The inflow of tourists is based on the integrated maintenance of the environment of Shiretoko as a whole, thus making it impractical to separate terrestrial and marine conservation activity. In contrast with most fisheries self-governance cases, in Shiretoko, through the unique management arrangement, multiple opinions are heard during the meetings and information from different sectors is gathered. During these meetings, consensus is always the primary objective so as to consider all the parameters before a decision is made, and to avoid conflicts between the stakeholder groups. This type of collaborative approach has proven pivotal for the sustainability of the coastal commons in Shiretoko. There are several examples that could be given, such the established practice of fishermen to organise tree-planting activities with the participation of the general community and the support of the local government and NGOs in order to improve not only the terrestrial ecosystem (forest), but also the water quality of the rivers and consequently the sea, as detailed below.

1. *Rausu fishers' research initiatives*

The Yesso giant scallop (*Patinopecten yessoensis*, in Japanese *hotategai*) is a famous product from Hokkaido and an important commercial species in Rausu. The species spawns in the northern part of Hokkaido and later the seeds migrate towards southeast Shiretoko. Until recently, as there were no scientific data on the spawning grounds, the FCAs of Northern Hokkaido, in a joint effort, implemented an observation project in order to collect environmental data about the Yesso giant scallop spawning processes. After three years of collaborative observations, the spawning area was found and the fishing efforts for stocks could be better managed.

2. *Rausu fishers' training initiatives*

As a cycle that repeats through generations, the leaders of different fishermen groups are encouraged and supported financially by the FCA to go on training trips to different fishing areas of the world. This is done to further enhance their understanding of fisheries and to develop innovative management approaches. Study trips include locations such as Alaska, for the study of pink salmon, or national waters near Kyushu, for the study of warmer water fish treatment. By participating in these training activities, fisherman acquire new knowledge and are able to better adapt their activity to changes in fish stocks.

3. Rausu fishers' policies for economic equality

Every five years, the FCA implements a voluntary programme of fisheries target reallocation among its members, in order to maintain equal distribution of wealth within the community. The fishermen are moved from a fishery that is facing unfair pressure to another, more profitable. At the moment, the set net fishery is highly profitable, so fishermen employed in bottom gill net are encouraged to shift to set net, so as to let many members of FCA to enjoy the profits of that fishery. For this transition to take place, the fishermen that change fisheries borrow money from the FCA, as there are no subsidies. Those fishermen that move from one fishery to another are supported by experienced fishermen through sharing of knowledge on the way to fish with the new gear. Furthermore, in some cases, the newcomers may even be employed directly by the older fishermen, until they gain the necessary experience in the new fishery.

4. Rausu fishers' environmental conservation initiatives

Fishermen in Rausu organise beach cleaning days twice a year, during which they remove garbage from the coastline, and to support conservation in the place in which their livelihoods rely. Furthermore, as the individuals of the fishing community are aware of the interactions between the various elements of the ecosystem that support their livelihoods, both the terrestrial and the marine aspects, they take seemingly irrelevant initiatives, that are however, extremely important for the coastal commons. The most profound of such initiatives is the planting of trees on the mountainsides with the participation of the general public, especially close to rivers that reach the sea, as such planting activities improve the river water quality, and subsequently, improve the marine environmental conditions as well. This activity is part of the wider notion of the local community that the various marine and terrestrial nodes, more specifically the forest, the rivers and the sea, are connected in an unbreakable cycle (*mori-kawa-umi,* literally meaning forest-river-sea).

6.3.1 Shiretoko SES and conflicts: The case of the Steller's sea lions

Even though the Shiretoko Approach has proved a major step towards a localised and inclusive management framework, some management issues still constitute obstacles to consensus. The most profound example would be the case of the Steller's sea lions. Asian Steller's sea lions are ranked as 'near threatened' in the IUCN Red List (IUCN, 2014a), as the population decreased rapidly during the

1980s. Currently, they are showing signs of slow recovery, at an annual rate of 1.2% (Makino, 2011). During winter, the Kuril and Okhotsk sea lion populations migrate to Shiretoko to overwinter. As the sea lions often cause significant damages to the nets of the local fishermen in their search for food, the latter consider them as pests and demand their removal. In order to at least partially accommodate the fishermen's demands, the Japanese Government has adopted a culling scheme. At the initial stage of the scheme, approximately 110 individuals were culled in Hokkaido, 10 of which were culled in the Shiretoko area. However, there was no significant scientific basis for the number of individuals that were culled annually, so the government had to amend the practice. After the scientific community calculated the Natural Removal Rate (NRR) for the Kuril and Okhotsk sea lion populations (United Nations University Institute of Advanced Studies Operating Unit Ishikawa/Kanazawa, 2011), the number of individuals culled annually doubled. Nonetheless, the number of culled animals in the Shiretoko WNHS remained the same, a fact that still causes friction with the local fishermen.

> *"Rausu fishermen are increasing their effort to increase the cull limit [of the sea lions]. The national cull limit was doubled last year [2014], but the local limit remained the same. The fishermen hold a feeling of unfairness"*
>
> *M.T., Local Government officer*

Even though the culling rate is calculated according to the NRR, as the data on the population levels and actual recovery rates are still lacking, IUCN is concerned about the sustainability of the culling scheme performed within the limits of the Shiretoko WNHS (IUCN, 2014b). Apart from IUCN, the various stakeholder groups involved in the Shiretoko area management also maintain different perspectives on the matter. Interviews conducted in the area in January 2015, showed that there is little agreement among the local residents about the sea lion culling practice. Depending on the employment sector and the geographical location of the interviewees, opinions on culling differ significantly. The most vocal groups in favour of the culling practices are the fishermen operating closer to the sea lion feeding grounds, as they were the ones suffering the largest damage. Other groups of fishermen, especially the ones targeting mostly "river fish" (salmonids), even though they might be sympathising with the cause, are not directly affected by the issue, and thus, they prefer to remain neutral. Furthermore, several academics support the culling practices, based on the idea of *Balanced Harvesting*, meaning the distribution of "a moderate mortality from fishing across the widest possible range of species, stocks, and sizes in an ecosystem" (Garcia et al., 2012) (see section 2.5). On the other

hand, other groups, especially among the nature conservationists, are against the culling practices, as they believe that human control should not be enforced within the WNHS, but rather "let nature do the job", a viewpoint consistent with the general vision of the WNHS as a real wilderness site. However, the general worldview of the society is that "we should protect the economy first" and they support the demands of the fishermen for sea lion population control.

> *"It would be ideal if we didn't enforce human control [on the sea lions] but let nature do the job. However, the general world view of the society is that we should protect the economy first"*
>
> *G.T., Shiretoko Nature Foundation officer*

Nonetheless, the situation seems to have improved considerably since the nomination for WNH, as the sea lion culling practices are now implemented with caution and with constant monitoring. In addition, a long-term study is being conducted by a researcher equally acknowledged by both the scientific community and the locals, aiming to determine the exact size of the local sea lion population and its recovery rate, in order to decide the future of the culling practices and put an end to the debate between the stakeholder groups.

6.4 Organisation and coordination of the Shiretoko WNHS

As there is no specific legislation regarding the conservation of World Natural Heritage Sites, the Shiretoko conservation plans are decided and implemented by several bodies together. This process is based on a range of laws, thus creating a new integrated management system based on cross-sector collaboration (Makino et al., 2009; Miyazawa and Makino, 2012). In 2003, as the first step towards the realisation of the vision of the Japanese Government to nominate the Shiretoko Peninsula as a UNESCO World Natural Heritage, the Shiretoko WNHS Regional Liaison Committee was established. The aim of the Committee is to bridge the differences between the various stakeholder groups. The members of the Committee belong to various institutions, governmental and private, ranging from National Ministries, to FCAs and NGOs. The Committee's main role is the coordination of policy decision-making among the administrative bodies (Makino, 2011).

In 2004, the government compiled the management plan for the Shiretoko area and nominated the area for the UNESCO World Natural Heritage programme. IUCN reviewed the proposal and the plan, and conducted a field evaluation, which concluded with the organisation expressing its doubts about the adequacy of the plan. In order for the Shiretoko nomination to be strengthened, in addition to the Committee, the Shiretoko WNHS Scientific Council was also established, with the aim to provide scientific advice and support to the Committee (Makino, 2011). The Scientific Council is

comprised by four Working Groups (WGs), each one specialising in a different research area: the Ecotourism WG, the Yezo Deer management WG, the River Construction WG, specialising in the improvement of river infrastructure, and finally, the Marine WG, specialising in marine ecosystem management. Similarly to the Shiretoko WNHS Committee, representatives from governmental and private bodies participate in the Scientific Council and its WGs, in addition to scientists (Makino, 2011). As the WGs collaborate and work closely together, and in cases where more than one WG is involved, the decision is made collaboratively with all the WGs concerned (fig. 6-6). Thus, the decision made is more holistic and less likely to cause conflicts in the future.

All the organizations founded within the Shiretoko WNHS are functioning based on mutual recognition, extensive collaboration and stakeholder participation, thus promoting knowledge exchange, and forming a forum for the user groups to state their opinions and reach agreement through inclusive debate. This arrangement, which constitutes the core of the Shiretoko Approach, supports the legitimacy of the plan that have consecutively been adopted and have led to the current Multiple Use Integrated Marine Management Plan (Makino et al., 2009).

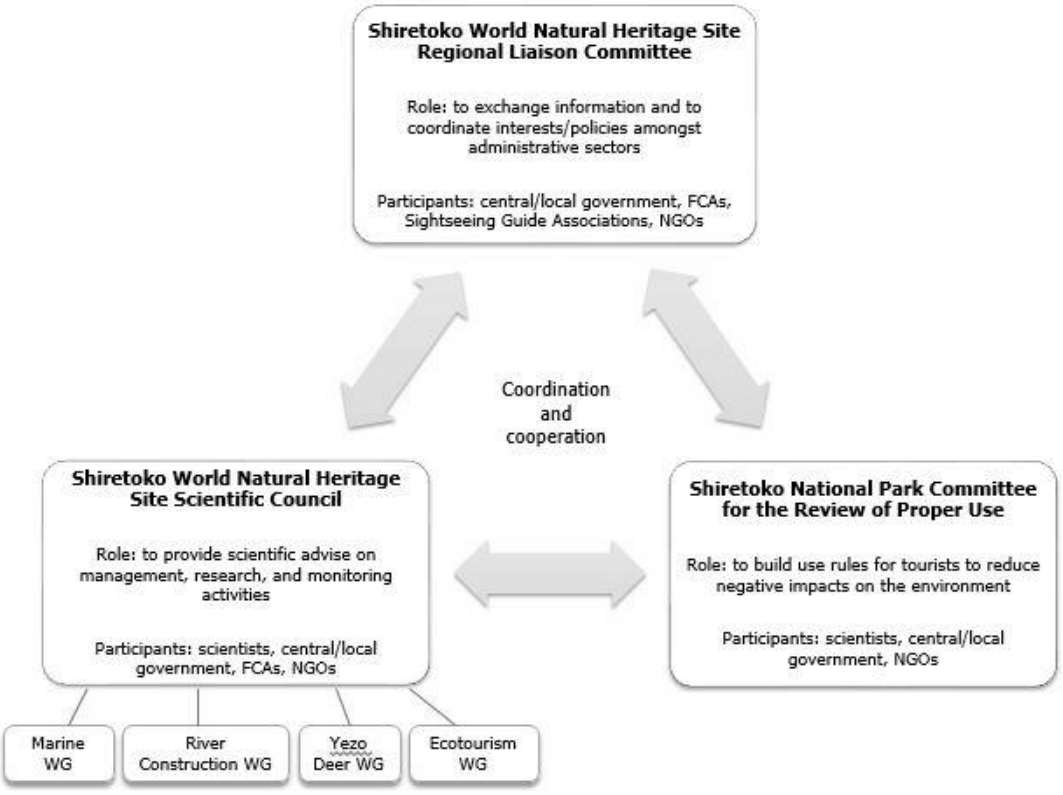


Figure 6-6: Coordinating system in the Shiretoko WNHS.
Adapted from Makino and Matsuda (2011).

In 2005, the IUCN made suggestions for the improvement of the Multiple Use Integrated Marine Management Plan (MUIMMP), which led to heated discussions between the members of the Marine WG, resulting in the amendment of its objective as "to satisfy both conservation of the marine ecosystem and stable fisheries through the sustainable use of marine living resources in the marine area of the heritage site" (Ministry of the Environment of Japan and Hokkaido Prefectural Government, 2007) (p.1). With this amendment, the core principle of the Shiretoko WNHS was officially recognised and adopted by all the participating bodies. Following the amendment of the MUIMMP, UNESCO and IUCN awarded Shiretoko with the World Natural Heritage status (Makino, 2011; Ministry of the Environment of Japan, 2009).

The unique nature of the Shiretoko Approach and its potential as a global best practice case have been highlighted in the Report of the Reactive Monitoring Mission, Shiretoko Natural World Heritage Site, Japan, 18-22 February 2008 (IUCN, 2008), (page 9):

> "The mission team also applauds the bottom up approach to management through the involvement of local communities and local stakeholders, and also the way in which scientific knowledge has been effectively applied to the management of the property through the overall scientific Committee and the specific Working Groups that have been set up. These provide an excellent model for the management of natural World Heritage Sites elsewhere."

6.5 SES Assessment of the Shiretoko WNHS

The Shiretoko Approach is a continuous process to conserve the environment of the Shiretoko Peninsula while protecting the local livelihoods and improving the living standards of the community. Faced with declining natural resources (fish stocks), the local stakeholder groups came together in order to decide on a common route of action. By building consensus among themselves and agreeing to implement a sustainable management framework, they achieved a balance between environmental conservation and local development.

The Shiretoko WNHS case illustrates a unique management arrangement to govern the local social-ecological system. The voluntary initiatives and self-governance, coupled with stately and scientific support have established a long-term conservation mind-set that adjusts according to the needs of the system as a whole. The actions are constantly evaluated and the best paths are chosen in order to maintain ecosystem health and community sustenance. In the case of fisheries in particular, the priority and power that the public (in this case the fishermen) yields is surprisingly strong, and thus, the decisions made reflect primarily the viewpoints of the stakeholders. It is important, however,

to mention that the Shiretoko stakeholders always consider conservation when they discuss issues at hand.

The nomination process for Shiretoko to become a World Heritage site played an important role in guiding the public to embrace conservation as it increased the perceived value of the area. Despite the existence of conflicts among stakeholder groups and their interests, as in the case of the sea lion culling, stakeholders are effectively using negotiation tools in order to gradually overcome their differences. The fact that the importance of academic input is acknowledged by all parties improves the capacity for conflict resolution through mediation from a third party (i.e. academia). Nevertheless, it is evident that there is still space for improvement of the consensus-seeking and participation strategies in Shiretoko. SES discourse in the area would benefit from more extensive research and data collection on the local environmental conditions, with a special focus on the commercial fisheries (i.e. walleye pollock) and the local flagship species (e.g. Steller's sea lion). Making scientific data available could positively affect the consensus-seeking processes by allowing for the stakeholder groups to argue in favour of their opinions based on scientifically supported arguments. The management plans that would emerge would be more likely to earn universal acceptance, as they would be built upon solid information.

The significance of the Scientific Council in the development of the Shiretoko Approach and its ongoing implementation should also be stressed. The Scientific Council is a directly involved advisory body, the nature of which is quite unique in the WNH world, with the Japanese Government, spurred by the Council's success in Shiretoko, establishing similar bodies in all its other WNH sites across the country, and UNESCO promoting the idea globally. The Scientific Council played a major role in the inscription of the Shiretoko WNH site. Initially, the Council persuaded the local communities that following the global sustainability standard as dictated by UNESCO would be a necessary step towards sustainability, to pave the way for selection as a WNHS. Secondly, it promoted universally the notion of self-management as an already established practice among local fishers. Lastly, it demonstrated how IUCN requests could be met by an unprecedented practice; the strengthening of self-management instead of the introduction of government regulations. Yet, it was the FCAs that made the decision which actually resolved the pending issues; all the Scientific Council did was suggest solutions. In this way, instead of the government taking responsibility to preserve nature in line with the conventional WNHS management system, the Scientific Council presented to the world a new WNH model.

The Ministry of the Environment acknowledged the success of the Scientific Council's role, naming it the *Shiretoko Approach* (Makino et al., 2009; Matsuda, 2016), and from there on the ministry established scientific councils for the existing Japanese WNHS of Yakushima and Shirakami-Sanchi, as well as for sites aiming for selection like Ogasawara and Amami (Ryukyu). In 2010, realizing the significance of the Shiretoko case, the International Association for the Study of the Commons selected it as one of its global impact narratives to be included under the title of "Co-management of Coastal Fisheries in Japan", defining co-management as a concept where not just the government, but also interested parties are included in autonomous management (Matsuda, 2016).

Another point of importance in the Shiretoko experience focuses on the international aspect of the potential arising from the lessons learned in this case. As the Shiretoko management process showed, there is much space for improvement towards a more holistic and inclusive ecosystem-based approach. Yet, the question that national territoriality imposes, still impedes the adoption of such frameworks. unilateral management measures imposed only to the Japanese side would not be effective, as, in light of complete lack of data from the Russian side, it would be impossible to assess which country's fishing industry had the largest impact on the stock – in other words, a quantitative comparison could not be made. The policy of the Scientific Council is to build first a trusting relationship between Japanese and Russian experts, in order to mutually share information on an informal basis. Afterwards, they could move on to propose to both countries an effective resource management scheme to cover all aspects. Frankly, formal sharing of information and implementation of a co-management scheme on an intergovernmental basis is not about to happen, as of yet at least. It is important to note that the Japanese government is not willing to countenance the Russian fishing activity around the Kuril Islands.

> *"During the last Scientific Council meeting, the FCA demanded officially to have the Russian fishing fleet data from the Northern Territories [Kuril Islands] disclosed to them. Despite the effort of the Japanese and Russian researchers the data was not disclosed under the excuse that the data is part of the relations between the two countries and should be treated at national level"*
>
> *T.I., FCA officer*

Nonetheless, during the Shiretoko nomination, IUCN pointed out that nearby islands shared a similar ecosystem with Shiretoko, with even a proposal going as far as to suggest that the selected area could expand in the future to encompass the surrounding areas in order to create a "world peace park". UNESCO recommends selections of World Heritage Sites that span international borders in the hope of promoting peace and friendship. Fortunately, Shiretoko was selected ahead of such proposals, so

Japan has the initiative rights on whether to expand or not the Site in the future. At present, there is no indication that the Japanese government is ready to use this trump card. Yet, for the noble cause of nature conservation, it is possible that a government proposal on nature conservation including the Kuril Islands might be put forward, even though such an action could bring the threat of a new problem concerning the Kuril Islands dissimilar to the question of territorial possession (Honma, 2005).

Figure 6-7: Fishing vessels painted yellow have permission to fish in the disputed waters between Japan and Russia. Photograph © Eirini Ioanna Vlachopoulou, 2015.

In relation to the aforementioned, Japanese, Chinese, and Russian researchers led by professor Shiraiwa of Hokkaido University, formed the *Amur-Okhotsk Consortium* in 2011, a body to promote academic collaboration in the Amur-Okhotsk region. While there are various restrictions placed on field trips in Russia and China, real progress is being made in establishing mutual trust among the researchers in their joint efforts. Indeed, the Ministry of the Environment and the Ministry of Foreign Affairs frequently hold workshops on cooperation in conserving ecosystems in areas adjacent to Japan and Russia. These workshops could possibly give hope also to the scientists involved with the fishers mentioned above.

Nevertheless, after the nomination of Shiretoko as a World Natural Heritage site, scientists from Japan, Russia and China, supported openly by their respective governments, made a pact for

knowledge and information sharing in order to promote sustainability in the region of the sea that surrounds Shiretoko. This region reaches the shores of Russia and China, namely the Sea of Okhotsk (Amur-Okhotsk Consortium, 2013). Currently, the sustainable management of several important fish stocks (e.g. walleye pollock and salmonids) relies on an agreement between the three countries (IUCN, 2014b). As the various phenomena that occur in the area (e.g. climate change) affect all the neighbouring countries, a further expansion of the agreement towards the implementation of climate change adaptation and mitigation strategies, for example, could vastly improve the environmental conditions within the Amur-Okhotsk area (Makino and Sakurai, 2012; Radchenko et al., 2010).

Such an agreement, however, is not legally binding and there is a possibility that one or more of the parties may not follow the terms. An official agreement is preferable. Such an agreement could actually be the outcome of the current arrangement and may result in transnational holistic conservation and management concepts which will benefit the region as a whole, as well as each country involved separately. The aforementioned point can be considered the most important outcome of conservation from the SES point of view. The local conservation initiatives, along with the scientific advances, produced an opportunity for international collaboration on conservation, which shows great potential for the establishment of a more holistic SES-based conservation plan.

Overall, the nomination of Shiretoko as a World Natural Heritage Site greatly improved local ecosystem management. The awarding bodies (i.e. UNESCO and IUCN) remained adamant about their positions on good resource management, and as a result, the stakeholder groups involved strived to keep up with the requirements (Yamanaka and Murakami, 2013). Local government also played an important role in attaining success. At the beginning of the long journey towards nomination, local governments argued that the management objective for the Shiretoko site was not only conservation, but also effective fisheries. The fact that the heritage site did not go back on its declaration, and supported the local fishermen in their effort to maintain the fish stocks, created an environment of trust between the state and non-state actors, which benefited cooperation efforts.

The meaning of conservation from an SES perspective in the case of Shiretoko is well-portrayed in the amended objectives of the Marine Management Plan (p. 1): "to satisfy both conservation of the marine ecosystem and stable fisheries through the sustainable use of marine living resources in the marine area of the heritage site" (Ministry of the Environment of Japan and Hokkaido Prefectural Government, 2007). In other words, in Shiretoko, in the concept of conservation governance, marine conservation and local livelihoods (fisheries) are of equal value and should not be pursued separately. Effort must be placed on fostering the stability and long-term maintenance capacity of the exploitable

resources, as well as the habitats sheltering them. Finally, the governance path followed in Shiretoko can be considered a successful transformation example. Through long term adaptation to change in the SES, governance actors have managed to match the profoundly complex local system and are guiding it towards sustainability.

6.6 Summary

In this chapter, the case study of Shiretoko was presented and explored through different perspectives, most importantly in its social-ecological context. Environmental change and local responses were analysed utilising the Social-Ecological Systems lens. Best practices as well as issues that cause conflict were introduced and examined, along with attempts for either promotion of solutions or resolution of problems. Taking all the aforementioned points in consideration, the Shiretoko case study is assessed with the use of SESA in order to enable the comparison with the Kalloni case study, presented in the next chapter.

Chapter 7
Social-Ecological Systems Analysis of Kalloni Bay, Lesvos

7.1 Lesvos as part of the Mediterranean Sea

7.1.1 Historical background

Lesvos has been inhabited since the Neolithic times, as indicated by the abundance of pottery remnants that have been excavated on the island, with activity dating back to 3200BC. Throughout its history, many emblematic figures among the ancient Greek intellectuals lived on the island, especially during its time of being a maritime power, including Sappho, Theofrastus, and Alcaeus (Marathianou et al., 2000). Importantly, in 347BC, Aristotle moved to Lesvos and inspired by the biodiversity of Kalloni Bay, devoted himself in the observation and examination of the anatomy and behavioural patterns of the local living organisms, focusing mostly on marine species. He recorded his findings in his book, *Historia Animalium*[16], earning himself the title of the *Founder of Biology* (Leroi, 2011; 2014).

Around 100BC, the whole island gradually came under Roman control, in which state it remained until the Roman Empire was divided into West and East. At that time Lesvos, similarly to the rest of the Northern Aegean islands, was incorporated in the East section. The island remained part of the Byzantine Empire until 1355, when it was handed over to the Gattilusio family from the Republic of Genoa (Gregory, 1991). The latter reigned over the island for about a century with efficiency, even said to have been the first to commercialise the local vine and olive production (Kizos and Koulouri, 2006). Lesvos was consequently occupied by the Ottoman Empire in 1462 and a large portion of the population was either killed or ostracised to Istanbul. During the ottoman occupation, the professional groups of the island operated in organisation similar to trade unions (*sinafia*) in order to protect and promote their interests (Chatzilias, 2009). The economy declined drastically and incomes –which derived almost exclusively from agriculture, animal husbandry, and fishing at the time- were reduced to subsistence levels (Marathianou et al., 2000). It was only in 1912 that Lesvos was freed from the occupation but still ottoman influences in the management of the island remained.

[16] Original title: *Τῶν περὶ τὰ ζῷα ἱστοριῶν*.

Later on, in 1922, the influx of refugees[17] from Asia Minor fleeing the *Asia Minor Catastrophe*[18] settled on the island, bringing with them revolutionary knowledge and craftsmanship. The refugees promoted innovation in various sectors of industry, both primary and secondary, as well as in trade, making use of the plentiful resources of the island.

7.1.2 Environmental conditions

Lesvos, like the rest of the Mediterranean Sea, exhibits the typical environmental characteristics of the Basin, with mild weather and Mediterranean typical habitats. Precipitation is relatively low, as the local climate is temperate, characterised by hot summers and short, mild winters (Kizos and Koulouri, 2006). The average annual temperature is 17.6°C, fluctuating from 8-12°C during wintertime. Cases of even lower temperatures and snowfall are not uncommon and during summertime, the island experiences often heatwaves. Rainfall occurs mostly during winter and autumn and is rare during the warmer months, with an annual average of 87.3 days of rain and 2693.3 hours of sunshine (Chatzilias, 2009).

Terrestrial biodiversity is also typical of the eastern Mediterranean, with a landscape covered in garrigue (phrygana – *Sarcopoterium spinosum, Genista acanthoclada*), and forests consisting mostly of pines (*Pinus* spp.) and oaks (*Quercus* spp.) (Kizos and Koulouri, 2006; Marathianou et al., 2000). As mentioned briefly in section 5.4.2, the local economy has traditionally been based on land produce, agriculture and animal husbandry. As they are greatly adapted to the local garrigue habitat, sheep and goats are the most commonly kept animals. The presence, and most importantly, the cultivation of vines and olive trees (*Olea europea*) has been evident on the island since the ancient years, and the tradition is still continued to the present day (Marathianou et al., 2000). Even today, olive oil produced in Lesvos is considered among the best varieties of olive oil globally[19].

The western part of the island is dominated by volcanic rock (Marathianou et al., 2000), forming an area of unique environmental conditions, with focal point the so-called *Lesvos Petrified Forest Geopark* (henceforth Lesvos Geopark), an area of approximately 15000ha dotted with hundreds of fossilised tree trunks created in the Miocene (23-5 million years ago) (Zouros, 2005). Geoparks are sites of particular geomorphological importance, recognised as protected areas for the promotion of geological heritage and sustainable development through geotourism by UNESCO and its Global Geoparks Network (UNESCO, 2004; Zouros, 2005). In order for a site to officially become a Geopark

[17] The number of the refugees that settled on Lesvos was approximately 24000.
[18] The Greco-Turkish War of 1919-1922, which resulted in a Turkish victory and population exchange between the two nations.
[19] In 2016, bottled organic olive oil produced in Plomari received the silver award for the World's Best Olive Oils 2016 by the New York International Olive Oil Competition.

in Europe, an array of requirements have to be fulfilled. Apart from its important geological characteristics, the site has to develop collaborations with the local authorities, to ensure financial support from the EU, and to enter the relevant network, among others (Zouros, 2004).

The Lesvos Geopark consists of four fossilised sites, terrestrial and marine, and was one of the first Geoparks to have been established internationally, as well as the very first in Greece. It has been recognised as a best-practice case by the European Geoparks Network, especially for its significant role in the promotion of sustainable economic development on the island of Lesvos (Zouros, 2010). The linkages between the Lesvos Geopark and the surrounding environment, both natural and manmade have been thoroughly examined and acknowledged and the authorities in charge of the Lesvos Geopark have made significant efforts to create a network incorporating all the related individual ecological and cultural aspects of the area. Importantly, the Lesvos Geopark supports the local economy, having established collaborations with women's cooperatives and local producers, promoting thus the local products and the traditional preparation processes. It is also creating employment, both direct and indirect, through its activities, as well as by increasing tourism inflow in the region (Zouros, 2010).

The significance of the Lesvos Geopark for local development is illustrated by the fact that it has been a driver for the development of international cooperation. In 2011, the Lesvos Geopark signed a sistering agreement with the San'in Kaigan Global Geopark, Toyooka, Japan, and developed opportunities to strengthen the ties between the countries, with student and educational exchanges (Zouros et al., 2015).

The waters surrounding the island of Lesvos host rich biodiversity, including a wide variety of commercial species, most importantly red mullet (*Mullus barbatus,* in Greek *koutsomoura*), striped red mullet (*Mullus surmuletus,* in Greek *barbouni*), cuttlefish (*Sepia officinalis,* in Greek *soupia*), gilt-head seabream (*Sparus aurata*, in Greek *tsipoura*), and sardine (*Sardina pilchardus*, in Greek *sardela*) (Pardalou and Tsikliras, 2015).

7.1.2.1 Kalloni Bay and surrounding ecosystems

The bay of Kalloni is the largest bay of Lesvos and spanning approximately 115km^2. Its length reaches 20km while its width ranges between 1 and 6km. The bay is characterized by relatively shallow waters, with average depth 10m and depth at the entrance of the bay reaching 25m (Panayotidis et al., 1999). The bay hosts the same marine biodiversity as the rest of the island and is one of the most important

fishing grounds of the area, with sardine and shellfish being the most popular commercial species (Kontogianni et al., 2001) (see Appendix VIII).

Figure 7-1: Greater flamingos at Alykes wetland. Photograph © Seishiro Sakita, 2016.

Apart from the bay in itself, the surrounding areas are also biodiversity hotspots, with most important the Kalloni wetland, located in the northeastern part of the bay. Due to the presence of several species of wildfowl, especially migratory ones including flamingos (greater flamingo, *Phoenicopterus ruber*, in Greek *finikoptero,* fig. 7-1), and endemic fish species, the area has been designated as a Bird Area, a CORINE biotope, and a NATURA2000 site (Kakalis, 2009; Kontogianni et al., 2001). Within the borders of the wetland there are also the so-called Alykes (salt pans). A variety of sensitive habitats make up the Alykes, including but not limited to sand dunes, salt marshes, and shallow brackish zones (Kontogianni et al., 2001; Spyrakos, 2005). The salt pans themselves span for 2.5km^2, constituting the 3rd largest salt pans site in Greece. The salt pans are exploited by a company called "Ellinikes Alykes Ltd" and in the mid 2000's they produced an average of 30000-40000t of salt per year (Spyrakos, 2005) (fig. 7-2).

Figure 7-2: Salt mounts in the Alykes site. Photograph © Maria Prokopi, 2012[20].

7.1.3 Socio-economic conditions of the local fishers

The local fishers target an array of species, varying according to the time of the year, the weather and the available fishing gear. Due to the limitation of the profession, the large proportion also maintain a secondary occupation, usually related to agriculture (e.g. olive trees), part of the production of which they keep for sustenance and sell the rest at the local markets. Some of the fishers also occupy themselves in the tourism sector, for example by maintaining rooms to let. Occasional subsidy programmes announced by the state and funded mostly by the EU have enabled those fishers with the capacity[21] to take full advantage of such opportunities to develop tourism infrastructure and obtain an alternate income source. These programmes however are decided at the national and the international level and there is not always connection with the local needs. The fishers cannot effectively request for a specific programme to finance their particular local needs.

[20] Photograph retrieved from http://blogs.sch.gr/mariapro/2012/06/02/

[21] For example, the LEADER programmes for fisheries offered subsidies of up to 65% of the investment, with the rest being paid by the receiver. However, even though in most cases an advance payment is provided, the rest of the investment must be paid by the receiver and payment reclaims would be done afterwards. In such cases, fishers with limited cash or assets available to liquefy would be unable to participate.

Nevertheless, the majority of the people active in the small-scale fishing sector consider themselves to be exclusively fishers. Particularly, out of 56 interviewees employed in the small-scale fishing sector of Skala Kallonis[22], 44 (78%) stated fishing as their primary and sole occupation during the interviews, and only 22% stated that they receive income from other sources (e.g. secondary employment) (fig. 7-3).

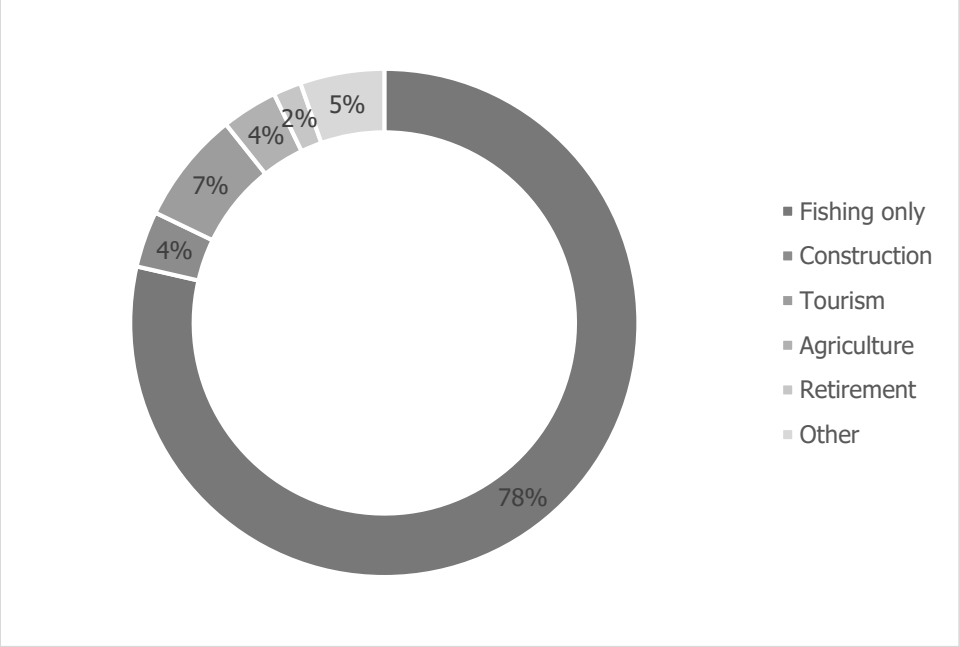


Figure 7-3: Reported income sources of 56 people employed in the small-scale fishing sector in Skala Kallonis. Produced by Eirini Ioanna Vlachopoulou, 2017.

7.2 The Fishermen's Club of Lesvos

Across the island, the small-scale fishers had founded associations to seek solutions to local issues and lobby in favour of the fisheries professionals. Any group of 21 people or more were allowed to form a professional fisheries association. As a result, throughout the island there were several associations run at the very local level, with limited power and authority. The local issues would be raised at the respective association and the association in turn would inform the regional government through a formal letter. The fisheries association of Kalloni was founded around 1960 and was maintained until it merged with the rest of the associations into the Fishermen's Club of Lesvos, with only a short period of disbanding in the early 1980s. Respectively, the fisheries association of Gera existed for

[22] According to official data, currently approximately 132 fishers operate at the Port of Skala Kallonis (66 registered vessels). Many of the fishers that are employed in Skala Kallonis live in Kerami, Kalloni or Dafia, rather than in Skala Kallonis.

more than 40 years before it merged into the Fishermen's Club of Lesvos. In the early days of the association, the president had the authority to get on board vessels of member fishers, inspect their activity and gear, and reprimand any fishers that did not follow the regulations.

Before the adoption of the fisheries associations, the only available institution concerning fisheries were the so-called *balouchanades*, a form of open market for fresh fisheries products adapted from the bodies available during the Ottoman regime. The fishers would land their catches at the local port and they would arrange fast-moving auctions, with the locals coming from the surrounding villages to buy the fish. In 2011 however, under the *Kallikratis Programme*[23], the 17 smaller associations merged together into the *Fishermen's Club of Lesvos* (herewith, Club) which now represents the fishers of the whole island.

The Club is responsible for making known the positions of the Lesvos fishers about fisheries related topics and submitting suggestions and proposals for the improvement of fisheries management and similar issues. The Club comprises about 80% of the all the professional small-scale fishers[24] on the island of Lesvos. Once every three years, 15 members of the Club are elected as to form the management board (president, vice president, secretary, cashier, and 11 board members) and the elected board members in turn vote for the council (president, vice president, secretary, and cashier) Approximately every 45 days, the management board of the Club convenes –every time in a different location across the island, even though the legal seat is in Mytilene- so that the issues raised by the fishers are discussed and possible routes of action are suggested.

The members of the Club are charged with an annual fee of €10.00 to cover the administrative costs of the Club and the production of any necessary paperwork, for example certifications provided by the Club that ensure legality of occupation as fisher in order to acquire or renew a professional fishing licence. As such documentation is necessary for the fishers when dealing with the state, the fishers that do not belong to the Club[25] still have to acquire it. In such cases, the Club charges the fisher for each copy provided. Nevertheless, due to the current economic and environmental situation, it is an often occurrence for a fisher to be unable to afford the membership or the paperwork fee. In such cases the Club provides its services free of charge.

The Club maintains good working relationships with the Regional Government Fisheries Secretariat and the local Coastguard, as the latter function as a bridge between the local fishers and

[23] The Law 3852/2010 (or Kallikratis Programme) was a major administrative reform in Greece, signed in 2010, effective 2011.
[24] 730 fishers with vessels; more than 1000 fishers if the ones without vessels are included.
[25] According to the Law, in order for an individual to become a professional fisher, they have to be a member of a professional fisheries association.

the higher levels of governance (the General Secretariat for Sustainable Fisheries of the Ministry of Rural Development and Food and the Directorate for Fisheries Control of the Ministry of Shipping and Insular Policy). The regional government authorities implement policies decided at the national and international level (EU) and mediate to the local fishers, explaining the contents of legislation and enabling the diffusion of regulation knowledge. On the other hand, the Coastguard monitors and enforces the regulation, sometimes with assistance from the fishers who occasionally alert the enforcers about incidents, mostly regarding non-members of the community.

Nonetheless, the Club has no authority to regulate. Any decisions made by the Club are not legally binding; the fishers follow the suggestions of their own accord. Furthermore, the Club can only submit suggestions to the state authorities; it has no legal power and practically cannot participate in the decision-making process directly, despite holding vast LEK. The central government tends to create rules that harm the profession of the fishers while offering minimal positive impacts on the environment. One such example would be the use of the special nets for needlefish (name of the net in Greek: *zarganio* or *zarganodichto*; needlefish: *Belone belone*, in Greek *zargana*). In 1988, a case of illegal modification of these nets was reported, which caused significant destruction in the marine environment. Reacting to the case and without consultation with the fisheries professionals, the central government banned completely the use of these nets, causing significant problems to the fishers that targeted needlefish.

> *"The Association [Club] doesn't have the authority to decide and have its decisions implemented"*
>
> *M.V., fisher*

Some of the suggestions, however, have been heard and resulted in interesting initiatives more often before the merge of the associations. In 1982, an experimental no-take zone was established over 3000m^2 of Kalloni Bay for the timespan of one year with the intent to restore biodiversity. According to the local fishers, a large proportion of the stocks started accumulating in the no-take zone. Unfortunately, after the first year the no-take zone was abolished, despite being very productive.

7.3 The Sardines of Kalloni

The particular shape of the island, hosting two large bays in the southern part, promotes local biodiversity, resulting in high quality produce, especially fisheries products, unique to the locality (see fig. 5-6). Among those products, the sardine is the most famous and one of the most significant income sources for the local fishers.

Even though sardines are caught around the island, the ones caught within the bay of Kalloni are renowned, due to their peculiarities, in terms of feeding and sizes. Normally, sardines, which are

the species with the highest yield in the Hellenic seas, venture in depths between 25-100m, in large schools (*families*) and are common in the Northern Aegean Sea; caught most often by purse seiners (Stergiou et al., 2011). The Sardines of Kalloni however, enter the Kalloni Bay during early summer, and remain in the shallow waters of the gulf until autumn, feeding on the plankton that exists in the productive waters. Because of their diet and the environmental characteristics of the bay (enclosed sea with relatively low water depth), the Sardines of Kalloni grow smaller in size than their pelagic counterparts, but richer in terms of fat, constituting thus a sought-after delicacy endemic to the region.

Despite the fact the Sardines of Kalloni have not been inscribed as a product of Geographical Indication (GI), they are as famed as any branded product, and during summer –when they are available for consumption- their demand is exceptionally high on the island of Lesvos where they are captured. Increased demand for the fish from incoming tourism pushes fishing effort upwards during summertime, in an attempt to satisfy the local needs. Due to their smaller than average size and high fat concentration, the original Sardines of Kalloni (the ones caught within the limits of the Bay of Kalloni) are only available for immediate consumption on the island, making their acquisition harder for consumers living away. Nevertheless, sardines processed and canned, reach the markets of Athens from the area surrounding the island of Lesvos, labelled as Sardines of Kalloni despite not having been caught within the limits of Kalloni Bay. The sardines caught outside the bay are longer and thus easier to process.

7.4 Shellfish aquaculture

Kalloni Bay, apart from sardines, produces a wide variety of commercial fisheries products, particularly shellfish. Across the whole bay occurs a variety of commercially important shellfish, ranging from cockles (*Cardiidae* spp., in Greek *kidonia*) to scallops (*Pectinidae* spp., in Greek *chtenia*) and Noah's Ark shells (*Arca noae*, in Greek *kalognomes*), while small clusters of bearded horse mussels (*Modiolus barbatus,* in Greek *chavara*) used to appear in a few specific locations.

In the 1990s, a marine expanse near the area of Skamoudi in Kalloni Bay was given to a private company by the local government for the development of a shellfish aquaculture unit[26]. According to the local fishers, the unit did not fulfil the legal requirements, and rather functioned as a front for illegal harvesting activity. The fishers alerted the local government and managed to prove that illegal extraction of shellfish was taking place, by uncovering a load of full-grown shellfish ready to be

[26] Initially, the unit was placed on the site of the submerged city of Ancient Pyrra, but it was moved to Skamioudi to protect the archaeological site.

shipped within only one month after the start of unit operation. The local government receded the operation licence and the case was taken to court. In order to support their claim on the licence, the owners of the aquaculture unit imported a load of live mussels[27], previously not present in the bay, and unloaded them within the area of the unit. The newly introduced mussels caused extensive ecological destruction in the bay, spreading their eggs throughout the bay. The fishers claim that the presence of the mussels affected the colonies of the endemic bearded horse mussels, causing the rise of a mutation[28] between the two. The species[29] has taken over a large part of the bay, driving other endemic species like scallops and crabs out (figs. 7-4 and 7-5).

"The mussels have spread everywhere [in the bay] and have influenced the other species"

P.P., fisher

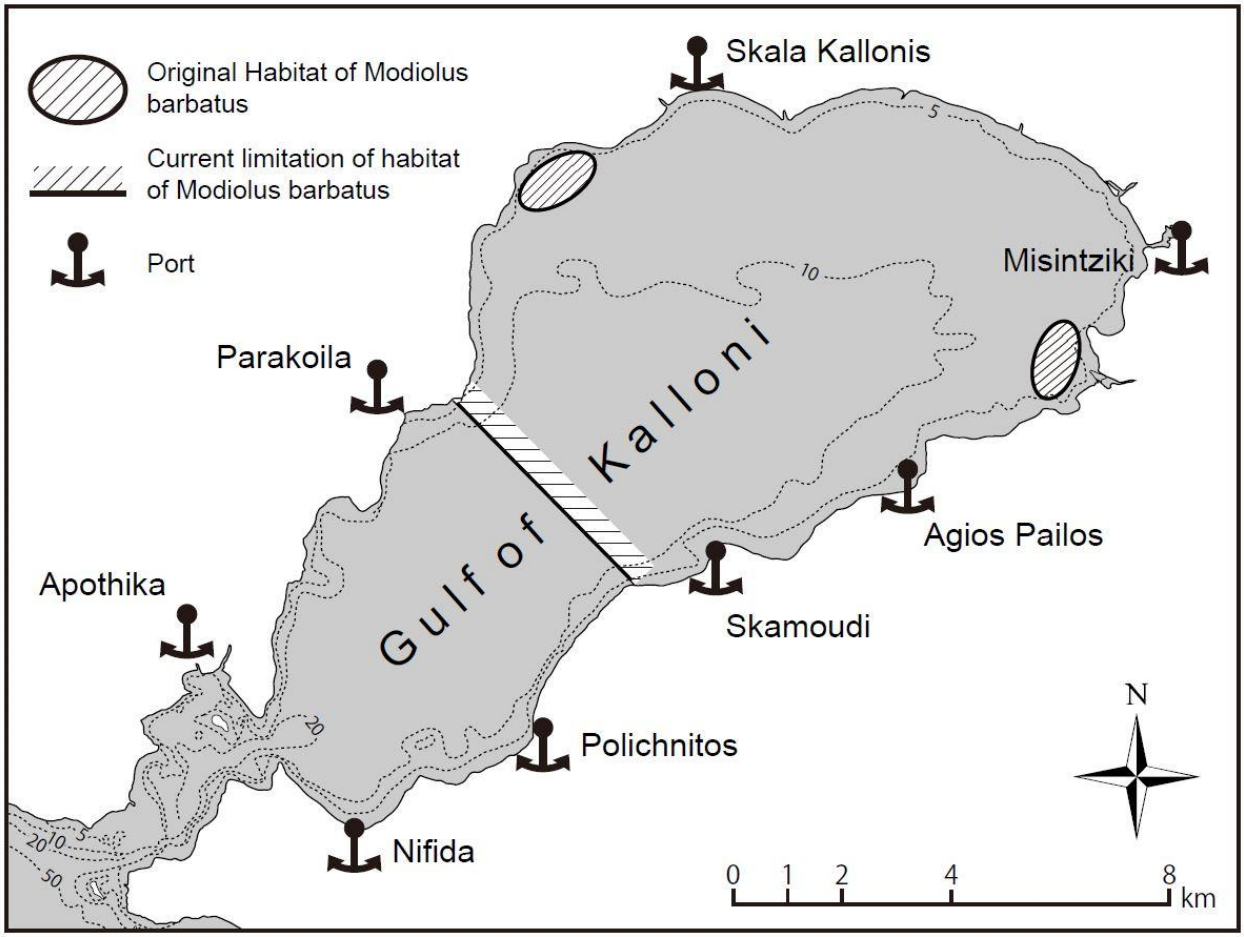


Figure 7-4: Map of the original and current habitats of the species *Modiolus barbatus* based on fishers' observations. Map produced by Seishiro Sakita, 2017.

[27] Quite possibly blue mussels or common mussels (*Mytilus edulis,* in Greek *midia*).
[28] The local fishers insist that the shellfish have mutated but there has been no actual scientific evidence that such a mutation has occurred. Further research is necessary to determine whether the shellfish have actually undergone some kind of mutation.
[29] The mutation or, quite possibly, the endemic bearded horse mussel has expanded in the bay. Due to the lack of scientific data, in this study it is assumed that the endemic species is the one that has expanded in the area.

The trial about the aquaculture unit is still ongoing and no activity of any kind is currently taking place in the area. Yet, the aftereffects of the activities up to this point are evident throughout Kalloni Bay and the fishers fear a possible renewal of the operation licence for the unit, which will cause further decline of the local ecosystem.

Figure 7-5: Shellfish growing on a crab carapace. Photograph © Seishiro Sakita, 2016.

Sales of wild caught shellfish are an important asset in terms of income for the local fishers, which harvest them with a traditional fishing tool called *lagkamna*, which assimilates the use of a rake. The fishers scrape the sea bottom at regular intervals[30] collecting wild shellfish. After the establishment of the shellfish aquaculture unit and the consequent introduction of the mussels, the fishers claim that the amount of shellfish available for harvesting throughout the bay has increased significantly, despite the fact that ecosystem equilibrium has changed causing the decline of local species (e.g. scallops). During the fishing season for shellfish, the fishers can make up for lost income from harvesting other species, making the shellfish fishery the second most important fishery of the region after the Sardines of Kalloni.

[30] The use of the *lagkamna* is officially regulated.

7.5 The case of the sea cucumbers

Recently, due to increased demand in the Chinese market, the fishing for sea cucumbers (*Holothuria* spp., in Greek *olothouria*) was promoted during the past year in the bays of Kalloni and Gera, with a harvest restriction of 150 individuals per boat per day having recently been introduced, along with a seasonal closure [01/06-31/10, as dictated by the Presidential Decree 109/2002 (Hellenic Republic, 2002)]. Sea cucumbers are a vital species for the health of the local marine ecosystems, as they clean the sea floor and the water column, removing organic particles, and becoming prey to larger species (Purcell, 2010; Sicuro and Levine, 2011).

The high prizes that sea cucumbers fetch for the fishers, coupled with lax law enforcement and monitoring of the fishing activity however, have put unprecedented pressure on the stock, with individual vessels capturing up to 2000 sea cucumbers per day. The members of the Coastguard station of Kalloni, who are responsible for regulation enforcement within the bay of Kalloni, claimed that because catch reporting is not mandated by law, monitoring of sea cucumber harvest is nearly impossible. The fishers recognise the vessel of the Coastguard and manage to hide harvested individuals that exceed the daily limit, claiming that they have only extracted the legal amount. Furthermore, as reporting is not obligatory, the enforcement officers cannot crosscheck the number of harvested sea cucumbers with the amount of individuals transported by the merchants.

As a result, within a single year, the population of sea cucumbers in the bays of Kalloni and Gera have dwindled, causing further disturbances in the already fragile ecosystems. The fishers themselves admit that there has been extreme over-extraction of sea cucumbers and claimed that the Coastguard have not been performing their monitoring duties adequately because they have been shouldering too many responsibilities, particularly related to the refugee issue (see section 4.1.1). Representatives of the Club insisted that the most effective route of action would be a fishing ban until proper research on the stock would be conducted and a consequent reorganisation of the management of the fishery.

> *"The [Skala Kallonis Coastguard] Station has requested from Mytilene [Coastguard headquarters] to implement obligatory catch reporting [for the sea cucumbers] so that we could recognise increased extraction"*
>
> *X., Coastguard officer*

7.6 The dam of Tsiknias River

The Bay of Kalloni is surrounded by rivers of various sizes that run into the sea, enriching the bay with nutrients and supporting the marine biodiversity. One of the largest rivers across the island,

Tsiknias, runs parallel to the town of Kalloni and into the Bay, next to Skala Kallonis (fig. 7-6). Despite the lack of need for additional freshwater sources, as noted by virtually every participant in this study, the authorities are planning to construct a dam along Tsiknias, in order to store water for the needs of Mytilene, the capital of the island.

If this plan is realised, the marine environment of Kalloni Bay will be impacted significantly. According to a researcher that was interviewed for this study, decreased freshwater input will increase the salinity level of the water of the bay, affecting thus the phytoplankton biodiversity of the area. A change in the phytoplankton will quite probably affect not only the produced quantity, but also the quality of the Sardines of Kalloni, as any change in the trophic chain (zooplankton that feed on phytoplankton are usual prey of the sardines) will impact on the taste of the sardines. It is also highly likely that the structure of the local habitats will also change if the authorities go on with the construction of the dam. The sandy beaches of the bay rely on the surrounding rivers for renewal of inorganic matter; an obstacle in the flow of Tsiknias River with the magnitude of a dam will radically disturb the natural processes of the local habitat.

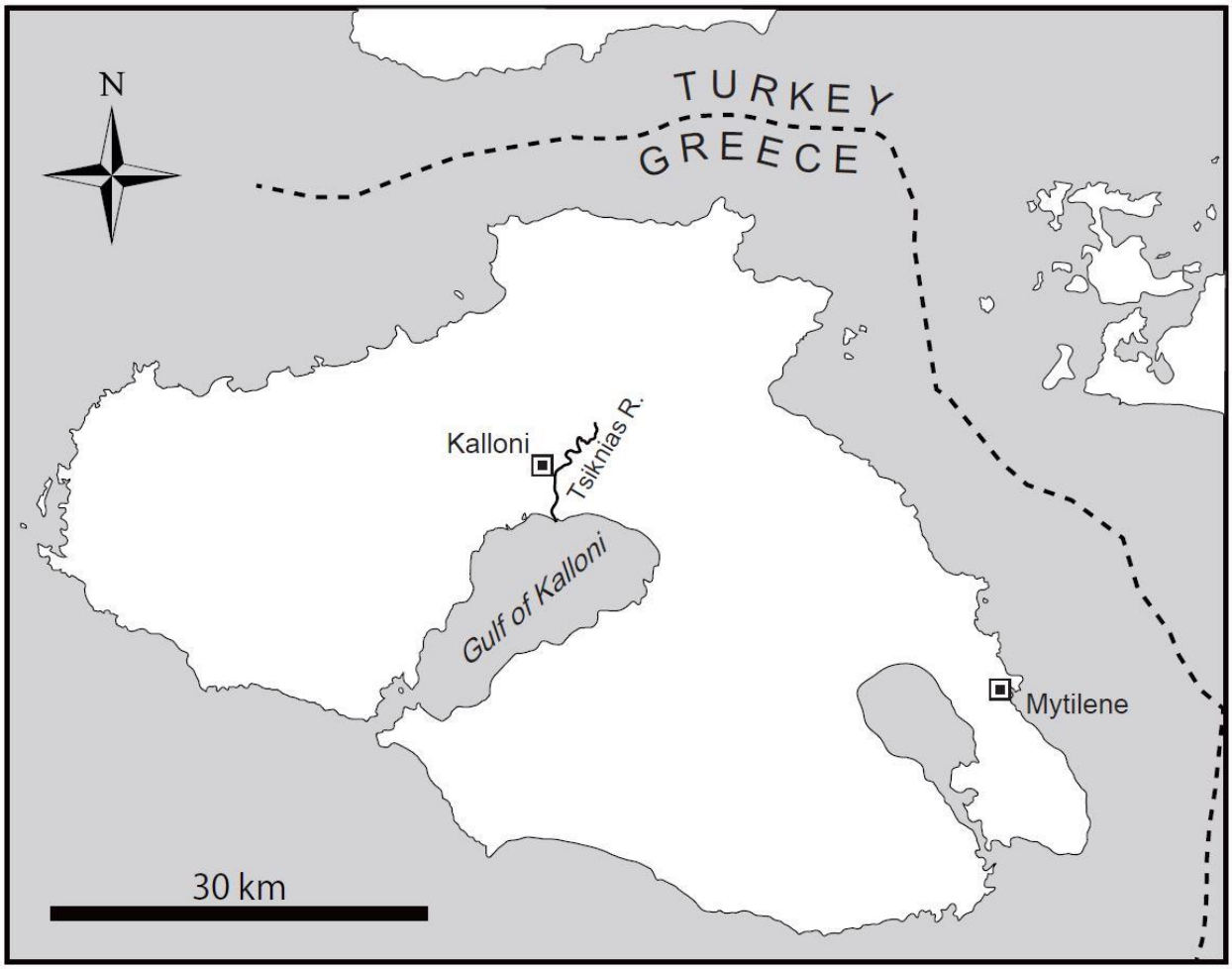


Figure 7-6: Map depicting the location of the Tsiknias River.
Map produced by Seishiro Sakita, 2017.

An additional issue that can be located in Tsiknias River, is the lengthy flow of polluted water into the river because of the inadequate operation of the system of biological treatment of wastewater. In 2013, the system experienced extensive leakages of untreated wastewater into the water of the Tsiknias river, with the runoff causing serious damage in the vulnerable ecosystem of Alykes. During that time, large amounts of fish were found dead around the mouth of the river and the rare endemic and migratory species of Alykes were threatened. After the leakage accident, inadequate operation was often reported and according to the Environmental Quality Control Group, there were significant indications of pollution in the waters of Tsiknias River. The local government undertook the responsibility to restore the system of biological treatment of wastewater and its return to operation in full capacity was scheduled for November 2016.

7.7 SES assessment of Kalloni Bay

Currently, the fisheries communities of Kalloni Bay are in a very difficult situation. Even though the sardine fishery is still productive, the rest of the fisheries upon which the local fishers rely are declining. The local livelihoods are threatened, with the income sources becoming scarcer and ever more difficult to acquire. At the same time, increasing taxation and fuel costs have become pressing matters to the traditional fishers. Larger scale vessels equipped with state of the art technological devices (sonars etc.) act as unfair competition to the tiny family businesses that struggle to survive on ever dwindling target fisheries.

Amidst this difficult working environment, the sardine stock is also fluctuating. In 'bad' years, the fishers only manage to catch a few kilos of sardines per day which are sold for very high prices in the markets of Mytilene. In 'good' years, the fishers catch larger amounts of sardines, but the prices plummet as the supply of the sought-after delicacy is high. At the same time, as the sardines are sensitive fish, they cannot be preserved and sold at a later date. According to the fishers, a significant factor in the fluctuation of the sardine stock is rainfall. In years with low rainfall rates, the amount of sardines entering the bay is low, resulting in 'bad' years. On the other hand, in years with high rainfall rates, abundancy of sardines occurs in the bay.

Regardless of the amount of sardines caught each year, undoubtedly, the stock is the pillar of survival for the local fishers. They wait for the months when the sardine fishery is open and they rely on the stock to make up for the rest of the declining stocks that they target the rest of the year. Still, it is difficult to create a good working environment that promotes sustainable fisheries and protects both the local livelihoods and the marine resources in the long term. Even though, as seen in fig. 7-7, willingness to promote conservation exists, as was evident with the establishment of the no-take zone in 1981 after suggestion of the fishers themselves. Still, there are disconnects between the different levels of governance, with the highly centralised approach imposing significant difficulties in the local management.

At the regional level, the Regional Secretariat has developed good working relationships with the local fishers, but due to the lack of a framework that would enable bidirectional flow of feedback and a multilateral approach in the way the levels come together and develop local management, the adopted measures do not ensure either sustainability or promotion of local livelihoods. Extensive conflicts between the stakeholder groups remain largely unattended by the stately actors mostly because the latter do not hold authority to mediate between the groups. All major decision-making is done at the national or the international level with limited or no participation of the local users. Wider

associations (e.g. the PanHellenic Confederation of Unions of Agricultural Cooperatives, *PASEGES*) may appear to be making interventions to the State in favour of the local groups, but even then the topics discussed do not relate to specific cases at the local level but mostly to general interests of the sector. Importantly, associations like the Club are not cooperatives and thus have even less power and space for action. Nonetheless, associations like the Club constitute a form belonging under the umbrella of the Social Economy and could be utilised in ways that would promote local development (Tsobanoglou, 2008).

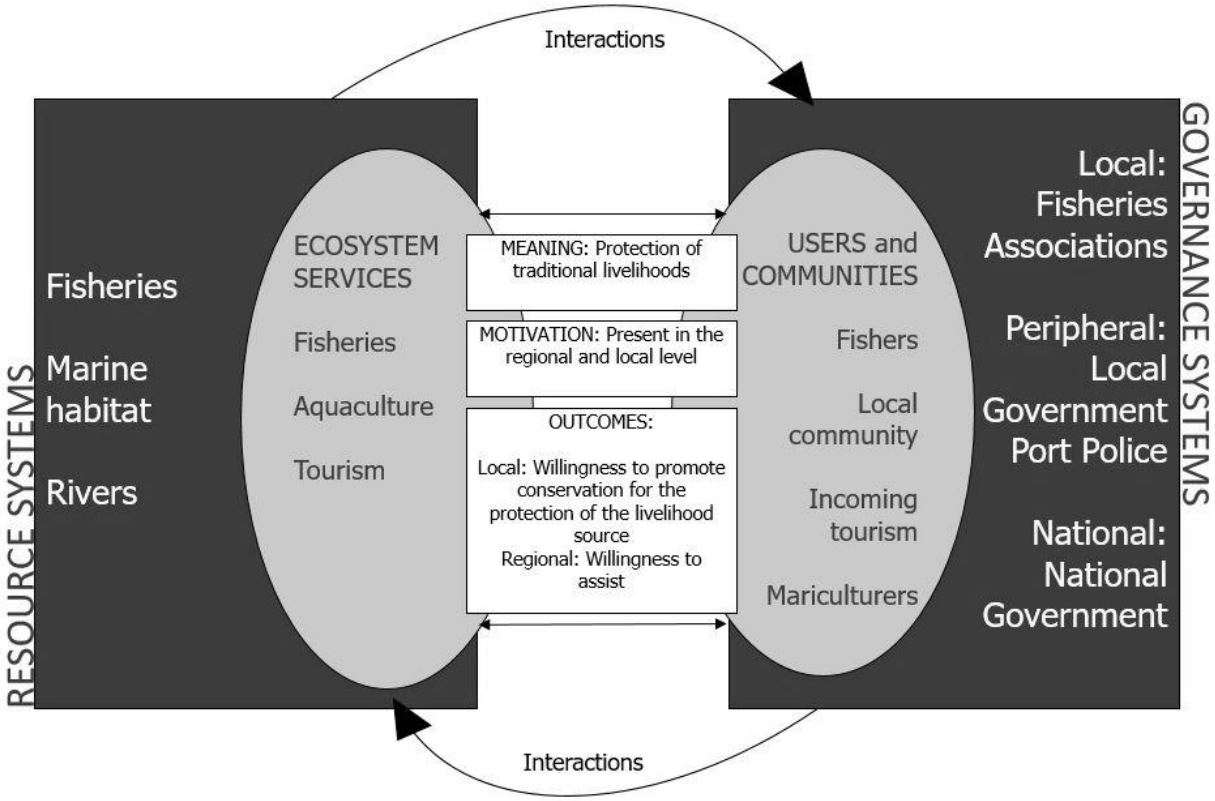


Figure 7-7: SES Analysis of Kalloni Bay.
Adapted from Berkes et al. (2014).

Obvious fragmentation in the national and regional governance levels also cause disturbances in the efficient management of the local resources. Lack of collaboration between the different stately actors involved makes practically impossible any holistic or even inclusive approach to management. It is interesting to note that, for example, fisheries management falls within the jurisdiction of the Ministry of Rural Development and Food, while environmental management (including marine management) is under the Ministry of Environment and Energy, fisheries control and law

enforcement is under the Ministry of Shipping and Insular Policy, and tourism belongs to the Ministry of Economy, Development, and Tourism. Among the four ministries there is limited collaboration, apart from specific issues, as in the case of fisheries control between the Ministry of Rural Development and Food and that of Shipping and Insular Policy, and in the case of fisheries tourism between the Ministry of Economy, Development, and Tourism, that of Rural Development and Food and the Ministry of Shipping and Insular Policy. This lack of coordination among the governmental institutions that liaise between the different functions and aspects of the fishing sector (rural development, ecosystem conservation, food security and so forth) impedes significantly the capacity of the insular periphery –not only Lesvos, but the rest of the Greek archipelago as well- to promote *Blue Growth*, namely sustainable growth in the marine sector (European Commission, 2012; 2013). As a result, there is no state agency that can shoulder the responsibility to champion the process of transition towards a sustainable fisheries management scheme.

Furthermore, the massive gap in knowledge alliances between the various research and academic institutions and the fishing communities of Kalloni Bay further hinders this progress forward, as there is limited direct access to scientific knowledge and training for the communities, as well as transfer of knowledge and information between science and holders of traditional knowledge.

7.7.1 Conflicts among the user groups

Even though motivation for the initiation of conservation activities, even unilateral ones, exists, it is dampened by lack in social trust. Extensive conflict exists among the user groups, as was evident during the interviews. The fishers of Skala Kallonis and those of Polichnitos for example, follow completely different fishing procedures and there is a large gap in communication between the two groups. Differences in time management of fishing activity may affect the quality of the catch (freshness), with the fish caught earlier being of lower quality than the rest. Consequently, in the cases when the same species of fish (sardines), caught by different groups (fishers of Polichnitos and Skala Kallonis) are sold to the same wholesale merchants and only a few fishers acting also as merchants, a batch of lower quality will also affect the price of the rest that maintains better quality, as the merchants have leverage power over the non-organised fishers.

7.7.2 Climate change impacts

Changes in the climate are important factors for the success of sardine fishing activities within Kalloni Bay. The fishers identified annual rainfall as an aspect that greatly impacts on the fishery. During years

with reduced rainfall, both the size of the catches and their quality are lower than those in years with plentiful rainfall, according to the fishers. During the past decades, the annual amount of rainfall has been perceived as decreasing[31], and cases of extreme weather conditions (longer dry periods and cases of extreme rainfall) have been increasing (table 7-1). Reduced amounts of rain has two major impacts on the sardine fishery:

1. Reduced amount of nutrient inflow through river run-off and
2. Higher water temperature in the bay, affecting movement of the stock within the limits of the bay.

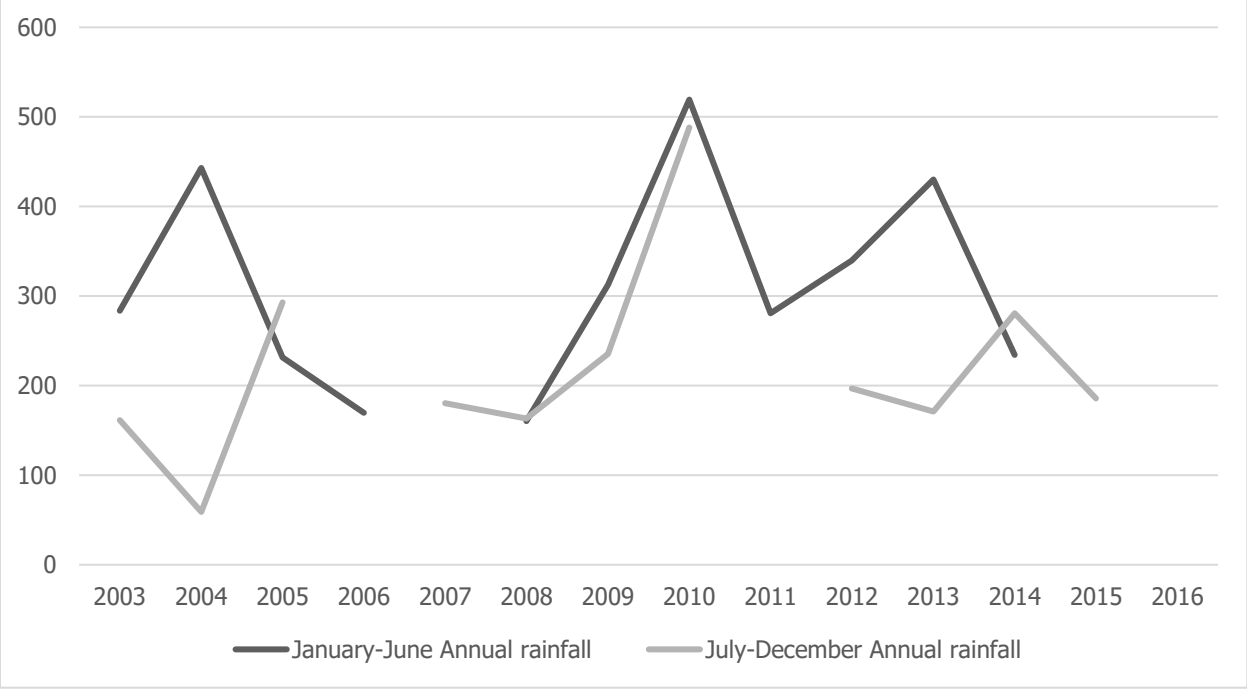


Table 7-1: Annual rainfall in Agia Paraskevi (the meteorological station closest to Skala Kallonis) from 2003-2016[32]. Data from Geography of Natural Disasters Laboratory (2016) and National Observatory of Athens (2016).

In years with reduced rainfall, the fishers earn less than in years of plentiful rainfall, as the sardines tend to avoid entering the bay, seeking lower water temperatures elsewhere.

Climate change has started affecting Greece nationwide, with increasing extreme weather phenomena, from extensive heatwaves to torrential rainfalls, and appearance of phenomena that were considered rare, like flash floods (Papagiannaki et al., 2013). Still, further scientific research is necessary,

[31] Available meteorological data dates back to 2003 and in most cases, due to unfavourable circumstances (accidents etc.) they are often fragmented, with monthly data destroyed or missing. As a result, scientific confirmation of the claims of the fishers is difficult.
[32] Blank spaces in the graph indicate lack of data for the specific time period.

as especially at the local level, there is a lack of data. The Greek people, despite being fairly informed about the issues related to climate change, do not consider combatting climate change quite as important as they used to, due to the effect of six years of continued economic crisis, when in 2008 they were among the EU member states most concerned about climate change (Directorate-General for Communication of the European Commission, 2008; Papoulis et al., 2015). Furthermore, they do not trust the governmental actors to take action against climate change, even though they would welcome initiatives towards that direction (Papoulis et al., 2015).

7.8 Summary

In this chapter, the case study of Kalloni was presented and explored through different perspectives, most importantly in its social-ecological context. Current human activity in the bay and environmental change were analysed utilising the Social-Ecological Systems lens, trying to identify good management approaches and unsuccessful ones, as well as possible causes and enablers. Taking all the aforementioned points in consideration, the Kalloni case study was assessed with the use of SESA in order to enable the comparison with the Shiretoko case study, presented in the previous chapter. Similarities and differences between the two case studies are presented in the next chapter.

Chapter 8
Similarities and Differences

8.1 Occupational alternatives

Even in regions were fisheries have developed sustainable management measures and long-term viability of the fisheries sector is pursued, like in the case of Japan, the fishing industry is still showing signs of distress, mostly due to aging professionals. Both in Japan and Greece, the younger generations prefer to stay out of the fishing industry and seek employment in other sectors as they view the fisher's profession as difficult and with little return. Quite often the older fishers themselves urge their children to avoid taking up the profession and seek alternate employment. Consequently, as employment opportunities in regions that rely heavily on fisheries tend to be limited, the younger generations also move out of their hometowns and villages to seek better opportunities in urban settlements.

As a result of these depopulation waves, the fishing communities grow thinner in numbers and the average age of the residents increases, setting not only the profession of the fisher, but also the existence of the communities themselves under threat. In order to counter this problem, there has been widespread acceptance of marine tourism as a viable solution to the lack of sustainable job opportunities within the blue economy. Marine tourism that actually fulfils the requirements for sustainability in both ecosystem and livelihood terms should be based on the concept of ecotourism, namely "tourism that aims at attracting visitors and stimulating local economies by generating tour revenues while conserving the natural ecosystem and the social and cultural resources of communities" (Shikida et al., 2010). It has the potential of bringing sustainable development, economic growth and employment for remote regions such as fisheries towns, increasing thus their resilience through economic alternatives (Berkes, 2015; European Commission, 2012). Fostering sustainable tourism in coastal areas will produce economic benefits, and, at the same time will nurture local social cohesion, preserving the local culture and nature (Romão et al., 2014).

Marine tourism could be any type of touristic activities that involve the sea; from recreational swimming to seaside paths and from marine mammal observation to recreational fishing. For the scope of this study, only those activities that could potentially benefit directly the fishing communities will be explored.

8.1.1 Fisheries Tourism – Animal observation and fishing tours

Regions highly abundant in marine wildlife have a vast array of opportunities to offer in order to develop innovative tourism-related activities. In Greece, traditional tourism activities like rooms to let owned by fisheries professionals have been promoted and funded by the EU and the Greek state. The development of infrastructure by itself however, is highly unlikely to attract quality tourism which will increase the income of the community. Tourism can establish a bond between visitors, local people and nature by promoting healthy interactions between the parties and nurturing nature protection. In order to do that, however, tourism has to be carried out with consideration towards the capacity of local environment and the hosting communities, safeguarding thus economic viability of the provided services and generating revenues and benefits (Romão et al., 2014). Promotion of activities and tourist attractions that will increase the inflow of visitors and at the same time will respect the marine environment is vital.

There are several types of such activities that have been developed in the areas under examination or can be developed here on. In the case of Shiretoko, marine mammal and bird observation tours are utilising the existence of vast biodiversity in the Nemuro Strait (O'Connor et al., 2009; Shioya et al., 2011) in order to offer a non-intrusive touristic activity. The routes of the cruises are carefully designed in order to avoid conflict with wild animals, and still ensure a feeling of excitement at the contact with wildlife. A clarifying example would be the case of the boat tours for the observation of spectacled guillemot (*Cepphus carbo*), a seabird that nests near the town of Shari. When the activity was first deployed, the routes passed dangerously close to the nests, causing distress to the bird population and pushing the number of individuals to 95 in 2009 from 140 in 2006. In order to protect the population of the spectacled guillemot, the groups involved in the conservation of the species (scientific community) along with those engaged in the activity (the tourism sector and the fishers performing the cruises), through extensive consultation and consensus building, redesigned the routes in order to eliminate impact on the species while maintaining the touristic activity. After awareness raising and scientific education of the fishers, the attempt was successful and the number of individuals has now stabilised at about 140 individuals again (Fukuda, 2010; Ministry of the Environment of Japan, 2013).

There is a range of other activities related to tourism and fisheries implemented in the Shiretoko area. Several fishers, for instance, worried about the future of the fishing profession, have converted their fishing vessels into animal observation boats. Taking advantage of the high rate of marine biodiversity on the region, as well as the seasonality of the migrating species (table 8-1), the

marine animal observation tours act as a perfect opportunity for year-round professional occupation that functions not only as an alternative income source for the pressured fishers, but also an additional asset for the region and the local communities.

Moreover, taking advantage of the already existing infrastructure of the Rausu FCA, members of the local fishing community have set up opportunities of hands-on experience of the harvest and preparation of local marine delicacies for visitors. Participants can join the walleye pollock roe processing tour and/or the short-spined sea urchin (*Strongylocentrotus intermedius*, in Japanese *ezobafununi*) harvesting tour, as well as the walleye pollock fishing tour. In the walleye pollock roe processing tour, the participants are taught how to open the fish in order to extract the roe, and observe the packaging process in the actual working environment, as the tour takes place in the factory. Consequently, they have the chance to taste fisheries products related to the walleye pollock fishery. During the sea urchin harvesting tour, professional fishers lead the visitors through the collection process, teach them how to extract the urchin roe, and allows them to choose whether they will consume the catch fresh or ship it home. If they choose to consume the urchins on the spot, the catch is prepared with local traditional recipes. Finally, during the walleye pollock fishing tour, the visitors can join a fishing trip to observe the fishermen in action while also savouring walleye pollock cuisine.

Common name	Scientific name	Japanese name	Seasonality of possible observation											
			WINTER		SPRING			SUMMER			AUTUMN			WINTER
			Jan	**Feb**	**Mar**	**Apr**	**May**	**Jun**	**Jul**	**Aug**	**Sep**	**Oct**	**Nov**	**Dec**
Baird's beaked whale	*Berardius bairdii*	Tsuchikujira												
Blackiston's fish-owl	*Ketupa blackistoni*	Shimafukurou												
Harbour seal	*Phoca vitulina*	Zenigataazarashi												
Killer whale	*Orcinus orca*	Shachi												
Minke whale	*Balaenoptera acutorostrata*	Minkukujira												
Ribbon seal	*Phoca fasciata*	Kurakakeazarashi												
Short-tailed shearwater	*Puffinus tenuirostris*	Hatsubosomizunaguitori												
Spectacled-guillemot	*Cepphus carbo*	Keimafuri												
Sperm whale	*Physeter macrocephaus*	Makkoukujira												
Steller's sea eagle	*Haliaeetus pelagicus*	Oowashi												
Steller's sea Lion	*Eumetopias jubatus*	Todo												
White-tailed sea eagle	*Haliaeetus albicilla*	Ojirowashi												

Table 8-1: Seasonality of observational tour target species in the area of Rausu, Shiretoko.

Sources: Shiretoko Rausu town Tourism Association (2015) and Rausu Kaisen Koubou (2012).

In the case of Lesvos, recently, the Greek state started supporting nationally the notion of fisheries tourism. According to Law 4070/2012 (Articles 174-186, FEK A 86/20-4-2012) (Hellenic Republic, 2012), the Greek State established the framework for the adoption of fisheries related touristic activities, ranging from observation of professional fishing and aquaculture operations and diving, to provision of accommodation within fisheries communities, awareness raising activities, and introduction to local gastronomy and culture, strictly performed by fisheries professionals[33]. The Law states that professional fishing vessels of up to 15 m can take up fisheries tourism activities provided that they fulfil the legal requirements[34]. However, in Lesvos, the idea is still very new and quite limited, including only the concepts of visitors joining in fishing trips as observers or leasing fishing vessels (and the fishers in charge) to go for recreational fishing. According to the Regional Government Fisheries Secretariat for the Northern Aegean, only 4 permissions to perform fisheries tourism have been given on the whole island, and the entirety of the receivers are somehow connected to the tourism sector.

Another problem with the effective implementation of the fisheries tourism initiative on the island of Lesvos is the continuous decline of the inflow of tourists as has been pointed out by the interviewees from the Regional Government Fisheries Secretariat. Since the beginning of the refugee crisis[35] in Greece, Lesvos has suffered significantly from inefficient policies to regulate the incoming refugee waves. Overwhelmed by the amount of people and with extremely lacking central support, Lesvos has faced several drawbacks in the smooth reception of the refugees and their consequent relocation. The vast majority of the refugees have been stuck on the island, unable to assume their journey to the mainland, overwhelming the existing infrastructure on Lesvos. Several cases of unrest have been reported, mostly due to the lack of provisions and staff, and the situation has taken its toll on the local people. As Lesvos is an island highly reliant on tourism, the negative image that has been reproduced by the mass media has fostered the perception that the refugee crisis has driven potential visitors away, resulting in a perceived decline of up to 70% on touristic activity[36]. Official data contradict this perception of reduced incoming tourism as can be seen in table 8-2.

[33] At least 50% of the practitioners have to be fisheries professionals.
[34] A range of legal requirements are included in the regulation, including health and safety of the vessels and the visitors, insurance, fishing activity control, and ticketing, among others.
[35] Due to the civil war in Syria, as well as the continuous political unrest in Afghanistan, waves of displaced people have flooded the Greek coastline across the borders with Turkey, fleeing their war-ridden homelands in search of refuge.
[36] The numbers used have been extracted by news bulletins and they do not originate from official statistics.

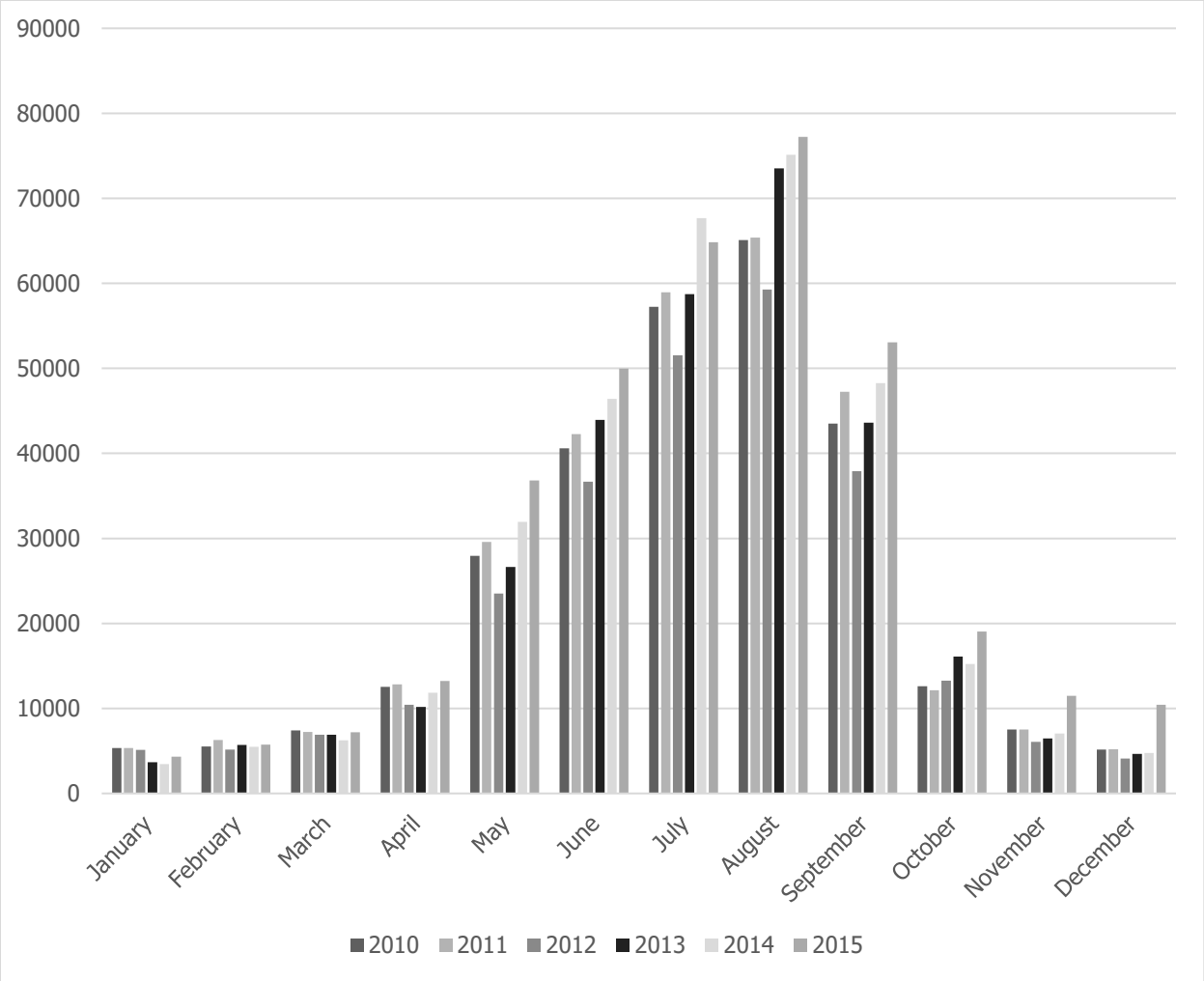


Table 8-2: Number of visitors in the Prefecture of Northern Aegean.[37]
Adapted from Hellenic Statistical Authority (2016b).

The perceived decline, however, has affected significantly the local fishing communities; the impact is twofold: first of all, the fishers that maintain accommodation infrastructure as their second occupation saw their income sources plummet; with fishing becoming ever less rewarding and tourism declining to unsustainable levels, livelihood maintenance came to be extremely challenging. Additionally, initiatives like fisheries tourism, which often require significant investments on the side of the fishers, lost their meaning. With the severe lack of visitors, such activities cannot provide any revenues and were thus abandoned, as the providers have no incentives to invest in the development of infrastructure and new activities[38].

[37] The data are not definitive as the type of visitors is not defined and thus it is not clear if they refer solely to tourists.
[38] One may challenge these hypotheses based on the fact that there is limited amount of scientific data supporting the claims of reduced tourism influx linked with the refugee crisis. Nevertheless, the perception of risk (in this case the reduction of tourism because

Nonetheless, initiatives in the fisheries tourism spectrum, if implemented after careful planning can prove beneficial not only for the local communities but the general public as well, especially in cases with vast potential for activity implementation like Kalloni Bay (Spilanis and Vagiani, 2009). For instance, in the case of animal observation tours, collaboration between the practitioners and the scientific community can provide an unexpected source of scientific data: animal appearances, migration routes, habits, and other ecosystem parameters observed during the tours can be recorded and consequently utilised by scientists to monitor local biodiversity. Such an approach can be easily implemented, either by allocating scientists to attend the tours and collect the data while providing scientific knowledge in the form of information packages for the visitors, or by educating the practitioners on easy data collection methods and tools and through the use of digital technology (e.g. portable GPS devices). A collaboration of the sort would promote awareness for the local environment and by engaging the locals in a two-way relationship with science focused on local issues, would enhance empowerment and capacity building within the local community.

8.1.2 Fisheries Tourism – Festivals and events

Fisheries tourism in general, however, is not limited to the aforementioned activities and does not always require the implementation of innovative approaches. Sometimes, existing practices can act as cost-effective attractions for visitors. The town of Rausu has utilised the local traditional festivals to attract tourism. Two annual events, closely linked with the fishing community are utilised to increase visibility to the town: the *Rausu Isaribi Fishing Fire Festival* and the *Rausu Konbu Festa*. The former takes place every September and focuses on the promotion of local fishing culture through traditional ceremonies, such as prayers and rituals for increased catches. Simultaneously, the visitors have the opportunity to taste local fisheries products and cuisine. The 4-day long *Rausu Konbu Festa* focuses on the promotion of its namesake, the local kelp *oni-konbu*. The festival was introduced quite recently, in 2014, yet it has proven widely popular and has been established as an annual event. During the Festa, several booths offer different experiences related to the *oni-konbu*, raising awareness about its cycle of life, its uses, and its importance for the local community. Visitors can observe and even participate in traditional kelp harvesting and processing, learn about the life and the profession of the kelp fishers, buy fisheries themed souvenirs (e.g. copies of traditional fisheries flags), and taste kelp themed cuisine (Shiretoko Rausu Konbu Festa Executive Committee, 2014).

of the refugee crisis) affects significantly the decision-making (in this case the decision whether to invest in infrastructure and the development of new activities or not).

Similarly, the *Sardine Festa*, an event with a more than 3 decade long history, takes place at Skala Kallonis, Kalloni Bay, every year in early August to celebrate the sardine fishing season. During the festival, which lasts 3 days, the visitors can enjoy a treat of grilled sardines offered by the local fisheries association, along with the trademark drink of the island, ouzo. The event also includes traditional Greek dancing performances and live music for the entertainment of the participants.

There are several other occasions that could be utilised in the quest to increase tourism inflow for the local fisheries communities; combination of fixed festivals, expansion of existing events, and even utilisation of occasional occurrences. Indicatively, annually in Lesvos, the Ouzo Fest takes place. During this festival, festivities happen simultaneously in various towns and cities across the island, which include the consumption of the traditional drink with *meze*, or traditional Greek finger food. If the local fishers could participate officially in events like the Ouzo Fest, or even attract part of the festivities to their towns and villages, such cases would act as promotion and exhibition events also for the fisheries products related to the main theme of the festival. During the Ouzo Fest, sardines are offered to the visitors as side dishes, but the local communities would benefit significantly from further highlighting of their produce and inviting more visitors to their region through the festivities.

Similarly, occasional fisheries events, notably related to traditional fishing rituals and the local religion could be utilised as tourist attractions. In Japan, several fishing occasions are accompanied by particular rituals and ceremonies. Such cases would be, for example, the introduction of a new vessel in the fishing fleet, when groups related to the vessel's owners send colourful flags to be displayed on board as a charm to bring large catches, and the owners throw Japanese rice cakes (*mochi*) to the onlookers to celebrate the vessel (fig. 8-1). In Greece, the introduction of fishing vessels to the fleet is accompanied by a traditional namesgiving religious ritual, when a local priest blesses the vessel with holy water (*agiasmos*) to be safe for the seamen and to bring large catches.

Figure 8-1: Colourful flags in celebration of the introduction of a new vessel in the fishing fleet (supporting vessel). Rausu City Port. Photograph © Eirini Ioanna Vlachopoulou, 2015.

Festivals and events are excellent chances for the local communities not only to attract visitors, but also to promote their culture along with the local fisheries products. Utilisation of such opportunities is vital for the development of alternative income sources to protect the local livelihoods. Fishing communities can benefit from tourism of such kind in several ways, most importantly through the creation of a bond between the visitors and the locals. The visitors gain knowledge about the local products, the working environment of the fisheries professionals, as well as the lives of the locals in general, while enjoying unique experiences regarding harvesting and processing of products, the local marine environment and biodiversity, and the local culture and traditions. The consumers have the opportunity to taste and prepare the produce on the spot which equals to a quality check of the goods, a fact that contributes significantly to marketability, as the whole process enables trust building between the sellers and the purchasers.

8.1.3 Fisheries tourism – Discussion

Tourism performed by the fisheries community can foster employment and empowerment of local people affected by low fisheries yield, reduce depopulation rates (Cheng, 2005; Cheng, 2010), while enhancing circulation of economic benefits generated by local landscapes, within the respective

communities. Fisheries tourism also promotes relationships of collaboration and trust with other stakeholder groups, such as governmental bodies and the scientific community (Fig. 8-2).

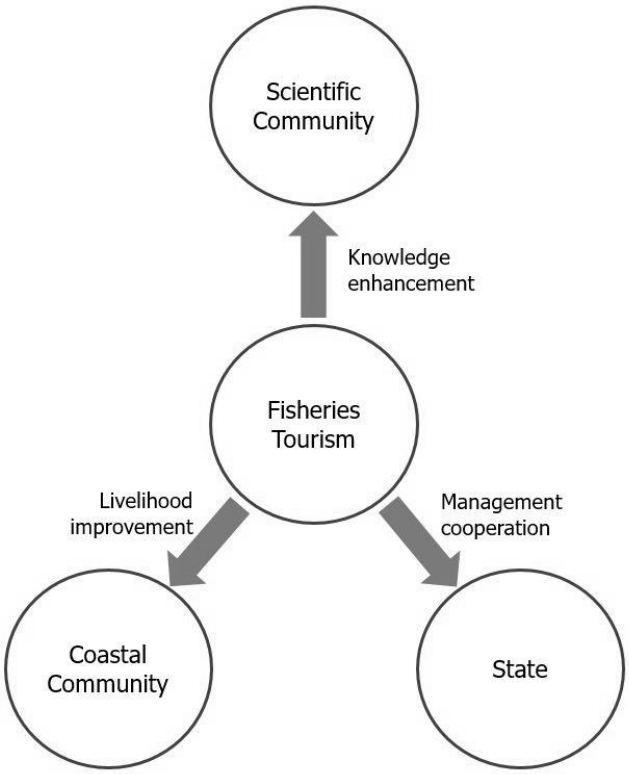


Figure 8-2: Fisheries association directed fisheries tourism benefits for other stakeholder groups. Graph produced by Darien D. Mizuta and Eirini Ioanna Vlachopoulou, 2016.

There are several points to which fisheries tourism can improve local livelihoods. First of all, fisheries tourism can function as a complementary or alternative income source for both the fisherman and other members of the household, in a working environment that they are already familiar with. It is important, however, to design carefully such initiatives, as significant adjustment of the infrastructure may prove costly. In the Greek case, extensive bureaucratic requirements for the allocation of fisheries tourism permissions act discouragingly towards the interested individuals. The current framework in Shiretoko on the other hand, allows for minimisation of transition costs, with the necessary institutions being already in place and having enough power to implement such initiatives (i.e. FCAs, Scientific Council). Furthermore, as the FCAs have been investing resources in Research and Development (R&D) on fisheries related issues, with 8% of the turnover being reinvested in the FCA for R&D promotion, physical infrastructure that can host such initiatives (offices, conference rooms, kitchens etc.) is already available. Consequently, the transition between

fisheries and fisheries tourism, or the adoption of a balance between the two can be implemented with minimum cost from the fishermen's side, making the embracement of fisheries tourism a cost-effective decision. In addition, and as a result of the former point, fisheries tourism represents a way of suppressing depopulation of the community. Younger members of the fisheries households, formerly inclined to leave the town in search for better working opportunities, may find a new income alternative to keep them in their birthplace. Therefore, the local community will receive significant advantages regarding its future survival prospects. Apart from the reduction of long-term depopulation, many job opportunities will arise, improving the living standards of the locals. These positive changes derive not only from the employment aspect, but also from the fact that the motivation of the local people to ameliorate the ecosystem will increase, as safeguarding ecosystem health will directly result in revenues from visitors interested in enjoying the local landscapes and biodiversity.

In addition, from the point of view of the scientific community, fisheries tourism can contribute greatly to the enhancement of scientific knowledge through utilisation of the information gathered during their daily activities and fisheries-science community meetings. It can also contribute directly to awareness raising about conservation, through informal environmental education. Environmental informative activities, which are inherent to the concept of fisheries tourism, conform greatly with the current framework for Education for Sustainable Development (ESD), through a loosely structured approach in developing a culture of awareness and eco-conscience.

Under a fisheries co-management regime, the fishing community plays the main role in the coordination of the fisheries sector, earning them the capacity to better manage conflicting activities in marine areas, as fisheries tourism would be conducted under the direct supervision of members of the local fisheries associations. Hence, introduction of this kind of tourism has strong potential to reduce the pressure of environmental management, regulation enforcement, control, monitoring, and conflict resolution that the local government is experiencing, as the fisheries professionals will assume part of such responsibilities.

8.2 The Satoumi concept

In Japan where the co-management narrative is widespread and popular, there is extensive history of local natural resource management enhanced by human activity. The term *satoumi*, which encompasses traditional concepts of ecosystem management, was initially defined as "a coastal area with high productivity and biodiversity due to human interaction" (Yanagi, 2006). As the relationship between

people and nature differs depending on location, the term has since, received a broader meaning and several interpretations, varying from: "coastal sea preserved by humans for their survival with nature and culture" to "coastal sea used sustainably in order to support life of local people" (Yanagi, 2013), with particular emphasis on prolonged human-nature interaction (Matsuda, 2010). Although the term originally referred to traditional Japanese landscapes, it is now contemporary with worldwide applications, detailing an ecosystem that is globally present and embodying social and human aspects inherently embedded in the system, coupled with environmental practices currently advocated for on a global scale.

Human interactions at Satoumi mainly aim to conserve habitats and create a desirable relationship between human and nature concurrently with economic production activities in the coastal area (Yanagi, 2013). While conservation and management of resources for an increased productivity are deliberate in Satoumi initiatives, higher biodiversity is not always an end in itself. Increased biodiversity can be an unintended, but desirable, result of sustainable Satoumi initiatives, such as when there is the creation of new hard substrate for biofouling through mariculture mooring equipment. Satoumi also maintains close ties with traditional resource management techniques and tools, which aim at the protection of the targeted ecosystem. The local resource users are the principal decision makers and marine conservation is an integral part of resource use (Makino and Matsuda, 2005). Through a lengthy trial and error approach -an approach strongly related to *adaptive management*- viable coastal management measures, which highly depended on local users, have been adopted in Japan.

Nevertheless, what makes the Satoumi framework unique are the key actors involved. Although scientists, policy makers, and members of the local communities are strongly engaged in the Satoumi creation, the main actors are the *fishers*, namely capture fishers and marine aquaculture farmers who conduct commercially productive activities in the coastal area. Even though economic aspects are the base of sustenance of fishers' lives, motivation of fishing village through empowerment and promotion of local tradition and culture are also included in the establishment of Satoumi and its related coastal zone management (Yanagi, 2013). The extensive popularity and widespread acceptance of the Satoumi concept have equipped the Japanese fishermen with deep understanding of their role in coastal sustainability and have forced them to promote this role in the areas under their jurisdiction. As a result, nationwide, they implement autonomous measures with Satoumi as a guide, in an attempt to safeguard the sustainability of the nearshore environment, along with their livelihoods and economic activity.

The term *satoumi* was born as an analogy to the widespread concept *satoyama*, referred to as "a mosaic of different ecosystem types […] along with human settlements, which has been managed to produce bundles of ecosystem services for human well-being" (Duraiappah et al., 2012) (p. 4). Even though the Satoumi concept has also gained wide publicity within the Japanese academic circles through various studies [see for example: Akimichi (2012)], it still remains relatively unknown not only to regulators and stakeholders, but also to international academics. It is alarming that the groups most involved in what would be considered as Satoumi seascapes, namely the stakeholders and the regulators, still remain largely ignorant about the concept. The problem stems from the fact that it is impossible to adopt a simple and concise definition of Satoumi related only to landscape ecology; the concept has a holistic nuance that covers everything from the physical ecosystem to human-nature activities with the respective ecosystem services and management, to traditional ecological knowledge embedded in conservation efforts and environmentally friendly production extending in the marketing of locally produced goods.

As mentioned earlier, the core idea of Satoumi is the synergetic co-existence of human and nature within the boundaries of a coastal ecosystem. Its foundations consist of: (1) ecosystem services; (2) traditional knowledge and modern science; (3) nature conservation; (4) environmental and economic sustainability (management). In Satoumi, traditional knowledge, developed through prolonged human-nature interaction, is merged with modern science to guide human actions towards wise use of the coast and marine resources; such an arrangement allows for establishment of a responsible production pattern and environmental conservation. Coastal users are expected to experience economic growth while ensuring long term continuity of ecosystem services through responsible use, which reflects in both environmentally and economically sustainable and resilient communities and society. All these actions combined result in a better coastal and marine environment, protecting thus, diversity of life below water and ensuring achievement of the Satoumi goals.

The Shiretoko WNHS is a prime example of the permeation of the satoumi concept in contemporary Japan, with the fishers taking the central role in decision-making, rule enforcement, and monitoring. Utilization of LEK, enriched and validated through scientific channels and with the contribution of institutions from every governance level, including the private sector, has enabled the implementation of an adaptive management framework appropriate for both the local marine environment and the fishing communities of Shiretoko.

Similarly, adoption of the ideas behind the satoumi framework would highly benefit the communities of Kalloni Bay. A paradigm shift in the perception of human-ecological networks and

interaction at the ecosystem level would reveal a range of alternative routes of action towards a more sustainable and viable approach, focusing on the importance of the human aspect for the successful management of the natural resources and the health of the local ecosystems.

8.2.1 Adopting the Satoumi framework

The satoumi framework is a concept to guide management decision-making towards a more holistic view of ecosystems, stressing the importance of the human factor in the process. Nevertheless, it is still only a concept, inclusive of a large variety of traditional and modern management tools and practices, each suitable to the respective system in which they are implemented. The Japanese Government and various international actors, including UNESCO, have recognised its potential for the development of informed and educated decision-making not only in Japan, but abroad as well. A wide range of marine management practices outside the Japanese borders could be included in this 'umbrella' concept and be acknowledged as holistic and sustainable approaches – as Satoumi practices.

Japanese fisheries researchers, with the support of the Japanese Government have been offering educational opportunities based on the Satoumi concept in developing countries in order to implement Satoumi-inspired initiatives for local development, as in the case of Palau, in the form of seminars, conferences, and workshops (Perry and Makino, 2013). During these educational meetings, management and decision-making tools for different stakeholder groups are offered to the participants, which can be utilised for the implementation of Satoumi-related measures and approaches. This transfer of knowledge could greatly benefit the decision-makers not only on Lesvos, but in Greece in general.

It is obvious that the Satoumi concept is very broad and sometimes even vague, and that the case-specific tools often cannot be replicated in other areas due to environmental, cultural, legislative, and other differences. Nonetheless, the recurring narrative behind the Satoumi ideas can offer universal insights to the inner workings of human-environment systems, promoting the social-ecological systems perception.

8.2.2 External support for the adoption of Satoumi ideals

The role of international agency is an important aspect in the promotion of the Satoumi narrative. As shown in the Shiretoko case (see section 6.5), the presence of UNESCO and IUCN constituted a considerable push forward for the success of the adaptive co-management system with particular focus

on the long-term sustainability and viability of both the local ecosystems and the communities. Similar impact has also had the designation as Geopark of the Petrified Forest (see section 7.1.2). In this case as well, the presence of an international network interested in local development and simultaneous preservation of the local natural and cultural heritage (the European Geoparks Network) and UNESCO supported significantly the adoption of ideals closely related to the Satoumi. It would be safe thus to assume that a possible designation of Kalloni Bay, which has already been awarded the NATURA2000 title, as a UNESCO World Natural Heritage Site for example (or a Man and the Biosphere Reserve) would have a significant positive effect on the current conservation and sustainable management efforts.

8.3 Fragmentations in the value chain

Market access is a major issue for the local fishing communities. As the sizes of catch are usually small, the local fishers tend to distribute their produce at the very local level, within the community or in nearby communities. Depending though on the level of organisation of the fishers, the scale of the catch can increase and product distribution can expand significantly. In the case of Shiretoko, the highly organised FCAs land their catches at their local port where direct sales to merchants take place. The fish are landed and immediately put in ice, which is manufactured by the FCA itself, boxed and then categorised according to species and size. The merchants arrive at the premises and the catches are either auctioned or in cases of pre-arranged sales bought at the agreed price. The sales are made directly with the merchants, avoiding the intervention of middlemen, gaining better prices for the fishers and keeping the consumption price at relatively stable levels. Furthermore, as the premises (landing site) belong to the FCA and the consumables (e.g. ice) are produced by the fishers, the fixed costs of the fisheries production at the selling level are low, which benefits greatly the members of the FCA. Following the set procedure, the local produce reaches directly not only the local markets, but also other metropolitan markets of the rest of Japan (mostly Sapporo and Tokyo).

"The selling [of the sardines] stops in Mytilene because the fish are very sensitive. The canned ones are from purse seiners, not from the Bay"

M.P., Regional Government officer

The existence of infrastructure, supported by the R&D priorities set by the FCAs, especially of Rausu town, also allows for the development of new products. In the processing facilities and the experimental kitchen that the FCA maintains, the members of the local fishing community (most often the wives of the fishermen) experiment with new applications of the fisheries products (e.g. new dishes)

and develop even more radical ideas for the utilisation of the local marine resources. Interestingly, the Rausu FCA has developed a whole line of high-end cosmetic products, from shampoos to moisturisers, based on the local kelp. The organisation of the production allows also for the development of a local brand of products. Marketing of these products is further enabled by the development of branding as they have a strong connection to locality, making them more attractive to consumers, especially as the fisheries produce used as the base of the branded products are nationally recognised as of high quality (i.e. *oni-konbu*).

Contrastingly, the fishers of Kalloni Bay, despite belonging to the Club, are not properly organised in a cooperative and show limited potential for collaboration and development of lobbying power. Even though the legal framework for the organisation of the fishers in a cooperative exists and could be utilised in the case of Kalloni Bay, the fishers that belong to different fishing villages seem unwilling to break the barriers between the communities and collaborate. When asked if they thought that collaboration between them would be possible given an adequate legal framework, they insisted that it would be impossible to work with their current competitors (e.g. the fishers of Skala Kallonis and the fishers of Polichnitos). They believe that their competitors are unable to work as part of a larger group and put the collective needs over their individual needs. Indications of complete lack of relationships of trust among the fishers and the members of the community were evident throughout the interviews, pointing towards fragmentation of local social cohesion and social capital deficiency, which sets obstacles on the efforts towards local development (Tsobanoglou, 2008).

> *"[Even with an appropriate framework] we wouldn't be able to cooperate. That's how people are here"*
>
> *G.N., fisher*

This lack of collaboration will has a multitude of effects on long-term sustainability of the communities. First and foremost, it allows for extensive exploitation of their fishing effort by merchants and middlemen. The fishing industry has been in danger of collapse for many years due to continuously increasing costs and rapidly decreasing fish stocks. With the financial crisis that has been ravaging economic crisis that has been ravaging Greece for more than seven years however, the financial circumstances have deteriorated to the current dire predicament (Rakopoulos, 2014; Tsikliras et al., 2013a). Catch amounts have decreased and the prices for the fish are fluctuating. With proper organisation, the fishers could maintain a stable price that would respond to supply and demand. Instead, by using a network of merchants and middlemen, they risk having their catches sold for very low prices –often failing to cover their costs- and still the price of the fish that the consumers will

have to pay to be many times higher. There have been several attempts to fight this distortion of the market in the agricultural sector in Greece (Rakopoulos, 2014), yet there has been no such progress in the small-scale fisheries industry.

This fact may well stem from the lack of infrastructure and equipment that keep the fishers from constructing a proper sales and distribution network similar to the Japanese. There are no physical local market premises, neither have the fishers access to refrigerated trucks to transport their catches. Currently in Skala Kallonis, there are 3-4 fishers who own vehicles adequate for fish transportation and they can only reach as far as Mytilene. The lack of equipment can be traced to the declining income due to the degrading stocks. Nevertheless, were the fishers organised, they could raise enough funds to buy and construct shared infrastructure and equipment instead of each one of them struggling to maintain their personal assets. Furthermore, the development of infrastructure would greatly increase their income as they would be able to better control the prices and thus the market for locally caught fish and seafood. It would be also possible to develop R&D projects and solve issues of added value; experimenting with different types of food preservation could yield results towards the successful preservation of the real Sardines of Kalloni which is currently impossible.

Even in highly decentralised systems, different from the one operating in Greece, there would be limitations in the organisation of fisheries governance. Ostrom (1999) has identified several limiting points that are also evident in the narrative of the fishers of Kalloni Bay when considering the existence of a decentralised system in their area of operation:

1. Some appropriators will not organise. Even though a large proportion of the fishers are willing to invest valuable resources (time, money, energy) in regulation of fisheries management, the rest are not willing to do so. This phenomenon might occur due to a variety of reasons, from the presence of conflict among the groups and lack of leadership, to fear of authority intervention that will overturn their efforts.
2. Some self-organised efforts will fail. It is expected that some groups may choose a management system that will prove inadequate and fail.
3. Local tyrannies may prevail. In cases of corrupted or inadequate local leadership, there is the possibility that the adopted system will fail due to shortcomings like partisanship. This problem is accentuated in cases when the cost of exit is very high (the presence of alternative occupations and/or income sources is very limited).

Maintenance of the fishing gear and the related equipment requires plentiful resources in the form of both time and money.

Organisation of the fishers in a body with authority to regulate their activity, implement a universal code of conduct, and develop a long-term plan for technological update of the small-scale fishing fleet would greatly enhance the capacity of the fishers to adapt to the continuous changes of their profession and respond to their financial needs, while protecting their income source.

4. Stagnation may occur. The users may rely on a management system that worked well in the past but now is not adequate anymore, and they might be unwilling to change it for a more innovative one.
5. Access to scientific information may be limited. If involvement of the scientific community is limited and the users have no access to scientific knowledge themselves, a gap in validated information may occur, which may compromise the efforts for an effective management system.
6. Conflict may arise among appropriators. Appropriate natural resource governance systems require the existence of external conflict resolution mechanisms. Lack thereof may result in escalation of conflicts among the groups of users.
7. Appropriators may be unable to cope with larger-scale common pool resources. In case of common-pool resources that extend beyond the jurisdiction of local users, it may prove difficult to regulate the resource in its entirety and exclude free-riders. Such an arrangement would effectively cancel out the incentives of the users to abide by the self-imposed regulations as well.

The aforementioned points exhibit parallels with the case study of Kalloni, where the fishers show disbelief towards the possibility to implement an effective natural resource management plan based on a co-management framework. The first obstacle is the presence of conflict between the user groups (i.e. fishers of Skala Kallonis and Polichnitos). As the two groups follow different procedures during the use of the common resource (i.e. fish stocks of Kalloni Bay), and there is no external conflict resolution mechanism to mediate between them and build consensus, it seems highly improbable that the transition to a collaborative management approach will prove possible. Furthermore, lack of access to scientific knowledge undermines any efforts towards the adoption of adequate local management measures. Even though the fishers themselves are asking for input from academic institutions, as was evident in the case of the sea cucumbers, there are limited, if any, communication channels between the two levels. The communities cannot make formal requests for the implementation of specific research projects and as a result, in most cases there is no connection between the real local needs and the research performed. Furthermore, the social aspect is not included in research and policy regarding natural resource management, as multidisciplinary and interdisciplinary approaches have yet to become the norm in Greece, with most institutions following mostly non-integrative routes of action. In contrast, the fishers of Shiretoko are supported by a wide net of institutions, both governmental and private that offer scientific knowledge and guidance and legislative support.

This fragmentation in the working framework poses further obstacles in the development of the local communities of the island of Lesvos, with most profound example the branding of the Sardines of Kalloni. Currently, the Sardines of Kalloni are renowned and well sought-after nationwide, yet they have been officially awarded neither with Protected Designation of Origin (PDO) nor with Protected Geographical Indication (PGI). Getting inscribed in either list would ensure that only sardines caught within Kalloni Bay, and thus caught by local small-scale fishers, would have the respective name. Earning such an inscription might also bring individuals from different groups that have similar interests together. During the interviews, individuals both from the fishing communities and Academia expressed interest in exploring ways to process and preserve the Sardines of Kalloni. Ideas like that could be realised into projects designed by a team made up of participants from a variety of stakeholder groups, brought together by an inscription of the Sardines as PDO or PGI, as the WNH nomination did for Shiretoko.

8.4 Social trust

Adopting the definition of Francis Fukuyama (1995) (p. 26) that trust is "the expectation that arises within a community of regular, honest, and cooperative behavior, based on commonly shared norms, on the part of other members of that community […] Social capital is a capability that arises from the prevalence of trust in a society or in certain parts of it", the evident lack in social trust in the fishing communities of Kalloni Bay reveals a deficit in social capital, the prerequisite of which is high level of trustworthiness within the community (Putnam, 1993; 1995; Roumeliotou and Rontos, 2009). Social trust is based on commonly shared norms, the belief that the members of the community will act in mutually benefiting ways, and that no party will seek to exploit the vulnerability of others (Fukuyama, 1995). This study revealed that the various user groups maintain doubts about the code of conduct of others, especially in the case of the fishers of Skala Kallonis and Polichnitos, as well as lack of faith in the intentions and measures adopted at the higher governance levels. When asked if the existence of a legislative framework to support local management would enable the adoption of collaborative measures, the answer was largely negative, as conflicts among the users and a predominant tendency to mistrust peers characterise the coastal communities around Kalloni Bay.

The results of this research are confirmed by Roumeliotou and Rontos (2009), who proved that the region of Kalloni exhibits particularly low social trust levels for a rural community and the social bonds among the local residents are not strong, further enforcing the narrative behind the social capital deficit. As social capital has been linked extensively to the capacity of a community for

development, this extensive deficit indicates also difficulties in the aspect of local socio-economic growth of the area of Kalloni Bay (Fukuyama, 1995; Putnam, 1993).

On the other hand, the wide network of institutions and working collaborations in the case of Shiretoko shows a completely different image. Despite the points that still cause friction among the users (i.e. the issue of the management of the Steller's sea lions and the Russian issue), mechanisms for conflict management, consensus building, and promotion of collaboration have been established and put in action, allowing for the development of long-term relationships of cooperation among the various stakeholder groups.

The gap in the levels of trust among the two case studies originates mainly from the differences in organisation of the communities and the perceptions of the groups. The Japanese mentality oriented towards high levels of social trust, promotes cooperation and mutually benefiting arrangements (Fukuyama, 1995; Yamamura, 2011), while the Greeks are inherently doubtful about their peers' behaviour and intentions (Lyberaki and Paraskevopoulos, 2002; Rontos and Roumeliotou, 2013). There is also significant variety in the way the communities perceive their respective governmental organisations and governance approaches. The Japanese state makes a significant effort to come closer to the fisheries sector and the local fishing communities, not only through the production and maintenance of a necessary support framework, but also through public exhibitions of the importance of the sector and the communities for the nation. An example of such actions would be the participation of the Emperor of Japan in the release of hatched commercial fish juveniles[39]. On the other hand, when the communities, as in the case of Greece, hold negative perceptions of the State and the latter does not take action – or is perceived to not take action - towards overturning the unfavourable atmosphere in its relations with the former, it is difficult, if not impossible to develop trust (Rontos and Roumeliotou, 2013). The vast majority of Greek inherently mistrust the State and its intentions when it intervenes with the private sphere due to prolonged dominant relationships of paternalism and corporatism in the public sector, discouraging activities related to the local level and the ideals of the Social Economy (Tsobanoglou, 2013; 2015). As a result, attempts for collaboration among the levels crumble and social capital decreases. After all, it is clear in the literature that local management, and therefore co-management, cannot function effectively without the support of and a working relationship with governmental institutions (Makino and Matsuda, 2005; Pomeroy et al., 2001).

[39] As noted in the fisheries newspaper Nikkan Minato Shinbun of 27 October 2015.

8.5 Summary

In this chapter, the two case studies of Shiretoko and Kalloni were compared and the similarities and differences that surfaced are analysed. An array of contexts are used in order to enable the comparison, from available occupational alternatives, to the existence of guidance frameworks (satoumi), condition of the respective value chain, and levels of social trust. These points are examined in the next chapter in order to draw conclusions and deliver suggestions for improvement.

Chapter 9
Discussion

9.1 Comparison of case studies

Comparison of case studies of management of the commons may prove to be a complex and confusing process, as experiences vary according to geographic location and characteristics of the resource under examination, among others. Nevertheless, the constant demand of the markets for products from the commons maintain the global tendency of nations to convert natural capital deriving from the commons into commodities (Zerner, 2000). Weak institutions can easily be overwhelmed by the speedy development of demand, and therefore of new markets, for such products, jeopardising thus viability of the resource (Berkes, 2006). Mainstream approaches to management of the commons often lead to extensive conflict among user groups/individuals and foster inequalities, both of economic and social nature, in areas and communities highly dependent on commons, causing thus significant deterioration of livelihood and wellbeing states (O'Brien and Leichenko, 2003).

Therefore, adoption of novel forms of institutions, focusing on multilevel, decentralised, and engaging governance is necessary in order to address the challenges imposed by overexploitation of the commons (Pritchard and Sanderson, 2002). Co-management is a prime example of such institutional frameworks, reaching across governance levels and involving a wide array of stakeholder groups in the decision making process (Berkes et al., 1991). Coupled with initiatives for resilience, co-management has the capacity to evolve into adaptive co-management, which focuses on benefits from learning and adaptation, enhancing thus collaboration (Armitage, 2008). Adaptive co-management is an operational framework suitable for a case-by-case approach, as it relies on inherent ecological knowledge and institutional arrangements which are constructed and exist within the respective system (Olsson et al., 2004).

Nevertheless, the literature of the commons, when it comes to these new forms of governance, tends to agree overall on the general characteristics that are necessary in order to deal with complexity of the systems (table 9-1).

Feature	Definition of Term
Participation, collaboration, and deliberation	A response to top-down, hierarchical or command-and-control management in which the value of multiple actors and perspectives is recognised
Multi-layered	Organisational structures with multiple, relatively independent centres
Accountable	Distributed institutional arrangements that allow for accountable authorities to pursue just distribution of benefits
Interactive	Mutually influencing relations between actors that possess an intentional and structural dimension
Leadership	A tendency to move from an authoritarian decision maker to a facilitator or catalyst
Knowledge pluralism	Drawing from a multitude of sources of knowledge to build a holistic understanding of the system
Learning	Collaborative and mutual development, and sharing of knowledge by multiple actors
Trust	Social interaction required for true partnership and collaborative engagements
Networked	Networks of actors to better coordinate people, improve information flows, synthesising and mobilising knowledge.

Table 9-1: Features of adaptive governance. Adapted from Armitage (2008).

The social processes of governance however, are highly dependent of an array of circumstances and it is difficult to assess them in a 'technical' way through the utilisation of indicators, with uncertainty being an inherent governance aspect (Armitage et al., 2009). The features of adaptive governance as presented on table 9-1, therefore, can only act as guides towards the valuation of governance in a specific case study as they are representations of what we would consider normative governance principles (Armitage, 2008). However, considering the complexity of governance of social-ecological systems, especially in comparative studies, the use of accepted guidelines is essential in order to enable comparability of the case studies.

Studying the institutions that characterise the case studies and taking into consideration the aforementioned features of adaptive governance can assist the assessment of the case studies. For this research, the case studies under examination are compared to the conditions for successful adaptive co-management as they have been identified by Armitage et al. (2009) (table 9-2), a list of indicators that allow insight on the structure of the respective institutions, as perceived under the lens of complexity in adaptive governance.

9.2 Shiretoko and Kalloni compared

The conditions of successful adaptive management examine the structure of the institutions of each case study in a holistic, yet largely socio-centric way, bring similarities and differences to the surface and uncovering possible reasons for the variation in management effectiveness. Comparing the two case studies, it is evident that the difference in the institutional background is a defining reason behind the variation in the results of management. Armitage et al. (2009) state that in order for adaptive co-management to be implemented successfully and bring about fruitful changes in natural resource management, all the conditions included in table 9-2 should be met, at least to some degree. The case studies act only as proof of this, with Shiretoko meeting all the criteria, while Kalloni is far from having even the foundations to build upon.

9.2.1 Well-defined resource system

In both cases, the resource system is mobile, as fish stocks tend to migrate between regions. Nevertheless, the primary fish stocks are quite well-defined, and their movements known, with the Nemuro walleye pollock stock in the case of Shiretoko moving mostly in the Nemuro area and the Kalloni sardines migrating every summer in Kalloni Bay. Both fisheries communities have vast knowledge about their respective target species that enable them to overcome the issue of resource mobility. However, in cases where knowledge is limited, resource mobility has proven to be a bleak point in co-management attempts, as in the case of the Steller's sea lions causing friction among the stakeholder groups of Shiretoko that are not aware of their mobility patterns between Japan and Russia.

9.2.2 Small-scale resource use contexts

Complexity of the small scale systems is central in the successful management. Obviously, any social-ecological system would exhibit high levels of complexity at the regional level, as there are conflicting uses of the same large –and regional- resource. In the case of Shiretoko, however, the fact that the majority of the uses are performed by the same stakeholder groups, the FCAs, which have the same legislative and institutional background and have developed communication and, most importantly, conflict resolution mechanisms, reduces the levels of complexity, especially compared to Kalloni, where the various user groups foster conflict, as they have no access to conflict management mechanisms.

Condition of Success	Explanation	Shiretoko	Kalloni
Well-defined resource system	Relatively immobile resources	Relatively	Relatively
Small-scale resource use contexts	Small-scale systems are less complex	Relatively	No
Clear and identifiable set of social entities with shared interests	Pre-existing linkages among users and to the locality and relationships of trust	Yes	No
Reasonably clear property rights to resources of concern	Pre-existing property rights	Yes	Relatively
Access to adaptable portfolio of management measures	Access to a variety of management tools to choose from	Yes	Relatively
Commitment to support a long-term institution-building process	Understanding that measures may take time to yield results and that the management process is a long-term one	Yes	Relatively
Provision of training, capacity building, and resources for local-, regional-, and national-level stakeholders	Access to learning and knowledge and resource exchange processes	Yes	No
Key leaders or individuals prepared to champion the process	Individuals committed to the process that can act as facilitators	Yes	Yes
Openness of participants to share and draw upon a plurality of knowledge systems and sources	Mutual acceptance of all knowledge sources	Yes	No
National and regional policy environment explicitly supportive of collaborative efforts	Pre-existing enabling policy framework	Yes	No

Table 9-2: Conditions for successful adaptive co-management. Adapted from Armitage et al. (2009).

9.2.3 Clear and identifiable set of social entities with shared interests

Social trust, or lack thereof, within the community and among stakeholder groups is crucial in determining the route of governance towards success or failure. A connection the locality is also important in building linkages around the resource. As was explained in Chapter 8, in a community that exhibits low levels of trust like Kalloni, attempts for the adoption of co-management approaches are most often deemed to fail. Especially when resources uses are linked to non-local interests, as has happened with the shellfish aquaculture units of Kalloni, further conflict escalation is accommodated between those strongly connected to the locality and the 'outsiders' or those who do not maintain significant ties to the area. On the other hand, in communities where linkages are wide and established networks support innovative governance like Shiretoko, adaptive management approaches are much more likely to succeed.

9.2.4 Reasonably clear property rights to resources of concern

In order to overcome the problem of the commons, well-defined property rights should be in place, regarding the resource under examination. The legally binding exclusive common rights bestowed upon the FCAs in Japan, and therefore in Shiretoko, play exactly that role. They safeguard access to the resource and promote incentives its conservation. Additionally, through an elaborate web of cultural rules and norms that governs the community, conformity to the rule is assured. Contrastingly, access to the fish stocks of Kalloni is enabled through a system of fishing licences that hardly assure long-term viability of the resource, with limited monitoring and control, and complete lack of incentivisation of fishers to safeguard the stocks, with *race to fish* being the dominant exploitation strategy.

9.2.5 Access to adaptable portfolio of management measures

A management toolbox should be available to the participants in order to test and utilise those tools that are most suitable to the respective resource. The fishers of Shiretoko, the primary decision-makers on matters of resource management in the area under their jurisdiction, have access to a range of tools, from mainstream fisheries management tools to technical assistance and educational opportunities. Management participants in Kalloni however, despite the existence of a variety of suitable tools, have no implementation power. Even though the fishers

have developed ideas for appropriate management measures, as was the case with the experimental no-take zone established in 1982, the high centralisation of the decision-making process renders them unable to utilise those tools.

9.2.6 Commitment to support a long-term institution-building process

Natural resource management is a lengthy process by its nature. Measures taken in the present quite possibly will not bear results until far in the future. Thus, attempting the implementation of a new approach requires inevitably a long-term commitment to the cause. In the case of Shiretoko, this process was initiated more than twenty years ago with the first self-imposed measures implemented by the local gillnet fishers decreeing the first no-take zones. Until this day, the management process is going, adapting to new conditions and data availability, and the fishers show remarkable commitment to the continuity of their effort. The case is not the same in Kalloni. No management strategy is in place, and despite the fact that the local stakeholders recognise the need for a long-term approach, motivation is low and measures are not adopted with long-term sustainability in mind.

9.2.7 Provision of training, capacity building, and resources for local-, regional-, and national-level stakeholders

Although the EU acknowledges and promotes lifelong learning and capacity building as essential aspects of fisheries sustainability, education channels and networks are very fragmented in the Greek periphery. The fisheries users of Kalloni have limited access to capacity building tools and even more limited access to training. Segmentation of research and alienation of educational institutions from the local level discourages the users from actively seeking training. On the contrary, Japanese research and educational institutions have historically strong ties with the fisheries professionals, developing case-specific training and support programmes, fostering capacity building and empowering the communities.

9.2.8 Key leaders or individuals prepared to champion the process

In both case studies, specific individuals (in the case of Shiretoko, members of the FCAs, committed researchers, and community leaders, and in Kalloni, members of the Fishermen's

Club, members of the coastguard, and government officials) are willing and have actively assumed the role to champion the adoption of adaptive management in order to safeguard the local resources and ensure long-term viability of the communities. Still, network fragmentation and high centralisation levels in the case of Kalloni have negative impacts on local activism, rendering the process impossible.

9.2.9 Openness to participants to share and draw upon a plurality of knowledge systems and sources

The fishers of Shiretoko, in collaboration with government officials and researchers, have developed a system of fisheries data collection which contributes to the national statistics. Furthermore, LEK is widely accepted as knowledge source of similar calibre as scientific knowledge, in order for a variety of information sources to be contribute towards an educated management approach. Knowledge in Kalloni, however, is still the exclusive territory of academic and research institutions, with extremely limited connection to the local communities. The lack of validation channels that would allow access and utilisation of LEK further reduce data availability and create a sentiment of inferiority to the locals, as the value of their ancestral knowledge is not recognised. In addition, the local users have very limited opportunities to collaborate with researchers in order to create relevant scientific knowledge, as no mechanisms for the communities to request the implementation of specific research topics and projects are in place.

9.2.10 National and regional policy environment explicitly supportive of collaborative efforts

Empowerment mechanisms are also essential in the adaptive management process. Once again, the highly centralised governance approach adopted by the Greek state comes in stark contrast to the local allocation of responsibility and right allocation followed by Japan. The latter has a robust framework of legislative, regulatory, and other institutional enablers in place, in order to foster collaboration through the empowerment of the local resource users and communities.

9.3 Discussion

It is evident through the comparison between Kalloni and Shiretoko that the movement towards an adaptive management approach is highly dependent on a range of factors. Although the two case studies exhibit many similarities, especially in terms of ecological conditions and cultural connections to the resource, the institutional context differs radically. The institutional background is the decisive factor that has allowed Shiretoko to develop from the bottom-up a more sustainable approach, focusing on the importance of the nodes of the local social-ecological system, instead of enforcing irrelevant and generic top-down regulations, as has happened in Kalloni.

Apart from the legislative and bureaucratic obstacles set by a centralised management approach upon the local natural resource, low participation levels in the decision-making process has additional impact on local perceptions of the fisheries governance systems. The fishers, even if they are inherently willing to adopt suitable management measures that will safeguard the resource for future generations, feel compelled to break the law and fish illegally or destructively. Coupled with weak enforcement and the absence of clear property rights, as well as the consequent cultural norms, adoption of co-management becomes nearly impossible. The artisanal fishers mistrust the motives of the rest of the resource users, as well as their colleagues', and become unwilling to cooperate in order to overcome the fisheries exploitation issues. It does not matter that they are perfectly aware that their income source is undergoing a major crisis and that their livelihoods are threatened; they firmly believe that they are incapable of changing their circumstances and only the top-down intervention can save the stocks and themselves.

There is logical foundation in their fears and beliefs, of course. There is no framework or tools that would enable them to take direct action and the complete lack of learning opportunities has deprived them of the means to develop innovative initiatives. One would wonder though, how weak and helpless they really are; is there nothing that can be done by the locals for the locals? It is quite possible that a new generation of users could bring new ideas in the community and help revitalise the will to work together. Nevertheless, the communities still suffer

"All the attempts to coil together have failed. Take for example the reduction of the sardine price. 80% of the sardine fishers got together and managed to raise the price up to 40%. The rest 20% of the fishers didn't want to serve the [common] interest and brought down the attempt"

P.N., fisher

from decades-long conflicts among the user groups and no will to bridge the gaps is evident anywhere. Yet, collective action could quite possibly act as leverage to press the regional or even the national level into action. The Fishermen's Club has a record of collective action 'victories', after all. If they could develop some form of consensus building mechanism, it is likely that they would become able to escalate their actions and even develop capacity building tools.

It is necessary however, that someone –or more specifically an organisation- takes a step forward to urge the rest into action. If for example, the academic and research institutions enabled pathways of collaboration with the local communities, great potential would be created. Collaborative networks are the backbone of the successful management system in Japan, and it would not be too difficult to replicate in Greece as well, where currently there is very limited connection between the state (especially at the local level), academic and research institutions, and local communities, as mentioned in section 7.7 (Tsobanoglou, 2011). Taking into consideration the vast difference in capacity for immediate implementation of initiatives between Kalloni Bay and Shiretoko, it might be desirable to seek a prototype that is closer in scale with Kalloni Bay. Such an example could be found in the Lagoon of Messolonghi (*Limnothalassa Mesologgiou)*, where a robust network of knowledge transfer and collaboration is in place. Through the cooperation of several actor groups facilitated by the Management Operator of Messolonghi Lagoon (*Foreas Diachirisis Limnothalassas Mesologgiou*) [40] , an organisation with similar structure as the Shiretoko WNHS Scientific Council, based on plurality in participation and representation. A multitude of mediation processes between actor groups take place within and through the Management Operator, including the bringing together of science and local users. Additionally, the Management Operator facilitates among others, conservation, education, and awareness raising initiatives, turning thus the focus on the social-ecological system of Messolonghi Lagoon.

Naturally, such a transition from an institutionally fragmented management framework to a model similar to the one adopted in Messolonghi Lagoon initially and Shiretoko later on needs financial support, which is quite scarce in current Greece. Nevertheless, there are significant non utilised funds from the EU which could be channelled towards the direction of fisheries management evolution in Kalloni Bay. The European

[40] Information about the Management Operator of Messolonghi Lagoon can be found on the official website: http://fdlmes.gr/index.php?option=com_content&view=featured&Itemid=101

Maritime and Fisheries Fund (EMFF) offers important financing opportunities for the fisheries sectors through its Operational Programmes. Yet, these funds go largely unexploited in Greece, as was shown in the Annual Implementation Report for the EMFF that the National Supervisory Authority (2016) submitted, regarding the absorption of EMFF funds in 2015. For the time period 2014-2020, €388million have been allocated to Greece, but the absorption of funds in 2015 was null; a fact indicating a deficiency in governmental proactivity quite characteristic of the Greek state (Tsobanoglou, 2016). These funds could be invested in the construction of institutional structures to support sustainability of fisheries communities and promote co-management in areas like Kalloni Bay, which are challenged developmentally not least by insularity.

The construction of such collaborative networks would immediately empower the local communities through the acknowledgement of the value of their LEK and by addressing, or at least attempting to address issues that are highly relevant to the local uses and dictated by the users themselves. The process of developing networks could be directed with the implementation of a needs assessment regarding the uses and deficiencies at the local level. Such an approach would optimise the outcomes of any initiatives, matching up real needs with the appropriate resources; for example non-absorbed EU funds with the needs of local fisheries communities.

Building upon such networks and the development of an appropriate working framework, the lacking conditions for successful adaptive co-management as defined by Armitage et al. (2009) should gradually be fulfilled and thus, reach a point where sustainable fish stock management inclusive of objectives for both conservation and cohesion would be readily attainable.

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Appendix I
Comparison between Greece and Japan

Indicator	Greece	Japan
Total Area	131957 km^2	377915 km^2
Water Area	1310 km^2	13430 km^2
Water Area (% Total)	0.99%	3.55%
Coastline	13676 km	29751 km
Coastline/Total Area	0.10 km	0.23 km
Territorial Sea	12 nm	12 nm
Contiguous Zone		24 nm
Continental Shelf	200 m depth or to the depth of exploitation	
Exclusive Economic Zone		200 nm
Climate	temperate	tropical - sub-arctic
Natural Hazards	earthquakes (volcanoes)	earthquakes, tsunamis, typhoons (volcanoes)
International Agreements	Antarctic - Marine living resources, Biodiversity, Endangered species, Law of the Sea, Wetlands	Antarctic - Marine living resources, Antarctic Seals, Biodiversity, Endangered species, Law of the Sea, Wetlands, Whaling
Strategic Geographical Position	Dominates the Aegean Sea	Strategic location in NE Asia
Archipelago	3000 - 6000 islands (approx - depending on minimum size)	6852 islands
Major Ethnic Groups	Greek (93%)	Japanese (98.5%)
Population	1077557 (2014 est)	127103388 (2014 est)
Migration (per 1000 population)	2.32 (2014 est)	0 (2014 est)
Urban Population	61.4% (2011 est)	91.3% (2011 est)
Life Expectancy	80.3 years	84.46 years
Economic Recession	since 2009	2008, 2011
GDP per capita	$23600	$37100
GDP real growth rate	-3.8%	2%
GDP Composition - Exports	28.4%	15.8%
GDP Composition - Imports	-31.7%	-18.4%
GDP Composition by Sector - Agriculture	3.5%	1.1%
GDP Composition by Sector - Industry	16%	25.6%
GDP Composition by Sector - Services	80.5%	73.2%
Labour Force by Occupation - Agriculture	12.4% (2005 est)	3.9% (2010 est)
Labour Force by Occupation - Industry	22.4% (2005 est)	26.2% (2010 est)
Labour Force by Occupation - Services	65.1% (2005 est)	69.8% (2010 est)
General Unemployment Rate	27.9%	4.1%
Youth Unemployment Rate	55.3%	7.9%
Population below Poverty Line	20% (2009 est)	16% (2010 est)
Marine Disputes	Turkey, Italy	Russia, S Korea, China, Taiwan

Appendix II
Shiretoko WNHS Timeline

- *1608-1868 (Edo Era)*
  - People from the Japanese main island begin to commercialise fisheries products and increasingly control and suppress the local people
  - The Ainu people have yet no concept of government or lordship
- *1790*
  - Beginning of commercial fisheries in Shiretoko with the foundation of a fishery market by the rulers of mainland Japan
- *1868 (Meiji Restoration)*
  - Hokkaido Island is formally incorporated into the Japanese territory
  - Offshore fisheries targeting halibut and cod start
- *1875*
  - Nationalisation of seas of Japan
  - Introduction of centralised fishing license system
- *1885*
  - Establishment of the Bureau of Fisheries within the Ministry of Agriculture and Commerce
- *1886*
  - Introduction of the Fishermen's Union Regulation
- *1901*
  - Introduction of the Meiji Fishery Law
- *1910*
  - Amendment of the Meiji Fishery Law
- *1945*
  - Japan loses the 2nd World War, and is occupied by the Allied Powers
- *1948*
  - Introduction of the Fisheries Cooperative Associations Law
- *1949*
  - Introduction of the Fisheries Law
- *1950s*
  - Japanese settlers from Honshu move to Shiretoko and cultivate land originally covered by virgin forest
- *1950*
  - Introduction of the Law for the Protection of Cultural Properties

- *1951*
  - Introduction of Fisheries Protection Law
  - Introduction of the Law on Administration and Management of National Forests
- *1952*
  - Restoration of sovereignty
- *1957*
  - Introduction of Natural Park Law
  - Local inhabitants mobilise to create Shiretoko National Park after the opening of highway between Shari and Utoro
- *1962*
  - Establishment of Marine Park System
- *1964*
  - The Shiretoko Peninsula and its surrounding marine areas are designated a National Park
- *1970*
  - Introduction of the Law Relating to the Prevention of Marine and Air Pollution from Ships and Maritime Disasters
  - Introduction of Water Pollution Control Law
- *1971*
  - Introduction of the Marine Fisheries Resource Development Promotion Law
- *1972*
  - Introduction of the Nature Conservation Law
- *1973*
  - Shari Town residents formally request that the Hokkaido Prefectural government to enact more restrictive logging rules in the Park. They passed a local "constitution" declaring it the responsibility of the Town to protect Shiretoko National Park
- *1975*
  - The first International Conference on Marine Parks takes place in Tokyo
- *1977*
  - Shari Town mayor announces plans to inaugurate a Shiretoko National Trust eligible to receive donations for the purchase of Shiretoko lands that would otherwise go to developers (100m^2 Campaign)
- *1981*
  - The Japan Forestry Agency releases its "Fourth Plan", which proposes the clear cutting of about 2300 hectares of the Shiretoko National Park, and newly built roads and loading facilities to service the cutting sites.
  - Grass-roots movement sprouted overnight, led by the Shari Town mayor, resulting in suspension of the plan.

- *1982*
  - Shiretoko National Trust headquarters move to Tokyo
- *1983*
  - Shiretoko National Trust organizes All-Japan National Trust Conference in Tokyo – academics, journalists and novelists participate, proposing for a revised Forest Plan
- *1985*
  - Fifth Forestry Plan is released; maintains articles about cutting in Shiretoko National Park. It is validated by the Hokkaido Prefectural government, the Environment Agency and finally, the mayor of Shari
- *1987*
  - Environmentalists tie themselves to old growth trees in protest.
  - Change of mayor. New mayor negotiates the termination of the Fifth Plan.
- *1988*
  - Special committee on Forestry and Environmental Protection, which includes a representative of the Japan Nature Conservancy, is formed.
  - Proposal for a Man and the Biosphere Reserve in Shiretoko are discussed.
- *1989*
  - Establishment of the Man and the Biosphere Reserve.
- *1990s*
  - Establishment of the Exclusive Economic Zone (EEZ)
  - Nemuro stock of walleye pollock collapses
  - Japanese sardine stock collapses
  - Gill net fishermen decide to increase voluntarily the mesh size for pollock gill nets from 91 to 95mm, in accordance with research provided by research station
  - Gill net fishermen divide the walleye pollock fishery ground into 34 areas according to their local experience
  - Rise of the international movement for the conservation of marine mammals
  - Hokkaido Fishing Coordination Commission sets a cull limit of 116 sea lions per year
- *1990*
  - Amendment of the Marine Fisheries Resource Development Promotion Law
  - Establishment of the Resource Management Agreement System
- *1992*
  - Introduction of the Law for Conservation of Endangered Species of Wild Fauna and Flora
- *1994*
  - Local governments start a campaign to acquire UNESCO World Heritage nomination

- *1995*
  - Gill net fishermen declare 7 areas of the walleye pollock fishery ground protected to conserve resources
- *1996*
  - Introduction of the Law Concerning the Conservation and Management of Marine Life Resources
- *1997*
  - The Japanese government introduces the Total Allowable Catch (TAC) system
- *2001*
  - Foundation of Shiretoko National Park Committee for the Review of Proper Use
  - Introduction of the Basic Law on Fisheries Policy
  - Establishment of Wide-Area Fisheries Coordinating Committees
- *2002*
  - Fishermen introduce a joint operation system to further decrease the fishing capacity
  - Introduction of the Wildlife Protection and Appropriate Hunting Law
- *2003*
  - Establishment of the Shiretoko World Natural Heritage Regional Liaison Committee with officers from a wide range of ministries and departments in central and local government
- *2004*
  - Formulation of management plan and nomination of the area for the UNESCO World Heritage List by the national government
  - IUCN reviews the proposal and management plan and conducts a field evaluation and express concerns about the adequacy of the plan
  - Establishment of the Shiretoko World Natural Heritage Site Scientific Council (three working groups: Marine WG, River Construction WG and Yezo Deer WG)
  - Extension of the Shiretoko National Park Committee for the Review of Proper Use
  - Until the end of the year, more than half of the gill net fishing fleet has been decommissioned voluntarily by the gill net fishermen to reduce fishing capacity
- *2005*
  - IUCN makes suggestions for improvement of the plan
  - After heated discussions, the Marine WG decides to set the objective of the Marine Management Plan as "to satisfy both conservation of the marine ecosystem and stable fisheries through the sustainable use of marine living resources in the marine area of the heritage site".
  - The government replies officially to IUCN and promises to make improvements to the plan according to IUCN's evaluation
  - Shiretoko is added to the UNESCO World Heritage List

- Beginning of modifications of man-made constructions along rivers
- Gill net fishermen declare another 6 areas of the walleye pollock fishery ground protected

- *2007*
  - Development and validation of the Multiple Use Marine Management Plan
  - JME ranks Steller's sea lion as "vulnerable"
  - Revision of the Steller's sea lion cull limit to 120 per year according to the PBR by the Fisheries Agency
  - Introduction of the Ocean Basic Act
- *2008*
  - Publication and inspection by UNESCO and IUCN of the English version of the Multiple Use Marine Management Plan
  - Formulation of the Basic Plan of Integrated Marine Policy
- *2010*
  - Establishment of the WG for Ecotourism under the Scientific Council

Appendix III
Greek Fisheries Timeline

- *1914*
  - The Fisheries Sector of the Ministry of National Economy is established
- *1922*
  - Asia Minor Catastrophe
- *1939*
  - Foundation of the Fisheries Organisation
- *1941*
  - Abolishment of the Fisheries Organisation and foundation of the Fisheries Directorate and the Directorate of Technical Organisation of Fisheries
- *1947*
  - Establishment of the Hellenic Hydrobiological Institute
- *1949*
  - Establishment of the GFCM
- *1952*
  - Implementation of the GFCM
- *1958*
  - Adoption of the first fisheries regulation through the Treaty of Rome
- *1950s*
  - Abolishment of the Directorate of Technical Organisation of Fisheries and transfer of the Fisheries Directorate to the Ministry of Industry
- *1970*
  - Implementation of the first EU rules
  - Adoption of the Greek Fisheries Code
- *1976*
  - Extension of fishing waters from 12nm to 200nm from the coast
- *1981*
  - Greece enters the EU
- *1983*
  - Adoption of the CFP
- *1986*
  - Spain and Portugal entered the EU, effectively doubling the number of EU citizens employed in the fishing sector

- *1992*
  - First review of the CFP showed overinvestment in vessels, decreasing landed catches, and overfishing
- *1994*
  - Establishment of the EU fisheries fund PESCA
- *1995*
  - Introduction of permit system to regulate fishing effort, and TACs
- *2009*
  - The CFP was opened for public debate
- *2014*
  - Revised CFP came into effect, focusing on the elimination of discards, protection of endangered stocks, and adoption of the MSY

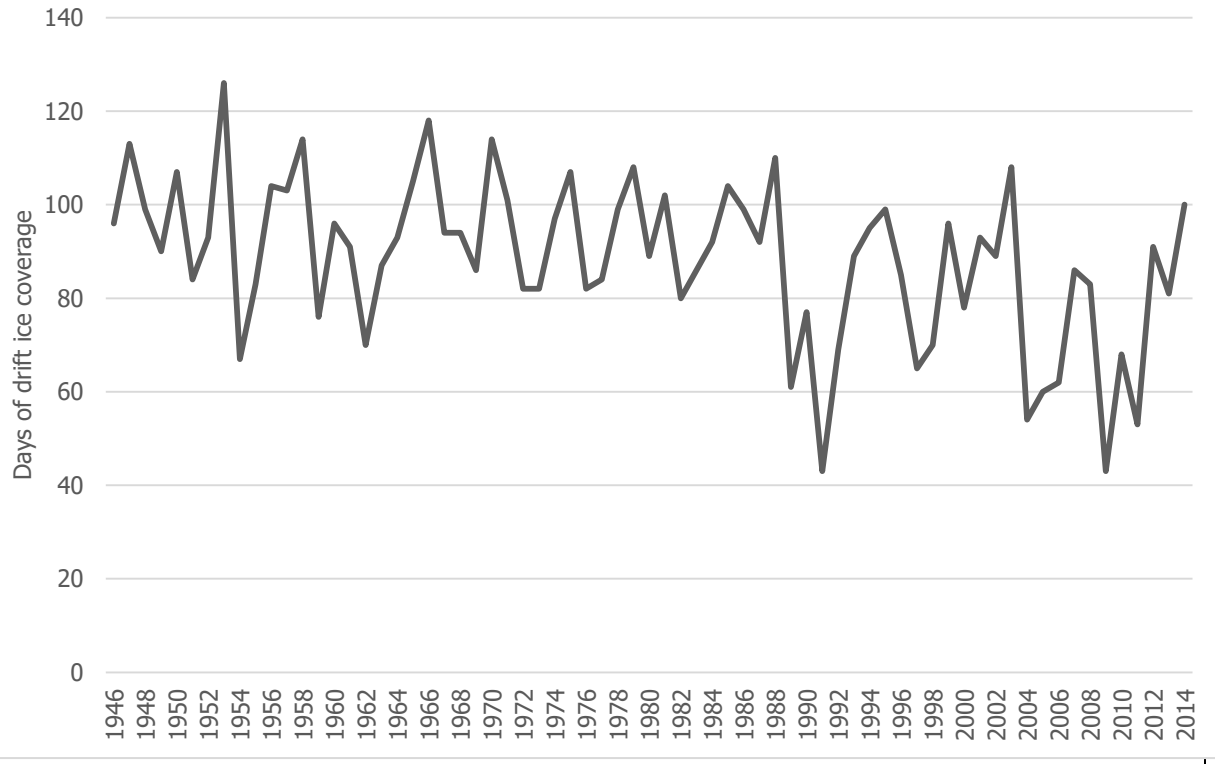
APPENDIX IV
SHIRETOKO IMBER-ADApT

A. BACKGROUND INFORMATION

In this section, please provide background information about yourself and your case study, as well as a clear description of the Main Issue affecting fishing or aquaculture in your case study. Please provide as much information as necessary to understand the Main Issue. If required, use an extra page and feel free to provide references where relevant.

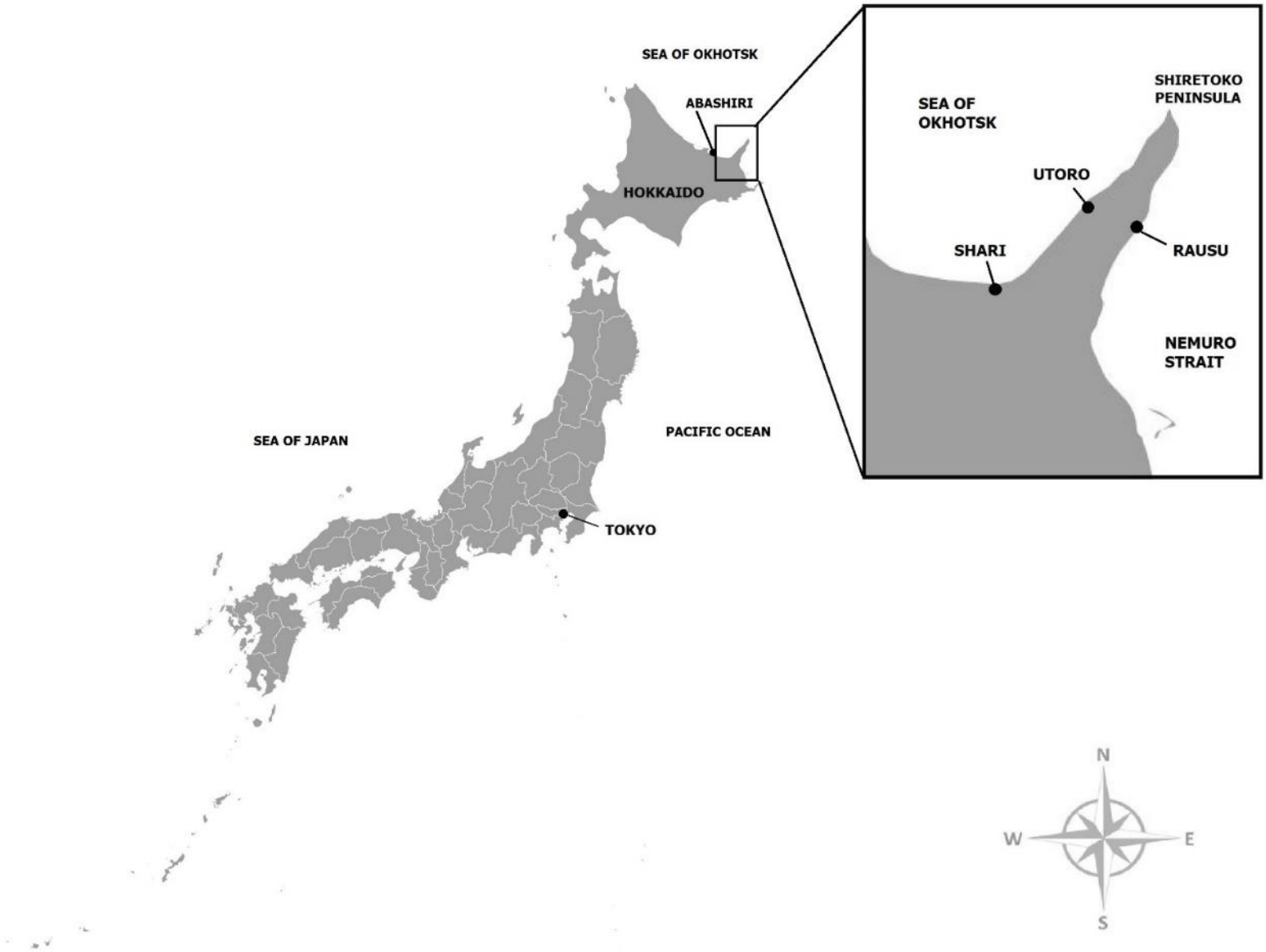
INFORMATION	**DETAILS**		
CASE STUDY CONTRIBUTORS (please include all contributors)	**NAME:** Eirini Ioanna Vlachopoulou **AFFILIATION:** University of the Aegean **Email:** socd12054@soc.aegean.gr	**NAME:** Mitsutaku Makino **AFFILIATION:** Japan Fisheries Research and Education Agency **Email:**	**NAME:** **AFFILIATION:** **Email:**
NAME OF STUDY AREA	Shiretoko World Natural Heritage Site		
COUNTRY/COUNTRIES WITH JURSIDICTION	Japan (conflicts with Russia)		
GEOGRAPHIC LOCATION (Temperate, Tropical or High Latitude)	Sub-arctic		
ECOSYSTEM TYPE (Coastal, Lagoon, Shelf or Open Ocean, other)	Coastal		
MAIN ISSUE (a) Provide a concise, detailed description of the Main Issue affecting the case study. Include the following information to show the extent of the effect of the Main Issue:	**Description of Main Issue** Ecosystem change (climate change, water temperature increase, alien species, human impacts) and social issues (competition among countries with fishing rights –Japan and Russia-, resource use conflicts –conservation and exploitation-, aftereffects of past overfishing) The most important current problem is the reduction of fish stocks (e.g. the stock of Japanese sardine, *Sardinops melanostictus*, has collapsed) due to past overfishing and ecosystem change (climate change). The environmental conditions have degraded and continue to do so, with the amount of drift ice declining annually. Target species have been migrating to colder water and southern species have been taking over the area.		

	location Waters surrounding the Shiretoko Peninsula, Hokkaido Island, Japan **size of marine area in your case study (km^2)** approx. 300km^2 **main species** *Theragra chalcogramma, Oncorhynchus* spp., *Todarodes pacificus, Gadus macrocephalus, Pleurogrammus azonus, Clupea pallasii etc.* *Laminaria diabolica, Saccharina japonica* *Strongylocentrotus intermedius* **main habitats** drift ice, kelp forests **size of area inhabited by people in your case study (km^2)** approx. 100km^2 **key stakeholders** fishers (Fisheries Cooperatice Association) local government local NGOs scientists **number of people affected by the Main Issue** **total number of people in your case study area** approx. 19000
(b) When did the Main Issue occur?	Available data since 1946 show slow decline in the annual amount of drift ice



(c) Are there other geographical areas that are also affected by this issue, but not included in this case study? If so, please indicate what they are.	Possibly the Kuril Island complex

Please insert a map of the area of your case study here


SEA OF OKHOTSK
ABASHIRI
HOKKAIDO
SEA OF JAPAN
PACIFIC OCEAN
TOKYO
SEA OF OKHOTSK
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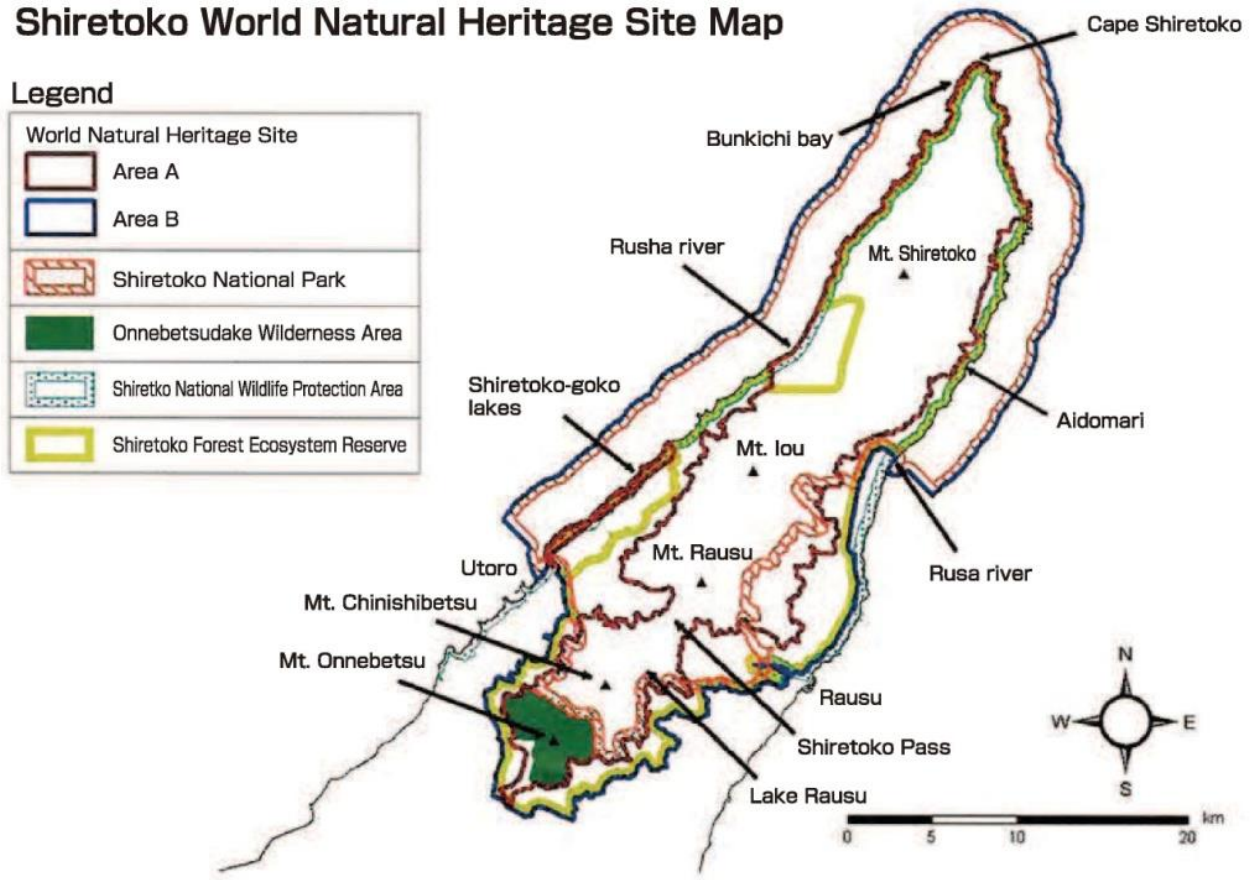
Shiretoko World Natural Heritage Site Map
Legend
World Natural Heritage Site
Area A
Area B
Shiretoko National Park
Onnebetsudake Wilderness Area
Shiretko National Wildlife Protection Area
Shiretoko Forest Ecosystem Reserve
Cape Shiretoko
Bunkichi bay
Rusha river
Mt. Shiretoko
Shiretoko-goko lakes
Aidomari
Mt. Iou
Mt. Rausu
Utoro
Rusa river
Mt. Chinishibetsu
Mt. Onnebetsu
Rausu
Shiretoko Pass
Lake Rausu
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B. DESCRIPTION OF THE STRESSORS AND THEIR IMPACTS

This section aims to gather information about the scale of the affected natural and social systems, and the governing systems, the main stressors affecting these systems, the consequent changes that these cause, and their impacts. Please provide as much information as necessary, but in no more than 200-300 words for each question. Please provide references where relevant.

Questions	Natural system	Social system	Governing system
1. What are the boundaries of the natural, social and governing systems?	The marine area surrounding the World Natural Heritage (extending beyond the designated marine area) until the Kuril islands and the Nemuro Strait	The fishing communities of Rausu, Shari, and Utoro	The FCAs, the local and national government, NGOs, IUCN, UNESCO
2. Which of the following levels is the Main Issue related to? Please describe for each system and level, where appropriate.	A. LOCAL Shiretoko WNHS B. REGIONAL (within country) Shiretoko area C. NATIONAL Japan D. INTERNATIONAL/GLOBAL Amur-Okhotsk area	A. LOCAL Shiretoko FCAs B. REGIONAL Shiretoko population C. NATIONAL FCAs nation-wide D. INTERNATIONAL Japan and Russia	A. LOCAL Shiretoko FCAs B. REGIONAL Hokkaido government C. NATIONAL Japanese Government D. INTERNATIONAL Japanese-Russian relationships
3. What are the main natural, social and/or governance stressors that affect this system?	Climate change	Past overfishing and use conflicts	Use conflicts
4. What changes in the natural, social and governing systems do these stressors cause and where?	Ecosystem changes	Fish stock decline	Reluctance to take radical action
5. What are the impacts or consequences of this change on the natural, social and governing systems?	Changes in species distribution	Reduced income for fishers, community depopulation	Friction between the governance levels

C. VULNERABILITY (6 questions)

Please provide as much information as necessary in no more than 200-300 words for each question, and provide references where relevant.
NB: These questions refer to the period PRIOR to the Main Issue

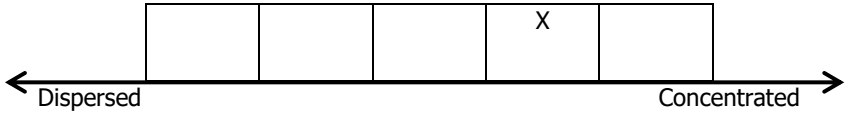
QUESTION	Details
6. What was the ecological status of the ecosystem (e.g., eutrophication, changes in size and/or trophic level, loss of key species, habitat quality, invasive species structure, dead zones) prior to the main issue?	Limited data According to the local users, the ecosystem was thriving
7. What was the productivity of the system (low, medium or high) prior to the main issue?	High
8. What were the main livelihood activities (e.g., fishing, tourism, etc.) directly affected by the Main Issue?	Fisheries, aquaculture, tourism
9. What other livelihood opportunities (e.g., farming, manufacturing, forestry, etc.) were there in the affected area prior to the main issue?	Limited agriculture and forestry
10. What % of the total catch/production from fisheries and or aquaculture was used for own household consumption (not sold) prior to the main issue?	Most of the production is directed to the markets
11. What proportion of household income came from fish caught or produced locally (including post-harvesting activities) prior to the main issue?	For the members of the FCAs and their families used to rely almost exclusively on fisheries and post-harvesting activities for their livelihoods

D. GOVERNANCE AND GOVERNABILITY (8 questions)

Please provide as much information as necessary, but in no more than 200-300 words for each question, and provide references where relevant.

NB: These questions refer to the period PRIOR to the Main Issue

QUESTION	**Details**
12. What were the relevant organisation(s) or individual(s) (including state, market and civil society) responsible for governance of fisheries and aquaculture at local, regional and national levels in this area prior to the main issue?	LOCAL: FCAs, Local Government (Rausu Town, Shari Town) REGIONAL: Local Government (Hokkaido government) NATIONAL: National Government
13. What was the mode of governance (e.g., self-, co-, hierarchical (local), hierarchical (larger scale), mixture) prior to the main issue. Please describe.	A mixture of self- and co-management Traditionally, the locals FCAs are responsible for the regulation of the areas under their jurisdiction, working with the support of the government and receiving feedback and advice from other sources (Researchers, NGOs etc.)
14. What were the long-term management objectives prior to the main issue?	To maintain local livelihoods while protecting the marine environment
15. What were the key rules, regulations, instruments and measures employed to achieve the management objectives prior to the main issue?	Meiji Fisheries Law, Fisheries Cooperative Associations Law, Fisheries Law, Fisheries Protection Law
16. Were there any informal rules, regulations, instruments and measures that play an important role in the governance of fisheries and aquaculture prior to the main issue? Please describe.	Cultural norms and informal rules implemented by the FCAs, changing according to the needs of the FCA members and their understanding of the local ecosystem changes
17. What was the nature of the relationship between the different sectors or livelihood occupations in this system prior to the main issue? (i.e., was there conflict or cooperation) Were there any special circumstances in their relationships that should be noted?	Please tick the box corresponding to the most appropriate situation 

18. Who dominated or wielded the most social power in the area prior to the main issue? (e.g., fishers' associations, unions, corporations, governments, business owners, etc.)	FCAs
19. How concentrated was social power in the area prior to the main issue? (ie., was power held by a few people/1 organisation (concentrated) or was it dispersed over several organisations)	Please tick the box corresponding to the most appropriate situation of the social system 
20. Were there any structural changes in the governing system or individuals prior to the main issue? Please describe the changes and why they occurred?	Relations between the members the FCAs and the various governance levels became increasingly tighter and management responsibilities held by the FCAs evolved and expanded according to improvements in scientific knowledge and ecosystem changes
21. Were there any changes to the key rules, regulations, instruments and measures, or have any new ones been introduced prior to the main issue? Please describe the changes and why they were introduced	Establishment of Marine Park System, Marine Fisheries Resource Development Promotion Law, Law concerning the Conservation and Management of Marine Life Resources, Total Allowable Catch system, Basic Law on Fisheries Policy, Wide-Area Fisheries Coordinating Committees (WFCCs), Ocean Basic Act Fisheries management became more institutionalised and the fishers' influence on national decision-making increased through participation in the deliberation (WFCCs)

E. RESPONSE (2 questions)

The objective of this section is to evaluate the response of the natural, social and governing systems to the Main Issue. We ask for information about Short Term (within 2-5 years) and Long Term responses for the natural, social and governing systems. Please provide as much information as necessary, but in no more than 200-300 words for each question. Please provide references where relevant.

	Natural	**Social**	**Governing**
22. a. What were the **short term** responses of the social and governing systems to the main issue? (Include structural changes in the governing system(s) or individuals, or the changes in key rules, regulations, instruments and measures etc.)	**N/A**	TYPE OF RESPONSE (eg behavioural change, exit of actors) Adoption of stricter approach to self-management (protected areas, decommission of vessels etc.) LEVEL OF RESPONSE (national, regional , local) of response)) Local (FCAs)	TYPE OF RESPONSE (eg management measure, technological change, $ aid) Establishment of management bodies, indirect financial support to encourage decommission of vessels LEVEL OF RESPONSE (national, regional , local) of response) Local – Regional (Local government) National (National government)
b. What were the **long term** responses of the social and governing systems to the main issue? (Include structural changes in the governing system(s) or individuals, or the changes in key rules, regulations, instruments and measures etc.)	Drift ice levels are still slowly declining Ecosystem changes seem to normalise (species adapting to changes in water temperature, e.g. kelp reduction in size) Fish stocks show signs of stability (e.g. limited fluctuations in catch sizes)	TYPE OF RESPONSE (eg behavioural change, exit of actors) Adoption of stricter approach to self-management with direct measures (decommission of vessels, closing off of fishing areas) that aim at reduction of fishing effort and indirect measures (e.g. target shifting and support among the FCA members changing gears and tools) that aim at reduction of fishing pressure on specific species while protecting local livelihoods LEVEL OF RESPONSE (national, regional , local) of response	TYPE OF RESPONSE (eg management measure, technological change, $ aid) Establishment of management bodies, indirect financial support to encourage decommission of vessels Promotion of local collective action towards adoption of adaptive management LEVEL OF RESPONSE (national, regional , local) of response Local – Regional (Local government) National (National government)

		Local (FCAs)	
23. a. What were the objectives of the **short term** social and governing responses for the natural, social and governing systems?	Improvement of environmental conditions (fish stock levels)	Protection of local livelihoods and ecosystems	Protection of local livelihoods and ecosystems
b. What were the objectives of the **long term** social and governing responses for the natural, social and governing systems?	Improvement of environmental conditions (fish stock levels), adaptation and mitigation of climate and anthropogenic change	Protection of local livelihoods and ecosystems	Protection of local livelihoods and ecosystems

F. APPRAISAL (7 questions)

The objective of this section is to evaluate the response of the natural, social and governing systems to the Main Issue. We ask for information about Short Term (within 2-5 years) and Long Term responses for the natural, social and governing systems. Please provide as much information as necessary, but in no more than 200-300 words for each question. Please provide references where relevant.

	Natural	**Social**	**Governing**
24. a. What were the results of the **short term** response for the natural, social and governing systems (ie were the objectives in Q.**Error! Reference source not found.** achieved)?	N/A	Reduction of fishing effort	Enabling local management, adoption of regulation and legislation
b. What were the results of the **long term** response for the natural, social and governing systems (ie were the objectives in Q. **Error! Reference source not found.** achieved)?	Drift ice levels are still slowly declining Ecosystem changes seem to normalise (species adapting to changes in water temperature, e.g. kelp reduction in size) Fish stocks show signs of stability (e.g. limited fluctuations in catch sizes)	Reduction of fishing effort, turn towards more adaptive management approaches	Enabling local management, adoption of regulation and legislation, promotion of collaboration with international bodies (IUCN, UNESCO) to strengthen long term management
25. Was the Main Issue addressed (Section A)? Please describe.	Even though drift ice coverage is still slowly declining over time, the local systems show signs of developing resilience through adaptation and mitigation	Response approaches are still ongoing and the fishery shows signs of viability	Response approaches are still ongoing and the fishery shows signs of viability
26. a. What factors contributed to the successful **short term** results described in Q.**Error! Reference source not found.**		High levels of local motivation, enabling policy, governmental and academic support	High levels of local motivation, enabling policy, governmental and academic support

(e.g., enabling policy, government funding)			
b. What factors contributed to the successful **long term** results described in Q **Error! Reference source not found.** (e.g., enabling policy, government funding)	Healthy and productive ecosystem supporting changes in the stable states	High levels of local motivation, enabling policy, governmental and academic support, incentivisation by international bodies (IUCN, UNESCO)	High levels of local motivation, enabling policy, governmental and academic support, incentivisation by international bodies (IUCN, UNESCO)
27. a. What factors (if any) prevented the **short term** objectives from being fully achieved? (e.g., regulatory barrier, lack of social cohesion, costs too high, climate variability, judicial decisions).	Slow response of ecosystem	Limited conflict among uses, lengthy response of adaptive management approaches	Limited conflict among uses, lengthy response of adaptive management approaches
b. What factors (if any) prevented the **long term** objectives from being fully achieved? (e.g., regulatory barrier, lack of social cohesion, costs too high, climate variability, judicial decisions).		Limited conflict among uses	Limited conflict among uses
28. Has there been a formal evaluation of the responses? If so, how was this done and when?	Ongoing research from various sources (research institutes, fisheries data)	Ongoing research from various sources (research institutes, fisheries data)	Ongoing research from various sources (research institutes, fisheries data)
29. a. What were the benefits related to costs of the **short term** response?	More data is required	More data is required	More data required
b. What were the benefits related to costs of the **long term** response?	More data is required	More data is required	More data is required

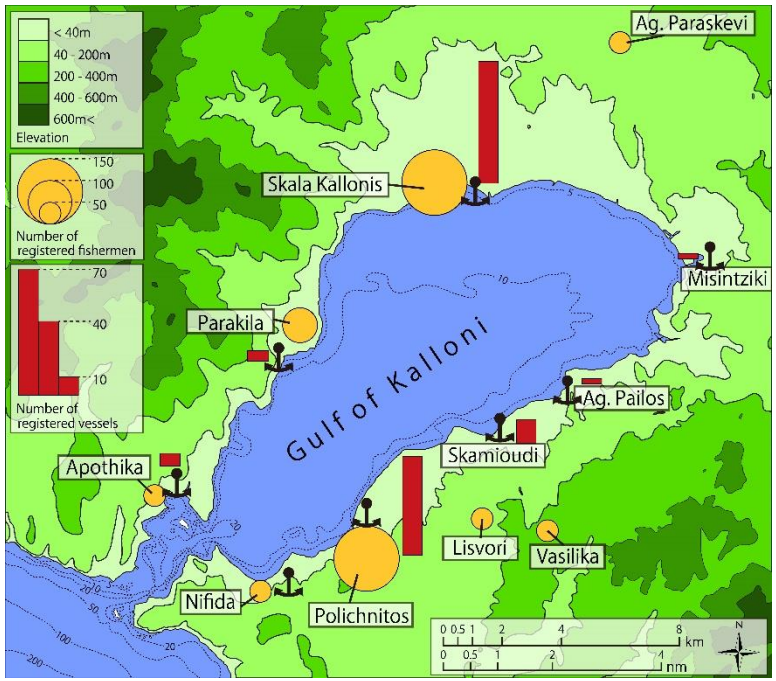
30. Were other options considered for the short and/or long term responses? Why were these not selected?	Adaptive management has been adopted: different options (measures, tools etc.) are implemented and adopted or discarded depending on their results or changes in the systems	Adaptive management has been adopted: different options (measures, tools etc.) are implemented and adopted or discarded depending on their results or changes in the systems	Adaptive management has been adopted: different options (measures, tools etc.) are implemented and adopted or discarded depending on their results or changes in the systems

Appendix V
Kalloni IMBER-ADApT

A. BACKGROUND INFORMATION

In this section, please provide background information about yourself and your case study, as well as a clear description of the Main Issue affecting fishing or aquaculture in your case study. Please provide as much information as necessary to understand the Main Issue. If required, use an extra page and feel free to provide references where relevant.

INFORMATION	**DETAILS**		
CASE STUDY CONTRIBUTORS (please include all contributors)	**NAME:** Eirini Ioanna Vlachopoulou **AFFILIATION:** University of the Aegean **Email:** socd12054@soc.aegean.gr	**NAME:** Seishiro Sakita **AFFILIATION:** Nagoya University **Email:**	**NAME:** **AFFILIATION:** **Email:**
NAME OF STUDY AREA	**Kalloni Bay**		
COUNTRY/COUNTRIES WITH JURSIDICTION	Greece		
GEOGRAPHIC LOCATION (Temperate, Tropical or High Latitude)	Temperate		
ECOSYSTEM TYPE (Coastal, Lagoon, Shelf or Open Ocean, other)	Coastal (semi-enclosed sea)		
MAIN ISSUE (a) Provide a concise, detailed description of the Main Issue affecting the case study. Include the following information to show the extent of the effect of the Main Issue:	**Description of Main Issue** Ecosystem change (water temperature increase, alien species, human impacts) and social issues (competition among fishing gears, income decrease, market access issues) The Kalloni Gulf sardine (*Sardina pilchardus*) stock is a fishery that exhibits significant fluctuations from year to year. Water temperature in the wider area of the Aegean Sea has been increasing, allowing for alien species to establish their presence ever north, endangering the local species. Past overfishing outside the gulf has affected present catch levels, and nowadays there are years that the stock does not reach the minimum landing size early during fishing season impacting thus on the fishers' income.		

	In the past, aquaculture units where granted permission to operate within the bay without reaching the ecological standards. As a result the bearded horse mussel (*Modiolus barbatus*) was introduced in the local ecosystem and altered significantly the ecological balance. Conflict between aquaculture and the sardine fishers (who fish for shellfish during winter) is extensive, affecting the community. Furthermore, continuous increases on fishing costs (fuel, taxation, declining demand) have been forcing the fishers' income downwards, increasing thus social frustration. The most evident issue affecting the Kalloni Bay sardine fishery is rainfall fluctuation. During the past decades, the annual amount of rainfall has been decreasing, and there cases of extreme weather conditions (longer dry periods and cases of extreme rainfall) have been increasing. Reduced amounts of rain has two major impacts on the sardine fishery: **1.** Reduced amount of nutrient inflow through river run-off and **2.** Higher water temperature in the bay, affecting movement of the stock within the limits of the bay 

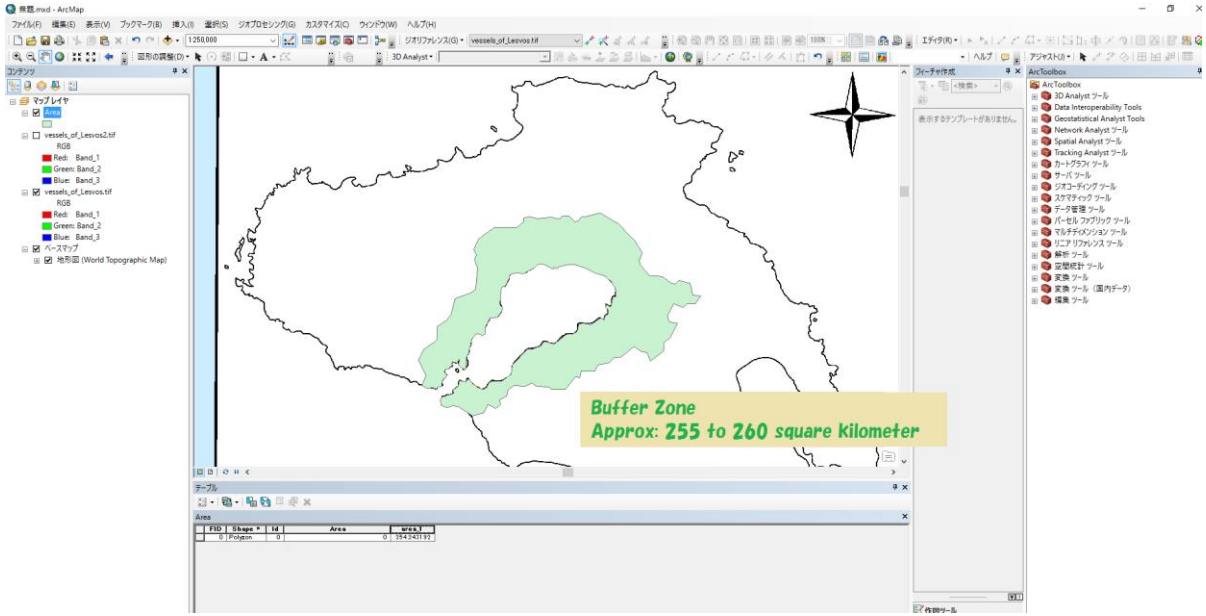
location
Kalloni Bay, Lesvos Island, Northern Aegean Sea, Greece

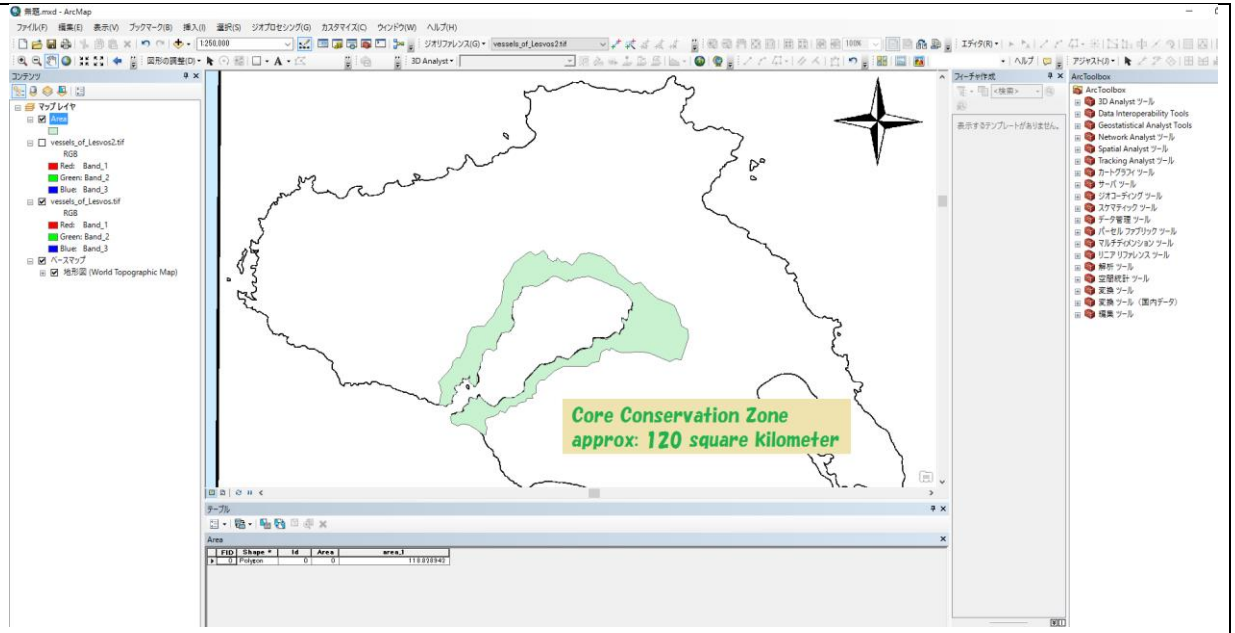
size of marine area in your case study (km^2)
approx. 115km^2

main species
Sardina pilchardus
Various shellfish (*Chlamys glabra, Mytilus galloprovincialis,* etc)
Mugil spp., *Mullus* spp., *Solla* spp., etc

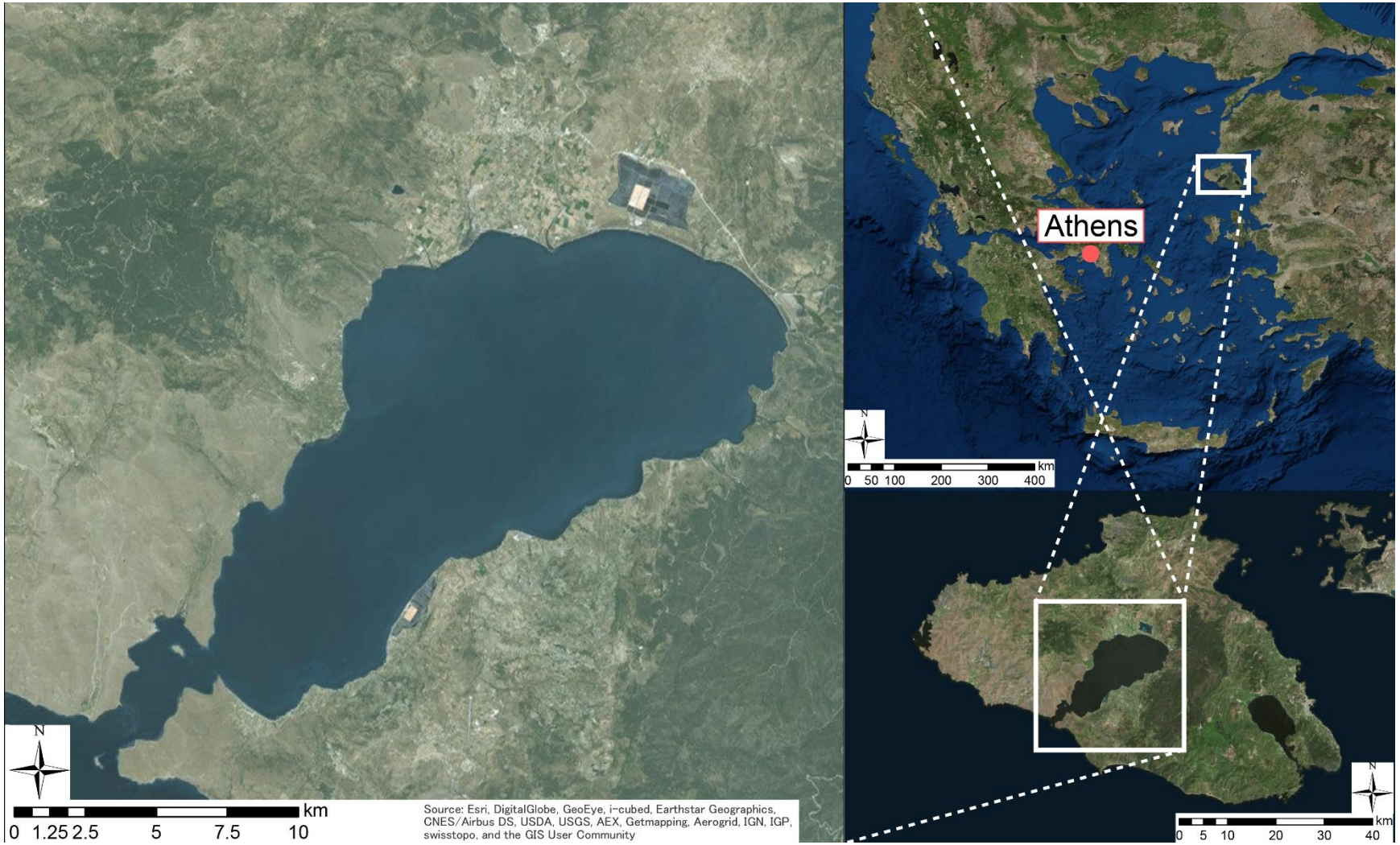
main habitats
muddy/rocky bottom, wetland, seagrass beds, coral reefs

size of area inhabited by people in your case study (km^2)
Core conservation area: approx. 120km^2
Buffer zone: approx. 220km^2



	 **key stakeholders** Small-scale fishers, shellfish marine farmers, local government **number of people affected by the Main Issue** approx. 2500 **total number of people in your case study area** approx. 10500
(b) When did the Main Issue occur?	According to studies (e.g. Pnevmatikos and Katsoulis, 2006; Varlas, Papadopoulos, and Katsafados, 2013), significant shifts in rainfall distribution occurred during the 1980s. However, it is difficult to calculate the exact timing of the change.
(c) Are there other geographical areas that are also affected by this issue, but not included in this case study? If so, please indicate what they are.	Climate change has been affecting the entirety of the Aegean Sea and social issues (policy problems) are evident throughout the country, as management is highly centralised.

Please insert a map of the area of your case study here


Athens
N
km
0 50 100 200 300 400
0 1.25 2.5 5 7.5 10
Source: Esri, DigitalGlobe, GeoEye, i-cubed, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AEX, Getmapping, Aerogrid, IGN, IGP, swisstopo, and the GIS User Community
0 5 10 20 30 40

B. DESCRIPTION OF THE STRESSORS AND THEIR IMPACTS

This section aims to gather information about the scale of the affected natural and social systems, and the governing systems, the main stressors affecting these systems, the consequent changes that these cause, and their impacts. Please provide as much information as necessary, but in no more than 200-300 words for each question. Please provide references where relevant.

Questions	Natural system	Social system	Governing system
6. What are the boundaries of the natural, social and governing systems?	The bay of Kalloni – the fish stock however moves in and out of the gulf	The fishing communities of the area surrounding the Gulf of Kalloni	The Fishermen's Club of Lesvos (17 former fishers' associations that have merged), the local and national government, EU directives
7. Which of the following levels is the Main Issue related to? Please describe for each system and level, where appropriate.	A. LOCAL The Bay of Kalloni B. REGIONAL (within country) Northern Aegean Sea C. NATIONAL Greece D. INTERNATIONAL/GLOBAL The Mediterranean Sea (reduced amount of rainfall has been occurring throughout the Mediterranean Basin)	A. LOCAL The fishers of Kalloni B. REGIONAL C. NATIONAL D. INTERNATIONAL	A. LOCAL The Fishermen's Club of Lesvos, the local (Lesvos) government B. REGIONAL The Regional Government (N.Aegean) C. NATIONAL The national government D. INTERNATIONAL EU (CFP)
8. What are the main natural, social and/or governance stressors that affect this system?	Climate change, pollution, alien species	Past overfishing and use conflicts	Disconnects between the levels of management, very limited cooperation between state and non-state actors, highly centralised management that is not appropriate on a case-by-case basis
9. What changes in the natural, social and governing systems do these stressors cause and where?	Ecosystem changes and disturbances in the ecosystem balance	Possible impact on fish stock fluctuation	Inappropriate management measures
10. What are the impacts or consequences of this change on the natural, social and governing systems?	Degrading ecosystem	Reduced income for fishers	Conflicts at the local level, reduced income for the community, mistrust towards the system,lack of appropriate conservation and management activity

C. VULNERABILITY (6 questions)

Please provide as much information as necessary in no more than 200-300 words for each question, and provide references where relevant.
NB: These questions refer to the period PRIOR to the Main Issue

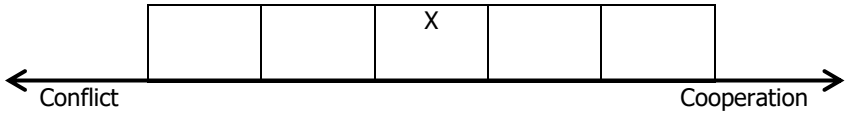
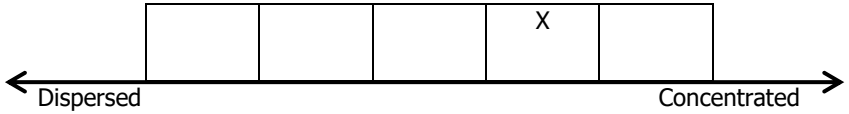
QUESTION	Details
31. What was the ecological status of the ecosystem (e.g., eutrophication, changes in size and/or trophic level, loss of key species, habitat quality, invasive species structure, dead zones) prior to the main issue?	Limited data
32. What was the productivity of the system (low, medium or high) prior to the main issue?	Limited data Due to limitation in available technology (engines, GPS, etc), catch productivity in the past was lower than today, but stock abundance was higher.
33. What were the main livelihood activities (e.g., fishing, tourism, etc.) directly affected by the Main Issue?	Fisheries, tourism, agriculture
34. What other livelihood opportunities (e.g., farming, manufacturing, forestry, etc.) were there in the affected area prior to the main issue?	Limited processing of produce
35. What % of the total catch/production from fisheries and or aquaculture was used for own household consumption (not sold) prior to the main issue?	Only a small proportion was used for own consumption. The majority of the catch was directed to markets.
36. What proportion of household income came from fish caught or produced locally (including post-harvesting activities) prior to the main issue?	Fishing was the most important income source. Some fishers maintained a few olive trees or produced some vegetables, mostly for own consumption.

D. GOVERNANCE AND GOVERNABILITY (8 questions)

Please provide as much information as necessary, but in no more than 200-300 words for each question, and provide references where relevant.

NB: These questions refer to the period PRIOR to the Main Issue

QUESTION	Details
37. What were the relevant organisation(s) or individual(s) (including state, market and civil society) responsible for governance of fisheries and aquaculture at local, regional and national levels in this area prior to the main issue?	LOCAL: fishers' associations REGIONAL: Local government (Island of Lesvos) NATIONAL: National government (based on the CFP directives)
38. What was the mode of governance (e.g., self-, co-, hierarchical (local), hierarchical (larger scale), mixture) prior to the main issue. Please describe.	Mostly hierarchical (larger scale – national and EU level) The Greek state implements management plans based on the European legislation, with limited or no involvement at the local level. Strong lobbying groups (e.g. trawlers) are taken into consideration, but groups with limited political power are mostly disregarded. Quite often, even the EU directions are misinterpreted.
39. What were the long-term management objectives prior to the main issue?	N/A
40. What were the key rules, regulations, instruments and measures employed to achieve the management objectives prior to the main issue?	CFP The Greek Fishing Code of 1970 Occasional presidential/ministerial orders
41. Were there any informal rules, regulations, instruments and measures that play an important role in the governance of fisheries and aquaculture prior to the main issue? Please describe.	the Fishermen's Club is trying to lobby in favour of a more viable management approach but there is limited agreement between the individuals.

42. What was the nature of the relationship between the different sectors or livelihood occupations in this system prior to the main issue? (i.e., was there conflict or cooperation) Were there any special circumstances in their relationships that should be noted?	Please tick the box corresponding to the most appropriate situation  Due to the natural characteristics of the gulf of Kalloni, there is limited conflict between large-scale and small-scale fisheries. In contrast with the rest of the Aegean Sea, large-scale fishing vessels cannot easily access the gulf and thus there is limited conflict between the levels. Aquaculture farmers and local fishers have conflicting interests in the area and conflict was extensive until the aquaculture units were reduced to 1. There is extensive disagreement among the small-scale fisheries, especially between those born and raised in different villages around the bay, regarding fishing methods and attitudes.
43. Who dominated or wielded the most social power in the area prior to the main issue? (e.g., fishers' associations, unions, corporations, governments, business owners, etc.)	The national government.
44. How concentrated was social power in the area prior to the main issue? (ie., was power held by a few people/1 organisation (concentrated) or was it dispersed over several organisations)	Please tick the box corresponding to the most appropriate situation of the social system 
45. Were there any structural changes in the governing system or individuals prior to the main issue? Please describe the changes and why they occurred?	The number of fishers' associations was lower. After the 1980s more associations were founded which finally merged into the Fishers' Club.
46. Were there any changes to the key rules, regulations, instruments and measures, or have any new ones been introduced prior to the main issue? Please describe the changes and why they were introduced	Management measures and regulation change constantly, following the national and European directives. However the local users are never consulted about these changes, and the rules often go unimplemented due to lack of enforcement and legitimisation.

E. RESPONSE (2 questions)

The objective of this section is to evaluate the response of the natural, social and governing systems to the Main Issue. We ask for information about Short Term (within 2-5 years) and Long Term responses for the natural, social and governing systems. Please provide as much information as necessary, but in no more than 200-300 words for each question. Please provide references where relevant.

	Natural	**Social**	**Governing**
47. **a.** What were the **short term** responses of the social and governing systems to the main issue? (Include structural changes in the governing system(s) or individuals, or the changes in key rules,regulations, instruments and measures etc.)	**N/A**	TYPE OF RESPONSE (eg behavioural change, exit of actors) Coiling effects at the local level (only within the same type of fisheries) LEVEL OF RESPONSE (national, regional, local) Local	TYPE OF RESPONSE (eg management measure, technological change, $ aid) N/A LEVEL OF RESPONSE (national, regional, local)
b. What were the **long term** responses of the social and governing systems to the main issue? (Include structural changes in the governing system(s) or individuals, or the changes in key rules, regulations, instruments and measures etc.)	Fluctuation of stocks	TYPE OF RESPONSE (eg behavioural change, exit of actors) None – during years with limited production, there is rapid increase in prices and increased fishing effort LEVEL OF RESPONSE (national, regional, local) Local	TYPE OF RESPONSE (eg management measure, technological change, $ aid) No response – oftentimes enforcement leniency (coastguard) LEVEL OF RESPONSE (national, regional , local) Local and Regional
48. a. What were the objectives of the **short term** social and governing responses for the natural, social and governing systems?		To maintain income level	To support local users
b. What were the objectives of the **long term** social and governing responses for the natural, social and governing systems?		No objectives	No objectives

F. APPRAISAL (7 questions)

The objective of this section is to evaluate the response of the natural, social and governing systems to the Main Issue. We ask for information about Short Term (within 2-5 years) and Long Term responses for the natural, social and governing systems. Please provide as much information as necessary, but in no more than 200-300 words for each question. Please provide references where relevant.

	Natural	**Social**	**Governing**
49. a. What were the results of the s**hort term** response for the natural, social and governing systems (ie were the objectives in Q.23.a achieved)?	Fluctuations remain	During years with low production, the income levels are lower	None
b. What were the results of the **long term** response for the natural, social and governing systems (ie were the objectives in Q.23.b achieved)?	There are indications of shifting baselines – the movement range of the fish has changed	There have been reductions in the catch amount	Limited
50. Was the Main Issue addressed (Section A)? Please describe.	No. Rainfall distribution is still changing. Moreover, not enough scientific research is conducted on the issue, resulting in significant lack of data	Issues not addressed	Issues not addressed
51. a. What factors contributed to the successful **short term** results described in Q.24.a (e.g., enabling policy, government funding)	N/A	N/A	N/A
b. What factors contributed to the successful **long term** results described in Q.24.b (e.g., enabling policy, government funding)	N/A	N/A	N/A

52. a. What factors (if any) prevented the **short term** objectives from being fully achieved? (e.g., regulatory barrier, lack of social cohesion, costs too high, climate variability, judicial decisions).		Limited cooperation and cohesion between stakeholder groups Lack of data	Highly centralised governance does not allow for local action. Economic and financial problems turn the actors' attention away from the issues. Lack of data
b. What factors (if any) prevented the **long term** objectives from being fully achieved? (e.g., regulatory barrier, lack of social cohesion, costs too high, climate variability, judicial decisions).		Limited cooperation and cohesion between stakeholder groups Lack of data	Highly centralised governance does not allow for local action. Economic and financial problems turn the actors' attention away from the issues. Lack of data
53. Has there been a formal evaluation of the responses? If so, how was this done and when?	No	No	No
54. a. What were the benefits related to costs of the **short term** response?	Not assessed	Not assessed	Not assessed
b. What were the benefits related to costs of the **long term** response?	Not assessed	Not assessed	Not assessed
55. Were other options considered for the short and/or long term responses? Why were these not selected?		Fragmented suggestions for local action issued by the Fishers' Club	Nothing

Appendix VI
Species List

Scientific name	common English name	Greek name	Japanese name
Commercial marine species			
Arca noae	Noah's Ark shell	*kalognomi*	*noanohakobunegai*
Belone belone	needlefish/garfish	*zargana*	*gaafishu*
Cardiidae spp.	cockle	*kidoni*	*zarugai*
Clupea pallasii	pacific herring	*regga tou Irinikou*	*nishin*
Cololabis saira	pacific saury	*saira*	*sanma*
Holothuria spp.	sea cucumber	*olothourio*	*kuronamako*
Laminariales spp.	kelp	*kelpia*	*konbu*
Modiolus barbatus	bearded horse mussel	*chavaro*	*hibarigai*
Mullus barbatus	red mullet/goatfish	*koutsomoura*	*himeji*
Mullus surmuletus	striped red mullet/goatfish	*barbouni*	*himeji*
Oncorhynchus keta	chum salmon	*solomos*	*sake*
Oncorhynchus masou masou	masu salmon	*solomos*	*sakuramasu*
Patinopecten yessoensis	Yesso giant scallop		*hotategai*
Pectinidae spp.	scallop	*chteni*	*itayagai*
Saccharina japonica	kelp	*kelpia*	*oni-konbu*
Sardina pilchardus	sardine	*sardela*	*youroppaiwashi*
Sardinops melanostictus	Japanese sardine		*iwashi*
Sepia officinalis	cuttlefish	*soupia*	*youroppakouika*
Seriola quinqueradiata	Japanese amberjack	*magiatiko*	*buri*
Sparus aurata	gilt-head seabream	*tsipoura*	*youroppahedai*
Strongylocentrotus intermedius	Short-spined sea urchin	*Achinos*	*ezobafununi*
Theragra chalcogramma	walleye pollock	*vakalaos Alaskas*	*suketoudara*
Thunnus thynnus	bluefin tuna	*erythros tonos Atlantikou*	*taiseiyoukuromaguro*
Todarodes pacificus	common squid	*kalamari*	*surumeika*
Cetaceans			
Balaenoptera acutorostrada	minke whale	*voria rygxofalena*	*minkukujira*
Berardius bardii	Baird's beaked whale	*vorios verardios*	*tsuchikujira*
Orcinus orca	killer whale	*orka/falena dolofonos*	*shachi*
Physeter macrocephalus	sperm whale	*falena fisitiras*	*makkoukujira*
Marine mammals			
Eumetopias jubatus	Steller's sea lion	*thalassio liodari tou Steller*	*todo*
Phoca fasciata	Ribbon seal	*fokia*	*kurakakeazarashi*
Phoca vitulina	Harbour seal	*kini fokia*	*zengataazarashi*
Birds			
Cepphus carbo	spectacled guillemot	*kepfos*	*keimafuri*
Haliaeetus albicilla	white-tailed sea eagle	*thalassaetos*	*ojirowashi*
Haliaeetus pelagicus	Steller's sea eagle	*thalassaetos tou Steller*	*oowashi*
Ketupa blackistoni	Blakiston's fish-owl	*psaroboufos tou Blakiston*	*shimafukurou*
Phoenicopterus ruber	greater flamingo	*finikoptero/flamigko*	*oofuramingo*
Puffinus tenuirostris	short-tailed shearwater		*hatsubosomizunaguitori*

Terrestrial species and birds			
Cervus nippon yezoensis	Yezo deer	*elafi sika*	*ezoshika*
Ursus arctos	brown bear	*kafe arkouda*	*higuma*
Plant species			
Genista acanthoclada	garrigue/phrygana	*phrygana*	*hitotsubaenishida*
Olea europea	olive tree	*elia*	*oriibu*
Pinus spp.	pine	*pefko*	*matsu*
Quercus spp.	oak	*drys/velanidia*	*konara*
Sarcopoterium spinosum	garrigue/phrygana	*phrygana*	

Appendix VII
Publications of Research

Tsobanoglou, G., and **Vlachopoulou, E.I.**, (in press). Participation in the Aegean Polynisia: Coop community challenges at a time of acute social crisis. In: Korres, G., Kourliouros, E., and Michailidis, M.P., (eds), *Handbook of research on policies and practices for sustainable economic growth and regional development.* Hershey, PA: IGI Global.

Tsobanoglou, G., and **Vlachopoulou, E.I.**, (in press). Social-ecological systems in local fisheries communities. In: Korres, G., Kourliouros, E., and Michailidis, M.P., (eds.), *Handbook of research on policies and practices for sustainable economic growth and regional development.* Hershey, PA: IGI Global.

Vlachopoulou, E.I., and Makino, M., (in press). The path to sustainable fisheries and the transformative impact of the Shiretoko World Natural Heritage Site. In: Armitage, D., Charles, A., and Berkes, F., (eds.), *Governing the coastal commons: Communities, resilience and transformation*. Routledge: New York and London.

Vlachopoulou, E.I., and Sakita, S., (in press). Small-scale fisher of Skala Kallonis – Kalloni Bay, Lesvos, Greece. In: Leis, M., and Chuenpagdee, R., (eds.), *The meaning of small: Diverse values of small-scale fisheries.* TBTI Publication series. St. John's, NL, Canada: TBTI.

Mizuta, D.D., and **Vlachopoulou, E.I.**, 2017. Satoumi concept illustrated by sustainable bottom-up initiatives of Japanese Fisheries Cooperative Associations. *Marine Policy*, 78: 143-149.

Vlachopoulou, E.I., and Tsobanoglou, G.O., 2016. Social-Ecological Systems in local fisheries communities. *Journal of Regional Socio-Economic Issues*, 6(2): 59-72.

Vlachopoulou, E.I., and Tsobanoglou, G.O., 2016. Sustainable cooperative management among fishermen: A challenge for Greece. *Journal of Regional Socio-Economic Issues*, 6(1): 62-70.

Vlachopoulou, E.I., Mizuta, D.D., Makino, M., and Matsuda, H., 2015. Social-ecological systems analysis in the concept of World Heritage – Fisheries management in the Shiretoko World Natural Heritage Site. *Proceedings of the 5th International Symposium on Environmental Sociology in East Asia*, Japanese Association for Environmental Sociology, ISA-RC24 and Tohoku University, Sendai, 30 October – 1 November 2015.

Vlachopoulou, E.I., Makino, M., and Matsuda, H., 2014. Fisheries vs marine conservation: Lessons learned from the Shiretoko World Natural Heritage Site. *Annuals of Marine Sociology* 23: 36-43.

Tsobanoglou, G., and **Vlachopoulou, E.I.**, 2014. Work participatory regimes in the Greek Archipelago: Current challenges at a time of financial crisis. *Journal of Regional Socio-Economic Issues*, 4(2): 31-44.

Vlachopoulou, E.I., and Tsobanoglou, G., 2014. Fisheries self-regulation, social capital and sustainability. *Proceedings of the 4th National Conference*, Hellenic Sociological Society, Athens, 12-14 December 2013. (in Greek)

Tsobanoglou, G. and **Vlachopoulou, E.I.**, 2014. Incentives for participation of artisanal fishermen in the regulation and control of fisheries protection areas: a case study from Greece. *The Cyprus Journal of Sciences* 12: 121-130.

Vlachopoulou E.I., and Tsobanoglou, G., 2014. International dimensions of fisheries co-management. In Korres, G., Kourliouros, E., Tsobanoglou, G., and Kokkinou, A., (eds.) 2014. *Socio-Economic Sustainability, Regional Development and Spatial Planning: European and International Dimensions & Perspectives*. Mytilene: University of the Aegean, pp.132-137.

Vlachopoulou, E.I., 2014. Fisheries Cooperatives: The solution to fisheries mismanagement? *Proceedings of the RC26 sessions during the XVIII ISA World Congress of Sociology* (CD-Rom), Yokohama, 13-19 July 2014.

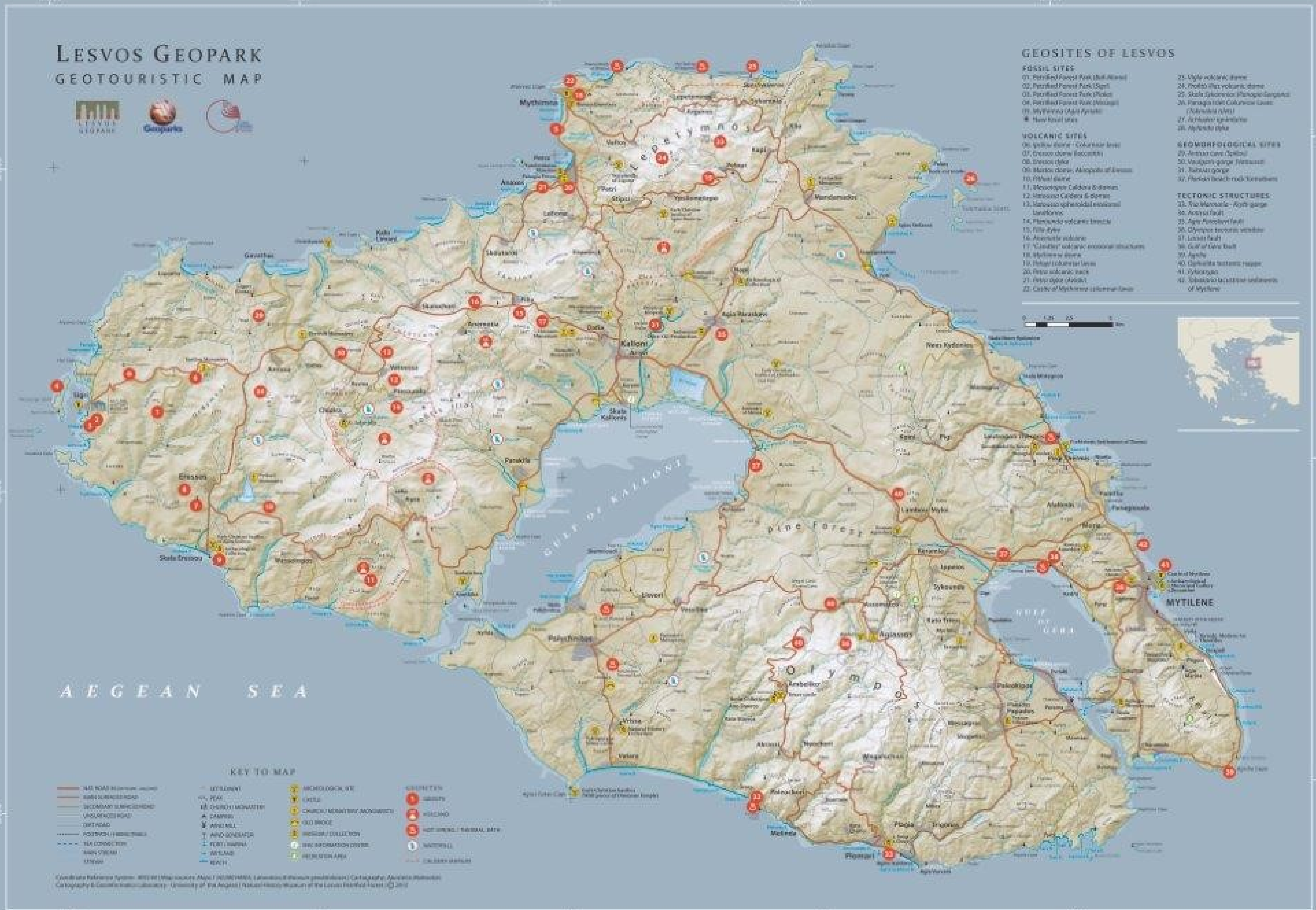
Tsobanoglou, G., and **Vlachopoulou, E.I.**, 2013. Participation and insularity: Challenges in a European framework at a time of financial crisis. *E-book of proceedings for the Volunteering and Participation Foundation working papers series* (ISSN: 2240-3272), Pisa, 31January – 1 February 2013.

Appendix VIII
Maps Related to Kalloni Bay

i. Lesvos Geopark geotouristic map. Map produced by Apostolos Makaratzis, 2015.

ii. Coastal wetlands of the gulf of Kalloni A. Map produced by C. Mandylas, K. Sykas, and A. Makaratzis, 2007.

iii. Coastal wetlands of the gulf of Kalloni B. Map produced by C. Mandylas, K. Sykas, and A. Makaratzis, 2007.


LESVOS GEOPARK
GEOTOURISTIC MAP
GEOSITES OF LESVOS
FOSSIL SITES
VOLCANIC SITES
GEOMORPHOLOGICAL SITES
TECTONIC STRUCTURES
KEY TO MAP
AEGEAN SEA
GULF OF KALLONI
GULF OF GERA
Lepetymnos
Olympos
Pine Forest
Mythimna
Kalloni
Eressos
Skala Eressou
Sigri
Antissa
Petra
Agiassos
Polychnitos
Plomari
Mandamados
Mytilene
MYTILENE

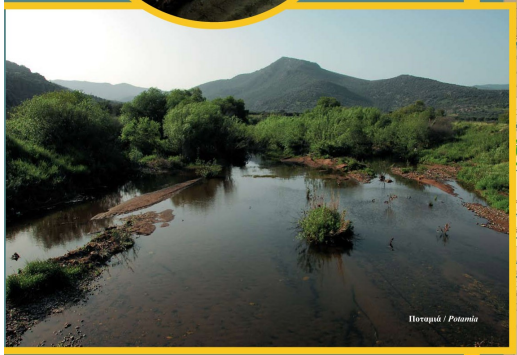
ΠΑΡΑΤΗΡΗΣΗ
ΠΟΥΛΙΩΝ
ΣΤΗ ΛΕΣΒΟ

BIRDWATCHING
IN LESVOS

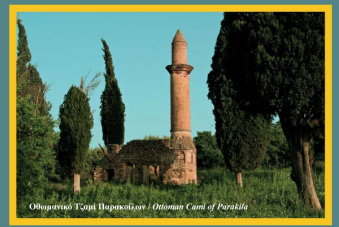
ΠΑΡΑΚΤΙΟΙ ΥΓΡΟΤΟΠΟΙ ΚΟΛΠΟΥ ΚΑΛΛΟΝΗΣ
COASTAL WETLANDS OF THE GULF OF KALLONI

ΠΕΡΙΟΧΗΣ ΔΗΜΟΥ ΚΑΛΛΟΝΗΣ
IN THE AREA OF THE MUNICIPALITY OF KALLONI

Πελαργός
Ciconia ciconia



Ποταμιά / *Potamia*

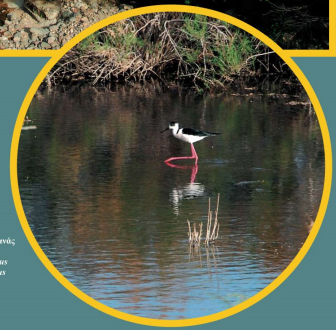


Οθωμανικό Τζαμί Παρακοίλων / *Ottoman Cami of Parakila*

Μωβ ίριδες / *Iris germanica*

Μαυροπελαργός / *Ciconia nigra*

Γέφυρα Γκορμπόζων
Bridge of Parakila



Καλαμοκανάς
Himantopus himantopus

ΑΠΟΣΤΑΣΕΙΣ ΚΑΙ ΥΨΗ ΣΕ ΜΕΤΡΑ — DISTANCES AND ALTITUDES IN METERS

ΚΕΥ ΤΟ MAP – ΥΠΟΜΝΗΜΑ ΤΟΥ ΧΑΡΤΗ

- ΚΟΡΥΦΗ ΒΟΥΝΟΥ — MOUNTAIN PEAK
- ΥΨΟΜΕΤΡΙΚΕΣ ΖΩΝΕΣ — LATITUDE ZONES
- ΙΣΟΥΨΕΙΣ 20 m — CONTOUR LINES 20 m
- ΙΣΟΥΨΕΙΣ 100 m — CONTOUR LINES 100 m
- ΟΡΘΟΓΛΑΓΙΑ - ΒΡΑΧΙΑ — CLIF _ ROCKS
- ΥΓΡΟΤΟΠΟΙ — WETLANDS
- ΔΑΣΟΣΚΕΠΕΙΕΣ ΕΚΤΑΣΕΙΣ — COVERED WITH FOREST
- ΥΔΑΤΟΡΕΜΑ ΠΕΡΙΟΔΙΚΗΣ ΡΟΗΣ — STREAM
- ΚΥΡΙΟ ΥΔΑΤΟΡΕΜΑ — MAIN STREAM
- ΓΕΦΥΡΙ, ΠΑΛΙΟ ΓΕΦΥΡΙ — BRIDGE, OLD BRIDGE
- ΕΠΑΡΧΙΑΚΗ - ΕΘΝΙΚΗ ΟΔΟΣ — MAIN SURFACED ROAD
- ΑΣΦΑΛΤΟΔΡΟΜΟΣ — SURFACED ROAD
- ΚΥΡΙΟΣ ΧΩΜΑΤΟΔΡΟΜΟΣ — MAIN UNSURFACED ROAD
- ΑΓΡΟΤΙΚΟΣ - ΔΑΣΙΚΟΣ ΔΡΟΜΟΣ — DIRT ROAD
- ΠΕΖΟΠΟΡΙΚΗ ΔΙΑΔΡΟΜΗ — TREKKING TRAIL
- ΟΙΚΙΣΜΟΣ — RESIDENTIAL AREA
- ΕΚΚΛΗΣΙΑ, ΕΞΟΚΛΗΣΙ — CHURCH, CHAPEL
- ΜΟΝΑΣΤΗΡΙ - ΜΕΤΟΧΙ — KLOSTER
- ΚΟΙΜΗΤΗΡΙΟ — CEMETERY
- ΑΡΧ. ΧΩΡΟΣ, ΑΡΧΑΙΟΤΗΤΕΣ — ARCH. SITE, ANTIQUITIES
- ΘΕΣΗ ΠΑΡΑΤΗΡΗΣΗΣ — OBSVERTION POINT
- ΧΩΡΟΣ ΣΤΑΘΜΕΥΣΗΣ — CAR PARKING
- ΠΑΡΑΔΟΣΙΑΚΟ ΚΑΦΕΝΕΙΟ — TRADITIONAL COFFEE-HOUSE
- ΣΕΡΒΙΡΕΤΑΙ ΦΑΓΗΤΟ — MEALS
- ΞΕΝΟΔΟΧΕΙΟ - ΚΑΤΑΛΥΜΑ — HOTEL – PENSION

- ΠΑΡΑΤΗΡΗΤΗΡΙΟ ΟΡΝΙΘΟΠΑΝΙΔΑΣ — BIRDWATCHING WATCH TOWER
- ΥΠΟΣΤΕΓΟ ΠΑΡΑΤΗΡΗΣΗΣ — BIRDWATCHING KIOSK
- ΤΟΙΧΕΙΟ ΠΑΡΑΤΗΡΗΣΗΣ — BIRDWATCHING SCREEN
- ΠΕΡΙΠΤΕΡΟ ΠΛΗΡΟΦΟΡΙΩΝ — INFO KIOSK
- ΠΙΝΑΚΙΔΑ ΜΕ ΧΑΡΤΗ — SIGN WITH INFO AND MAP
- ΚΕΝΤΡΟ ΠΕΡΙΒΑΛΛΟΝΤΙΚΗΣ ΕΝΗΜΕΡΩΣΗΣ — ENVIRONMENTAL INFORMATION CENTER

NATURA 2000

Η ΔΡΑΣΗ «ΔΗΜΙΟΥΡΓΙΑ ΘΕΣΕΩΝ ΠΑΡΑΤΗΡΗΣΗΣ ΟΡΝΙΘΟΠΑΝΙΔΑΣ ΣΤΟΥΣ ΥΓΡΟΤΟΠΟΥΣ ΔΗΜΟΥ ΚΑΛΛΟΝΗΣ ΛΕΣΒΟΥ - NATURA 2000» ΧΡΗΜΑΤΟΔΟΤΗΘΗΚΕ ΑΠΟ ΤΟ Π.Ε.Π. ΒΟΡΕΙΟΥ ΑΙΓΑΙΟΥ, ΟΛΟΚΛΗΡΩΜΕΝΑ ΠΡΟΓΡΑΜΜΑΤΑ ΑΝΑΠΤΥΞΗΣ ΑΓΡΟΤΙΚΟΥ ΧΩΡΟΥ (ΟΠΑΑΧ 2000 - 2006) ΠΕΡΙΟΧΗΣ ΔΥΤΙΚΗΣ ΛΕΣΒΟΥ, ΔΡΑΣΗ 2.1.2 ΚΑΙ ΣΥΓΧΡΗΜΑΤΟΔΟΤΗΘΗΚΕ ΑΠΟ ΤΗΝ ΕΝΩΣΗ.

ΔΗΜΟΣ ΑΓΙΑΣ ΠΑΡΑΣΚΕΥΗΣ
MUNICIPALITY OF AGIA PARASKEVI

ΠΑΡΑΚΤΙΟΙ ΥΓΡΟΤΟΠΟΙ ΚΟΛΠΟΥ ΚΑΛΛΟΝΗΣ
COASTAL WETLANDS OF THE GULF OF KALLONI

ΠΕΡΙΟΧΗΣ ΔΗΜΟΥ ΑΓΙΑΣ ΠΑΡΑΣΚΕΥΗΣ
IN THE AREA OF THE MUNICIPALITY OF AGIA PARASKEVI

ΠΑΡΑΤΗΡΗΣΗ ΠΟΥΛΙΩΝ ΣΤΗ ΛΕΣΒΟ
BIRDWATCHING IN LESVOS

ΚΕΥ ΤΟ ΜΑΡ – ΥΠΟΜΝΗΜΑ ΤΟΥ ΧΑΡΤΗ

- ΚΟΡΥΦΗ ΒΟΥΝΟΥ – MOUNTAIN PEAK
- ΥΨΟΜΕΤΡΙΚΕΣ ΖΩΝΕΣ – LATITUDE ZONES
- ΙΣΟΥΨΕΙΣ 20 m – CONTOUR LINES 20 m
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- ΔΑΣΟΣΚΕΠΕΙΣ ΕΚΤΑΣΕΙΣ – COVERED WITH FOREST
- ΥΔΑΤΟΡΕΜΑ ΠΕΡΙΟΔΙΚΗΣ ΡΟΗΣ – STREAM
- ΚΥΡΙΟ ΥΔΑΤΟΡΕΜΑ – MAIN STREAM
- ΓΕΦΥΡΙ – BRIDGE
- ΕΘΝΙΚΗ ΟΔΟΣ – MAIN SURFACED ROAD
- ΑΣΦΑΛΤΟΔΡΟΜΟΣ – SURFACED ROAD
- ΚΥΡΙΟΣ ΧΩΜΑΤΟΔΡΟΜΟΣ – MAIN UNSURFACED ROAD
- ΑΓΡΟΤΙΚΟΣ - ΔΑΣΙΚΟΣ ΔΡΟΜΟΣ – DIRT ROAD
- ΔΡΟΜΟΣ ΕΝΤΟΣ ΟΙΚΙΣΜΟΥ – VILLAGE STREET
- ΠΕΖΟΠΟΡΙΚΗ ΔΙΑΔΡΟΜΗ – TREKKING TRAIL
- ΟΙΚΙΣΜΟΣ – RESIDENTIAL AREA
- ΕΚΚΛΗΣΙΑ, ΕΞΟΧΙΚΟ – CHURCH, CHAPEL
- ΑΡΧ. ΧΩΡΟΣ, ΑΡΧΑΙΟΤΗΤΕΣ – ARCH. SITE, ANTIQUITIES
- ΠΑΡΑΔΟΣΙΑΚΟ ΚΑΦΕΝΕΙΟ – TRADITIONAL COFFEE-HOUSE
- ΣΕΡΒΙΡΕΤΑΙ ΦΑΓΗΤΟ – MEALS
- ΞΕΝΟΔΟΧΕΙΟ - ΚΑΤΑΛΥΜΑ – HOTEL – PENSION

- ΠΡΟΣΤΑΤΕΥΟΜΕΝΗ ΠΕΡΙΟΧΗ «NATURA» GR 4110004 – "NATURA" PROTECTED AREA GR 4110004
- ΠΑΡΑΤΗΡΗΤΗΡΙΟ ΟΡΝΙΘΟΠΑΝΙΔΑΣ – BIRDWATCING WATCH TOWER
- ΘΕΣΗ ΠΑΡΑΤΗΡΗΣΗΣ – OBSVERTION POINT

ΜΕΛΕΤΗ ΧΩΡΟΥ, ΦΩΤΟΓΡΑΦΙΕΣ: Χ. ΜΑΝΔΥΛΑΣ - ΟΙΚΟΣΦΑΙΡΙΚΗ

ΣΧΕΔΙΑΣΗ ΕΠΟΠΤΙΚΟΥ ΥΛΙΚΟΥ: Χ. ΜΑΝΔΥΛΑΣ - Κ. ΣΥΚΑΣ - Α. ΜΑΚΑΡΑΤΖΗΣ

Η ΔΡΑΣΗ «ΤΟΠΟΘΕΤΗΣΗ ΠΑΡΑΤΗΡΗΤΗΡΙΟΥ ΟΡΝΙΘΟΠΑΝΙΔΑΣ ΚΑΙ ΣΗΜΑΝΣΗ ΑΝΑΡΤΗΣΗ ΠΛΗΡΟΦΟΡΙΑΚΟΥ ΥΛΙΚΟΥ ΣΤΟΝ ΥΓΡΟΤΟΠΟ ΑΛΥΚΗΣ ΚΑΛΛΟΝΗΣ ΤΟΥ ΔΗΜΟΥ ΑΓΙΑΣ ΠΑΡΑΣΚΕΥΗΣ ΛΕΣΒΟΥ»
ΠΟΥ ΧΡΗΜΑΤΟΔΟΤΗΘΗΚΕ ΑΠΟ ΤΟ ΕΠΙΧΕΙΡΗΣΙΑΚΟ ΠΡΟΓΡΑΜΜΑ (Ε.Π.) «ΚΟΙΝΟΤΙΚΗ ΠΡΩΤΟΒΟΥΛΑ LEADER + (2000-2006)»
ΤΟΥ ΥΠΟΥΡΓΕΙΟΥ ΑΓΡΟΤΙΚΗΣ ΑΝΑΠΤΥΞΗΣ ΚΑΙ ΤΡΟΦΙΜΩΝ ΚΑΙ ΣΥΓΧΡΗΜΑΤΟΔΟΤΗΘΗΚΕ ΑΠΟ ΤΗΝ ΕΥΡΩΠΑΪΚΗ ΕΝΩΣΗ (ΤΑΜΕΙΟ ΕΓΠΑΕ-Π).