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Safeguarding the future of Bluefin tuna in the Mediterranean Sea: How to honour the inherent value of the living being while ensuring sustainable livelihood for people?

Master's Thesis

Thesis Supervisor: Mgr. Tomáš Daněk, PhD.

Olomouc

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Declaration of Academic Integrity

I hereby confirm that the present thesis is solely my own work and that if any text passages or diagrams from books, papers, the Web or other sources have been copied or in any other way used, all references – including those found in electronic media – have been acknowledged and fully cited.

In Olomouc, 16. 12. 2015

Martin Pirkl

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Dedication

I dedicate this to Prof. PhDr. Miloslav Pojsl.

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This master thesis examines the roots of declining the Atlantic Bluefin tuna populations in the Mediterranean Sea before it proceeds to introducing a broad set of various measures which have a potential to stabilize and reverse current insecure situation of the Bluefin tuna. The thesis is factually divided into two main parts. In the beginning, the study deals with the problem of overfishing itself before embarking on the very Bluefin tuna case and its drawbacks. The starting point of the final part is formed by the section devoted to environmental ethics. The knowledge presented here pervades the proposed measures part where each solution is assessed against the ethical criteria. The master thesis concludes then with summarizing the main findings.

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Abstract

The Atlantic Bluefin tuna (*Thunnus thynnus*) is one of the most valued fish species in the world as there has been an ever growing demand mainly on Japanese sushi and sashimi markets. As a consequence, the fish have been facing mounting pressure in the last decades as the fishermen, in an endeavour to secure larger financial gains, have raced almost to the bottom of the Mediterranean branch of the Atlantic Bluefin tuna stocks by heavy industrialization of the fishery. That said, the thesis further examines the roots of declining Bluefin tuna populations, before it proceeds to introducing a broad set of various measures, which have arguably lesser or bigger potential to stabilize or even reverse current insecure situation of this fish. The section of environmental ethics is positioned at the beginning of the second part of the study in order to constitute a default point of departure for seeking any solution to the problem. Although, environmental ethics is seen as a crucial precondition for restoring healthy marine ecosystems with abundant stocks of Bluefin tuna, an additional need to push through a specific blend of political, economic and social measures is strongly accented within the bounds of the author's proposed "good governance of the Bluefin tuna fishery". Among the most crucial provisions are a proposed ban on purse seining and a return to artisanal fisheries managed by local communities.

Key words:

Bluefin tuna, Mediterranean Sea, purse seines, farms, sushi, environmental ethics, overfishing, IUU fishing, ICCAT, quota (TAC), good governance.

Abstrakt

Tuňák modroploutvý (Thunnus thynnus) je jednou z nejvíce ceněných ryb světových oceánů, k čemuž přispěl hlavně růst poptávky na japonských trzích se suši a sašimi. Proto také tato ryba čelí neustále rostoucímu tlaku rybářů, kteří v honbě za zisky vyměnili obyčejné lodě za velko-kapacitní flotily. Takto vybavení rybáři přiblížili populace tuňáka modroploutvého (jež se každoročně vytírají ve Středozemním moři) kolapsu. Ve světle těchto okolností se práce dále věnuje příčinám stále se snižujícího počtu populací této ryby. Na zmiňovanou část poté navazuje sekce, kde je představeno široké spektrum nejčastěji akcentovaných řešení s větším či menším potenciálem ke zvrácení současného neudržitelného trendu lovu. Uprostřed studie je umístěna sekce věnovaná environmentální etice, kterou autor považuje za výchozí bod v hledání možných řešení. Ač v tomto kontextu autor chápe etiku jako zásadní ve snaze o obnovení mořských ekosystémů s opět hojnými počty tuňáka modroploutvého, tak je v rámci autorova navrhovaného konceptu "dobrého řízení rybolovu tuňáka modroploutvého" zdůrazněna nutnost zakomponovat také konkrétní politická, ekonomická a sociální opatření, včetně zákazu tzv. *purse seines.* Silně doporučen je také návrat k tradičním rybolovným technikám a decentralizaci řízení rybolovu na místní rybářské komunity.

Klíčová slova:

Tuňák modroploutvý, Středozemní moře, "purse seines", farmy, suši, environmentální etika, nadměrný rybolov, nelegální nehlášený a neregulovaný rybolov, ICCAT, kvóty, dobré vládnutí.

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List of abbreviations

ABNJ	Areas beyond National Jurisdiction Program
ABT	Atlantic Bluefin tuna
AIS	Automatic Identification System
BCD	Bluefin Tuna Catch Documentation System
BICREF	Biological Conservation Research Foundation
BT	Bluefin tuna
BTE	Eastern Atlantic Bluefin tuna
BTW	Western Atlantic Bluefin tuna
CBD	Convention on Biological Diversity
CITES	Convention on International Trade in Endangered Species of Wild Fauna and Flora
CMO	Common Organisation of the Market
CPCs	Contracting Parties, Cooperating non-Contracting Parties, Entities or Fishing Entities
EAF	Ecosystem approach to fisheries
EC	European Commission
EEZ	Exclusive economic zones
EFCA	European Fisheries Control Agency
EIR	Electronic Inspection Report
ERS	Electronic Reporting System
EU	European Union
FAD	Fish aggregating device
FAO	Food and Agriculture Organization of the United Nations
FIFG	Financial Instrument for Fisheries Guidance
FotS	Friends of the Sea
GEF	Global Environment Facility
GFCM	General Fisheries Commission for the Mediterranean
GFW	Global Fishing Watch
ICCAT	International Commission for the Conservation of Atlantic Tunas
ICIJ	International Consortium of Investigative Journalists
IEO	Spanish Institute of Oceanography
INTERPOL	International Criminal Police Organization
ITQs	Individual Transferable Quotas
IUCN	International Union for Conservation of Nature
IUU	Illegal, unreported and unregulated fishing
JDPs	Joint Deployment Plans
JFA	Japanese Fisheries Association
MAC	Marine Aquarium Council
MARC	Malta Aquaculture Research Centre
MEDITS	International Bottom Trawl Survey in the Mediterranean
MENA	Middle East and North Africa
MPAs	Marine Protected Areas
MSC	Marine Stewardship Council
NGO	Non-Governmental Organisation
PBT	Pacific Bluefin tuna
PSMA	Agreement on port state measures to prevent, deter and eliminate the IUU fishing
RFMO	Regional fisheries management organisation
ROP	Regional Observer Programme
SCIP	Specific Control and Inspection Programme

SCRS	Standing Committee on Research and Statistics
SELFDOTT	Self-sustained Aquaculture and Domestication of Bluefin Tuna
SSB	Spawning stock biomass
TAC	Total allowable catch
TEK	Traditional environmental knowledge
UNCED	United Nations Conference on Environment and Development
UNCLOS	United Nations Convention on the Law of the Sea
UNEP	United Nations Environment Programme
UNFSA	United Nations Fish Stock Agreement
VMS	Vessel monitoring system
VWR	Virtual Watch Room
WSSD	World Summit on Sustainable Development
WTO	World Trade Organisation
WWF	World Wide Fund

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1 Introduction

Overfishing of Bluefin tuna illustrates a specific instance of over-exploitation ocean ecosystems. The situation is particularly serious in the Mediterranean Sea, where the populations of the eastern branch of Atlantic Bluefin tuna annually migrate to spawn. Since 1970s, local fishermen's traditional practice of fishing have been in this region retreating under growing pressure of industrial fleets. The onset of large purse-seine vessels ignited by sudden increase of demand for this fish in Japan dramatically changed the nature of the Bluefin tuna fishery in the region. This was accompanied by introduction of Bluefin tuna farms, what enabled to accommodate large amounts of fish to be fattened up, while enabling picking right moment to sell them to market. By that time, Bluefin tuna had gradually turned into a mere commodity.

Recently, the fish have been caught in the time of reproduction in the spawning areas by high-tech vessels. Operators of these vessels have largely disregarded quotas set by international fishery organizations, because the enforcement has been poor. In the meanwhile, the number of farms and purse-seiners has been growing, while the stocks have been declining. Recently, the problem has drawn attention of an array of scholars and certain segments of the wider public. However, the current business-as-usual still goes on, while the knowledge on the very fish and its future is shrouded in uncertainty.

Having said that, this study re-examines the roots of declining Atlantic Bluefin tuna populations in the Mediterranean Sea, before it proceeds to introducing a broad set of various measures which have a potential to stabilize and reverse current insecure situation of Bluefin tuna. The thesis is factually divided into two main parts. In the beginning, the study acquaints readers with the problem of overfishing itself before embarking on the very Bluefin tuna case and its drawbacks. The launch pad to the concluding second part is formed by the section devoted to environmental ethics. The knowledge and the line of thinking presented here pervades the consequent part with proposed measures in a sense that it establishes the conceptual bounds within which all the humans' actions arguably should be taken. This is, however, not to perform any unequivocal verdicts along the ethical lines. In fact, ethics and more specifically the environmental ethics currently has to be understood as complementary to a series of legal, institutional, political and economic steps which have to be taken at once. Along these lines, the chapter 9 encompasses all this in an author's attempt to design a framework to safeguard the future of Bluefin tuna. The study wraps up then with an attempt to give answers to following research questions:

Is there a chance to achieve a state of the environment, where Bluefin tuna can enjoy their untamed way of live and freedom to multiply their numbers, while meeting the demand of consumer and grant the fishermen jobs?

Does the environmental ethics have a potential to shift the market attention from immediate financial gains towards the long-term benefits for the environment itself and the society as a whole?

Being aware of the constraints inherent to the environmental paradigm of research, the built reliance on the verified data already provided by various scientific disciplines, this thesis to a certain extent employs the environmental ethics as a distinctive perspective not only to look into the problem, but to seek its solution. The application of ethical considerations or perhaps contemplations, yet still follows rigorous factual examination of the problem. This entails findings collected by author, while working at the Department of fisheries in Malta. There was conducted an investigative research consisting of personal interviews with experts on Bluefin tuna, further substantiated by harvesting large amount of latest data. To a major extent this work also exploits an array of recently compiled studies on the topic.

The thesis strives to bridge across profound ethical contemplations and practical down-to-earth measures, thus a broad range of literature had to be employed for this end. For the sake of authenticity, opening sections of the study are based to a considerable extent on up-to-date information gathered through the Department of fisheries in Malta from the most powerful Bluefin tuna management organization – ICCAT (International Commission for the Conservation of Atlantic Tunas). Due to its massive scientific platform, ICCAT provides annually arguably the bulkiest amount of reliable information on Bluefin tuna. Nevertheless, being well aware of the political nature of ICCAT, a larger number of unbiased studies were scrutinized. In fact, the amount of research papers concerning Bluefin tuna has been growing ever so slightly, thus at present there is quite some information on most aspects of current Bluefin tuna fishery.

In elaborating on the ethical dimension of the problem, the study strives to offer a plausible discourse to achieve a less harmful impact human manner of thinking and lifestyle imposes onto Bluefin tuna. For this end was made use of a compilation of books written by renowned philosophers such as Aldo Leopold, Peter Singer, Patrick Curry, and Floris van den Berg, as well as a number of research papers. In addition to that and on the contrary to the nature of research instruments employed in describing the Bluefin tuna problems, much wider scope of processing information has been leveraged for the solution part and concluding sections. In fact, an endeavour has been made to comprehend crucial global developments, pinpoint them

and relate them to the problems of Bluefin tuna in an attempt to engineer a comprehensive remedy. Simply said, overfishing of Bluefin tuna is a vastly complex issue which has to be approached accordingly.

2 Introduction to overfishing

As early as in the Bible (Genesis 1:28), there was enshrined the humankind's authority to govern the life of the sea:

"*And God blessed them and said to them, be fruitful and multiply and fill the earth and subdue it, and have dominion over the fish of the sea…".*

It has to be said that humans truly have embraced this God's good will to their taste and committed to fulfil this to a spectacular extent. The size of current global fishing fleet is such that it could catch four times more fish than really do live in world's oceans (Murray 2009). Moreover, there has been a significant growth in technological capacity of these fishing fleets (Villasante 2010). For instance, in the EU, more technically efficient vessels with greater fishing capacity[1] have caused that almost 90% of certain European fish stocks are overfished (Lutchman et al. 2009).

Never before have people consumed so much fish and were depended in such an extent on the sector for their well-being. Fish have been looked upon as an important source of food, health and in particular case of Bluefin tuna, wealth and status (FAO 2014a). For many less economically developed countries with the world's poorest communities, seas are key to survival. Indeed, nearly 3 billion people rely on fish, providing them with 20% of animal protein intake, while the fishing and aquaculture industry provide jobs to 12% of the world's population (Brunner et al. 2009, WWF 2015).

However, the people heavily dependent on fish have been gradually put into risk, as over-exploitation of marine ecosystems rendered their waters exhausted. This situation has been largely brought upon by a conflict between desires of the more-developed world, where people are encouraged to eat more fish for purported healthy reasons, and the real needs of people living in less-developed parts of the world, where lack of fish might have fatal ramifications (Brunner et al. 2009, WWF 2015). But this is in no way a recent development. In fact, the problem began already in the middle of the twentieth century by advancing fishing technology while utilizing cheap fossil fuels, what allowed the fishermen for the first time in history exploiting the high seas (Cullis-Suzuki and Pauly, 2010). The fact that fishing activities spread from size-limited shallow offshore waters to deep ocean waters soon caused such an increase

[1] The average catch of the EU-13 fleet denoted 161–164,000 t per vessel in the 1990–2006 period (Villasante 2010).

of global fishing pressure, that between 1950 and 1960s it exceeded human population growth (Pauly et al. 2002).

Nowadays, almost one third of marine fishing grounds are overfished with large predatory fish biomass at 10% of pre-industrial levels. The current pace of harvesting marine live by industrial fleets denotes on average 80% of marine biomass loss within 15 years of exploitation in a particular area (Myers and Worm 2003, WWF 2015). As a consequence, the whole complex marine food webs are altered which seriously threaten the marine ecosystem balance. The major reason why overfishing has grown to such a magnitude is a difficulty to manage the common-property and an inability to cope with the shared stock nature of the fishery. It is a rule of thumb that fishermen advert to inherent uncertainties in managing fisheries, what have resulted in a high discount rate assigning greater value to present catches to the detriment of those in the future. (Kraak 2011, Sumaila and Huang 2012). This also partly explains why the fishermen generally incline to aim at fish that reproduce early, live fast and die young (Dieckmann et al. 2009).

However, overfishing has not been caused only by official fishing activities. On the contrary, it has been the illegal, unreported and unregulated fishing (IUU), a form of transnational organized crime, which inflicts extensive damage to marine ecosystems. Unfortunately, it has been made possible by low risk and perpetuated by high profit. Moreover, the international legal setting supposed to govern activities at high seas is seriously insufficient and undermined by low enforcement. Additionally, IUU is further amplified by weak governance, poor monitoring and technological advancements leading to overcapacity. Technological innovation have only contributed to achieving high efficiency in this overexploitation. In fact, both legal and illegal fishing industries have developed to a stage when they spend less money to catch the same or larger amount of fish in a much shorter time than ever before (FAO 2014a, Phelps Bondaroff et al. 2015, Samoglou 2014). Money is at the same time the main propeller rendering IUU and industrial fishing seemingly unstoppable (Gatt 2015a, Phelps Bondaroff et al. 2015).

Yet, regrettably, overfishing has tended to be on the edge of interest of the contemporary environmental agenda. On the contrary, the puzzle of resolving the common property character in marine fisheries has attracted an immense interest from the renowned economists (FAO 2014a, Kato 2011, 187). This study takes up a role of shedding more light on this problem by elaborating on one of the most blatant displays of overfishing – exploitation of Bluefin tuna.

2.1 Overfishing in the Mediterranean Sea

Mediterranean nations cherish marine products not only for its nourishing significance, but also for its traditional value. It has been an inherent part of their culture and life for thousands of years when the fishing skills have been passed from one generation to another. The diversity of fished species in the Mediterranean region is bigger than elsewhere due to massive consumer demand and overwhelming presence of tourism industry, keeping high the prices of marine products. Apart from that, Mediterranean is distinguished by shared, overlapping, and highly migratory fish stocks. A lot of Mediterranean fisheries take place in the coastal waters which are already under serious pressure stemming from other human activities such as tourism, shipping, coastal development, coastal and inland agriculture, and pollution (Camiñas 2009, 33-34, European Commission 2008a).

In addition to these pressures, there has been growing competition among the industrial, semi-industrial and artisanal (small-scale/local) fisheries during the last two decades, mainly due to technological developments within the industrial fisheries (Camiñas 2009, 35). Ever so slightly, industrial fishing has been forcing small-scale fisheries out of business, while by large scooping up majority of marine resources. This is because these industrial fleets have been inherently conjoined with over-capacity facilitated by heavy state subsidies, although it's been repeatedly exposed by experts for its malign economic effects weakening economic resilience (Colloca et al. 2013). This in fact is very indicative to what happens in the Mediterranean Bluefin tuna fishing sector. But there are several other species-targeting fisheries dealing with the similar problem, perhaps with the same difficulties, like for example swordfish fisheries[2].

The Garret Hardin's well known theory on *Tradegy of the Commons* is actually quite fitting for fishing in the Mediterranean region. The common sea resources are under serious threat, for their populations are being hunted by various fishing industrial groups in a manner notoriously described as *the race to the bottom*. This displays itself by the fact that according to a study (Colloca et al. 2013) 85% of the stocks are currently overfished, measured against already questionable criteria of *maximum sustainable yield* (MSY) and 30% are outside safe biological limits. The most immediate consequences of this could be the imminent extinction of species such as Bluefin tuna and the fact that the local fisheries will have received a minimum of resources and benefits from these otherwise destructive and unsustainable practices (Hanoteau 2012).

[2] According to experts, current situation of swordfish (Xiphias gladius) is of the same severity as that of Bluefin tuna five years ago.

Local communities really are among those to suffer the most from recent developments in the Mediterranean region. An ever troubling issue is also that knowledge of the experienced fishermen is often disregarded, even though careers of some are long enough to provide a useful insight into the development – highs and laws of certain fish populations (Busuttil 2009, 128). As a matter of fact, a lack of communication between managers, fishermen and scientists could be noted as a general problem impairing the Mediterranean fisheries (Colloca et al. 2013).

3 About the Atlantic Bluefin tuna

Bluefin tuna is an extraordinary fish. Its abnormal strength, stamina, dynamic speed and size are features resembling sort of a bull of the seas. Although relatively little is known about this fish, the features scientists have been able to describe are quite impressive.

Contrary to its genetic features as a fish, tunas are regionally endothermic, thus warm-blooded. This enables them to adapt to temperatures varying from 3°C to 30°C, while the body warmth remains constant at around 25°C. Since their ability to regulate their own body temperature, they can expand their habitat vertically from the water surface to 1 kilometre depths, but most frequently they occupy upper layers of the water column[3] (Block et al. 2001, Der Werf and Robertsson n.d., 19, Fromentin 2006). Nevertheless, Bluefin tuna is typical pelagic species, meaning that its most common habitats form parts of the water column. During migrating, the fish tends to swim near the sea surface which makes it easy for the fishermen to spot it. It is the largest of the tuna species and can grow up to a maximum size of 4 metres and 700 kilograms in weight and live up to 40 years. The sheer size, however, doesn't impede the breath-taking speed of the fish reaching up to 90 km/h. In fact, this is achieved only by movements of its tail; the remaining of the body is straight and rigid. In order to produce such a spectacular speed, the fish needs to move around-the-clock-wise to feed a huge gill with enough amount of oxygen (Der Werf and Robertsson n.d., 17, ICCAT 2015a, IUCN n.d., Kato 2011, Korman 2010, NOAA Fisheries 2013).

Figure 1. Bluefin tuna (credit: Mark Gatt).

[3] From the water surface till the depth of 300 metres (Block et al. 2001).

There is precious little known about moving patterns of the Atlantic bluefin tuna, particularly concerning location of its feeding grounds. There is also a complex variation of movements among different schools of fish. Nonetheless, two main branches of the ABT – the western Atlantic stock and the eastern Atlantic stock (or Mediterranean) were officially recognized. The artificial demarcation line was proclaimed the 45° W meridian based on the spawning locations of the stocks (ICCAT 2015a, IUCN n.d.). The western stock is supposed to inhabit areas within the swath stretching from Labrador to the Gulf of Mexico and Caribbean Sea, while the eastern Atlantic stock inhabit waters expanding from Norway to the Canary Islands and to the Mediterranean Sea. There were even reports that BT be seen in coastal waters of Mauritania and South Africa, however, this was far back in 1980s. The ABT, however rarely, can be traced also in the southern Black Sea, where it was very abundant in ancient times. In the waters off Brazil, there has been no sing of the fish in recent four decades, in spite of its past common presence (IUCN n.d.).

From this point on, the notion of the Atlantic bluefin tuna will for the sake of simplification and lucidity always refer to the eastern Atlantic (Mediterranean) stock[4].

BT is a top predator, but opportunistic feeder preying on whatever comes its way. Most frequently it feeds on crustaceans, cephalopods and fish such as herring, sardine, sprat, mackerel, and the most favoured pray in the Mediterranean Sea - anchovy (Fromentin 2006, ICCAT 2015a). The Mediterranean Sea is BT's spawning sanctuary. The major spawning areas takes place off Balearic Islands, south of Malta, the South Tyrrhenian Sea, the Levantine Sea and in the offshore waters of Crete. Based on newest scientific findings, reproductive habitat covers approximately 5% of the Mediterranean Sea. Importantly, however, BT may behave opportunistically when encountering new convenient locations, meaning that it might be able to spawn in most of the Mediterranean Sea. Spawning itself begins when the water temperature has reached above 20.5°C, what de facto entails the second part of May to July, occasionally even in August (Di Natale et al. 2015, Druoun 2010).

During the reproductive season BT spawns multiple times with an annual fecundity of an average (100 kg) female reaches up to 172 million eggs. As a general rule, the older the fish, the more eggs it produces. Importantly, the survival ratio is extremely low, around 1:40 million that an egg will become an adult one day (Druon 2010, ICCAT 2014b, Mylonas et al. 2010, Orsi Relini et al. 2010). The fish reaches maturity at age of 3-5 years. At this age, BT has grown to a

[4] Since this study elaborates on the ABT stock only, an abbreviation **BT** – bluefin tuna - will be used throughout the rest of the study.

size between 103 and 120 cm, weighing 20 to 35 kg. Being aware of that, ICCAT has established the minimum size of BT allowed to be targeted. The fish weighing less than 30 kg or with fork length less than 115 cm cannot be harvested. Apparently, the line is drawn on the very edge if not under, as there is only a minimum (if any) scope for uncertainty. Additionally, there is an exception to this rule. It concerns BT caught in the Adriatic Sea for farming purposes, and BT caught in the Mediterranean Sea for immediate consumption by the coastal artisanal fishery, baitboats, longliners and handliners. Under this exception the minimum size is determined for bluefin tuna of just 8 kg or 75 cm fork length (Der Werf and Robertsson n.d., 23, Fromentin 2006, ICCAT 2014a).

BT is much sought-after species because of the quality of its meat. The most precious part of its body is the belly - the fatter, the better. The Japanese consumers appreciate the most the flesh from the belly area called *toro. Toro* can vary in its fat content with maximum 40%, what is then called *otoro.* This comes from the section near the head of the fish and usually represents the most expensive and craved for piece of sushi (Heffernan 2014, Kato 2011, 153). On the other hand, scientific evidences have recently sparked a debate over healthy issues linked to the chemical composition of the meat from BT. Nowadays, it's been acknowledged that the meat of BT contains high proportion of mercury. In fact, this is not something related only to BT. The larger the fish and the longer the life-span, the more pollutants from the water accumulates in the body of the fish (Kato 2011, 178, Longo 2011, 419).

Figure 2. Pieces of Bluefin tuna's meat at the Malta's most familiar fish market in Marsaxlokk (from author's archive).

BT occupies almost the very top of the marine food chain. Among its only natural enemies are killer whales, mako sharks, and the most dangerous ones –humans. Further decline of their populations thus poses a serious threat to the whole marine ecosystems with far-reaching consequences. Apart from that, BT is still a very poorly understood species capable of both individual and collective decision making (Di Natale et al. 2015, Walker Guevara et al. 2010). Currently, still a high risk exists that it will be wiped out before we can learn more.

3.1 Development of the BT fishery in the Mediterranean

BT has been caught for consumption in the Mediterranean Sea since ancient times. From the first millennium AD on, elaborated tuna traps systems of nets to catch and pen BT have been utilized by coastal communities across the Mediterranean. The Spanish fishermen have crafted their own technique called *almadraba,* a maze of nets running from the coast to the open sea (Arrigo 2013, Der Werf and Robertsson n.d., 25). Nevertheless, the meat of BT was first and foremost a locally consumed commodity. Going much forward in time, in the early 1900s – quality of the flesh was generally looked upon with disdain, attached low value, being served as a food for dogs and cats. Back then, arguably the most appealing feature of the fish to general public was its combativeness in recreational fishery. But the global status of the fish was to change radically. The change has its origin in the 1970s when Japanese launched their sushi and sashimi markets[5]. It was chiefly provoked by Japanese consumers' cravings for high fat content in the fish and made more available by US supplies of BT in the 1960s and 1970s. Thenceforward, fishing for BT have stepped to another level by rapid industrializing the sector, opening an era of purse seines[6]. Soon, this fishing technique became the most prevalent, capitalizing on a recent (1950s) development of freezing technology and on an upcoming development of BT farms (Heffernan 2014, Katavić et al. 2015, Korman 2010, Longo 2011, 413-418, Mylonas et al. 2010, 267).

Such a massive increase of the Japanese demand however resulted into gradual depletion of the stocks in the Pacific Ocean leading to a 10,000% rise of the BT's value on the Japanese market (Der Werf and Robertsson n.d., 51). In the early 1990s, consequences of the latest trends soon came out in the Mediterranean itself. The mature Mediterranean BT stocks, or the summed spawning stock biomass (SSB[7]), experienced between 1970 and 1992 a sharp decline,

[5] The reference is made to Japanese markets with raw fish. The difference between sushi and sashimi is that the former refers to slices of raw fish wrapped in or around special sushi rice, while the latter stands for the sliced raw fish only.
[6] Purse seiner is a fishing vessel that employs a net encircling the fish while also enclosing the bottom, hence the resemblance to a purse. The term is further elaborated in the section 3.2.3.2.
[7] The stock population capable of reproducing.

fluctuating around 20 and 30% comparing to 1970s' level (approximately 300,000 tonnes) (Hanoteau 2012, ICCAT 2014b, IUCN n.d., Longo 2011). The largest volume of catch was recorded in 1996 – 52,785 tonnes, which is a number three times higher than in the previous decade. To put this in a different perspective, the official reported landings of BT in the period 1950-1993 were averaging between 15,000 and 39,000 tonnes per year, the minimum denoting 5,000 to 8,000 tonnes from the fifties through early seventies (European Commission 2011, IUCN n.d., Kato 2011, 150, Sumaila and Huang 2012).

Nevertheless, there have been promising instances of governments rebelling against the mighty industry lobby. In 1992, Sweden proposed placing BT on CITES Appendix I[8], which would mean prohibiting trade of this species. Unfortunately, the proposal was met with a massive opposition and was swept aside. In 2010, it was Monaco's turn to try turn things around at the Triennial General Assembly of the Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES). Monaco to a large part thanks to support of Prince Albert II, has once more strived to ban trade in BT by voting to have BT added to Appendix I. The proposed amendment was, however, eventually defeated on the grounds of the outcome of the secret ballot, which was propelled by Libya before key data had been considered (CITES 2010, Heffernan 2014, Kato 2011, 165).

In the meanwhile, the decline of BT in terms of SSB continued till the mid-2000s to hit a 150,000 tonnes. In 2006, the stock had reached a state of collapse. A year later, a figure of mere 78,724 tonnes revealed the fastening negative trend. At that time, the BT stock found itself on the rock bottom since the start-up of the industrial fishing era. It was obvious, that ICCAT had to act. On that grounds, the member states committed themselves to comply with a 15 year Bluefin tuna Recovery Plan. Planned to start in 2007 and projected to continue until 2022, it initially set the fixed TACs (total allowable catches) for the first four years to 29,500 t, 28,500 t, 27,500, and 25,500, while open door was left to amend TACs for following years to enable making reflections on potential progress in rebuilding of the stock. However, in 2009, ICCAT's scientists accentuated the need for more substantial reduction of TACs, suggesting 8,500 to 15,000 tonne quota. The EU as a major player amongst the ICCAT member parties accompanied itself with various other countries-allies, while allegedly threatening those against this proposal by trade sanctions, and finally pushed through quota of 22,000 tonnes (Briguglio 2013, European Commission 2011, ICCAT 2006, ICCAT 2014b, Walker Guevara et al. 2010).

Two years later, reported catches plunged to the lowest level since 1950 - 9,774 tonnes and the BT stocks dropped by 90% since 1975 (Fromentin et al. 2014, ICCAT 2015, IUCN n.d.,

[8] BT is currently listed on the IUCN Red List of Threatened Species as 'endangered' under Criterion A2.

Sumaila and Huang 2012). It was obvious that the Recovery Plan adopted in 2006 failed big time. In reaction, the ICCAT scientific committee came up with another plan stressing the need of quota reduction to 12,900 tonnes (European Commission 2011). Surprisingly, ICCAT has recently come up with a good news, proclaiming there has been a positive development concerning BT juveniles - a four-fold increase in juveniles abundance in 2009-2011 compared to 2000-2003 (Fromentin et al. 2014, ICCAT 2014b). A latest revelation, however, somehow turn this around ascribing the trend to abnormal climate conditions (Di Natale et al. 2015).

3.2.1 Contemporary BT market

The world's largest importer of BT is Japan with over 45 countries competing to provide the Japanese massive demand. Consequently, Japanese consumers comprise 80% of the total BT consumer market what constitutes a monopsony situation, meaning that there is practically only one buyer supplied by multiple sellers. The share of Mediterranean countries in this market is fundamental with estimated 80% of the Japanese market supplied by the Mediterranean fisheries. Among the most significant exporting countries from this region is Malta which hosts the largest volume of ranched BT in the Mediterranean Sea. An outright majority of BT fattened in the Maltese ranches goes for export (Foster 2013, Garcia Rey 2010, Heffernan 2014, Korman 2010, Sumaila and Huang 2012). The process of exporting is usually speed-up thanks to well-equipped processing vessels which cover the whole processing chain from killing the fish through measuring, gilling, gutting, filleting, freezing and transhipping to another ship. The whole process happens at sea and is very efficient. Usually only the ill or injured fish are taken to local markets, where they sell for much lower prices than in Japan (Gatt 2015a).

Among the major players involved in the Mediterranean BT business are Maltese Azzopardi Fisheries and Fish and Fish; Japanese corporations Mitsui and Company and Mitsubishi; Spanish firm Ricardo Fuentes e Hijos; Croatian Kali Tuna D. O. O. ; Italian Jonica Pesca S. R. I. and Turkish Dardanel Orkinos Besiciligi Projesi. Yet, the Japanese have been financially involved the most. Mitsubishi alone covered 40% of the Mediterranean imports to Japan, as it enjoys a position of the world's largest BT trader (Der Werf and Robertsson n.d., 57, Longo 2011, 417). Nevertheless, there has been also a gradual demand for BT in China, while the United States has sustained already high demand, being the second-largest market for non-canned tuna products in the world. Apart from the U.S., a fraction of the BT exports head to the EU where the meat is highly valued in certain circles (FAO 2014a, Heffernan 2014, Longo 2011, McCurry 2015).

Figure 3. Bluefin tuna weighing more than 500 kg "harvested" at a farm owned by the Maltese Fish and Fish (credit: Mark Gatt).

Prices of BT have been increasing particularly since 1996, which had an impact on the Japanese consumer base, altering consumers' eating habits to a certain extent. Their attention have partially turned to less expensive substitutes - wild-caught yellowfin tuna and bigeye tuna. But BT still remained the most wanted commodity (Mylonas et al. 2010, 274). In 2013, €1.59 million - the record price ever paid for a 222 kg BT at the Tsukiji market auction in Japan, was almost one million more than at the previous year's auction. These astronomical profits are often reaped by a small group of powerful fishing companies. Interestingly, restaurants' owners in Japan often pay such an amount of money with no interest to gain immediate profit. They often sell out sushi for a tenth of the price they paid, even though this may climbs up to €23 per piece of *otoro*. By doing this, they seek boosting reputation and pay respect and gratitude to its loyal customers. This trend at the same time entails irresponsible unsustainable consumption and ever growing demand (European Commission 2013, Foster 2013, Kato 2011).

Until very recently it appeared as though the trend of rising prices would continue almost indefinitely, however, times are changing. An utterly fundamental development has taken place recently in Japan, South Korea, Malta, and Spain where successful attempts to artificially breed BT has brought about an array of consequences. One of them is dropping prices for BT either possibly linked to market speculations that sustainable artificial unlimited production of the fish would render it less precious, or (hopefully) to increasing consumer awareness. Indeed, compared to last year's inaugural fish of the Tokyo Tsukiji market auction, this year a BT

weighing only 40 kg less was sold for price several fold lower – "only" €33,200 (McCurry 2015). In San Diego, the U.S., there have even been incidents where the Pacific genera of BT was being sold for a ridiculous bargain - approximately €5 per kilo. This has been, however, to a large extent inflicted by raised public awareness on the current situation of the Pacific BT, and following opposition of customers against selling BT in the US (Leschin-Hoar 2015). Juxtaposing the current market price of the PBT to the ABT at the Maltese market represented by the Azzopardi Fisheries – which is currently €16, we find that the price of the latter is still much higher, but this is not to say the cost reaches anywhere near the prices in Japanese sushi restaurants.

Figure 4. A piece of Bluefin tuna flesh for sale in the chief Azzopardi's store in San Pawl (Malta) (from author's archive).

Despite their huge appetite, Japanese have shown determination to keep this business sustainable. In 2009, they resorted to turn down a dubious imported batch of 3,500 tonnes frozen BT originating from Mediterranean ranches (much of it from Malta), due to forged documentation (ICIJ 2010). But this effort is in fact deeply entrenched in readiness to maintain the status quo. Therefore, should the Bluefin tuna trade was banned by CITES, Japanese would most certainly ignore it anyway (Korman 2010). Having said that, it is clear, that Japan unequivocally sets the direction of BT market. Thus attempts of other countries to ban BT import, such as most recently the Netherlands (Der Werf and Robertsson n.d., 66), de facto represents only a minute relieve for heavily exploited stocks. Additionally, in the end it can be offset by increased demand from elsewhere anyway (most probably from Japan).

3.2 Current situation of BT fishery

From the above mentioned subtle evidence, ICCAT concluded a gradual increase of quotas is again possible. There is however a large uncertainty embedded in this presumption what is proved by the scientists from the Standing Committee on Research and Statistics (SCRS). Indeed, according to Di Natale et al. (2015) BT like a number of other pelagic species reacts sensitively to any modification induced by an oceanographic situation, particularly during the spawning time. Therefore, long and hot spring and summer can have positive effects on BT spawning and the consequent recruitment. This was exactly the case in 2003, 2006, 2007, 2009, 2010, 2011 what brought about the relative abundance of BT juveniles. Di Natale et al. submitted a scientific paper at the latest SCRS meeting in Madrid. It is crucial that ICCAT reflects this on its meeting in Malta in November 2015.

Nonetheless, judging by the present Multi-annual recovery plan, it doesn't seem likely, for it features a clause: "*…according the last SCRS scientific advice and even if uncertainties remain in assessment results, the goal of the recovery plan might already have been, or will soon be reached."* The uncertainties notwithstanding, it appears that ICCAT have already taken these developments for granted. As a result, the member states now can enjoy a prospect of 20% increase (9,372 tonnes) of the overall quota for BT over the upcoming three years. Thus, for 2015 it brought the quota up from the yesteryear's 13,243 t up to 16,142 t and for 2016 it is set to reach 19,296 t. Finally, for 2017 ICCAT agreed upon 23,155 t (European Commission 2015, ICCAT 2014a, ICCAT 2014b, ICCAT 2015).

CPC	Quota 2015 (t)	Quota 2016 (t)	Quota 2017 (t)	%
Albania	39.65	47.40	56.91	0.2506266
Algeria	169.81	202.98	243.70	1.0733333
China	45.09	53.90	64.71	0.2850125
Egypt	79.20	94.67	113.67	0.5006266
European Union	9372.92	11203.54	13451.36	59.2435090
Iceland	36.57	43.71	52.48	0.2311278
Japan	1345.44	1608.21	1930.88	8.5041103
Korea	95.08	113.66	136.46	0.6010025
Libya	1107.06	1323.28	1588.77	6.9973935
Morocco	1500.01	1792.98	2152.71	9.4811529
Norway	36.57	43.71	52.48	0.2311278
Syria	39.65	47.40	56.91	0.2506266
Tunisia	1247.97	1491.71	1791.00	7.8880702
Turkey	657.23	785.59	943.21	4.1541604
Chinese Taipei	48.76	58.28	69.97	0.3081704
TOTAL	**15821**	**18911**	**22705**	100

Table 1. The total allowable catches (TAC) set by ICCAT for all the contracting parties. Note: The total amount do not include additional adjusted quota for Algeria, Turkey, Egypt, Mauritania, Libya, Chinese Taipei, South Korea and Japan (ICCAT 2014a).

The 2017 quota still adheres to ICCAT estimates of the quantitative MSY (maximal sustainable yield) - 23,256 t per year (ICCAT 2014a). According to its latest forecast, BT would not be overfished with 60% probability by 2022. Importantly, these estimates are still based on data flawed with uncertainties. The very SCRS admits having issues with poor quality of the catch statistics and alerting the ICCAT to step up its efforts in dealing with this problem (ICCAT 2015, ICCAT 2015b, 100). Having said that, an independent study comes with quite a contrary view on the alleged sustainability of the ICCAT quotas, pointing out that annual quota of just 8,000 metric tonnes would only allow a 50% chance that the BT stocks would recover by 2023 (Der Werf and Robertsson n.d., 56, MaltaToday 2014).

After initiating the quota, individual shares of the TAC's cake are assigned to various member states. The governments then decide on allocation among the fishermen. However, ICCAT still holds the decisive mandate on prescribing the scheme according to which members redistribute quota among the individual fishing sectors. In other words, the government receives a portion of quota and is told to which sector to assign and how much (Gatt 2015a).

In general, ICCAT has largely favoured bigger vessels what can be showcased on its 2014 Multi-annul Recovery Plan for BT, commanding member states to allocate no more than 2% of its quota among the local artisanal fishermen (ICCAT 2014a).

"These are not fishermen, these are businessmen."[9]

On these grounds, local fishermen are increasingly hold down, since while revenue from the species has boomed for industry farmers, income for the traditional fishermen has drastically dropped. Therefore, it is clear, that for example Maltese local (long lines) fishermen's decreased catches[10] have been recently recorded partly on the grounds of increased number of fishing vessels equipped with new technologies and partly as an aftermath of lower quotas given them by ICCAT. The more advanced fishing fleets have begun to deprive the small-scale fishermen of the fish they used to see more abundant (BICREF 2015, Sea Shepherd 2010a).

Figure 5. A fishing vessel anchored in Marsaxlokk, Malta (illustrative photo, from author's archive).

In total, there are 910 specialized vessels fishing for BT registered in the EU (European Commission 2015). As a matter of fact, most BT targeting fishing vessels operate in conjunction or in association with other similar vessels, pursuing strengthen fishing capacities, efficiency and ultimately better chances of higher catches and profits. This has been the case of Italian purse seiners teamed up with the Turkish, Greek, Libyan, and French fishermen (WWF 2008). Turkey has been a country with the biggest fleet specializing on BT. The state alone has officially 98 BT vessels with a capacity of 200-300 tonnes each. However, all together they are entitled to catch only 887 tonnes per year, the number which obviously does not add up if all of them are to make a profit. Unfortunately, the gap is often filled illegally. Turkey can be

[9] A fisherman gives vent to a deep dissatisfaction with the current situation the artisanal Maltese fishermen have to face (Sea Shepherd 2010a).
[10] In 2015, Maltese long liners together with recreational fisheries notched up roughly 50 tonnes of BT (MARC 2015). In contrast, for example Libyan purse seiners operating in virtually "no man's land" this year enjoyed quota of 1,107 tonnes (ICCAT 2014a).

particularly showcased for a dishonest practice involving another party – in this instance Algeria – with dysfunctional fleets illegally passing its paper quotas on fleets of another nations – Turkey – so as both can reap the maximal benefits (Der Werf and Robertsson n.d., 29, WWF 2008).

The Eastern Mediterranean and the waters off Northern Africa are monitored and controlled much less stringently than in the North and Western Mediterranean. This is not to say that monitoring in these areas is sufficient and without flaws. In fact, France is one of few contributors to patrolling during the fishing season with its navy, another one being Malta through its Armed Forces (Der Werf and Robertsson n.d., 38, European Commission 2015, Grech 2009). But the Mediterranean part of the regional grouping MENA (Middle East and North Africa) has been largely failing when it comes to implementing management plans laid down by ICCAT. Particularly the Libyan, Algerian and Tunisian fishermen have been rather unreliable allies in the commitment to fulfil BT management plans (Gatt 2015a, Walker Guevara et al. 2010, Mylonas et al. 2010).

Notwithstanding, it's definitely not possible to make a clear distinction between the good and the bad states. In fact, as fishing grounds grew depleted, the fleets and ranches moved on from southern Europe to Tunisia, Libya, Egypt and Algeria in search of new sources of BT. This was happening particularly during 1997-2007, when these African countries were permitting EU fleets to enter their lawless waters[11] (Garcia Rey 2010, Walker Guevara et al. 2010). Thus, all parties concerned are to blame.

3.2.2 Employment in the BT industry

There are two possible ways how to describe employment in the BT fishery. The first one is to look at the employment rates among the artisanal fishermen in coastal areas, impoverished by the arrival of large industrial fleets into their regional waters. The second one is to assess job possibilities within the BT industrial fishery.

Let us begin by taking on the first approach, briefly looking at a region in the Western Sicily. This region is in fact symptomatic to trends of artisanal fishermen collapsing under pressure of large industrial fleets. Generations of local families have throughout centuries been relying on BT as a source of employment and food. They have not just been making a living from BT, but the fish have also to a large extent determined the culture of the region. Their original

[11] Notwithstanding, even de facto failed states such as Libya and Syria have been given quotas from ICCAT to catch BT.

lifestyles unfortunately succumbed to pressures of industrial fisheries (Longo 2011, 419). Along these lines, the role of the fishermen has to be seen in a wider social and economic perspective which is not confined to fishing only. With disappearing populations of tunas there is shrinking offer of jobs for hawkers, middlemen, boat builders, suppliers and retailers of fishing gears, engineers, and scientists for all of whom the fish ensure livelihood (Busuttil 2009, 116, FAO 2012a).

In Italy, Portugal, Morocco and Spain, the traditional fishing gear called *almadraba* is still being deployed. It is in fact more labour-intensive than any other fishing method, thus offers significantly more jobs per each gear (trap) - on average 43 jobs compared to 10 jobs on a purse-seiner and 6 jobs on pelagic long-liners (Ambrosio and Xandri 2015, 9). Nonetheless, these small-scale gears are still side-lined and largely overshadowed by the typical component of industrial fishing - purse-seiners - cashing on much bigger quotas. In fact current trends show dwindling numbers of jobs both for the industrial sector and the local fisheries (FAO 2012a). But considering bias towards the industrial fisheries in recent decades, in terms of creating jobs they have performed really bad. This may be due to a limited length of the fishing season (European Commission 2015) and utilization of new less labour intensive technologies.

A growing number of BT farms linked to purse-seiners can offset this trend to a certain degree, supplying related jobs such as regional observers carrying out work for the ICCAT, but employed by specialized private agencies generated for this particular purpose (Gatt 2015a, ICCAT 2014a). Purse seining also requires stringent monitoring, generating a work placement for observers.[12] Hence the potential offsetting factor in industrial BT fishery.

In drawing a clear juxtaposition, let us contrast the opposites – *almadraba* as the most traditional way of fishing and industrial purse-seining – a symbol of current large scale BT fishery in the Mediterranean Sea. Should we disregard the number of related jobs, then over 3,500 jobs are provided by more than 600 tuna purse seiners in the whole Mediterranean region. In contrast to that, for instance the only 2 Italian *almadrabas* (traps) entail 105 direct jobs (Ambrosio and Xandri 2015, De Werf and Robertsson n.d., Sumaila and Huang 2012).

3.2.3 Present fishing methods

Among the commonly employed BT fishing gears are bait boats, set traps (*almadrabas*), driftnets, pelagic trawling, FADs (specialized fish aggregating devices), long lines, and purse seines. The most common gears with the largest impacts on the fish population have to be

[12] The terms regional observer, ICCAT and purse seining are elaborated i.e. in sections 3.2.3.2 and 5.2.

subject of a set of rules imposed by the ICCAT, such as the length of the fishing season outside of which fishing activity is prohibited. This relates to long lines, purse seines, bait boats, trolling boats, to sport and recreational fishing. On the other hand, fishing with all the other gears is permitted throughout the entire year what exposes the BT to almost incessant fishing pressure (ICCAT 2014a, The Pew Charitable Trust 2014a). As indicated in the graph below, the most significant fishing gears in terms of total catch volume is by far purse seining. Now, a brief description of the most important fishing gears will follow.

Purse seine is a specific fishing gear making use of a net which hangs vertically in the water with floats at the top and weights at the bottom edge. The ends of the mesh are finally being drawn together to encircle the captured fish. Purse seiners thus capture the fish alive. It is the most prevalent fishing method, conducted approximately by 3/4 of all Mediterranean BT fishing fleets. Large size of the nets enables them to catch as much as 3,000 fish at once. It can be more than one kilometre long and reach up to 200 meters depths (Walker Guevara et al. 2010, Mylonas et al. 2010, 267). Purse seining was introduced into the Mediterranean in the 1970s (Longo 2011, 413). In 2008, there was 614 registered purse seiners. These vessels are currently responsible for up to 70% of the BT catches in the Mediterranean (Der Werf and Robertsson n.d., 27).

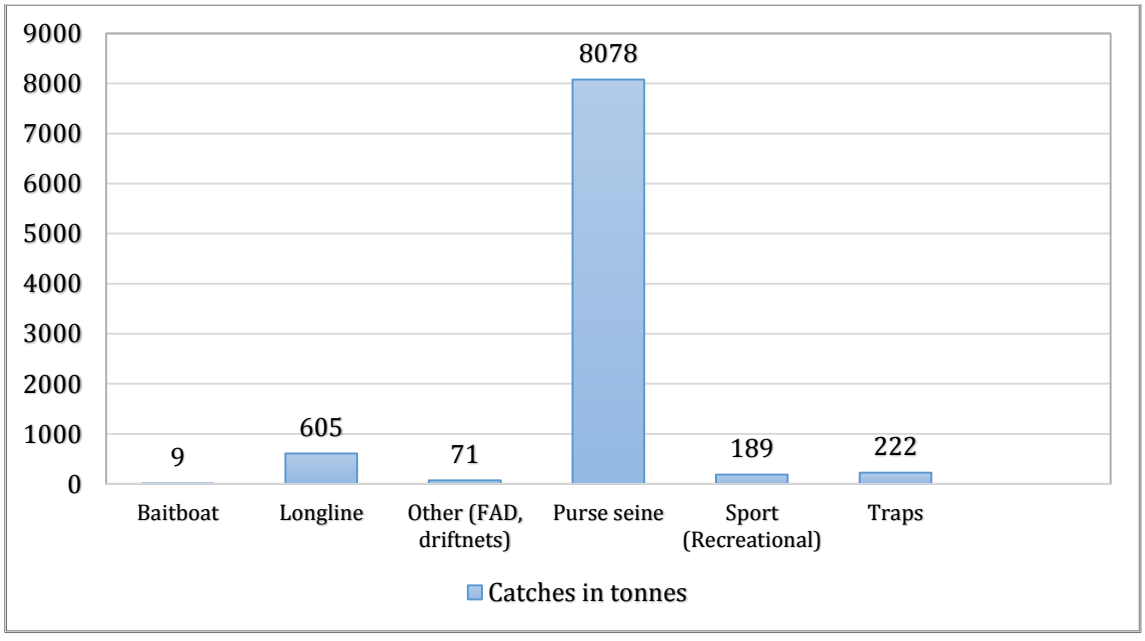

Chart 1. Total catches of BT for each gear by year 2013 (Ambrosio and Xandri 2015).

3.2.3.1 Purse seines

Purse seiners are only allowed to operate for one month a year since 26 May to 24 June (ICCAT 2014a). Nevertheless, this type of hunting poses a stock assessment problem residing in the

sheer mass of caught fish (Sumaila and Huang 2012). The fish are not immediately harvested and recording the numbers of the fish caught in the nets bears inaccuracies. Nowadays, almost all of the BTs caught by the purse seines, are being sold to fattening operations throughout the whole region of the Mediterranean Sea[13] (Mylonas et al. 2010).

A serious drawback (not only) of this type of fishing activity consists in that BTs are mostly captured on their way to reproduce, and particularly in their spawning areas. To render more accurate identification of the current BT whereabouts there are often deployed so called spotter planes, even though ICCAT strictly prohibits using airplanes, helicopters or any types of unmanned aerial vehicles for searching BT. Notwithstanding, Italy has systematically provided its territory for this illegal activity allowing foreign airplanes to get hired by Italian BT companies to tracking the fish (ICCAT 2014a, Mylonas et al. 2010, WWF 2008).

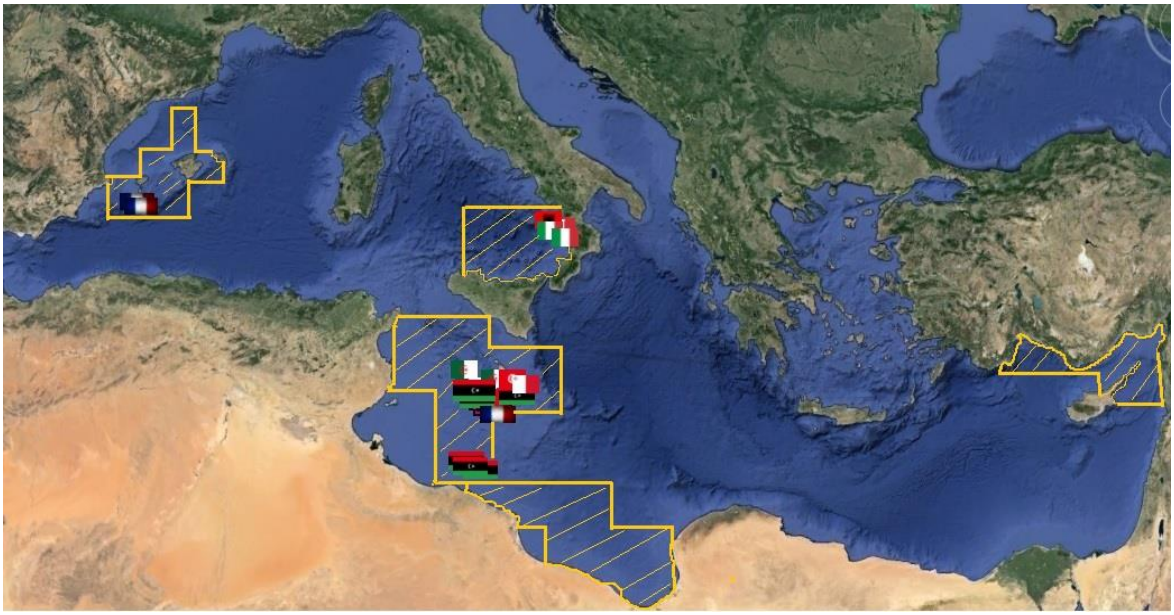

Chart 2. Localities where the BT were caught (by purse seiners), that ended up in the Maltese BT farms in the year 2015. The yellow-hatched areas define the BT's spawning grounds. The flags illustrate the flag countries of the vessels (based on information gathered at MARC).

Another setback consists in low transportation speed needed to safely convey the tunas to the farms. While avoiding damaging of the nets and restricting available space for the fish, this on the other hand, raising the level of stress fish have to undergo during the long trip (Mylonas et al. 2010, 269). Paradoxically, despite the massive economic value of BT purse seiners are under gradual economic pressure, a fact which can be explained by high initial and revolving capital

[13] For more information see the section 3.3.

investment, stringent amortization, financial costs, ever-growing costs of fuel, fishing licences, or need for the spotting airplanes (Longo 2011, 414, Wichmann 2009).

3.2.3.2 Long lines

It was Japanese who established this form of modern fishing in the Mediterranean in 1972 (Longo 2011, 412). Nowadays, the fishermen in Malta are the last ones out of the industrial EU fleets employing long-line fishing when targeting BT. All the other fleets use purse seining (Camilleri 2014). As a matter of fact, the Maltese long-liners are almost the only supplier for domestic market, since nearly all fish from purse seiners are destined via farms abroad, principally to Japan[14]. Nevertheless, a breakdown of the BT caught by long-liners shows that still roughly one third of their catches also heads to Japan, while approximately 25% is shipped to Spain, and only 40% remains in Malta (MARC 2015).

Long lines can range from several miles up to as much as 129 kilometres in length setting thousands of baited hooks. In fact, a middle sized vessel between 12 and 24 m usually deploys between up to 3,000 hooks. Large-scale pelagic longlines catching vessels over 24 m are allowed to conducts its fishing activities from 1 January to 31 May (ICCAT 2014a). The fishing season of smaller artisanal long-liners starts is not restricted by ICCAT, but it is subject to national jurisdictions.

Long lines are infamous for sometimes indiscriminate fishing when birds, turtles, dolphins, and sharks are prone to fall victims as a bycatch (Longo 2011, 413). In terms of specialized BT long lining, the rate of bycatch is lower. However, species such as pelagic sting ray, sharks and loggerhead turtles are still often in danger of becoming a bycatch. On the other hand, bycatching of sea birds in BT fishing is nowadays very rare mainly as a positive consequence of implemented measures which rendered gears more selective[15] (Gatt 2015a, Inoue et al. 2015). Operations of long-liners are compared to purse seiners small-scale, for the amount of catch is much smaller. This arguably entails more favourable environmental performance, but under the condition of eliminating by-catch.

3.2.3.3 Other gears

As afore-mentioned, the thousands years old traditional ***almadraba*** or **set traps** has not enjoyed much quotas from ICCAT and slowly fade into obscurity. Only countries where traps are used more frequently are Italy, Morocco, Portugal and Spain. This is rather unfortunate for

[14] Only the less valued farmed BT is not fit for export and resold at local market (Sea Shepherd 2010a).
[15] See chapter 7.3.5.

it is relatively respectful of the environment and resources, generates hardly any waste, respects seasonality, the energy consumption needed is minimal and also it usually catches bigger BT, usually older than 14 years. These fisheries usually supply local markets, thus all benefits are reaped by the local communities (Ambrosio and Xandri 2015).

FADs are deployed at the sea surface in order to lure fish to hide under. For this purpose, the fishermen deploy special buoyant devices attracting tunas to move in. When aggregated under the floating buoy, fish are easily encircled and hauled by purse seiners. The use of FADs by purse seine fisheries has come under increasing criticism for its potential deleterious impacts on tuna stocks and for a large proportion of bycatch. Nevertheless, this fishing strategy is pursued mainly in tropical tuna fisheries, in the Mediterranean Sea is targeted mainly Yellowfin tuna. Nevertheless, in the Mediterranean there are caught sometimes even BT juveniles (Dagorn et al. 2013, Gatt 2015a, The Pew Charitable Trust 2014a).

A **driftnet fishing** is banned in almost all countries involved in BT fishery on the grounds of a declaration passed by United Nations in 1992. The reason is that driftnets incur bycatch of unintended animal species such as other kinds of fish, birds, turtles, whales or dolphins. Indeed, estimates indicate that thousands of sharks and turtles and around 10,000 cetaceans are killed every year in the Mediterranean. In spite of that, it seems that this activity is still widely proliferated across the Mediterranean, Morocco, Italy, Algeria, Tunisia and Turkey still deploying driftnets (Der Werf and Robertsson n.d., 32, IUCN n.d.).

Bait boats and **trolling boats** are permitted since the beginning of July until the end of October (ICCAT 2014a). Bait boat fishing is carried out principally in the Hispano-Algerian basin, while troll fishing is mainly conducted in the north of the Balearic Islands. Bait boats are often multi-purpose boats, but their speciality resides in fishing with pole and line off the starboard side. Up to fifteen fishermen are equipped with winches to hoist the catch and immediately catch for another one (ICCAT 2008). Trolling simply entails dragging fishing line baited with organic or artificial lure behind the boat.

3.2.4 New technologies

There is a range of emerging new technologies ever more tilting the fishermen's superiority over the fish. New technology renders the job easier for the fishermen, but at the same time it speeds up the depletion of stocks. Doppler radar tracks the motions of fish schools and bird locating radar cashes on the well-known link between bird occurrence and fish near the sea surface. Moreover, omni-scan sonars, advanced fish aggregating devices enhanced by sonar

and satellite, and satellite-derived sea surface temperature information all amplify the already deadly armament of the fishermen (Samoglou 2014, Longo 2011, 414).

The technological improvement in the sector that is enhancing the possibility of better yields in fishing is ever more disrupting conservation efforts (Bianchi 2009). New fishing technologies including the current large-scale industrial gears such as purse seining in fact eliminate the evolutionary developments that have helped fish to escape from being caught (Dieckmann et al. 2009). Indeed, an increased awareness and an ability to avoid a fishing gear is not of much help to fish when facing the massive, high-tech fishing architecture.

3.3 Farming and fattening

According to an official ICCAT definition, BT farming and fattening entails caging the fish in farms and subsequent feeding aiming to fatten and increase their total biomass (ICCAT 2014a). It was introduced into the Mediterranean in 1996 in the waters off Cartagena, Spain and in the same year it spread over to Croatia, the only country allowed to capture immature tunas (from 8 up to 20 kg) (European Commission 2011, Katavić et al. 2015, Orsi Relini et al. 2010). From then on, BT farms have spread across the Mediterranean Sea in a speedy pace. Malta has seized the paramount position being the Mediterranean's largest and one of the biggest world's exporters of farmed BT. In 2007 it processed 11,360 tonnes of the fish, the overwhelming majority of whom was destined to Japan (Briguglio 2013, Garcia Rey 2010). A very recent data on input and output of the Maltese farms show that in 2014 it reached roughly 4,000 tonnes, and 6,084 tonnes respectively. The explanation why the two values differ is simple – the fish have grown[16]. This year (2015) approximately 5,200 tonnes of BT was caged in Maltese farms (almost 45,500 individual fish). The average weight of these imputed fish was just shy of 120 kg which denotes BT approximately 8 years old (Fromentin 2006, MARC 2015).

Farms are with their operations dependent on healthy and unstressed large amounts of BT. When purse seiner catches the fish, the whole school is to be transferred to a tow cage transported by tug boat to stationary net pens at tuna ranches. The transport can take up to months for the tug boat has to move in a slow pace preventing the fish getting injured. The redeployment of fish from the transfer cage to the stationary cage is a crucial moment, for it is now when the body mass of the whole batch of fish is estimated to prevent quota infringement. For this purpose is deployed specialized underwater stereoscopic camera, remotely measuring the length of the fish swimming from the tow cage to the stationary cage. Every time, at least

[16] In Malta, BT is farmed on average for 5 months. After five months the fish gains approximately 51% of its body mass (MARC 2015).

20% of the fish have to be measured in order to attain more or less precise picture of the fish biomass (Gatt 2015, Katavić et al. 2015).

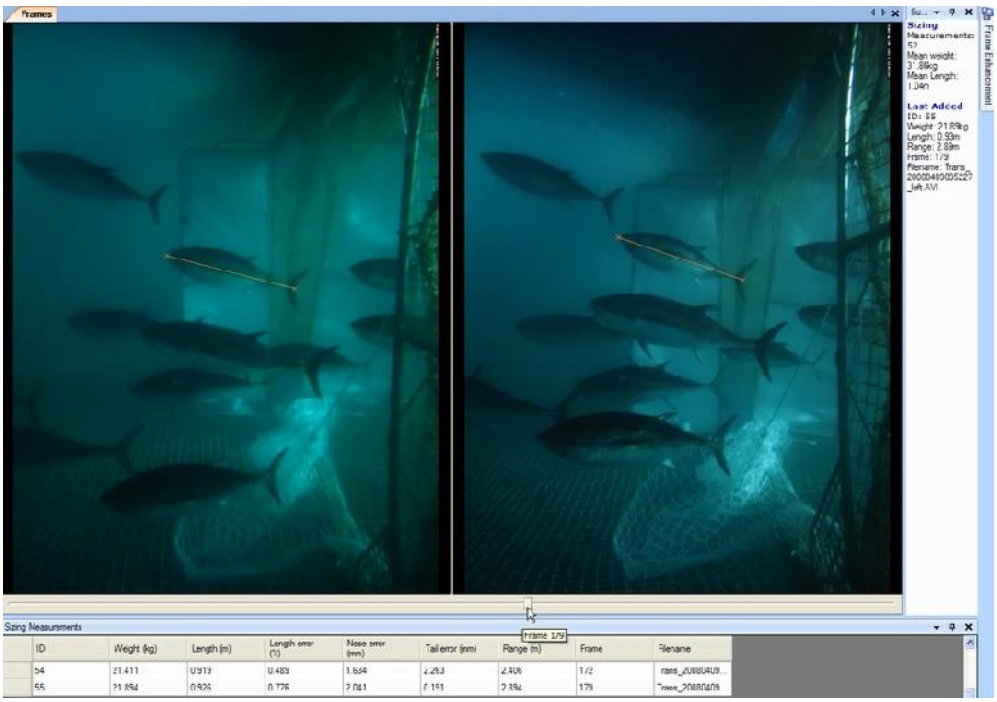

Figure 6. Counting and measuring of BT being transferred from the transfer (tow) cage to the stationary cage. A specialized computer program compatible with the stereoscopic camera is required for this purpose (credit: Mark Gatt).

Utilizing the underwater stereoscopic cameras is not, however, problem-free. Firstly there is a setback in the estimation. The length estimation is actually quite precise with a mere 0.8% error margin owing to necessity to have the fish positioned straight (Gatt 2015, Katavić et al. 2015). But when it comes to weight estimation, Katavić et al. (2015) estimate the error margin between 3% and 7%. This is due to a serious setback embedded in the camera not taking into account the height of the fish. Quite paradoxically, it is the weight of BT which is more important than weight, as the quota given by ICCAT are set in tonnes. Secondly, when a number of undersized fish is detected to breach maximal permissible limit of 5% per batch, there is currently no mechanism to sort them out and release them. ICCAT is well aware of this problem, but so far nobody has been able to come up with a solution (ICCAT 2014a, Gatt 2015a).

When finally caged, BT is reared in circular or rectangular floating pens for a short period of time in order to increase the body fat. The need for doing this stems from the fact that the fishing season overlaps with the spawning period when the fish are exhausted. The fatter the fish, the higher esteem from Japanese consumers it receives. Secondly, rearing is profitable for

the fishermen intending to obtain a better profit by supplying the market continuously, avoiding market glut (Mylonas et al. 2010). At present ICCAT officially recognizes 68 fattening farms in the Mediterranean. Apart from Malta, among other significantly involved countries are Cyprus, Greece, Italy, Spain, Tunisia and Turkey (Mylonas et al. 2010, 268).

Figure 7. Stationary pens belonging to one of the Maltese BT farms (credit: Mark Gatt).

At farms, BTs are fed with a diet of small pelagic fish with high fat content; e.g. *Sardinella aurita*, *Sardina pichardus*, herring, mackerel, horse mackerel, chub mackerel, or cephalopods. However, these species are themselves getting to the brink of extinction as fishing quotas keep growing and allow these fish to be harvested only for feeding purposes. Sadly, this in turn causes other advanced predators like dolphins to become exceedingly rare in some areas in the Mediterranean (Der Werf and Robertsson n.d., 44, Mylonas et al. 2010, 269). In fact, the food conversion ratio for BTs is likely the highest of any farmed fish with twenty to thirty kilograms of fishes is need to produce just one kilogram of BT. For instance in Malta, farms consume every day one shipping container of mackerel or sardines to cater farmed BT. Smaller fish species are better equipped to withstand the pressures of overfishing since they breed in large numbers, but this does not mean their populations are infinite (Der Werf and Robertsson n.d., 44, Gatt 2015a, Kato 2011). There is also a relatively high mortality of BT themselves, for they often die colliding against the cage structures, nets and walls (European Commission 2013).

Lately, calls for a sustainable future for this sector have grown louder. Many experts advocate establishing a self-sustained system independent upon the caught of wild fish (Mylonas et al.

2010, 277, Pauly 2009). In actual fact, there have been attempts to lay foundations of such a system for 40 years now. But until very recently, BT could be farmed only, not bred. It took this much time until the Japanese Kinky University finally developed a method of raising bluefin tuna from larvae to maturity – an achievement of far-reaching consequences for the BT fishing industry (McCurry 2015).

In fact, Japan has not been the only country striving to accomplish something what had already been done with other fish such as salmons. A project called SELFDOTT (Self-sustained Aquaculture and Domestication of Bluefin Tuna) has been as well on the track to artificially reproduce BT in captivity. Scientists at the Spanish Institute of Oceanography (IEO) were ultimately successful in inducing BT held in captivity to produce eggs which managed to evolve to fish of 1kg in three months (European Commission 2013). A massive setback entrenched in these endeavours is a very low survival rate of the artificially raised BT, fluctuating from only 1 to 3% (McCurry 2015, Ramsden 2015).

However, this hasn't imposed limitations to a development of additional activities to BT ranching – collecting eggs for hatching trials. On that ground, Malta has become one of the world's most significant hubs for this end, supplying Korean and Israeli counterparts with eggs destined for artificial breeding and growing fingerlings. This year, arguably the most prominent fishing company in Malta – Azzopardi Fisheries, alone garnered 100 million eggs (last year it was 40 million) (Ramsden 2015). Utilizing the same strategy, the Kinko University, having started its own restaurant-chain, already pledged to artificially produce 6,000 fish by 2020 (McCurry 2015).

Figure 8. The chief of Azzopardi chain stores in San Pawl (Malta) (from author's archive).

In accomplishing artificial induction of spawning and ensuring growth to consumable size, BT farms turn into **aquaculture**. This per se, however, does not entail it is sustainable and harmless to the marine environment. It has been proved that although aquaculture helps to satisfy ever growing demand for the fish products, it also brings about increasing fishing pressure as it per se consumes 40% of all the caught marine fish. Moreover, it is often bound to pollution of marine ecosystems owing to the large amount of forage and faeces loaded into the sea farms, clogging the sea bottom. In addition to that, the input of nutrients accompanied by antibiotics increases danger of epidemic outbreaks and potentially reduces climate change resilience for coastal communities (Der Werf and Robertsson n.d., 45, Longo 2011, 419, Schacht et al. 2013, WWF, 2015).

If the BT aquaculture was indeed to be implemented on a large scale, it would have to be done with all the side-effects within a fairly large marine compounds. This is because rearing BT in captivity requires vast areas of coastal water, for BT is naturally equipped to swim thousands of kilometres within a life span and needs to move a lot in order to breathe. Aquaculture of BT is also rather unpredictable because the tuna fingerlings are very delicate and subsist on crustacean fingerlings which are also very fragile and difficult to supply to aquacultures (Gatt 2015a, McCurry 2015).

4 Illegal, unreported and unregulated fishing

Illegal, unreported and unregulated fishing (IUU) poses one of the greatest threats to marine ecosystems and to BT in particular. It has escalated in the past twenty years and developed typically on the high seas. Nevertheless, at present IUU takes place in all dimensions of fisheries and occurs both on the high seas and within the areas covered by national jurisdiction (FAO 2014a). It is **illegal** on the grounds that it is carried out by vessels without permission to do so, it takes place in a marine protected area, it is conducted with prohibited gear and when quota is breached or when catching endangered species. The **unreported** fishing consequently stands for misreported or undercover conducts. The **unregulated** fishing encompasses vessels fishing without nationality or those using flag[17] of a country belonging to none of the RFMOs (regional fisheries management organisation). These criminal conducts are usually institutionalized by bribery or forging licences (Phelps Bondaroff et al. 2015). Against particular backdrop of the Mediterranean BT fishery, there's an array of activities falling into the IUU category. Those are underreporting numbers of caught BT (both ranched and sold), farming undersized fish, fake releases of BT from farms, unfaithful declaring of the volume of harvests and deploying illegal pens and cages (Garcia Rey 2010).

Daniel Pauly, a renowned expert on overfishing says that: "*fisheries are one of the most criminalized sectors in the world*" (in Walker Guevara et al. 2010). IUU fishing is indeed something more than isolated misconducts spread around the world. In fact, it has evolved to an internationally coordinated malign system intertwined with various economic and political sectors. In simple terms it is a highly organized form of transnational crime comprising of large-scale international organizations, endowed with most sophisticated equipment. Moreover, there has been revealed that IUU fishing contains not only the disruptive activities related to fish, but also to humans. Indeed, there has been ever growing number of incidents of human trafficking, illegal drug smuggling and homicides (European Commission 2008, FAO 2014a, Phelps Bondaroff et al. 2015). Yet, so far it has been almost impossible to investigate crimes on the high sea. *The New York Times* recently published an extensive article providing a shocking insight into operations of a tuna refrigerator vessel whose shipmaster (under command of the owner) was constantly breaching fishing rules, abusing and exploiting his crew and even causing a massive oil slick. Startlingly, the ship long continued operating freely

[17] In other words 'flag of convenience'. IUU fleets often register their boats in tax havens or in developing countries unable to enforce laws. Thanks to that, these vessels cannot be under the current legal setting punished for its illegal activities by no one else than the flag state. For more see section 5.1.

and even now, under a new operator, the owner still continues operations unpunished (Urbina 2015).

There is a complex web of illegal activities including an elaborated black market worth of €9 billion to €28 billion. Through what O'Neill (2013, 189) calls 'extended commodity chains', this market reaches up to 26 million tonnes of seafood a year, or more than 15% of the yearly total global output of the fishing sector. In some ports IUU fishing even accounts for up to 50% of the landings. The products of illegal activities then penetrate into retail chains without being detected (FAO 2014a, FAO 2015a, Phelps Bondaroff et al. 2015).

Between 1998 and 2007 one third of BT was caught illegally. The crooked activities pervade the BT fishing industry, from fishing fleets and ranches, through states' ministries to the main export destination – Japan. Among the most notorious perpetrators in this regard is China, which has been for years underreporting its catches, the majority of which ended in Japan. The biggest culprits in the Mediterranean have been France, Spain, Italy and Turkey (FAO 2015a, ICIJ 2010, Walker Guevara et al. 2010, WWF 2010). France has been representing sort of a leader among the cheaters, striving to catch up with losses inflicted upon the local fishing industry by ICCAT's restrictions on BT catches. Libyan fleets have not fallen very far behind France. For instance, in 2006 were Libyan and Turkish fleets together responsible for catches equivalent to at least 40% of then (32,000 t) ICCAT quota. Unfortunately, the current situation in the north-African country does not allow for monitoring the harvesting operations nor any law enforcement (ICIJ 2010, Heffernan 2014, Kato 2011, Sumaila and Huang 2012, Wichmann 2009).

The Mediterranean region is particularly known for large uncertainties in reported data. Between the mid-1990s and 2007, catches of BT were seriously under-reported, while during approximately the same period about one third of all BT in the Mediterranean were caught illegally. The illegal activity peaked in 2007, when according to some estimates, roughly 60,000 metric tonnes of BT were caught illegally (Der Werf and Robertsson n.d., 26, ICCAT 2014b, IUCN n.d.). Yet, financial gains from illegal fishing activities don't reach the very fishermen, rather they render possible to proceed with these activities on a broader scale or diversify the criminal activities of the major culprits (Phelps Bondaroff et al. 2015).

There have been documented several twists used by IUU fishers in order to avoid higher taxes. Instead of exporting fish straight to customer, the product is shipped at a discount to their real value to a middleman located offshore in a beneficiary jurisdiction. The fish are only then sold from the intermediary to the customer for the real value (Phelps Bondaroff et al. 2015). This scheme in fact brings even more detrimental impacts when the fish have to be additionally

transported (which requires oil) what puts more pressure on the environment and also the intermediaries in fact make a living of plain trafficking without any added value.

It is not that the industrial fishing fleets are the only culprits. Small-scale artisanal fishermen can ignore, try to avoid or partly breach regulations as well. However, this is often enforced by the dire state of the fish populations brought about by operations of the industrial fleets (FAO 2014a, Phelps Bondaroff et al. 2015, Roberts and Hawkins 2000, WWF, 2015), or by current presence of IUU fishing in their waters[18] (European Commission 2008, FAO 2014a, Stewart 2015).

4.1 Transhipment at sea

By transhipment at sea is meant the transfer of both legally and illegally caught fish from one vessel to another. It's usually carried out in a way that the fish are collected by a refrigerator vessel from a number of various fishing fleets, while the refrigerator vessel itself is often exempt from monitoring (contrary to the requirements of the ICCAT). Such laundering of frequently illegally caught fish poses a huge problem for it is conceived a widely used practice. Apart from the ICCAT's officially designated ports entitled to provide for transhipments, there are also for the sake of anonymity, so called ports of convenience, where inspections are almost non-existent. Vessels with illegal catches often also assume a strategy of several unloading at multiple different ports. Sadly, the perpetrators still can operate largely unnoticed and untargeted by the officials (Der Werf and Robertsson n.d., 53, ICCAT 2014a, Phelps Bondaroff et al. 2015).

As for BT, there's a precedent that undersized fish were illegally transferred into ranches. Furthermore, the illicit activities are not limited to having destructive impacts on fauna and flora only. In fact, the process of transhipment can also be accountable for human and labour rights violations, as vessels with its crews as prisoners may stay on the high seas resupplying and unloading cargos for years (ICCAT 2014a, Phelps Bondaroff et al. 2015).

[18] One of the most tragic displays of local-communities suffering from illegal fishing takes place in Somalia, where international IUU fleets plunder local waters which have been finally cleared from pirates. For local communities it is as if 'out of the frying pan into the fire'.

5 Related deficiencies of the system

Getting acquainted with the phenomenon of IUU fishing logically evokes questioning the nature of international political and economic setting. The following sections provide a comprehensive insight into BT fishery-related segments of these global tiers.

5.1 Legal and institutional setting

Global fisheries slightly differ from the specific setting of the Mediterranean Sea on the grounds that the latter is relatively small in size, but borders with a large number of states. Having said that, twenty-two countries and territories have to make agreements upon how to share, take responsibility and protect the ecosystem services of the Mediterranean Sea (Camiñas 2009, 36). Another distinctive element is the width of the exclusive economic zones (EEZ) of the coastal states. Contrary to a general 200 miles (322 kilometres), the territorial waters of the Mediterranean states extend only 6 to 12 nautical miles (11 to 22 kilometres), not even encompassing the entire continental shelf. Because the bulk of illicit fishing activities takes place on the high seas which represents 60% of the seas and oceans stretching beyond the EEZ, the coastal states have traditionally been assigned responsibility also for all vessels flying their flag on the high seas (Cullis-Suzuki and Pauly 2010, European Commission 2008a, Phelps Bondaroff et al. 2015).

Therefore, if there's a vessel flying a flag of a certain nation, which breaches the laws on the high seas, other countries are legally restricted to intervene, for it is sovereign responsibility of that flag state (European Commission 2008, FAO 2014a, Phelps Bondaroff et al. 2015). The possibility of flying flags of convenience indeed represents one of the most favourable conditions for overfishing to flourish. A vessel can use flag of a certain state, be operated by cosmopolitan crews, owned and directed by a company or a consortium of multinational companies and fish anywhere in the world. Some fleets even operate several vessels with the same name fishing under only one permit or a single ship can obtain several registrations under multiple names enabling it to fish with a number of permits (Phelps Bondaroff et al. 2015).

The above described still happens despite the fact that throughout the recent decades, three universal legal and institutional pillars have been established in an endeavour to lay the foundations of sustainable fishery on the high seas. The legal one is represented by the provisions agreed under the 1982 United Nations Convention on the Law of the Sea (UNCLOS), the 1995 United Nations Fish Stock Agreement (UNFSA), the 1992 Convention on Biological

Diversity (CBD), and the 2013 UN General Assembly Resolution on Sustainable Fisheries, obliging all member states to comply with international law on conservation living marine resources. The second, environmental cornerstone, was initiated by the 1992 United Nations Conference on Environment and Development (UNCED), held under auspice of the United Nations Environment Programme (UNEP) and reinforced by the 2002 World Summit on Sustainable Development (WSSD). The third pillar puts forward cornerstones of the fisheries management and is represented by Food and Agriculture Organization (FAO) through the 1995 Code of Conduct for responsible Fisheries (Bianchi 2009, FAO 2014a, Sainsbury 2010).

In scrutinizing UNCLOS, it has been apparently built around values of preserving marine resources only to have them exploited in the future (Pirkl 2014). Having said that, it has allowed for the over-exploitation of migratory marine species such as BT, while constantly favouring developed nations over the developing country members (McGuire 2003, 1). The situation in which the developing states find themselves takes its toll on the entire marine ecosystems. Moreover, the developing countries are in general less capable of imposing regulations, hence more valuable to host illegal activities conducted by their own fishing fleets and internationals (FAO 2014a, Phelps Bondaroff et al. 2015). In comparison to UNCLOS, the aforementioned UNFSA allegedly enjoys a significant degree of respect from the member states and have successfully pushed through some sound international principles and standards at the global level. Yet it still suffers from an inability to fully enforce its requirements, partly because of the lack of willingness within the implementing regional bodies – RFMOs (Balton and Koehler 2006, Phelps Bondaroff et al. 2015).

RFMOs officially represent international groupings of countries dedicated to sustainable management of the fishing grounds in a particular area (FAO 2014a). Some RFMOs can as well focus on highly-migratory species such as BT, within a vast geographical range which is the particular case of the International Commission for the Conservation of Atlantic Tunas (ICCAT). As a matter of fact, for the Mediterranean Sea there are only two existing RFMOs with competencies in fisheries management – the aforementioned ICCAT and the General Fisheries Commission for the Mediterranean (GFCM), which is instituted and mandated by FAO to cover the Mediterranean and the Black Sea. Since 1994 both RFMOs have cooperated through implementation of joint GFCM-ICCAT working groups on BT (Camiñas 2009, European Commission 2014). ICCAT and GFCM don't necessarily have to find common grounds in the process of decision making as each regional body adopts its own regulations. GFCM in fact has been carrying out the role of ICCAT towards its members who are but non-members to ICCAT, by propelling them to comply with the BT recovery program (European Commission 2008a). The European Commission also plays an interesting and indeed important role in the BT

fishery management, since it's the very Commission who factually enforces stringent compliance of the members of the EU-27 with the ICCAT provisions. Interestingly, the member states allegedly fears much more the repercussions from the EC, than from ICCAT (European Commission 2008a, Gatt 2015a).

Having briefly scrutinized the above presented legal and institutional setting, we find out that the legal setting covering the world fisheries, has been both on the state level and internationally often complex, opaque and unambiguous, enabling states to smoothly navigate through the soft international treaties (McGuire 2003, 1, Sumaila and Huang 2012). The reason for that could unfortunately be that this was the intention of the architects of this setting. Rendering laws and provisions as blurry as possible and institutions backward and heavy-footed, has looked as if it was actually all part of an agreed-upon scheme flawed with lack of willingness to embark on serious reforms. On this account it reminds rather a set of provisions designed above all to regulate the fishing industry rather than to tackle its misconducts (Balton and Koehler 2006, Cullis-Suzuki and Pauly 2010, Heffernan 2014, Phelps Bondaroff et al. 2015). All this is de facto summarized in Briguglio's (2013, 57) apt description of the Mediterranean BT fishery: "*What exists is a lobbying battlefield characterised by antagonistic discourses, yet hegemonically characterised by neo–liberal ideology and the interests of big–businesses and nation–states.*"

5.2 International Commission for the Conservation of Atlantic Tunas

ICCAT was briefly aforementioned as the chief RFMO in charge of managing BT stocks in the Mediterranean Sea. Reflecting upon its crucial role, this section looks into the structures of this organization more in depth and provides a critical review.

ICCAT was established in 1966 by the International Convention for the Conservation of Atlantic Tunas, what was a multinational agreement promulgated in pursuit of sustainable future for BT. It entered into force three years later with the goal of conserving tunas and tuna-like species in the Atlantic Ocean and adjacent sea. In doing this, it's supposed to strive for maximizing international cooperation (ICCAT 2007, Kato 2011). Apart from a large number of contracting parties (50), each with a variety of different economic and social interests, an important part of ICCAT is made of an independent scientific group called the Standing Committee on Research and Statistics (SCRS). SCRS draws up annual plans recommending the

sustainable level of fishing quotas to the member states.[19] However, the SCRS has only advisory mandate, therefore ICCAT does not necessarily have to take into account its suggestions[20] (Der Werf and Robertsson n.d., 53, ICCAT 2014, Korman 2010).

In administering TAC, ICCAT takes a strategy of 4 different allocation criteria: historical fishing practices, status of the stocks, relative commercial dependence on stocks by local coastal communities and past record of compliance. The relative weighting to each criterion is not determined, but especially the historical criteria giving larger quota to those who previously catch more is much criticized. In addition to that, ICCAT has been long rather incapable, or unwilling, to enforce TAC, which have in most cases yet been designed in a manner not to hurt anyone. For example, even though ICCAT at last to a certain extent abides by the SCRS's recommendations, in 2010 it allowed the real annual catch outstrip official quota three times (Boon 2013, 6-14, Heffernan 2014, Sumaila and Huang 2012).

Notwithstanding, ICCAT stepped up efforts to ensure stringent monitoring and compliance through recent implementation of the Regional Observer Programme (ROP). Accommodated in this is a provision according to which a regional observer must be deployed on every purse sein vessel larger than 24 meters authorized to fish BT; during all transfers of bluefin tuna from purse seiners; during all transfers of bluefin tuna from traps to transport cages; during all transfers from one farm to another; during all cagings of bluefin tuna in farms; and during all harvesting of bluefin tuna from farms.[21] Furthermore, in an attempt to certain decentralization, there is the CPC Observer Programme which requires member states to deploy their own observers on 20% of the longline vessels over 15 metres, pelagic trawlers, baitboats, harvesting operations from traps and importantly, towing vessels (ICCAT 2014a). Regrettably, all information garnered by the observer on-board a vessel is regarded confidential, so that spreading the information about potential misdemeanours among the wide public is improbable (ICIJ 2010, Kraak 2011).

These are however secondary measures, not altering the fundamental character of ICCAT. That the ICCAT's scope of authority is given by the member states renders it a political organisation. On this account it is left to rely on achieving political compromise (Boon 2013, Kato 2011). Additionally, there have been ongoing conflicts between members of ICCAT and non-members,

[19] The latest meeting of SCRS took place between 28 September and 2 October in Madrid.
[20] That ICCAT in past had largely ignored the SCRS recommendations arguably stands behind the current dire state of BT populations.
[21] The cost of such a deployment is fairly high though and it is the fishermen, or farmers respectively, who are to pay. For instance, in October 2015 a Maltese BT farm paid €5,529 for having the observer controlling its operation for 21 days – what constitutes approximately €263 per day (MARC 2015a).

notching large proportion of BT through IUU activities. This is in fact another significant barrier for the TAC system and eventually for ICCAT's effective conservation activities. IUU affects the accuracy of vital information, increases overfishing, and results in a competitive disadvantage to those members of ICCAT who follow the rules. Therefore, regulation will continue at a disadvantage, as ICCAT cannot force its proposed measures on non-member states otherwise than through trade sanctions (Kato 2011, 158, Sumaila and Huang 2012).

In fact, even the severity of sanctions imposed on the member parties is questionable. All the possible disciplinary measures the ICCAT is endowed to employ are restrained by the law, which does not count the fishing crimes as criminal cases. The organization therefore can only levy fines, seize illegal fishing gear and catches, sequestrate incriminate vessels, suspend or withdraw authorization to fish, and reduce or withdraw the fishing quota. In reality, however, it rarely resorts to punishments harder than slight decreasing TAC or releases tunas from ranches (ICCAT 2014a, Korman 2010, 713).

5.3 Defective economic incentives and mechanisms

According to several authors (Boon 2013, Hanoteau 2012, McGuire 2003), the issue of overfishing arises from a bad specification of the property rights to fish stocks, when particularly the institutions charged with managing highly migratory species have not yet developed systems to equitably and efficiently allocate these rights. In fact, the question how to approach common fishing grounds equitably has troubled economists for decades. The most prevalent and most favoured by governments have been the system of allocating catch quotas. But this has turned disastrous, as quotas have often ignored scientific evidence on sustainability and with regard to other species than BT, they have often led to massive bycatch and discard (Booker 2007, Heffernan 2014)

Among the single most deleterious economic incentives is **subsidization**. Subsidies have been often looked upon as a universal remedy to any biological or economic crisis in a fishery. They have served to increase employment or support local communities (Hilborn 2007). Taking place mostly in developed world, subsidies contribute to increment of the global fishing fleet already three times larger than sustainable (WWF, 2015). This economic measure is ordinarily applied in several ways[22], though most commonly through direct government contributions to the industry via modernization of fleets, subsidizing fuels and buying out unsold catch (Phelps Bondaroff et al. 2015).

[22] Among the other mechanisms are tax renunciations and deferrals, government loans and insurances.

Between 2000 and 2008 the EU earmarked through the Financial Instrument for Fisheries Guidance (FIFG) €35 billion to serve as public subsidies. In fact, the majority of this sum was ultimately used to increase fishing effort, as estimated 60% (€18.9 billion) of the volume poured into the fishing sector to enhance its capacity. This represents a sticking point, because the European fleets are already heavily oversized, compared to the dwindling fish stocks of BT in particular. In fact, it was the EU subsidies having driven mechanisation of BT fishery via purse seine capture techniques and ranching, when from 2000 to 2008 the EU invested €33.5 to modernization of BT vessels. Furthermore, subsidies trigger a vicious circle, for those subsidized fishermen who receive a loan or a subsidy, then usually buy a bigger, more expensive vessel which ultimately has to be repaid by even more intensive fishing efforts. What more, the older vessels often are not decommissioned as they are supposed to, for scraped is only the licence. Hence, these vessels can still be used to catch, even without quota (Garcia Rey 2010, Heffernan 2014, Longo 2011, Pauly et al. 2002, Phelps Bondaroff et al. 2015, Sumaila and Huang 2012, The Pew Charitable Trust 2012).

5.4 Bycatch and unsustainable waste management

In general, there are two main reasons for bycatch to occur – economic and legal. The former entails two more sub-reasons. The first follows that the market values of non-targeted species is too low to get on board, thus the fishermen prefer to use the vessel's available space for more precious fish. This is obviously not very often the case of BT. The second, so called high grading[23], already can well involve BT, but arguably as a reason for discarding other species because of the high value of BT (Kristofferson and Rickertsen 2005). Speaking about the legal reasoning, it simply accounts for a ban on catching the non-target species, as they may be subject to quotas or catch restrictions. Pitifully, this again leads to wasting of fish (European Commission 2007).

Bycatch denotes one of the most serious problems of all fisheries. This is in large part because it brings about discarding, hence massive wasting and ecologic hazard. Among the bycatch are often juvenile fish, the majority of whom being tossed back to the sea where subsequently succumb to sustained injuries. In certain fisheries bycatch accounts for up to 60% of the total catch. There's an ecological concern that fishing for tuna causes bycatch of excessive numbers of top predators, while there has been a danger of underestimating the cumulative effects of relatively little by-catch within the BT fisheries (Cotter 2010, European Commission 2007).

[23] High grading stands for sorting out more valuable fish out of the less precious which are then to be thrown overboard.

Although BT itself usually is a targeted species, it may become bycatch when caught off season or sometimes by pelagic longline fleets in the swordfish and other tuna fisheries during the designated BT fishing season (ICCAT 2015b, 8). The possibility of BT bycatch occurring outside designating season, however, isn't likely for the fishing seasons match up with times when BT migrate into the Mediterranean to spawn. There's another scenario though. Despite the ICCAT quota, the fishermen may also feel incentive to smuggle the catch, hence the danger of non-controlled bycatch. Nonetheless, on the whole, there's arguably much bigger problem embedded in bycatch of unwanted species when fishing for BT.

Clearly, when a BT is caught it is highly unlikely, if it ever happened at all, that it be discarded. If this happens under circumstances, when BT was not a targeted species it is still subject of ICCAT quota scheme, thus the vessel must be in possession of authorization to keep the fish (ICCAT 2014a, MARC 2015). But when looking into the whole production chain of the tuna fishing industry, the final phase, discarding the fish leftovers, has been quite missed out. In fact, the industry still produces a large amount of waste. In the tuna filleting and loin industry the product yields about 30-50 percent. Correspondingly, global production of tuna species was 4.76 million tonnes live weight in 2011 out of which just 2 million tonnes was processed into cans. Solid wastes such as heads, bones, viscera, gills, dark muscle, belly flaps and skin put aside by the tuna canning industry could be as high as 65 percent of the original material (FAO 2014a).

Figure 9. BT meat freshly processed on a processing vessel at one of the Maltese BT farms (credit: Mark Gatt).

6 Environmental ethics

Environmental ethics is hereby entrusted to help determine the magnitude of potential impacts the following suggested measures could bring about. Any time the term is employed, it is in an endeavour to conform with its core principles, avoiding resorting to simplistic or perhaps even naïve judgements. The ultimate reason for utilizing the concept is rather to construct certain moral ambience within which all the future steps towards healthy marine environment and drastically reduced fishing for BT should be undertaken. For this end, there is a need to accentuate importance of values, which so far have been largely omitted by fact-dependent experts. Having said that, positioning of this section prior to the proposed measures is to ensure that the measures are comprehended in a rather non-conventional way so that the still prevailing paradigm of understanding BT only as a commodity can be better recognized and measures to reverse this trend adopted.

Environmental ethics evolved approximately 40 years ago with an ever more apparent global ecological crises. It happened as a response to prevailing anthropocentrism - unjustified privileging of human beings at the expense of other forms of life. Although, ironically, it is probably only humans who is naturally privileged by the very ability of critical moral thinking (Blewitt 2008, Curry 2011). Environmental ethics comes with a response to this fact by insisting there is no superiority following from this human uniqueness. It further strives to answer the question how to treat the natural world ethically, hence loving and respecting it for its own sake. As the point of departure to achieve this is seen by Leopold (1995) a necessity to honour the natural world. On that account, ethical thinkers have responded by formulating a concept of intrinsic values of nature. It further pinpoints a need to put an end to disenchanting the natural world, where the natural ecosystems are no more perceived sacred (Curry 2011, 54, Daněk 2015). A vital step towards this, particularly in the context of the fishing industry would be to root out the current trend of commodification of fish.

Curry (2011, 61-126) further classifies ethics (in his interpretation ecological ethics) into three levels on the coloured scale, ranging from light green indicating the most anthropocentric, hence human-oriented ethics, through mid-green to deep green ethics. **Light green ethics** is the least ecological ethic out of the three and also the prevailing one. Light green ethics defines an environmental problem as the one that poses difficulties for humans, regardless of its effects on the rest of nature. It adheres to a belief that all animals put their own survival first, and humans should do the same by a factual takeover of evolution. The current management of BT populations could in fact be well classified as a product of light green ethics. **Mid-green ethics** hasn't got stuck to valuing humans only, though it doesn't extend all the way to ecosystems. It

already dares to morally consider animals, assigning them independent moral status and corresponding protection for their own sakes.

Dark green ethics is the closest to the natural world philosophers have been able to get. It is built upon so called virtue ethics which is seen by Curry as something close to wisdom and to understanding what is good. This ability is fundamental and indicates good character (Van den Berg 2012). Embedded in this movement, nature has an intrinsic value, which may, in specific instances, predominate over the human value. But what is actually meant by the intrinsic value of nature? Naess and Sessions (1984, 3) assign it a merit of well-being and flourishing of human and nonhuman life on earth. In their views, such flourishing is to a considerable extent contingent on richness and diversity of life forms. Leopold (1995, 242) as well saw integrity, stability and beauty of the biotic community as features of an utmost value. This is however not to say that the dark green ethics discredits traditional human-centred ethics, which is still important within the boundaries of human-human interactions. It is intended rather to inspire ethical behaviour that cannot be induced by more traditional anthropocentric thinking (Curry 2011, 7).

It is a widely recognized fact (Curry 2011, Leopold, 1995, Singer 1995), that such profound ethical beliefs and views only matter insofar as they are elevated into **ethical practice**. How could this possibly work and how can we determine whether something is ethically right or wrong? Singer (1995, 205-207) opines that to act ethically entails the ability to consider implications of actions beyond one's own interest, while living with a broad perspective encompassing the whole world. Having said that, he advocates for a willingness to imagine in the situations of those affected by our actions. Along these lines goes a rather convincing method how to acquire the capability of comprehensive ethical thinking. Through so called universal subjectivism we are encouraged to imagine ourselves into the worst possible live scenarios of people or animals and based on that we can establish more favourable conditions in the real world (Van den Berg 2011, 3, 2013)[24].

Within the scope of this study, that less fortunate living being obviously is Bluefin tuna. Therefore, in the light of the above said, the proposed measures and indeed the whole rest of the study should therefore be looked upon critically and thought through more thoroughly with the core ethical principals in mind. After all, as Derek Parfit (Parfit 1984 in Singer 1995, 18) puts it: "*…since we cannot know how Ethics will develop, it is not irrational to have high hopes*".

[24] This method will be elaborated in depth in the section 8.2.1.

7 Universally proposed solutions

This section provides an enumeration, although probably not complete, of the most frequently accentuated proposals or already pursued measures to address the flaws in the Mediterranean BT fishery. At the beginning, the ecosystem approach to fisheries (EAF) theme serves as a connecting line enabling to move smoothly from the ethical contemplation to real world of fisheries.

7.1 Ecosystem approach to fisheries

The concept of the ecosystem approach to fisheries has been ever more frequently articulated by fisheries management organizations and environmental agencies, and by key international agreements since 1990s. Yet there has persisted a widespread confusion or misunderstanding what actually is behind the concept (Bianchi 2009, FAO 2015). The official FAO definition goes as follows:

"An ecosystem approach to fisheries strives to balance diverse societal objectives, by taking into account the knowledge and uncertainties about biotic, abiotic and human components of ecosystems and their interactions and applying an integrated approach to fisheries within ecologically meaningful boundaries."

The important milestones for the EAF was the 2001 Reykjavik Declaration on Responsible Fisheries in the Marine Ecosystem and the 2006 Bergen Conference on Implementing the Ecosystem Approach to Fisheries. The aims of the conference were to review the main features of the concept so that the best possible strategies and practices could then be identified. In Bergen, scientists, fisheries management and conservation practitioners, fishery industry representatives, non-governmental organizations and other interested parties came to reformulate the concept once more. The outcome is that the EAF is *an integrated approach employed to manage marine space and thus fisheries in a manner that addresses the needs of present generations of humans without jeopardizing the food security of future generations provided by aquatic ecosystems*. In order to achieve this, it is set to incorporate the concept of sustainable development into the fishing sector so that both human and ecological well-being is ensured. Therefore, this entails adopting measures such as quantification and minimization of bycatch, bottom trawling closures, or designations marine protected areas. This should ensure the odds are enhanced for fisheries to be better able to provide food and livelihoods to humans (Bianchi 2009, Bianchi et al. 2006, CIEAF 2006, FAO 2015).

Notwithstanding the definitions above, there exists no universal scheme how to approach EAF. On the contrary, it has to be tailor-made to every specific locality with its particular ecological, social and cultural conditions (Bianchi 2009). Australia constitutes an example what a form the EAF can take on the ground, for it has been one of the forerunners in the development and implementation of the EAF. Australia has defined and implemented harvest strategies both for target and bycatch species on the basis of ecological risk assessments accompanied by large scale spatial management. Among other sort of a pioneering countries in terms of applying the EAF has been Norway and Canada, the latter adopting the approach already in 1997 (Bianchi 2009, Snelgrove and Koebberling 2011). Recently, there has been presented a proposal to take on the EAF by the SCRS at its latest meeting in Madrid. The Subcommittee on Ecosystems brought up a framework consisting of four ecological dimensions – supporting essential habitats of targeted species, minimizing the bycatch of non-targeted species, maintaining the trophic interdependencies, and sustainable catch of targeted species (Olsen 2011, Jordá et al. 2015).

As for the BT fishery, there is a need to focus on a prey that BT eats and the natural enemies it is facing in order to maintain the trophic interdependence. FAO has promoted such a management strategy aiming at distributing fishing pressure (mortality) across all trophic levels labelling it a 'balanced harvest' (FAO 2014a). Apart from that, it is necessary to avoid so called 'fishery-induced evolution', taking place when fish get gradually adapted to fishing pressure by maturing earlier. This doesn't escape without serious biological repercussions as fish that are forced to reproduce early in life often do so less successfully and at the expense of becoming less well adapted to their natural environment (Dieckmann et al. 2009). Lifting of pressure on BT stocks in terms of vigorous reduction of fishing activity thus appears as a fundamental prerequisite which has to be included in the EAF framework.

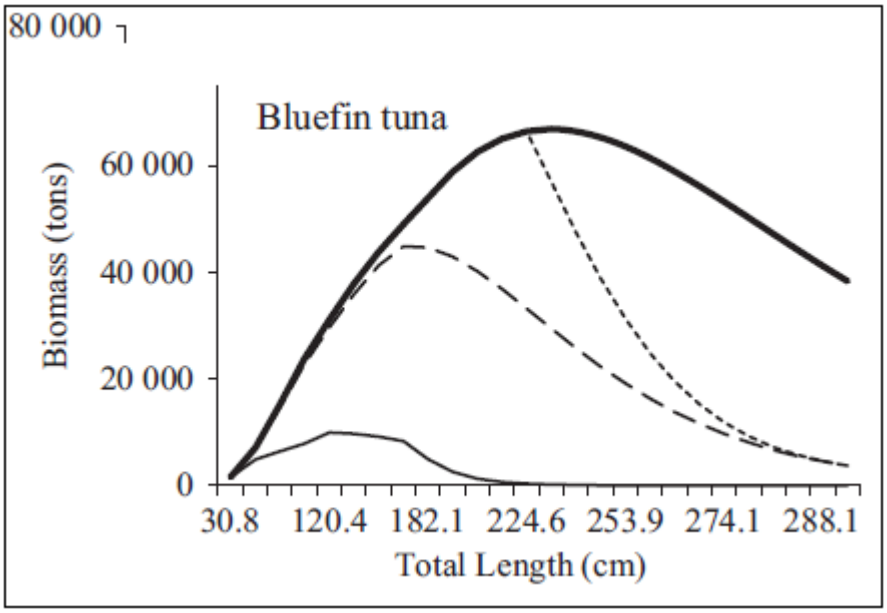

Chart 3. Cohort biomass against mean length at age with three exploitation-rate scenarios - no-exploitation (indicated by bold line), exploitation at MSY rate (dashed line), exploitation at optimal fish length (dotted line) and current exploitation pattern (thin line). Based on a selection of Mediterranean exploited stocks (Colloca et al. 2013).

In putting forward a design model of the EAF, FAO (2014a) advocates for addressing the issue of the stock assessment. Along these lines, the opening part of the following section concerns this very aspect.

7.2 Improved stock assessment and control

In order to garner the knowledge base for managing ecosystem impacts of BT fishing, a set of technological tools might be instrumental. Under current paradigm of industrial fishing, the merit of new technological innovations should not be neglected. New technology represents a potential weapon to combat IUU fishing, but at the same time it allows for surveying of spawning areas. For the purpose of rendering the former, e.g. remote-controlled aerial drones have been deployed, while aerial means are also utilized for the latter. Investigating spawning areas has been conducted in the Mediterranean since 2010 and thus represents one of the most abundant sources of knowledge on spawning biomass (Carruthers et al. 2015, Phelps Bondaroff et al. 2015). These activities, however, must be carried out with caution in order to prevent its misuse by the IUU fishermen who would seek out this information to exploit the fish stocks (Druon 2010). At the same time, the very asset of surveying spawning areas is problematic.

ICCAT fiercely promotes and justifies scientific[25] means of gathering knowledge on BT as a way how to ensure its long-term sustainable exploitation (ICCAT, 2015b, SCRS, 2015). Reflecting on ethical line, it is quite fitting to annotate this endeavour or perhaps even oppose by words of Curry (2011, 27): *"(techno-science)… cannot supply answers to the kinds of question that most urgently need asking, questions of meaning, value and justice, in short: of ethics."* Alternatively, as Weston (2004) puts it: „*We cannot have an adequate idea of another being until we already have approached them ethically".* Nevertheless, Leopold (1995, 244) much earlier brought about an interesting point by reasoning that: *"We can be ethical only in relation to something we can see, feel,* ***understand****, love, or otherwise have faith in."*. Accenting the need to understand, the new technology might perhaps be helpful after all (Blewitt 2008, 48). Thus, to what extent has ICCAT been successful in deepening and dissemination of knowledge on BT?

ICCAT¨s endeavour to identify feeding and spawning habitats in fact constitutes only a part of the process of advancing the knowledge on BT which is still very limited due to extremely complex and sophisticated behaviour of the fish (Di Natale et al. 2015). On that account, biologists hired by ICCAT have strived to dig out more information and thus embarked on BT tagging and biological sampling. Whereas the sampling activities were launched in 2011 and so far have resulted in 8,090 sampled fish (what inherently entails killing the fish), implementation of the former has been conducted in slower pace when fish have been tagged individually by divers. Apart from almost eighty one hundred dead BT, the provisional results of the biological samplings are that genetic analyses confirmed clear genetic difference between the western ABT (BTW) and the eastern ABT (BTE), while there is a considerable mix of these two (SCRS 2015, Addis et al. 2015).

The tagging strategy could bring about benefits by helping to construct a clearer picture where in the Mediterranean is a need to establish restricted fishing grounds. Importantly, without the need to kill the fish (Druoun 2010). Having said that, the fishermen have largely feared the actual results of scientific discoveries could bring about consequences they would find hard to cope with (European Commission 2008a). Nevertheless, there is no reference to be found in the ICCAT strategy on utilizing research for purposes of establishing marine reserves. All in all, these surveys have so far resulted only in confirmation the already described main spawning areas and perhaps adding even more uncertainty (by a revelation that migrations of BT can be to various degrees modified from year to year) (Di Natale et al. 2015). These findings point to an interim conclusion that despite the aforementioned attempts, there is still a poor knowledge on BT.

[25] Incidentally, Biermann et al. (2009, 70) warn that science is inherently bound to politics.

7.2.1 Electronic Bluefin Tuna Catch Documentation system

In a bid to strengthen its monitoring and control apparat, ICCAT has recently launched the ROP, which was then further equipped by the **Electronic Bluefin Tuna Catch Documentation system (BCD).** The BCD has been set up in an effort to track and document the catch of tuna from fishing nets through the fattening farms and harvest, to market (European Commission 2011, ICCAT 2012, ICCAT 2014a) and was instituted on the grounds of failure of the previous paper system (Sumaila and Huang 2012, The Pew Charitable Trust 2011). Yet, although are the ICCAT observers supposed to serve as collectors of verifiable data for BCD, their monitoring capacity is largely confined by poor technological equipment. In fact, in estimating the volume of BT, they hinges on a common conventional camera (Walker Guevara et al. 2010).

But this situation lasted until recently for the whole processing chain – from the point BT were netted, through the transfer caging to the destined farming cage – the amounts of all catches were based only on eye- or conventional camera-based estimations of the fishermen, regional observers and farmers. Therefore, in order to streamline the BCD, there has been an urgent need for improvements in underwater observations of the size and numbers of BT (European Commission 2011, ICCAT 2014b).

This has been achieved by development of the stereoscopic camera. It is, however, only the fisheries officers of a state where the particular farm is being operated, who possess the camera. The significant factor contributing to this is simply the very high cost of the camera[26]. As a consequence, the technological incompetence of the regional observer is reflected in certain lack of respect from the fishermen and the flag states (Gatt 2015a). Nevertheless, with the accession of the stereoscopic camera, there has been much enhanced effectiveness and potential of the whole BCD, for it can now process more accurate records of farms input.

Therefore, to describe the current BCD in operation, firstly a rough estimation is made by the fishermen. At the same time the regional observer on-board issues his own estimation based on the use of a conventional underwater camera. He doesn't necessarily have to agree with the fishermen's estimates as he may or may not sign the consequent transfer of fish to tug boat. In fact, his decision entails no far-reaching consequences as the fish are going to be transferred anyway. This is because for the fishermen and the master of the tugboat it is crucial only to

[26] Approximately €50,000 for the complete camera system (Gatt 2015a).

receive authorization from the flag state[27]. The flag state then drafts the first provisional version of the BCD (Gatt 2015a, ICCAT 2014a)

It is important to note that the fish are commonly handled by several tug boats prior even reaching the farm, for there are often transfers of the whole catch or part of it among tug boats. Notwithstanding, later, during the transfer of fish from the tugboat to a farm, there is made another estimation of the fish employing the stereoscopic camera. As already noted, this is usually done by the governmental fishery officers of the country where the farms are operated. After gathering this data, it goes back to the flag state which has to amend the initial fishermen's data in the provisional BCD accordingly. However, the whole operation can get even more complicated when BT are further moved from one farm to another (in another state), or from one cage to another within the same farm. Yet, the tracking doesn't end here. A whole new cycle begins when BT are farmed, fed and then eventually harvested. At the harvest it is actually the first time when estimations are replaced by recordings of concrete data, since each BT is finally weighted and counted. Eventually, as aforementioned, the BCD covers also the eventual destination of the fish at the market (Gatt 2015a).

[27] The state where the vessel is registered.

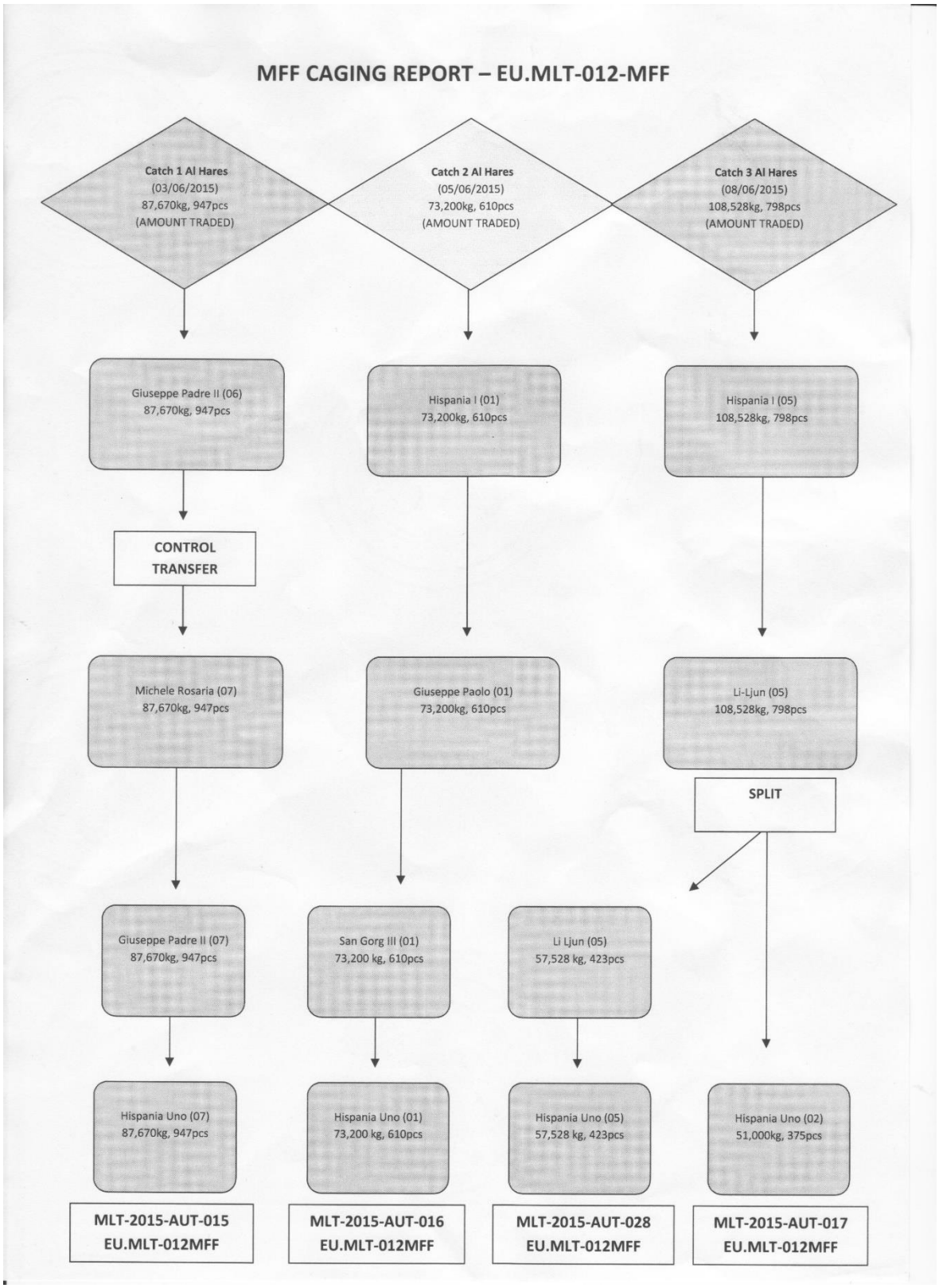

Chart 4. The diagram depicts how three different catches of one vessel (registered in Libya) were handled before finally reached four various cages belonging to the Maltese farming company Fish and Fish (MFF). As indicated, every batch of live BT was handed over three times (MARC 2015).

To conclude, the regional observer as a harvester of important data for the BCD, has not enjoyed much authority, nor equipment. The rather high cost of her/his deployment thus inevitably questions efficiency of the very ROP. On the other hand, a good reason for employing the regional observer is that ICCAT gets represented in situ, hence can restrain illegal activities, should there be no corruption in place. Efficacy of BCD could be improved by the introduction of the stereoscopic camera, however, it isn't perfectly accurate. Also, the complicated and bureaucratic process of generating the BCD is inherently susceptible to wheeling and dealing.

7.2.2 Streamlining the control agencies

The largest and most prominent agency responsible for the conservation of tunas and tuna-like species is ICCAT, thus it is this organization which has to be redesigned first. Paradoxically, perhaps the weakest point in the ICCAT's management of BT populations are the member states. Their past failure to comply with already excessively high quota is a strong evidence, not to speak about usual falling short of submitting required data. Having said that, also the system of redistributing quota has been defective. In this light, the way TAC are generated and allocated must be transparent, so that it's perceived fair by its members. Stemming from this is urgency to abandon historical catch as a criteria for TAC allocation. Instead, one of potential alternative mechanisms could be auctioning quota by ICCAT - the price would represent the actual cost of fishing and governments and conservationists would be able to get involved and restrict capacity. In so doing, ICCAT would raise its budget (Boon 2013, FAO 2012, Korman 2010).

The current attitude the members hold towards ICCAT has to change fundamentally. The crucial prerequisite to bring about this is in fact what ICCAT has so far missed – political will (Boon 2013). In author's opinion, the member states should allow for establishing an independent executive committee to pass on decisive mandate and power. The board would be comprised of a given number of experts on the problem of BT fishery drafted from the ranks of fishermen, scientists, and economists. Importantly, the organization must be *apoliticized*. Only then issues such as enforcement of adherence to rules can be resolved.

The European Fisheries Control Agency (EFCA) could be supportive to this task. The EFCA was constituted by the European Commission in 2005 as a controlling mechanism set to impose restrictions to free exploitation of BT in the Mediterranean. The concrete presumption of its foundation was to coordinate fisheries control and inspection activities by the Member States of EU, adhering to regional Joint Deployment Plans (JDPs) (EFCA 2014, EFCA 2015, European Commission 2008a). In 2014, the EFCA established the Specific Control and Inspection

Programme (SCIP) in an endeavour to impose stricter controls on the BT fishery. The important part of its agenda resides in deploying inspectors to conduct checks during the crucial time, when fish are transferred from cages to farms (European Commission 2015).

To monitor catches continuously, the EFCA utilizes satellite-based control system – Vessel Monitoring System (VMS)[28]. In fact, ICCAT has made a contribution to establishment of such a scheme when its member states agreed that fishing vessels longer than 24 metres will be required to transmit location data to any ICCAT coastal state when fishing in its waters (European Commission 2015, The Pew Charitable Trust 2014).

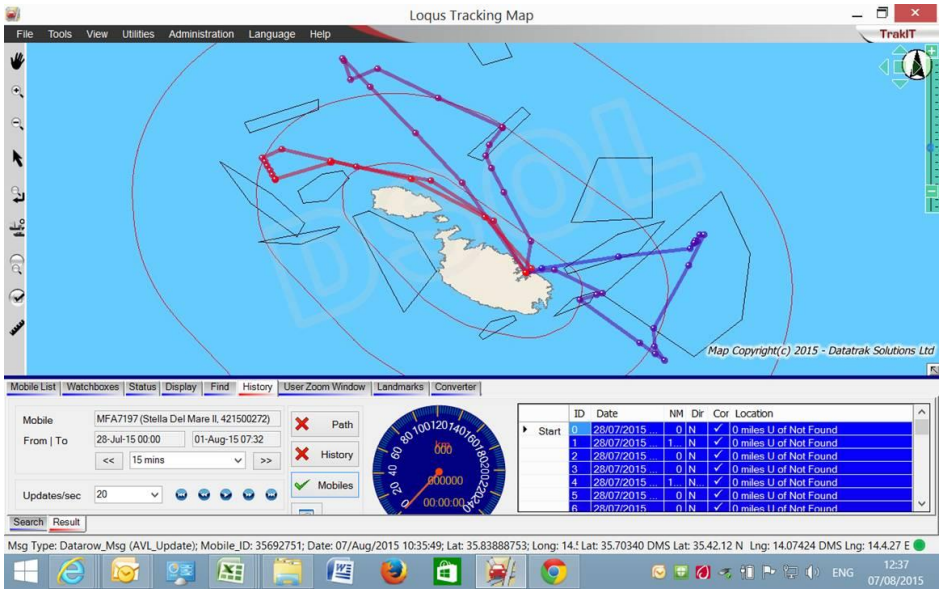

Chart 5. The Vessel Monitoring System in practice (from author's archive).

In addition to that, in 2014, the EFCA issued data monitoring systems such as the Electronic Reporting System (ERS) and consequently the Electronic Inspection Report (EIR) system. Utilizing gained information, the EFCA's inspectors conducted at the same year roughly 500 inspections based on the sea and land, focusing on the market, transport and also farms and traps. Out of those 500 inspections, there were revealed 79 infringements, the ratio for an offence by inspection was thus more than 16%. This is in fact ten percent more than a year before. Nevertheless, quite strikingly, no violations were found on the farms, market or during the transportation (EFCA 2014). The question could thus arise; Are the inspections rigorous enough and is the number of conducted inspections sufficient?

[28] VMS makes use of satellites to transmit information on the vessel's location in order to improve monitoring, control, and surveillance efforts.

On the whole, to render the EFCA more powerful and effective in its mission, it is requisite to establish clear goals and responsibilities, while opening wider to general public. The scope of EFCA's authorisation has in fact been rather unknown to stakeholders, perhaps due to the insufficient structural platform[29] implying the capacity has to be built up (CFCA 2012). It is also imperative that EFCA reinforces communication and coordination channels between ICCAT, the member states and the GFCM.

7.2.3 Engagement of alternative watchdogs

As a reaction to the weaknesses inherently embedded within the international fishing control agencies, NGOs such as a US non-profit organization Pew Charitable Trust work on developing alternative control systems. One of them, the Virtual Watch Room (VWR), is the most recent of so called Life Satellite Systems. The VWR was launched earlier this year with the aim to monitor, detect, and respond to illegal fishing activity. This is planned to come into being by analysing several sources of tracking data which are to be supplemented by concrete information on the flag state and history of a particular vessel. In so doing, authorities should be able to track unauthorized vessels and generate sharable information applicable to press legal charges against the perpetuators (The Pew Charitable Trust 2015b).

Another satellite tracking system, the Global Fishing Watch (GFW), was launched a year earlier by a coalition composed of Google and two non-profit environmental organizations, Oceana and SkyTruth. Oceana is one of the biggest organizations focusing on problems of oceans. Its goal is to raise awareness on these issues by conducting "specific, science-based campaigns". The SkyTruth is a much smaller group concerned with analysing images and data in order to provide scientifically credible information to wider public. With the support of the global internet giant - Google, they have developed and started operation of the GFW based on the Automatic Identification System (AIS), which utilizes tracking data to visualize global fishing activities by determining the speed and whereabouts of a vessel and communicating this information to other fleets (Oceana 2015, Phelps Bondaroff et al. 2015, SkyTruth, 2012).

As a matter of fact, the above-mentioned campaigns were all preceded and perhaps inspired by Windward, a data analysing company which in 2010 seized then blank spot in the sector of data processing. In so doing, it has been unveiling the commodity trade flows to highlight the world trading patterns. Importantly, it has been investigating incidents when the fishermen manipulate with the global positioning system (GPS) and tracked cases of identity fraud,

[29] The CFCA staff accounts for just around 50 employees (CFCA 2012).

obscuring destinations, turning off AIS, and GPS manipulation (Phelps Bondaroff et al. 2015, WINDWARD 2015).

A rather unique approach has been taken on by two international non-profit organizations - Greenpeace and Sea Shepherd. The latter exclusively devoted itself to safeguarding marine wildlife, while the former's quest against overfishing is one among an array of other missions. When it comes to BT, both groups were in fact most active in 2010, launching its vessels to a battle against illegal fishing and penning of BT in the Mediterranean. Greenpeace sent out two of its ships, Arctic Sunrise and Rainbow Warrior, while Sea Shepherd dispatched its flagship vessel Steve Irwin. Coincidently, both crusades met together in Libyan waters, where both were attacked. Steve Irwin found itself in a particular danger, when assaulted at one moment by three vessels (Libyan and Italian) operating pens illegally off designated season. Sea Shepherd yet managed to free 800 illegally retained BT and consequently won a law suit brought against it by the Maltese second largest farming company Fish and Fish, the recipient of the fish (Sea Shepherd 2010, 2010b, Greenpeace 2010).

7.3 Economic incentives and measures

According to an array of experts, politics has gotten ever so slightly dominated by economics[30] as the status and power of states has been diminishing gradually to the benefit of free trade actors (Carter 2015, Singer 1995, The Economist 2015a, Weyland 2004). This has in fact restricted states' abilities to employ the trade to protect endangered species such as BT. There is, however, still a common believe that trade must be part of the long-term solution with the economy being looked upon as one of the sub-systems of the biosphere (Boon 2013, Korman 2010, Tietenberg 1998, Singer 1995).

In general terms, the idea that overfishing of BT could be tackled through monetary instruments (Chichilniski 2015, Hanoteau 2012, Tietenberg, 1998) is still often promoted. The rationale is that when incomes suffer, further conservation measures become more difficult to implement, and incentives to violate the regulations are intensified. Either way, achieving an ultimate collapse of the species brings no potential for financial gain whatsoever (Kato 2011, 185). What are then some prospective economic incentives to secure the future of BT?

[30] The already noted politicizing fisheries is thus directed by business.

7.3.1 Subsidies reduction

There is a multitude of substantial proves that financial subsidies can have very harmful effects on its recipients. This co-financing in effect often creates additional mandatory costs and deforms rational economic decision-making. They also distort market prices depreciating the information attached to a commodity (Kohout 2015). It is clear then, that utilizing subsidies must be subject to rethinking.

In fact, the impact of harmful economic subsidies has been highlighted for years. At the 2002 World Summit on Sustainable Development in Johannesburg, the need to eradicate disruptive subsidies flowing into fishing sectors was recognized as one of the crucial steps to maintain healthy marine environment. Later, this topic was elevated to become a tricky agenda at the round table of the World Trade Organization (WTO). WTO has been working towards a binding international law to get rid of the most deleterious forms of fishery subsidies while allowing for continuation those designed for sustainable ends (Sumaila 2012, WWF 2011a).

However, the remit to revise subsidies on the national level should be left down to states. Indeed Sumaila (2012) holds that favourable subsidies should be negotiated on a corresponding level, meaning that the recent quest for finding a universal solution needs to be changed by splitting the debate into domestic and international domain. On the international level, it is admittedly a thorny way towards reaching an agreement. But the same author entrusts this to hands of WTO.

Individual states should in turn expand capacities of subsidies by diverting them to more constructive, sustainable uses. This entails generating financial aid to improve monitoring capacity, data collection, enforcement, reducing fishing capacity, and efforts to minimise bycatch. Moreover, further investment should land onto the fishing communities to help fishermen to pull off successful transition to more sustainable livelihoods by providing them with better education and enhancing their skills. Finally, an alternative way how to transform subsidies into a bold financial instrument is through initiatives such as “fishing for plastic”[31] (Global Ocean Commission 2013, Sumaila 2012, WWF 2011a).

7.3.2 Individual transferrable quota system

A potential economic mechanism resolving how to divide the already reduced shares between the fishermen is Individual Transferable Quotas (ITQs). Some economists (Chichilniski 2015,

[31] An initiative providing fishermen with incentives to clean the ocean rather than exploit its resources.

Hanoteau 2012, Hilborn 2007, Tietenberg 1998, 339) have long advocated to redistribute the (ideally already reduced) quotas among the stakeholders. On these grounds, the ultimate goal of economy is, in their opinion, the effective trade and to achieve this it is necessary to establish private property, thus divide the portion of natural wealth into private hands.

In the present, TAC is determined annually by the governments which can adjust it based on the latest developments of the stock. In effect it generally represents a sea alternative to the emission trading scheme, sort of an open cap-and-trade system with no barriers to entry, by issuing de facto property rights to exploit common natural commodity (Chichilnisky 2015, Korman 2010, Tietenberg 1998, 350).

The system of ITQs allows the fishermen to keep the rent for themselves, however, the scheme encompasses only the current generations of the fishermen, while the future generations have to pay for entering the system, be it through the tax system or by purchasing the quotas (Tietenberg 1998, 340). Importantly, the value of all granted ITQs should be equal to the expected earnings generated by the fishery. However, this system relies on an eligible, respected and accountable regulator (perhaps the government) which must impose control over the resource rent and consequently justly redistribute it to various stakeholders (Hanoteau 2012).

Initially, the fishermen are expected to bear the burden of the ecological reform as there might be losses of jobs and profits. Nevertheless, an adjustment to the mode of quotas allocation could be designed in order to offset the negative economic impacts on the fishermen and thus enhance the odds for this policy (Hanoteau, 2012). In fact, an illustrative case of such an initiative dates back to 1980s, when the government of New Zealand[32] brought forth an idea which offered a leeway to the fishermen who did not want to take part of a new scheme. In so doing, it offered those leaving the industry buy-backs of catch quotas (financed out of general revenues, subsequently by a fee on catch quotas) and then giving those fishermen an allowance to start off a new business. In the meanwhile, those who agreed to quit fishing, but opted to remain in the business, later appreciated that when the fish populations recovered and their profits increased once again (Tietenberg 1998, 342). Pitifully, there are only few examples of successful ITQ implementations, out of whom a majority has taken place in national fisheries like in New Zealand (Korman 2010).

[32] Among other countries applying this mechanism have been Iceland, Australia, Canada, USA (Hilborn 2007).

Indeed, in case there's need for an international redistribution of a common pool, it has been tough a proposition to solve. Indeed, the contemporary framework for allocation quotas in the BT industry which is still asserted by ICCAT, has quite uneven impacts on different parties. This is grounded on the already mentioned ICCAT's allocation criteria being largely derived from historical catches. Hence, a country which has been enjoying high quotas will almost certainly receive such quotas into the future and the other way around. This poses a precedent which could spur further wave of ignorance towards international regulations from the side of various vessels as they might not see any reasonable stimulus to enter such a biased and narrow-minded regime (Boon 2013, 14, Busuttil 2009).

There's also a downside to the transferability itself for it is inherently prone to play in favour of larger fishery companies. Indeed, there is a considerable probability that the quotas will end-up at the minority of the wealthy fishermen who will obtain a permanent, almost unrestricted access to the fish[33]. With the possession of quotas concentrated within a small group of the strongest, there is a great chance that a lot of smaller fishermen would go belly up due to induced job losses. Hence, the transferable quota system may lead to considerable social and ethical problems (Busuttil 2009, 127, Hilborn 2007, WWF 2008). In response to this, Korman (2010) comes with a proposal, putting forward a negative-externality-producing open system. This would encompass a low barrier to entry allowing for entrants to easily bid for the right not to utilize that resource, allowing a party to purchase another's right to fish to prevent harmful fishing. When tailor-made to accommodate needs of both marine ecosystems and artisanal fishermen, it might be an eligible system worth trying.

7.3.3 Dedicated access privilege programme

This scheme allows smaller fisheries to be privately held. Application is however confined to not very mobile fish or to the species which instinctively return to the place of birth to spawn, the latter fitting to BT. Along these lines, the owner is incentivized to invest in the resources in order to establish conditions allowing for increasing the productivity of the fishery (Tietenberg 1998, 332). The core reason for giving out a stake in a common resource to private hands is to ensure more responsible behaviour based on changing objectives from maximizing cash flow to a concentration on asset value. This is also aligned with the sense of immediate responsibility for the stock and correspondingly, it should ensure long-term and secured tenure (FAO 2014a, Hilborn 2007).

[33] This is in fact illustrated in the section 3.2 on the example of illegal quota trading between Algeria and Turkey, the latter being already one of the most prominent BT fishing entities in the Mediterranean.

Such a concept is in actual fact nothing new, since there has long existed a traditional ownership of orally designated plots of reefs and sea within the communities in Pacific islands (Akimichi 1984).

7.3.4 Eliminate bycatch, discarding and wasting

There has been an array of technological innovations encouraged by NGOs (particularly by the WWF), and scientists primarily focusing on mastering gears selectivity. In the event of using nets, the most obvious solution is to adjust the mesh size to render it adequately large to avoid entangling of juvenile species (European Commission 2007, WWF 2011).

ICCAT has been very active when it comes to implementing measures curbing bycatch of long liners. In 2013, a seabird bycatch mitigation regulation was introduced stimulating the fishermen to start employing an array of innovative gear designs such as tori lines[34], dyed bait, bird curtain, bait robot setting, weighted blanch lines, and night setting with light management, what resulted in reducing bird bycatch to near zero (Inoue et al. 2015). Furthermore, recently, a new wave of using circle hooks instead of traditional long-line hooks supported by WWF (2015) has brought about positive outcomes in 80% decrease of turtles' bycatch. Nevertheless, there is still a need for improvements in bycatch of sting rays and sharks. Although ICCAT has conducted studies and established basis for scientific evaluations of such bycatches, so far it appears to be just bound to monitoring and evaluating (Cotter 2010). The situation thus again requires involvement of NGOs.

An alternative way, how to overcome bycatch relies on the market principles. It follows that as long as the market value of the extra fish exceeds the cost of quotas, the fishermen will have an incentive to land and cash on the fish (Tietenberg 1998). Aligned with this idea, there is an EU sub-policy called the Common Organisation of the Market (CMO) (the oldest pillar of the Common Fisheries Policy of the EU), whose purpose is to intervene in the market in order to ensure certain minimal earning for the fishermen when a fish cannot fetch expected price in the open market. The idea behind this concept is arguably right, the fishermen have incentive to not get rid of the bycatch. However, the scheme is getting rather obsolete, since it has not been catching up with the growing market prices (European Commission 2008b, Wichmann 2009). Nevertheless, the above mentioned still cannot solve the problem which rises when the species caught as a bycatch is endangered and officially banned from fishing. In these cases, in

[34] A line with streamers, towed as a scaring device over the area behind a vessel where sinking baited hooks are within range of diving seabirds.

the author's view, the fishing activities should be restricted as a precautionary measure in the areas distinctive with a high density of such species.

In terms of discarding, the BT industry has made significant progress in utilization of by-products, even though there are still some gaps in the management. Some processing vessels collect BT hearts, stomachs, and heads. The first two for human consumption, the latter mainly for fish food apart from the cheeks and parts of the lower jaw which are in many countries considered delicacy. Further, refined tuna oil has been increasingly utilized to fortify food products and the cooking juices from canning industry has been used as a flavour agent (FAO 2014a, Gatt 2015a). Moreover, there have been some major campaigns against discarding, such as the one in Great Britain. It was led by renowned chefs and backed by retailers, fishing organisations, the government and environmental groups, and at the end managed to attract a lot of support (European Commission 2011). This kind of initiatives, in author's view, are inherently influential for its mass coverage and thus have a considerable potential.

7.3.5 Substantial financial sanctions

There is no doubt about the necessity to put up substantial financial sanctions. Notwithstanding, as astounding as it may sound, there has been no harmonised system of sanctions penalizing the IUU fishing. In some European countries, up to 90% of detected infringements have not been sanctioned, while in those instances where it has been so, the penalties paid by the European fishermen have ranged only between 1.0 and 2.5 percent (expressed in monetary value it was €1548 in 2009) of the value of their respective landings. Thus, this more than anything else, resembles mere operational costs rather than a serious punishment (European Commission 2009, Phelps Bondaroff et al. 2015).

The current situation has to be redressed by substantially elevating the cost of wrong-doing in order to avoid a situation when perpetrators would take sanctions merely as a buy-out from being non-cooperative (in this context e.g. by rejecting to join ICCAT), or as purchasing the right to overexploit the common resource. While redesigning the height of the fines, the magnitude of profits from overfishing has to be taken into account in order to eliminate any financial motivation to proceed with IUU fishing. It could very well be the local fishermen and stakeholders generating and imposing sanctions, for it is them who suffer most from the illicit activities taking place in the waters they fish (European Commission 2008, Kraak 2011, McGuire 2003, Sumaila and Huang 2012).

The exemplary punishments should be accompanied and yet again reinforced by confiscating the infrastructure involved in IUU fishing to drive away others, or would-be perpetuators.

Ultimately, even states which failed to meet their obligations must pay the price. The funds raised from a penalty program can be then used for stock rebuilding, research and for covering the costs of keeping the program in operation (European Commission 2008, Phelps Bondaroff et al. 2015, Sumaila and Huang 2012). In author's opinion, it is extremely important to avoid scapegoating, so that the heaviest penalty falls on the head of the business owner, not on the often impoverished fishermen themselves. Sadly, when the owner is disciplined[35], it doesn't automatically entail that the problem is gone. It's important to realize that IUU fishing only responds to consumer demands (which is still high in the BT sector) and strikingly, the governments sometimes provide cover ups[36].

7.4 Strengthening the legal framework

The legal status of high seas hasn't been comprehensive and featured many loopholes. Therefore, the necessity to revise and reform the concept has been apparent. Thus, in pursuit to defeat IUU fishing, there is a need for strong legal back-up, because the high fines might not be enough in the fight against the whole criminal cartels[37].

One of the first amendments to the current scheme and indeed the most crucial one would be to reconsider the overfishing crimes (as well as other environmental crimes) as a serious criminal offence. Another important step is to confront the use of flags of convenience, before embarking on combating fish and money laundering, and tackling tax evasion. Furthermore, it is necessary to induct compulsory registration of fishing vessels, as has already long been the case for the merchant ships. Firstly, this entails assigning a unique identification number, which would greatly simplify monitoring of a vessel. Secondly, it would legally bind the port authorities to bar the entry of IUU vessels (Phelps Bondaroff et al. 2015). In author's opinion, enlisting BT in CITES is obviously another crucial legal provision which would very much enhance chances of BT to strive into the future, for it entails a ban on trading.

Another, rather systemic imperfection which must be redressed, resides in the fact that the information relating to the fishermen's activities, such as data drawn from the vessel monitoring (VMS), is treated as classified (ICCAT 2014a). The monitoring happens behind closed door and all the information gathered is treated as confidential. This has to change to enable better detection of illicit activities by preventing states from providing potential cover ups to fisheries in question. Another asset in having this measure carried through is according

[35] The following section brings up a suggestion to classify these offences as crimes, thus ideally he would be detained.
[36] See the documentary *Sharkwater* or Wilson et al. 2011.
[37] See the documentary *Sharkwater.*

to Kraak (2011) the merit of spreading information among the fellow fishermen, which is vital to maintain high level of trust necessary to ensure successful cooperation (Kraak 2011). In general, however, states should still be in charge when making legal amends. (Phelps Bondaroff et al. 2015). Nevertheless, in author's opinion, this process has to be aligned with certain internationally agreed principles, such as the accessibility of information on industrial fishing activities.

To end this section on a positive note, finally, a spark of hope in terms of much desired redefinition of the legal status of high seas emerged in January. The UN General Assembly agreed to embark on negotiating an unprecedented treaty addressing protection of marine life beyond national jurisdiction (The Pew Charitable Trust 2015). It will remain a question, however, how the international community secures monitoring, and importantly, enforcement.

7.5 Enhanced international cooperation

An indispensable prerequisite to achieve a successful international dialogue and to launch a concerted action against the fishing crimes is ensuring that on the state level the fundamental steps towards sustainable fishery has already been made. To bring about this, all layers and actors of society need to be included. Although e.g. Pauly (2009) describes governments as the only actors that can achieve a turnaround in the fishing industry, should they free themselves from being involved in the system, other authors (Anholt 2014, Korman 2010) plead for enhanced international cooperation. In fact, the latter strategy arguably has been supported stronger across the international community as an opposition to the inherently inward oriented governments and states often ruthlessly competing against each other. Against this backdrop, **competition has to be replaced by cooperation** (Anholt 2014, European Commission 2008, FAO 2014a).

Here comes an obvious need for change. According to author, it is not that the governments should not be entitled to constitute and enforce their own stringent set of rules and laws. However, these should be inspired by and derived from an international dialogue. This has to be done in order to ensure an overarching international discourse generating an environment, which inherently allows and makes it easier for those who are committed to do "good".

Having said that, it is absolutely necessary to redesign current international institutions in order to have them resilient to corruption and fully resolved to achieve what they are set for. Only then, international cooperation can become reality. As a prerequisite, members of any

international conservation organization should agree on all conditions of the membership in advance, in order to establish trustworthy atmosphere of mutual cooperation. Boon (2013, 22) also advocates creating greater synergies between the various parties concerned, in an endeavour to evoke deeper understanding of the world's interconnectedness. To ensure an environment with strong governments willing to cooperate internationally with powerful and honourable institutions is certainly much easier to say than to have it done. Nonetheless, it is not that there haven't been attempts by current governments and institutions to step up efforts to fight IUU fishing and overfishing.

In 2013 the International Criminal Police Organization (INTERPOL) actually set precedent for this through initiating efforts to raise awareness of fisheries crime. In doing so, INTERPOL strives to persuade member states to establish National Environmental Security Task Forces. These are intended to approach and reproach the environmental crimes in the similar vein as with other crimes – by coordinated, collaborative and international actions. In 2014, the organization even introduced the Most Wanted List for environmental criminals among which some of the IUU fishers are included (INTERPOL 2014, Phelps Bondaroff et al. 2015).

Another example of such an international cooperation is a concerted action initiated in 2011 by the Council of the Global Environment Facility (GEF) eventually giving birth to the Global Sustainable Fisheries Management and Biodiversity Conservation in the Areas beyond National Jurisdiction Program (ABNJ). FAO serves as the coordinating agency being assisted by the United Nations Environment Program and the World Bank. Among 19 involved actors are as well 5 tuna RFMOs (including ICCAT) with 87 different countries as their members. The initiative also brings together NGOs such as WWF and Birdlife, scholars, and private sector (FAO 2014a, ICCAT 2015b). The program focuses particularly on tuna fisheries with an intention to achieve conservation of biodiversity through sustainable harvest. The main discourse pervading the program activities is the ecosystem approach, while the jurisdiction covers specifically remote or peripheral areas of the ocean (FAO 2014). As such, it could serve right to protect BT during their migration to the Mediterranean, which starts off in the Atlantic Ocean.

FAO is particularly active in the fight against IUU. In 2009, it facilitated adoption of the Agreement on Port State Measures to Prevent, Deter and Eliminate the IUU fishing (PSMA). PSMA is designed to promote collaboration between the fishermen, port authorities, coast guards and navies in order to streamline the efforts to combat on land and seas. In particular, it introduces a set of standard measures for port states to apply when foreign vessels seek to unload their catch in port. Along these lines, flag states are called to account for taking actions

at the request of the port state, or when vessels flying their flag are suspected from participation in IUU. Consequently, illegally caught fish can be denied access to national and international markets (FAO 2014a, FAO 2015a).

Importantly, the PSMA has a binding character what makes it a promising international instrument. However, let's not get overwhelmed prematurely. The agreement will come into force when at least 25 countries have deposited their acceptance of accession. So far, unfortunately, the states have been slow to ratify, accept, approve or accede to the PSMA. In fact, just 12 countries have done so up to now, the latest being Iceland in June 2015 (FAO 2014a, FAO 2015a). Having said that, the pace of accession representing 12 member states per 6 years implies a possible scenario of another half-dozen years would be necessary to make the PSMA work. Obviously, it's just not 'soon' enough to combat IUU fishing and overfishing of threatened species such as BT.

Furthermore, it is urgent that Japan join any such initiative. It has been already made clear that Japanese consumers play a particular role in maintaining, hence potentially also in reversing current trends in the BT fishery. However, Japan traditionally hasn't been spectacularly fond of international cooperation which aims at limiting its marine harvests, particularly when it comes to BT and whales[38]. It comes then as no surprise that Japan is neither among the 12 PSMA contracting parties (MercoPress 2015, Milman 2015).

7.6 Marine Protected Areas

In the last few decades a concept of Marine Protected Areas (MPAs) has been vigorously promoted by a broad range of experts as a persuasive tool to curb over-exploitation of marine resources (Halpern 2003, Gaines et al. 2010, Molloy et al. 2009, Murray 2009, Roberts and Hawkins 2000, Voyer et al. 2015). The basic idea behind it resides in designating sufficiently large areas of seas and oceans, completely or partially barred from fishing and other disturbing activities. A vital prerequisite to ensure its effectiveness is to establish stringent monitoring and enforcement. There is nearly a unanimous consensus that if managed properly, implementation of MPAs would lead to growing biomass accompanied by increasing the average size and diversity of marine species residing inside and in the adjacent areas of the reserve. Along these lines, MPAs are widely conceived as a crucial instrument to safeguard marine ecosystems.

[38] This could be showcased on a recent incident when Japan unilaterally decided to resume whale fishing in the Southern Ocean after the hopeful 2014 season when the whale fishing was suspended (Milman 2015).

It is estimated that around one third of the global oceans and seas should be entitled this protective status (McGuire 2003, 28, Roberts and Hawkins 2000, 26). Yet, in the present only 3.4 per cent is given this status (WWF, 2015). This is largely because there is an absence of legal instruments. That means it is not feasible to establish fully legally recognized and protected MPAs in the international waters (The Pew Charitable Trusts 2015, The Pew Charitable Trusts 2015b). However, in recent years there has been a flurry of ambitious projects in territorial waters, particularly in Oceania (Cappiello 2009, MacGillis 2012, Vaughan 2015, Vaughan 2015a, Watkins 2015). Yet, the total protected area is still far from sufficient as only few thousandths of the whole area of seas and oceans are banned from all sorts of fishing (Roberts and Hawkins 2000, 8).

This is clearly exhibited in the Mediterranean with a total of 677 MPAs, covering but only about 114 600 km^2 (out of what 87,500 km^2 is represented by the Pelagos Sanctuary for Mediterranean marine mammals). To put this figure in proportion, only 1.08% of the Mediterranean Sea is legally protected, should we exclude the Pelagos Sanctuary. This entails a mere 0.1% of strict protection zones or no-take zones, when 96% of these MPAs are in the northern part of the Mediterranean Sea basin. Importantly, BT was spotted only in 35% of these reserves (such as the Ligurian Sea) as it is just crossing them to get to the spawning grounds (Der Werf and Robertsson n.d., 77, MedPAN 2012, 31, 109, Orsi Relini et al. 2010).

The reason for this relatively small proportion of strictly-protected areas resides in difficulty to achieve a unanimous consensus to obtain social approval. This can only be done by getting aboard all the parties involved, such as local fishermen, their communities and industrial lobby (Voyer et al. 2015). On that account, unfortunately, legal settings of some of the largest MPAs accommodates certain back doors or deliberate loopholes in order to satisfy the fishing industries and are built around a condition to not upset the fishermen. In this light, MPAs have been often biased to be placed towards remote waters where fishing mostly had not taken place anyway. These areas which are often unpromising for extractive or fishing activities, in fact may attract politicians to make bold gestures while minimizing costs and conflicts with the fishing and mining industries (Devillers et al., 2014, Pirkl 2014). On the contrary, such areas as the Mediterranean BT spawning grounds are still disregarded. Nevertheless, at all events, any MPA based anywhere in the world is more a positive than negative news for marine ecosystems and consequently also for fishermen.

This is because if managed properly, a reserve would bring about spill-over effects of the increased diversity, the average size, the density and the biomass of organisms living inside the reserve to outer areas. Fishermen would benefit from these spill-overs by achieving bigger

catches along the MPAs (Halpern 2003, Roberts and Hawkins 2000, 13). Furthermore, it is highly desirable to create permanent networks of such reserves instead of relying on large, but isolated reserves (Gaines et al. 2010, Roberts and Hawkins 2000, 56-60). At the same time, caution has to be made not to measure success or efficiency of MPAs against the criteria of area protected (Devillers et al. 2014). An alternative form of protection is to ban fishing beyond certain depths, which would apply to one of the most destructive forms of fishing - bottom trawling. This would create a marine protected area devolved on the vertical spatiality (The Economist, 2015). In the particular case of BT, it is indispensable to render reservations flexible in order to preserve the migrating fish, while also protecting its spawning areas. All in all, any conservation effort should give priority to inherent and complex assets of marine ecosystems, instead of just calculating their economic payback.

8 A change of mind-set

We cannot solve our problems with the same thinking we used when we created them.

(Albert Einstein)

Right from the start, it is about time to accept a new challenge residing in eradication of human's deeply entrenched addiction to what Curry (2011, 35) calls *managerialism* - a belief that humans have both right and the ability to successfully manage the natural world. That this indeed holds even within the industrial fisheries could be clearly showcased on four major categories of their objectives: biological (indicated by maximum sustainable yield), economic, social and political (Hilborn 2007). Hence, the point of reference has been anchored firmly on the human side, disregarding those values of marine ecosystems, extending beyond human comprehension and needs.

Stemming from that, there's a need to alter the way we approach marine ecosystems and how we perceive our relation to the natural world (Hance 2015, Leopold, 1995). Of course, it is easy to say, but rather difficult to bring about in the current era enchanted by the omnipresent idea of unlimited economic growth and consumerism (Curry 2011). This evolved in the age trademarked by the phenomenon of money which has been dominating the world order for a long time now. The overwhelming merit of money is actually something worth ponder over, as not only the natural resources, but our lives too have become monetized and commodified more than ever before. Yet, the intrinsic value of money - the purely human invention - is placed outside the biological system, it is just an agreed-upon faith-based social institution (Harari 2015, Robejšek 2015, Twist 2013). Harari (ibid.) goes even further to liken money to the only human-made story everybody believes and around which has evolved a world of fictional reality. This world is endorsed by financial and political bodies which happened to become the most powerful entities in history.

In this light, an alternative paradigm shall be based on utterly different values, favouring non-material richness over an "impoverishing" material or financial wealth. For as Lepold[39] says (2000, 13):

[39] Leopold described the situation in 1940s, but his reflections largely overlap to the present days.

"Our bigger-and-better society is now like a hypochondriac, so obsessed with its own economic health as to have lost the capacity to remain healthy. . . . Nothing could be more salutary at this stage than a little healthy contempt for a plethora of material blessings."

Having said that, a fact remains that radical amendments in our lives have always proved to be difficult to swallow as Anholt (2014) reminds us: *"Humans don't like to change, since they're an inherently conservative species".* Thus, is there a way how to turn people to profess ethical considerations of Bluefin tunas, so that the fish is not seen merely in terms of money or food? In author's opinion, there are arguably two ways. The first could be labelled as a **profound intrinsic change**, whereas the second is a **rational change**. Now, it would be reasonable to assume that the former should precede the latter, however, the gravity of the problem of overfishing is such, that it requires either to bring about both changes at the same time, or the latter first. But what is actually meant by these two types of change and how they differ? Firstly, let us proceed with an explanation of the latter.

So far, the proposals for solution have been largely on the supply side. Notwithstanding, arguably even more attention has to be paid to the demand side. It is the individual consumer who possesses the deciding mandate which fish will be most valuable. By arousing consciousness of a consumer, there is a massive potential to curtail the demand side (Kato 2011). Elementary economics is grounded in the relation supply versus demand, when the latter has fundamental effect on the former, as a smaller demand brings about decrease in price, thus less appeal to proceed with the fishing operations. Apart from an individual, any respected or powerful segment of the society disposes a great potential to raise awareness by conveying the important facts to public space. A good example (WWF 2013) to illustrate an endeavour to become an ambassador for change is the government of Hong Kong. In 2013 it set an encouraging precedent when issuing a ban on shark fin and BT consumption among its members.[40]

The profound change arguably comes on the heels of the rational change, as it takes much more to comprehend. For example, Peter Singer (1995, xi, 20) challenges all humans to live ethically as he believes it is the most good anyone can do. "*Deciding to live ethically is both more far-reaching and more powerful than a political commitment of the traditional kind*". He specifically refers to the current paradigm "*once we get rid of that dominant conception of the good life, we can again bring to the centre questions about the preservation of the planet's ecology…".* An alternative (or complementary?) view on a potential form of that profound change, particularly

[40] For more see the section 7.3.4.

related to fish, is offered by Perkins (n.d.): "*Instead of seeing fish as either a food to be consumed, or a species to be conserved, or an organism to investigate, or something to catch in a leisure time, we could begin to understand the world as a place in which life in its various forms impacts upon people and expose them to interact with their surroundings, making new hybrid worlds".*

The profound change may eventually be projected through some tangible ramifications. Recently, this has been proved by a movement built on a resentment to the rise of standardised fast food, the Slow Food Movement (Curry 2011, 196). It stood as an inspiration for founding its sea food variation – the Slow Fish movement. The core idea resides in promoting seafood gastronomy based on regional and seasonal products coming from sustainable fisheries and aquaculture. Thereby, it draws consumers back to the good old traditions and to savour the very process of eating the fish, while it strives to turn the public away from endangered species such as BT (European Commission 2011).

Finally, in legal terms, there has been achieved an auspicious reversal of the very attitude that international bodies take on when approaching the problem of overfishing in terms of the already mentioned UN General Assembly's altered approach to the status of high seas. For the first time, instead of negotiating a treaty to organize extraction of the marine resources, the United Nations will negotiate a global treaty to preserve them (The Pew Charitable Trust 2015). Furthermore, the recent upswing of MPAs points at new developments in approaching marine ecosystems. However this still arouses a question whether such an endeavour is confined by the scope of *managerialism* or whether this is being done with a concern of the inherent value embedded in marine ecosystems (Devillers et al. 2014, Pirkl 2014).

8.1 The role of NGOs recapped

"Never doubt that a small group of thoughtful committed citizens can change the world; indeed, it is the only thing that ever has." (Margaret Mead).

Public opinion is frequently more progressive than that of its political representatives. Recently, there has grown an ability of civil society to partner together and engage the public in exposing environmentally damaging corporate practices, particularly by publicizing the negative impacts of fishing. This was made possible owing to an emergence of new ideas and norms about sustainability, and reinforced by growing availability of global communication tools and technologies. Thereby, it has become much easier for civil society actors to gather and disseminate information about environmental issues (Curry 2011, Hilborn 2007, O'Neill 2013, 168-171).

The dire situation of BT unfortunately has long been avoided in emotions arousing campaigns highlighting stories rather of other overfished species like sharks (Kato 2011, 187), but there have been positive developments. Indeed, the environmental NGOs have become more powerful and used communication tools with the general public more efficiently to call attention to the poor stock status of BT (Fromentin et al. 2014). For instance, Greenpeace has recently approached a chain of luxurious Nobu restaurants with a request that the environmental status of BT be noted on their menu. Sadly, the result is not so robust, as only one restaurant[41] out of the worldwide chain of 33, attached to its menu a disclaimer notifying the customers about the status of BT[42] (Kato 2011, 155, Noburestaurants 2015).

Along these lines, there's a further need to generate larger influence by raising more substantial awareness. For this purpose we should be targeting media, schools and universities, which in fact possess a power to sway youngster's perceptions of natural goods. These efforts could be as well supported by popular life-narratives and all together it could bring about setting up of locally led movements (Curry 2011, 168).

8.1.1 Eco-labelling

To render the process of decision-making easier for consumers, there is a broad range of certification programs which also serve to the fishermen to prove their products sustainable and thus makes them a good advert. Certification schemes emerged in 1990s and gradually evolved into a form of non-state market driven full-fledged governance (O'Neill 2013, 173-177). Owing to them, the traceability in the fish supply chain is gradually becoming a standard (FAO 2014a).

The eco-labels are voluntary and necessarily involve three parties. Besides the party which expresses interested to get certified and the certifier, there is further a need for a third party conducting the independent assessment of the environmental effects of the product, hence *third party certification* (Sainsbury, 2010). According to O'Neill (2013, 179) there are two more – *first party certification* and *second party certification.* But these are inherently unreliable when for example some restaurants have begun to label themselves as sustainable.

There are four main third party seafood eco-labelling non-governmental schemes in operation – the Marine Stewardship Council (MSC), the Friend of the Sea (FotS), Naturland and the Marine Aquarium Council (MAC) (Sainsbury 2010). Arguably the most eminent of those four is MSC

[41] Situated in London, Berkeley Street.
[42] The disclaimer contains a sentence: **Bluefin tuna is an environmentally threatened species - please ask your server for an alternative.*

with an eco-labelling program directed specifically on the problem of overfishing. MSC was established by the WWF and Unilever in 1997 and launched in 1999. It has become the most important fishery certification program ever since. MSC certifies individual fishing industries as a whole after carrying out in-depth scrutiny of its operations. It specifically looks into state of fish stocks, examines if the activities of an industry go along the lines of the EAF and if it complies with scientific, economic, and social principles. Nevertheless, according to the MSC's standards, the fishery may be granted certification, even if it falls short of certain standards. This entails that a fishery with significant flaws may still be marked by the MSC logo before it has achieved any steps towards sustainability (Food & Water Watch 2010, Kato 2011, Marine Stewardship Council 2013, Pauly 2009, Sainsbury 2010). It was not just for the afore-mentioned that MSC has been recently exposed to heavy criticism. In fact, it has provided its seal of approval to large, controversial companies, among whom even those focusing on tuna. Apparently, the MSC has embarked on strategy based on awarding its labels to any interested party to widen its business portfolio (Food & Water Watch 2010, Pauly 2009, Smith 2011, Zwerdling, and Williams 2013).

Against the backdrop of this study, there is however one more interesting certification program - Marine Eco-Label Japan - launched in 2007 by the Japanese Fisheries Association (JFA). This time, however, it is an initiative of the governmental agency (Sainsbury 2010). If effective, this step could be perceived with a hope that the country where the customers coveting BT meat the most, is willing to accept the sustainable course set by some NGOs.

There are some other market-based initiatives, which for instance provide integrated websites and wallet-size cards. These are supposed to serve customers as the guides to the labyrinth of certification schemes (Jacquet and Pauly 2008, Pauly 2009, Sainsbury 2010). The word 'deemed' is very important indeed, as one survey (Warner et al. 2013) highlights mislabelling of fish products taking place all over the U.S. Hereby, tuna was one of the two[43] most frequently mislabelled species with the rate of mislabelling reaching 59%. This recent trend of substituting more valued, often endangered species by more common ones with labels referring to the latter can give consumers skewed idea of the current market and may evoke a feeling the fish are not so threatened after all.

As illustrated above, the *third party eco-labelling* faces an array of challenging issues. There is an inherent risk they might work to the advantage of industries, which might weaken the pressure of consumer overwhelmed and confused by diversity and number of certification schemes (O'Neill 2013, 185). Thus, certification must be held entirely transparent and

[43] The other fish was red snapper.

incorporated in a clear hierarchy of certificates' structure to as much simplify the customer's reasoning as possible. At the same time, the certification must be made voluntary and non-discriminatory for smaller fisheries. In so doing, limitations of such fisheries in their ability to fulfil particular requirements (high financial costs) must be taken into consideration while maintaining the overall course of sustainability (O'Neill 2013, 185, Sainsbury 2010).

8.2 Power of an individual

Every individual is the necessary agent of change and as such she/he has to take up responsibility for her/his actions. The decisive moment comes in when we learn about a problem. Then there is no place to hide from that conscience for once we get to know about an issue, we cannot just erase the knowledge from our mind, and thus we cannot get away from the ethical responsibility arisen from that cognizance.

It has become a well-established fact that without changing minds of consumers who continue propelling mass hunting of BT, the situation is not likely to be reversed (European Commission 2008, Kato 2011). A decrease in consumer demand has great potential, however sushi customers so far have not been made aware of the impact their eating habits bring about (Kato 2011, 187) or just did not care. Again, the biggest eaters of BT worldwide are unequivocally the Japanese, so how could we persuade them to change their beloved traditions?

Let us make a pause here and introduce words of a late English moral philosopher R. M. Hare (in Singer 1995, 144) "*An essential feature of moral thinking is our willingness to put ourselves in the position of others before making a moral judgement*". In order to enable ourselves to imagine into a Japanese, it is requisite to learn something about the culture. According to Singer (1995, 151), in Japan, the sense of responsibility for the public good and the interest of the global healthy environment has not been spectacularly developed throughout its history. Importantly, in Japan it is allegedly socially unacceptable for an individual to publicly criticize what the majority does. On the contrary, an average Japanese commits himself to a confined group represented by his employer and co-workers and devotes a major part of his life to corporate interests, for whom he/she is willing to make sacrifices.

Having shed some light onto the rather distinctive culture of the biggest consumers of BT, we have found out that the power of an individual is to various extent derived from and constrained by a particular socio-political setting. But, it is by no means to say that one cannot attempt to break away from traditional orders. Nevertheless, Japanese BT consumers should

be perhaps educated about sustainability as a group[44] (the unit e.g. defined by a corporation) to reinforce the odds to successfully convey the message.

8.2.1 Expanding the moral circle

In the context of this section, addressing the Hare's quote anew will induce a complementary question. Shouldn't we also imagine ourselves into the position of fisherman and the fish after all? If the former is the case, the deeds of the fisherman only deflect what the consumer wants, since there is still a huge demand for BT. Of course, a line has to be drawn between the common fishermen carrying out the dirty job, and those who are at the wheel of this often illegal business. On the other hand, should we empathize with the fish trapped in the net waiting for the harvest, it would be a good help to look at Van den Berg's (2011, 2012, 2013) method of expanding moral circle through employing universal subjectivism.

Universal subjectivism is basically an ethical mechanism enabling expanding the moral circle in practice. It is powerful in its simplicity. Anybody can imagine itself into position when in charge of a control panel through which general rules are set. However, we have to consider our decisions carefully for we don't know in which position we find ourselves in a society after we will have set the rules. This condition Van den Berg calls *the veil of ignorance.* Thus, it is very well possible a person would become BT. It is probably not a desirable fate for anyone to become a fish netted in a farm. But is nowadays an average human capable of including fish in his considerations? A study (Kupsala et al. 2011) conducted in Finland strived to find out about people's perceptions of farmed fish. It turned out that farmed fish rated even lower compared to traditional farmed animals.

Notwithstanding, the moral consciousness of humankind has been evolving throughout the centuries in a manner resembling the expanding circle. This somehow indicates what was morally justifiable and comprehensible in societies in particular stage of development. As Van den Berg (2011, 44) points out, at times slavery was taken for granted until slaves were accepted into the moral circle. Then came to the fore emancipation of women, followed by acknowledging children rights. Then, thanks to Singer and his idea of animal liberation it was finally animals' turn. Singer (1985) in fact elaborated on Jeremy Benthem's revolutionary thought that moral consideration should be assigned to living beings on the basis of their ability to suffer. Yet, can fish suffer? Now, this is a crucial question since general public unknowingly

[44] E.g. through raising competitions among corporations in achieving environmental-friendly strategies.

tend to incline to Singer's and Bentham's criteria when caring for animals' welfare (Kupsala et al. 2011).

In fact, there has been a long ongoing quarrel between scientists who are persuaded about the ability of fish to suffer and most importantly to feel pain (Braithwaite 2010, Griffiths 2014, Kirby 2003) and the other group of researchers who are convinced about the opposite (Rose et al. 2014, Key 2014). The latter have been pointing on misleading and inappropriate methodology and reasoning of the researchers defending the ability of fish to feel pain. They posit that fish do not feel pain the way humans do as they do not have similarly developed neuro-physiological capacity for a conscious awareness of pain. Thus a sudden motion when pain is inflected could be a mere reflex. This is opposed by conclusions of the former group advocating for the fish can feel pain in a manner similar to humans. Moreover, according to them fish have an ability to memorize well, and exhibit behaviour seen in primates, such as developing cultural traditions and learning from one-another.

It seems natural that the burden of proof should lay on the shoulders of deniers and that the arguments of defenders the ability to experience pain should be sufficient enough to include fish in our moral circle. As a matter of fact, there are places, where this shift already took place. In Germany, an animal protection act was revised in 2013 in favour of fish welfare. The German Animal Welfare Act is one of the most rigorous legislations worldwide protecting animal rights by putting them almost on the same line as humans (Max Planck Institute for Biological Cybernetics 2015). Hereby, fish are declared sentient species entitled to be protected against cruel acts performed by humans (Rose et al. 2014). Should the farming of BT continue, then a similar provision would be a great news for BT.

8.3 Respect for traditional environmental knowledge

Traditional environmental knowledge (TEK) describes indigenous forms of traditional (tacit) knowledge on sustainable management of local natural resources. The knowledge is generated cumulatively by handing down from generation to generation through traditional means of communication - songs, stories, paintings etc. In this manner it is growing out of experience acquired over thousands of years of direct and continuous humans' contact with the natural world. It is thus extremely important to have it protected (Blewitt 2008, Bonny and Berkes 2008, Curry 2011, 173-178). After all, the need to protect, preserve and maintain TEK is enshrined in the 1992 Convention on Biological Diversity binding each contracting party to:

"Subject to its legislation, respect, preserve and maintain knowledge, innovations and practices of indigenous and local communities embodying traditional lifestyles relevant for the conservation and sustainable use of biological diversity and promote their wider application with the approval and involvement of the holders of such knowledge, innovation and practices and encourage the equitable sharing of the benefits arising from the utilization of such knowledge, innovations and practices..."

Figure 10. A fisherman in Birżebbuġa (Malta) (from author's archive).

TEK is a tacit knowledge**,** hence a local wisdom or a local knowledge which is not universal. Nowadays this knowledge is being penetrated by outside sources of information – universal theories found on the internet or imposed by the other media Prynoy (2004). According to Biermann et al. (2009, 70) it is beneficial to accompany tacit knowledge with practised-based knowledge, experiential and research-based knowledge. Thereby, Yamnill and McLean (2010) see knowledge not just as a mean of maintaining a status quo, but as an opportunity to bring about change through employing a "community action research" which again emphasises need for collaboration rather than competition. The large potential residing in collaboration with the local fishermen has been largely ignored by global fishery decision makers, despite the fact it is the fishermen, who collect experiences and gather knowledge (traditional fishery knowledge) throughout their many years spent at sea. Such fishers can provide critical information on inter-annual, seasonal, lunar, diel, tide-related and habitat-related differences in behaviour and abundance of target species and also can reflect on developments in local marine stocks (Akimichi 1984, Busuttil 2009, 126, Johannes et al. 2000).

There are substantiated views that the knowledge gained on the spot is of fundamental experience, thus if the fishermen were invited to contribute into the process of resource management, it would help render the fishery more resilient and at the end sustainable. Furthermore, the magnitude of local fisheries contributing to poverty alleviation and food security has been recognized even by FAO (Busuttil 2009, 127 FAO 2014a, Johannes et al. 2000). To reflect traditional knowledge of fishermen is complementary to a much needed shift from deeply rooted inclination to promote the scientific method as the only basis for structuring ecological research (Johannes et al. 2000). Moreover, beliefs and views only matter insofar as they influence practice, therefore it is of a big merit for the decision-makers to take on more forward-looking proactive approach. Having said that, a holistic approach is to be applied, however cautiously, in order to prevent the risk of oversimplification (Curry 2011, 173-178, Verreet 2009).

9 Good governance of the Bluefin tuna fishery

When crafting a potential design of a good governance of fish stocks and particularly of BT, the ethical line should be followed, while incorporating arguably the more promising from an array of the aforementioned measures. Along the lines of this study, there is first a need to revise understanding of the relationship humans hold to all-encompassing planet's ecosystems. In wider perspective, in author's opinion, humans are just an element embedded into this scheme. Notwithstanding, as a product of overarching evolution, we have found ourselves capable of realization, reasoning (thus description), and impacting on the environment we happened to be born to. Having said that, there is an urgent need to recognize that the alterations we have been imposing to the natural world surrounding us, are unprecedented in the whole history of the planet.

With this cognizance comes conscience and responsibility. We have to become stewards of nature - as a part of it (Hance 2015), and work with rather than overrule evolution (Curry 2011). It is not to say that the nature needs us, rather we need it. Notwithstanding, again, we cannot renounce the role we already play. On the contrary, we should act adequately to our dispositions. A corresponding set of characteristics constituting such a demeanour would be comprised of attributes such as the 4 classical virtues: temperance, justice, courage, wisdom (Curry 2011, 45-49) eked out by compassion, sensibility, comprehension, sympathy, honesty, humbleness and diligence. Admittedly, such an attitude blended with all of aforementioned characteristics might take a considerable time to develop, experience and finally authentically profess. Or does it? Perhaps it is not such a remote idea. According to several authors it holds true that humans are inherently gifted by an ability of altruism[45] (Singer 1995, Kraak 2011). There is only a need to shape and tilt this potential towards the non-human world, as Stephen Jay Gould (in Orr 2004: 140) puts it: *"We cannot win this battle to save species and environments without forging an emotional bond between ourselves and nature as well - for we will not fight to save what we do not love."*

This could be showcased on the strong relationship between the artisanal fishermen and the sea which has existed already since ancient times. Indeed, it seems that the artisanal fishermen may have had embraced these tenets already centuries ago (Akimichi 1984, Johannes et al. 2000). However, recently their efforts have been gradually constrained by top-down regulations and importantly by IUU fishers invading their waters. It spurs little debate over the

[45] Based on the definition of the *oxforddictionaries.com*, altruism is 'a disinterested and selfless concern for the well-being of others'.

need to ruthlessly eradicate IUU fishing by imposing severe punishments. The phenomenon of top-down approaches is next to be dealt with.

Ever more often it appears that the top-down strategy of managing fisheries undermines willingness of the local actors to cooperate. In fact, this kind of intervention has often resembled an all-wise arrogant authority making incompetent decisions and forcing compliance with these on the local level. From that perspective, it has become ever more apparent that this should stop (Curry 2011, Kraak 2011). International bodies and the governments should not generate recommendations on behalf of the fishermen, instead the fishermen should be more respected and reflected as a vital source of advice on how to approach the fisheries into the future.

The mandate of international institutions should be instead based mainly on data drilling, knowledge dissemination, and mediation of cooperation. They should in particular constitute a platform where diverse knowledge, experience and ideas from across the world is collected, processed and finally broadcasted widely around the globe in order to be better able to recognize complex trends in marine ecosystems. This is important, since there is a deep interrelation between local and global scale, so it is vital to respect that distant events such as overfishing of BT in western Atlantic may have profound local impacts e.g. in the Mediterranean (Blewitt 2008, 2, Ostrom et al. 2012).

Having said that, the ocean governance has to be decentralised, hence a proportional part of it eventually passed on the every individual fisherman. To achieve this, a considerable share of autonomy has to be first entrusted to **local communities** (Ostrom et al. 2012). Since every community represents a different context, there's obviously no universal management plan. In fact, this situation favours sustainable use of resources, for local distinctiveness is internally entwined with sustainability (Curry 2011). Therefore the community would have to a large extent a free-hand in shaping management of the resource, reflecting the knowledge on the state of the fishing grounds.

In fact, communities are better able to find stable and effective ways to define the boundaries of a common-pool resource, to define the rules for its use and to effectively enforce those rules (Ostrom et al. 2012). The relative small-size of the community naturally coerces complying with the rules, for the local actors are aware of the potential impacts their activities may induce on their fellows. Social experiments (Singer 1995, 154, Kraak 2011) has proven that people are in fact more inclined to contribute to the common pool if their reputation is at stake. This does not mean, that incidents of non-compliance among the members of the community never occurs. In order to establish a basis for internal authority - hence the perception of legitimacy

of the regime among its members - institutional capacity and internal rules should be developed in concerted action by all members concerned. Consequently, those need to be acknowledged and respected by the government and by external actors in order to attain also a level of external authority. The government indeed still plays an important role. It should facilitate and financially support monitoring and enforcement as well as dispute resolutions. Furthermore, the government has to become a defender of local communities from external pressures exerted by various interest groups (O'Neill 2013, 190, Ostrom et al. 2012, 27).

Having established a favourable socio-political setting, there is a need to allow communities to operate a viable economic scheme. The natural choice would be traditional concept of a moral economy. This term was coined in reaction to destructions that neoliberal policies have imposed to small-scale fisheries and communities. But in principal the moral economy has always been the cornerstone of traditional fishing communities (Langdon 2015, Pinkerton 2015, Pinkerton and Davis 2015). The moral economy is based on a system of sharing and a sense of equal opportunity. Indeed, small-scale fishing communities generally operate in more equitable manner allowing more access and distributing that access more equitably. This in fact denotes opposite to neoliberal policies supporting the industrial fisheries. Indeed, within the moral economy, there is usually more fishing licences for more vessels with less capacity. The moral economies were traditionally based on providing employment for young members of a village. These young fishermen would gradually accumulate the skills and experience, and one day purchased their own boat. Thereby, this concept is based on the value of maintaining place-based identity and occupational stability (Langdon 2015, Pinkerton 2015). Concurrently, while promoting the moral economies, it is in author's opinion vital to vigorously abate the current technological developments of industrial fishing, which have had such deleterious effects on BT populations and the rest of the marine ecosystem. Having said that, among the first measurements must be **a ban on purse seining and associated BT farming**.

As an alternative, attention of policy-makers should return to supporting the size-limited vessels employing more traditional fishing gears with smaller impact on the BT populations, such as trolling boats, traps (*almadrabas*), bait boats and long liners. As a consequence, there would be more jobs and much reduced pressure on the BT stocks. There is an evidence, that the number of fishermen employed per a unit of investment in fishing vessels is roughly 100 times higher in small-scale fisheries. Small vessels employ 25 times more people and use one-quarter of fuel (the annual fuel consumption is 7 times less than in industrial fisheries) to catch roughly the same amount of fish with drastically reduced discard rate compared to the industrial vessels. In addition to that, small vessels require a much lower capital cost per catch than large boats. Finally, small-scale boat construction is generally performed by locals what

again contributes to employment (Chuenpagdee et al. 2006, Jacquet and Pauly 2008, Pinkerton 2015). To sum up, with the moral economy there is a potential to provide jobs for many more fishermen, while saving money and preserving more BT.

Notwithstanding, there would still be a need to establish flexible MPAs. Designation of given areas should be a shared responsibility of international organizations, governments and local communities. Monitoring can be passed on locally-based NGOs, while the enforcement should be along the lines of the above said, entrusted to the government (Busuttil 2009, 130, Roberts and Hawkins 2000, 81). In author's opinion, the MPAs should be spatially designed so that they copy the main spawning areas and in terms of time, they must be fully protected from any fishing activity from January until the beginning of August, when the majority of BT is spent. As for fishing outside the spawning areas, the season would not have to be restricted, due to exclusion of destructive purse seiners. Furthermore, external bidders (outside the Mediterranean) to catch for BT should not be allowed to do so in order to preserve the specific cultural character of the fishery.

The local fishermen could be given various licences allowing to catch different amounts of fish. Importantly, these licences should be co-designed by the fishermen and must not be subject to speculations. To illustrate what a form could such a license take, the cost should reflect the amount of fish intended to catch. Above a certain basic amount of catch, it would be possible to buy some more but the cost would be gradually higher for any additional tonne of BT and there would be a definite ceiling to the amount available to catch, above which allowances would not be granted. Furthermore, Japanese could be given shared responsibility in monitoring illegal fishing. Also, their domestic market has to be strictly opposed to any illegally caught fish. This would ensure sustainability of the supply and at the same time high price of the fish, for there will be fewer fish caught without purse seiners.

Finally, the "rationale" for implementing the above presented is grounded in the spirit of Leopold's thoughts (1995) that the greatest natural value embedded in the fish such as Bluefin tuna is its effervescence. Nevertheless, it is clear, that such measures, no matter how beneficiary to Bluefin tuna, small-scale fishermen, states' economies, and Mediterranean marine ecosystems, they will be vigorously rejected by the lobby of fishing industry. Notwithstanding, in words of Niccoló Machiavelli:

"It ought to be remembered that there is nothing more difficult to take in hand, more perilous to conduct, or more uncertain in its success, than to take the lead in the introduction of a new order of things."

10 Conclusion

This study has contributed to a recent wave of analyses and descriptions of the situation Bluefin tuna has been facing in the last few decades. As a reference point was chosen the Mediterranean Sea, where the eastern stock of Bluefin tuna annually migrates to spawn. Overfishing of Bluefin tuna has its roots entrenched in the development of industrial fishing. In fact, the current situation denotes one the most visible and acute consequences of this evolvement.

Bluefin tuna is a fish which is distinguished by its extraordinary biological features – high speed, great stamina, huge size and characteristic flesh. Japanese have been world's biggest consumers of Bluefin tuna meat, which fits in their sushi and sashimi, the fatter the better. This craving was in fact one of the most crucial reasons behind launching Bluefin tuna farming (ranching). On the grounds of this development, there emerged a huge impetus for purse seiners to set out to the Mediterranean Sea in a quest to harvest tonnes of live Bluefin tuna, transfer them to farms and get them fatten.

The Bluefin tuna market price has grown ever since what drew incentives of rogue fishermen to make the most of it by pursuing illegal fishing. Sadly, current indulgent legal setting has not made such illicit activities difficult to conduct. The chief organization authorized with management of the Bluefin tuna stocks, ICCAT, has mostly failed to ensure sustainable fishing largely on the account of its political character and an almost inherent disrespect to scientific recommendations. Although there have been positive indications in this respect, the alleged positive trend in increasing number of Bluefin juveniles might well not be caused by any of the ICCAT provisions, but ironically, by the radical change in the weather patterns. Furthermore, it is a well-documented fact, that the sector of Bluefin tuna industrial fishery in the Mediterranean Sea has been massively subsidized to the detriment of the local small-scale (artisanal) fisheries. Also clear is that the present system of allocating quota is flawed with setbacks such as the historical catch criteria.

Following the enumeration of all the aspects of the Bluefin tuna industrial fishery, the concept of environmental ethics was introduced so that readers better come to empathize with the situation of the fish and the local fishermen when critically assessing the proposals for a change in the current practice. There is a general consensus on a need for a blend of management, economic and political provisions which are supposed to bring the fishery towards a sustainable course. Among the generally acknowledged urgent steps is to eradicate IUU fishing

by imposing stern punishments, establishment of MPAs, discontinuing subsidies or a stepped up role of NGOs.

Importantly, the point has been made that the dire state of Bluefin tuna is directly proportional to the character of managing the fisheries when the fish has been understood only as a commodity to be harvested and cashed on. On that account, an effort has been made to encourage readers to contemplate the moral aspects surrounding the current status of fish, what led to stressing a need to respect and reflect on the traditional environmental (fishery) knowledge. In so doing, it was demonstrated that small-scale fisheries are a rich source of knowledge on how to sustainably catch fish and as such they deserve to be honoured and learnt from.

The added value in proposing the so called good governance of the Bluefin tuna fishery is that the design includes along the aforesaid social, political and economic aspects also the ethical dimension, partly residing in the inherently close bond between the fishermen and the sea. The concept of good governance is not meant to be a mere abstract notion. In essence, it features altruistic and humble fishermen gathered in a small community to a large part establishing its own management plan. Enforcement of such a plan is entrusted to communities themselves, while the government provides a back-up whenever necessary. Importantly, as illustrated, having established such a setting, many more fishermen would be granted a stable job, much less money would be necessary to invest in the local fisheries with fewer oil consumption would mean a relief for the environment as a whole. Last but not least, Bluefin tuna would not never again face a threat of extinction.

Having said that partly answers **the first research question**. As for the consumer demand, there has been the crucial development of Bluefin tuna aquaculture with the rise of an artificial production. This might in fact lead to a decrease in consumers' demand for the supply of wild Bluefin tuna fatten in farms. However, it is in author's opinion, that notwithstanding the development of a still insecure artificial production, particularly the Japanese consumers will have to cut down on the cravings for the Bluefin tuna sushi and sashimi anyway. The local Mediterranean fisheries would probably not be able to satisfy the Japanese demand for Bluefin tuna, but their supply would most likely be sufficient for the rest of the world. **To answer the second research question**, the case has been made that throughout the history the artisanal fishermen, although perhaps unconsciously, have been living in accordance with most of the tenets contained in the deep green ethics. Thus, it is nothing unreal. But unfortunately, nowadays these principles are almost always required to be accompanied by e.g. economic incentives to render them credible and worth pursuing for society. This hints to a fact, that the

concept still has not been taken seriously on a global scale, what fundamentally limits its present potential. So far, it appears that in continuation of the money-centric course, environmental ethics will be yet long side-lined.

In conclusion, there has been a shortage of studies summoning ethical principles when approaching environmental problems and the problem of overfishing in particular. This study is supposed to help fill this gap, although there is a scope for more profound further research.

"Whenever you find yourself on the side of the majority, it is time to pause and reflect."

(Mark Twain)

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[46] Mark Gatt is a scientific officer in charge of tuna management at the Malta Centre for Fisheries in San Lućjan.