MULTI SPECIES FISHERIES ASSESSMENT

REPORT, FEBRUARY 2022

Fishery Under Assessment	**Gulf of Thailand Mixed Trawl**
Date	**February 2022**
Assessor	**Yuttana Theparoonrat**

Application details and summary of the assessment outcome			
Name:			
Address:			
Country:		**Zip:**	
Tel. No.		**Fax. No.**	
Email address:		**Applicant Code**	
Key Contact:		**Title:**	
Assessment Details			
Name of Assessment Body:		Marine Trust	
Assessor Name	**Peer Reviewer**	**Assessment Days**	**Initial/Surveillance/ Re-approval**
Yuttana Theparoonrat			Improve Program
Assessment Period	2021		
Scope Details			
Management Authority (Country/State)		Thailand	
Main Species		Mixed	
Fishery Location		Gulf of Thailand	
Gear Type(s)		Bottom trawl gear	

Assessment process

The report shall have a summary of the assessment process based on the topics below, referencing electronic or other documents used:

- Particulars of the recognised groups with interests in the UoA.
- Details of consultations leading to the formulation of the Fisheries Action Plan (FAP).
- Arrangements for on-going consultations with interest groups.
- Details of the decision-making process or processes, including the recognised participants.
- Details of any planned education and training for interest groups.

Summary of Section 1 results

General Clause	Outcome (Pass/Gap)
M1 – Legislation, policy and plans	Pass
M2 – Institutions and stakeholder engagement	Pass
M3 – Monitoring, control and surveillance	Gap

Summary of Section 2 fishery risk ratings

	Very Low (0-20)	Low (21-40)	Moderate (41-60)	High (61-80)	Very High (81-100)
Catch - Part A		25			
Catch - Part B				76	
Catch - Part C			58		
ETPs*			52		
Habitats			58		
Ecosystems				64	

*ETP = endangered, threatened and protected species

Initial screening

	Pass/Fail
1. Defined unit of application.	Pass
2. Organized framework for compliance and enforcement.	Pass
3. No dynamiting, poisoning or other comparable destructive fishing.	Pass
4. Not directly target endangered, threatened or protected (ETP) species.	Pass
5. ETP species not used in manufacture of fish meal or fish oil.	Pass
6. Not carry out shark finning at sea (removal of fins and discarding of body).	Pass

Characteristics of the fishery

1 Area of operation of the UoA and jurisdiction under which it falls

Unit of Assessment

This assessment covers all trawling activities conducted in the Thai Exclusive Economic Zone (EEZ) within the Gulf of Thailand (GoT). Official statistics divide trawl vessels into three gear types (Otter Board Trawl, OBT; Pair Trawl, PT; and Beam Trawl, BT) and five size categories (small artisanal, large artisanal, small commercial, medium commercial, and large commercial). Combined, the GoT trawl fleet catches around 360 different species or species groups[1], with total reported landings in 2012 of around 532,327t. Of these, the majority (367,495t) were caught using otter board trawl gear; 162,795t were caught via pair trawl; and 2,037t with beam trawl.

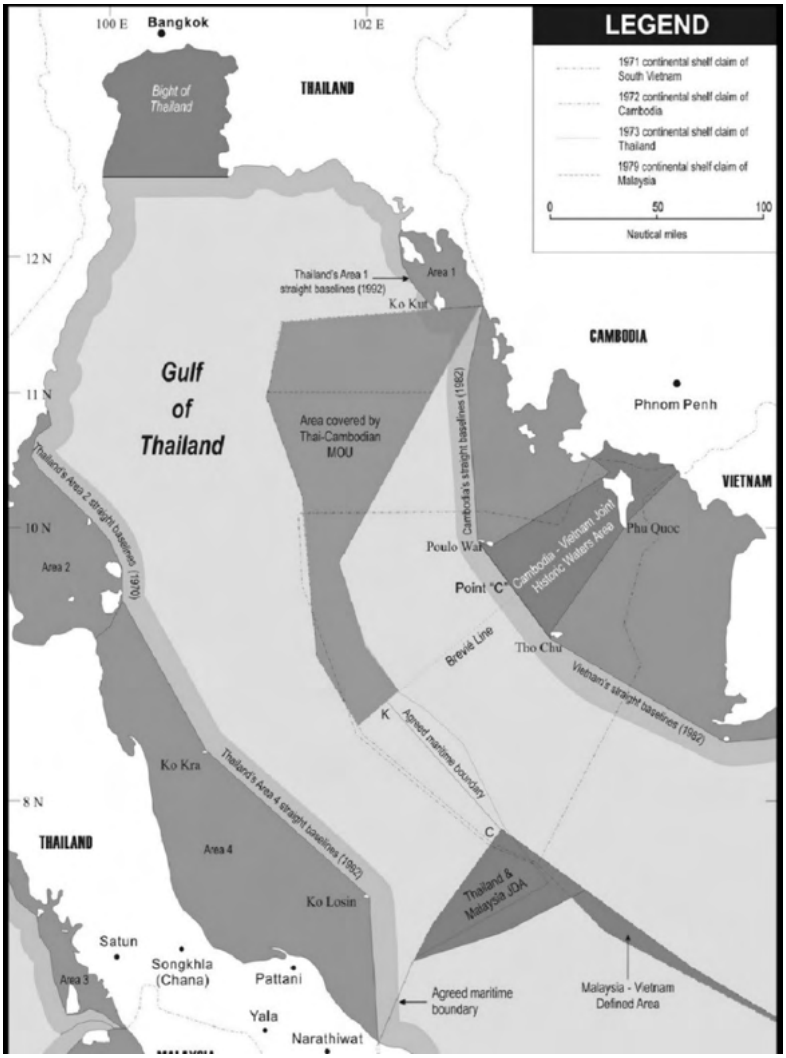


Figure 1 Map showing the marine fishing areas in Thailand; this assessment covers the Gulf of Thailand.

[1] Although around 60% of the groups reported in catch composition data represent individual species, the remainder are identified only to genus or higher. In some cases, particularly for invertebrates, the groups can be potentially quite large (e.g. "crab", "small shrimp"). The figure of 360 quoted here represents the number of groups reported to be in the catch; consequently, the number of actual species in the catch is likely to be considerably higher.

2 History of the fishery and its past management

After the introduction of the German otter board trawl, the marine fisheries in Thailand have developed rapidly over the last four decades since 1960s. The trawling technology was highly efficient; the fisheries had more profited and rapidly attracted more investment especially for large sized boats. Within that period of just about 15 years later, the fishing effort especially the number of trawlers increased to a maximal level to take the maximum sustainable yield. It has several scientific evidences that the demersal fishery resources in the Gulf of Thailand were already fully exploited in the late 1970s.

During 1960 to 1979, Thailand's fishing capacity had been grown up rapidly in terms of increasing number of fishing vessels and introduction of new technologies. In addition, trawl and purse seine fisheries largely affected fisheries resource. When the fisheries resource was declining, the fishers had developed larger vessels with higher horsepower which could fish further offshore and stay in the sea for longer periods of time.

Between 1990 and 2007, Thailand became one of the world's largest producers of fisheries products with 2.5 million tonnes of catch. Although neighboring countries started to declare their exclusive economic zone during 1977 to 1981, Thailand's overseas fishery had been operated through joint venture. Large vessels had gone further to Bangladesh, India, Sri Lanka, and Yemen.

The Marine Fisheries Management Plan (FMP) 2015-2019 outlines the nature of the management challenges facing Thailand and details what actions and management measures are required to transform. It is essential to change open-access fishery by regulating open access fishery based on balancing the fishing effort with the productivity of the resources (Maximum Sustainable Yield (MSY)). The Marine Fisheries Management Plan (FMP) of Thailand is closely linked to the National Plan of Action to prevent, deter and eliminate Illegal, Unreported and Unregulated (IUU) fishing 2015 (NPOA-IUU) and the 5 National Control Plan (NCP) 2015. The FMP aims to reduce the fishing capacity and fishing effort over the next 3 years. The main measures to achieve include: the removal of currently illegal fishing vessels; and reducing the total allowable fishing days. DoF established quota system by using MSY in 2015 as a reference point to manage the number of fishing license. As a result, in 2016 the number of trawlers in the Gulf of Thailand increased to 3,092. Although, total number of trawlers did increase but the number of PT, the highest fishing efficiency, had decreased.

Due to the political intervention, the number of registered trawlers increased in 1980, 1982, 1989 and 1996. In addition, the number of trawlers increased again in 2016 because of the new policy on fishing license registration system based on quota management concept.

3 Catch and fleet profiles

Many types of gear (multi-gear) are used to catch many species (multi-species) in Thailand's tropical marine fisheries. Most fishing gears can catch more than 100 species and there are more than 20 types of fishing gear. Further, most fishing vessels are artisanal and support a large number of fishers and fishing communities. This multi-species/multi-gear and artisanal nature of the fishery needs to be taken into account when assessing the status of the resources and applying management measures based in the context of temperate fisheries.

Catch Overview

After the introduction of the trawl fisheries, the state of demersal fishery resources has been monitored and evaluated through catch landing statistics record and routine standardized research vessel trawling surveys. Landing data (both total catch and species composition) as well as fishing effort have been available for all trawl gear types since 1971. The catch composition data including trash fish landing also recorded since that time. Total landing by trawl gear in the Gulf of Thailand significantly increased from 400,000 t. since 1971 up to more than 900,000 t in 1987 (Figure 2). The catch was composed of more than 50% of trash fish. Since 1987 the total landing has declined, fluctuating down to around 400,000 t. in 2019. Whereas the composition of trash fish was around 50% of total catch.

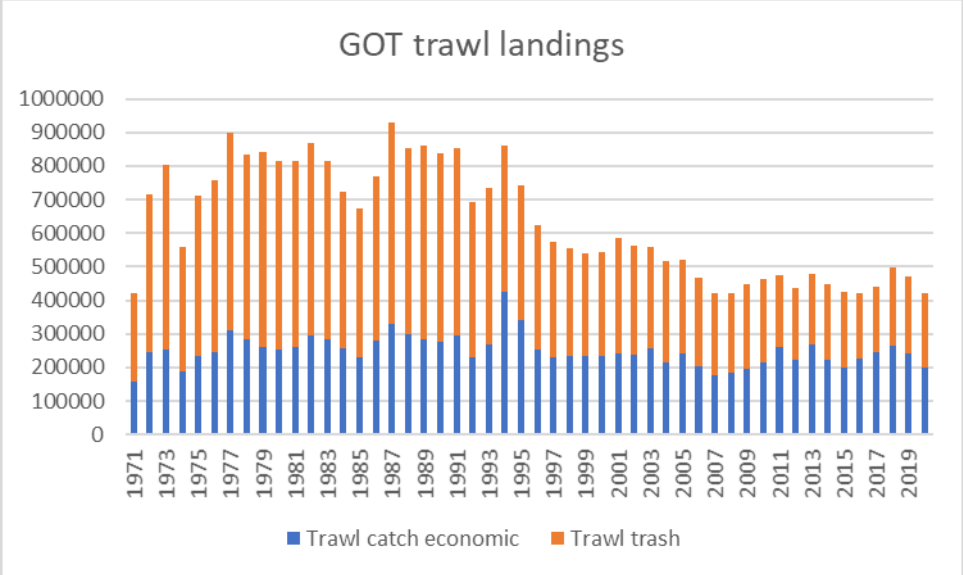


Figure 2 Total recorded landing by year in the GOT trawl fishery, catch economic species and trash fish. From statistics provided by the DoF.

Landings estimates for trawl gears used in the GoT are available for all trawl gears and vessel sizes for 2016. There are also landings data for all gear types produced annually since 1995. The catch categorizations vary – some landings are recorded at the individual species level, others at genus, and others as larger groups. The total number of species caught in all trawl gears is around 360, although this figure is likely an under-estimate due to many species being grouped together. Total landings fell from a peak (in recent years) of 1,134,721t in 2002 to around 532,327t in 2012. Landings statistics distinguish between “Economic Fish” and “Trash Fish”. The precise definitions of these categories are not clear, but in general terms trash fish are small individuals, often juveniles, with limited economic value outside of the reduction market. The proportion of trash fish in the catch varies by gear type, with pair trawling generally producing the highest proportion.

The following three graphs show the ratio of trash fish to economic fish landed using each gear type over time. Note that the y-axis is to a different scale in each graph – in 2012 otter board trawl landings represented around 69% of total landings, pair trawlers around 30.5%, and beam trawlers only 0.5%. Pair trawlers produce the greatest ratio of trash fish, landing around 40% of the trash fish total.

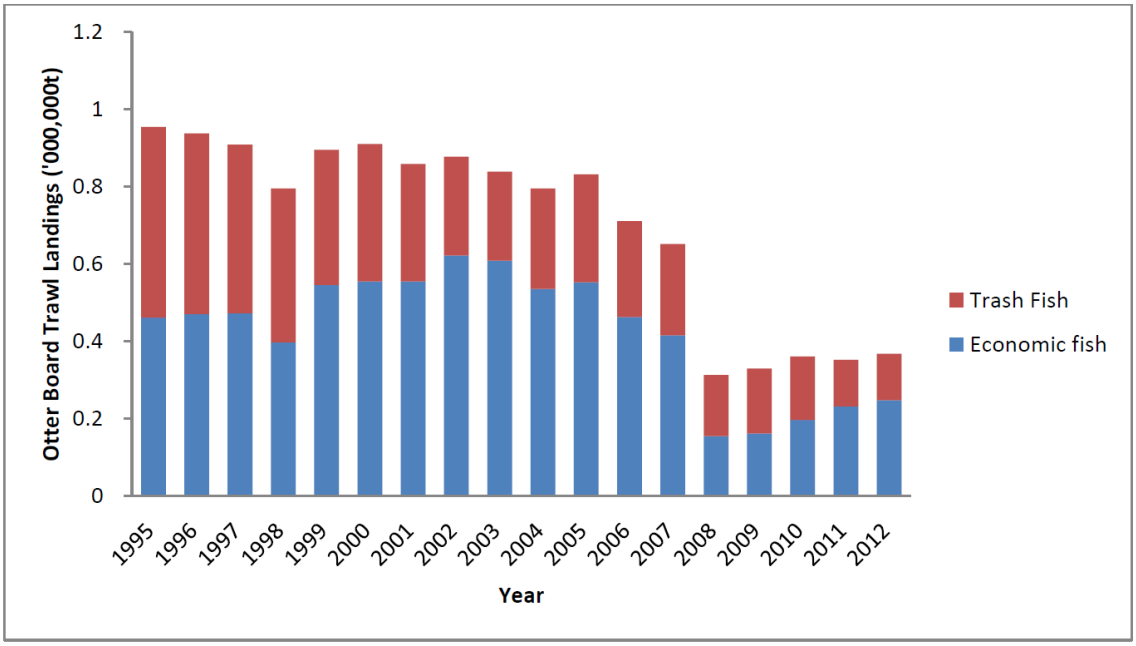


Figure 3 Landings by year in the otter board component of the trawl fleet.
From statistics provided by the DoF via TSFR.

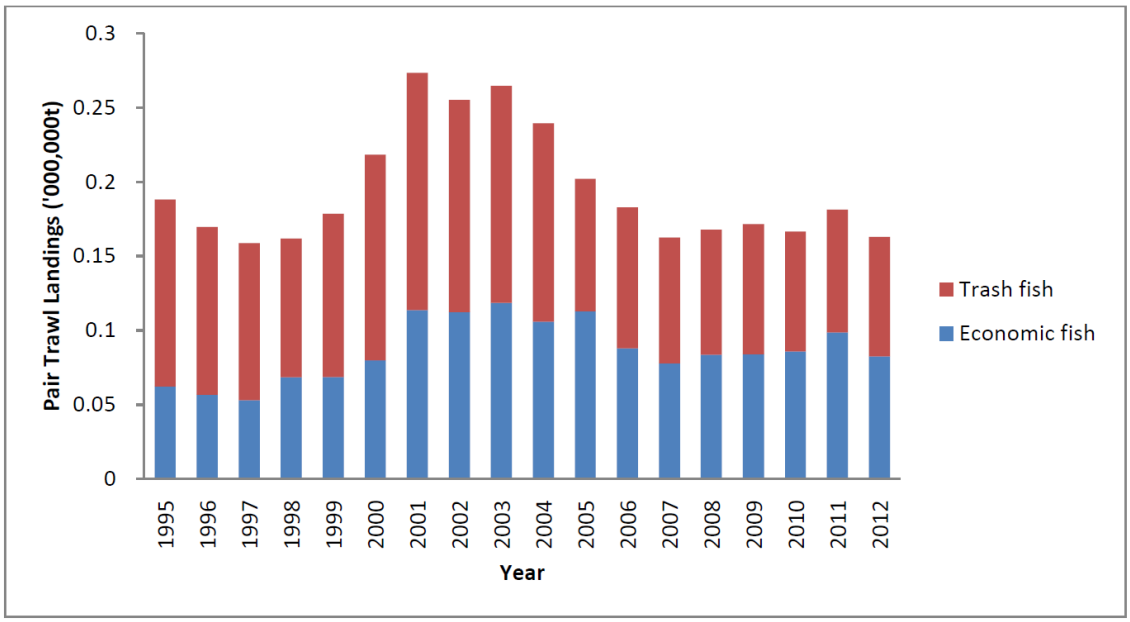


Figure 4 Landings by year in the pair trawl component of the fishery.
From statistics provided by the DoF via TSFR.

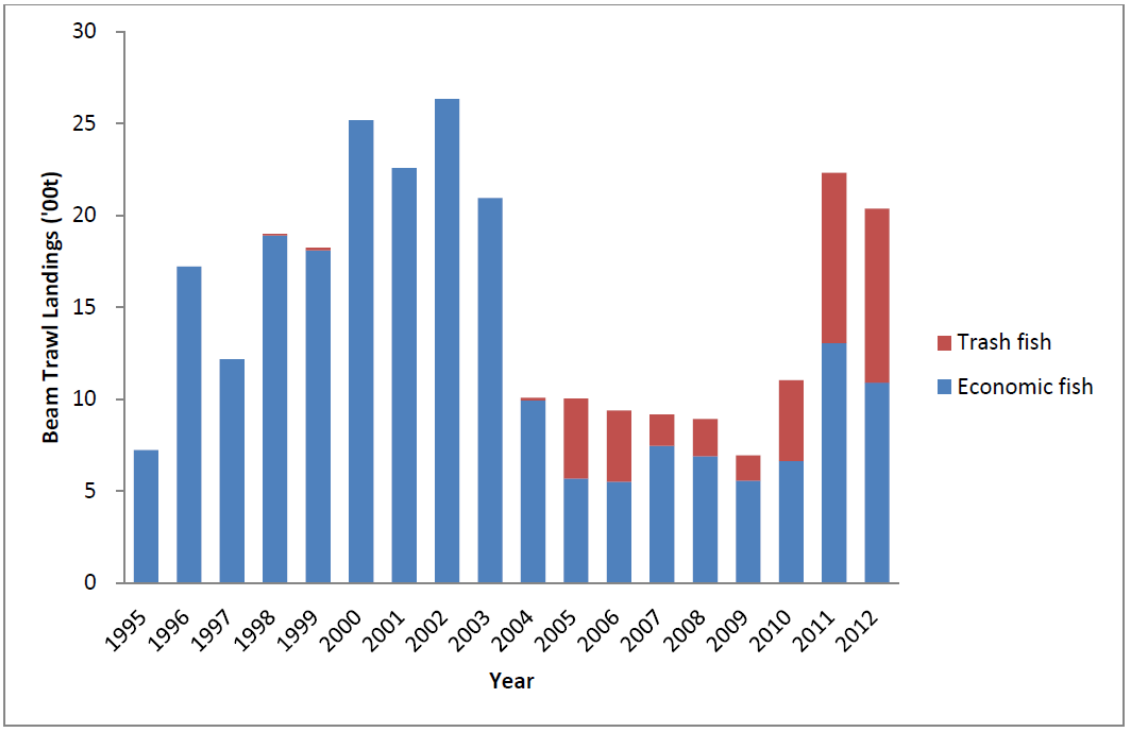


Figure 5 Landings by year in the beam trawl component of the fishery. Note the y-axis scale is in 100s of tonnes. From statistics provided by the DoF via TSFR.

The following graphs show the ratio of trash fish to economic fish landed using each trawl gear type in GOT in2019. In 2019 pair trawl landings represented around 61% of total landings, otter board trawlers around 36%, and beam trawlers only 3.2%. Pair trawlers produce the greatest ratio of trash fish, landing around 51.8% of the trash fish total. In terms of trash fish composition in each gear type, pair trawlers represent around 51.8%, otter board trawlers around 42.3%, and beam trawlers only 5.3%.

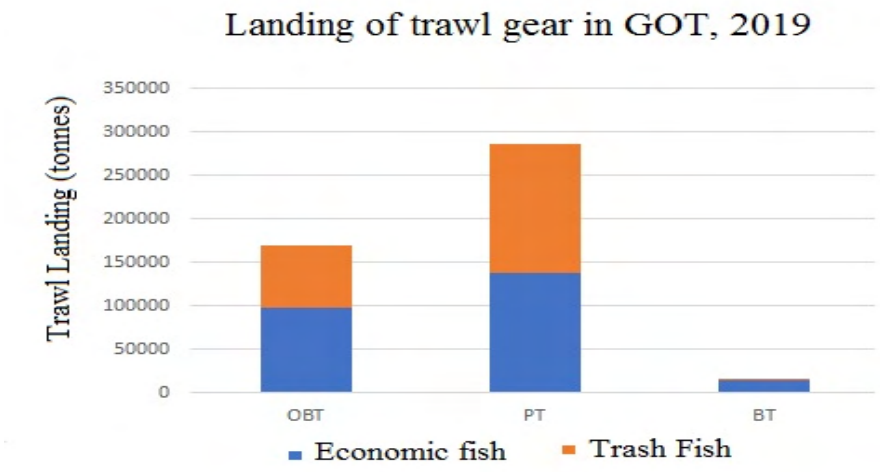


Figure 6 Landings of fish component of trawl gear in GOT in 2019. From statistics provided by the DoF via TSFR.

Fishing fleet

Fishing vessels in Thailand are categorized into artisanal and four commercial categories based on size, power and fishing gear[2]. In 2019, there were about 32,529 fishing vessels comprising 21,460 artisanal vessels and 11,069 commercial vessels.

Commercial fishing vessels are divided into 2 groups, i.e., vessels operating highly efficient fishing gear and vessels operating low efficient fishing gear. All commercial vessels are required to be licensed. In 2018-2019 fishing license round, a total of 10,645 vessels were licensed (8,690 fishing vessels and 1,955 light luring vessels). Artisanal vessels operating high efficiency gear (i.e. trawls, purse seine, anchovy purse seine and light luring vessel), and dredges also need to apply for commercial fishing license in order to control their efficiency and fishing effort. Registered commercial fishing vessels without fishing license are locked under the Marine Department regulation.

Table 1 Number of fishing vessels by fishing vessel category and fishing gear in Thai marine waters on 1st April 2018

Type of fishing gear	Category of vessel						
	Artisanal	Commercial					
			Small	Medium	Large	Extra large	Total
	< 10 GT	< 10 GT	10 - <30 GT	60 - < 60 GT	60 - <150 GT	>150 GT	
Pair trawl		2	3	275	841	5	1,126
Otter board trawl		144	548	794	521	16	2,023
Beam trawl		11	166	204	71	0	452
Purse seine		13	43	161	601	51	869
Anchovy purse seine		3	68	22	86	17	196
Anchovy falling net		0	162	296	117	0	575
Anchovy lift net		0	13	20	0	0	33
Light luring vessel		70	1,706	178	1	0	1,955
Total high efficiency		243	2,709	1,950	2,238	89	7,229
Total low efficiency	21,154	63	2,125	1,053	169	6	3,416
Total	21,154*	306	4,832	3,003	2,407	95	10,645

* estimated from the number of registered artisanal vessels in the 2015 survey

Number of registered trawlers in the Gulf of Thailand classified into OBT, PT, BT from1970-2016 is shown in Figure 7 . The otter board trawlers have more number than others. The obviously peaks showed reopened for registration due to politic intervened. Anyhow the number has decline for the last three decades.

[2] Marine fisheries management plan of Thailand (2020-2024), Appendix C: Categories of fishing vessels in Thailand https://drive.google.com/drive/folders/1paucb10bk4qSSXaOPsWfOErx8EIWdmen

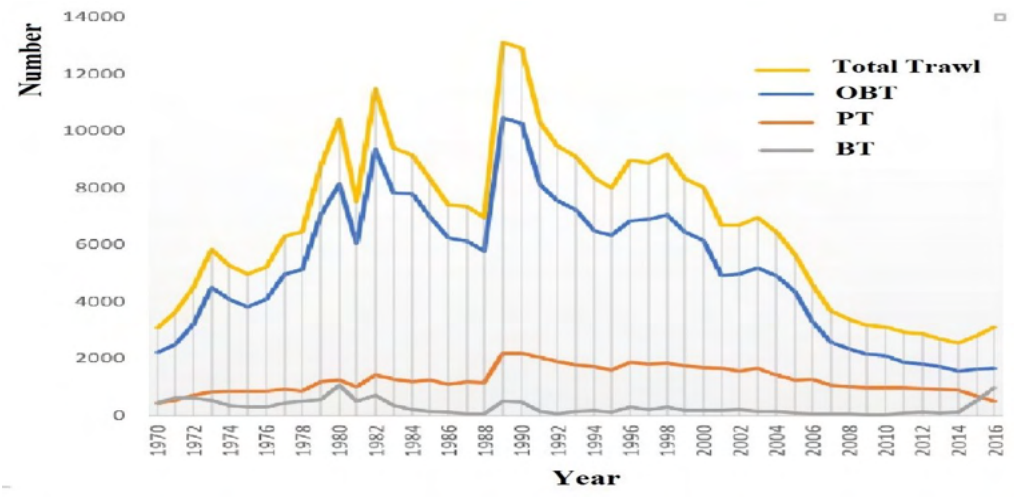


Figure 7 Number of registered trawlers in the Gulf of Thailand, 1970 to 2016.

Fish catch

The total catch for the Thai fishing fleet was calculated from statistic data, fishing logbook and landing survey data. The total catch in 2019 was 1,410,666 tonnes comprised 1,410,415 tonnes inside Thai waters, increase from 1,317,217 tonnes in 2015, and 251 tonnes outside Thai waters. The Gulf of Thailand catch was 73.7% of the total Thai waters.

The bulk of the catch in Thai waters comes from commercial vessels – 88.4% of the total catch in the Gulf of Thailand and 89.1% in the Andaman Sea. Overall, commercial vessels accounted for 88.6% of the total catch (Table 2).

Table 2 Total catches (tonnes) in 2017

Resources	Gulf of Thailand		Andaman Sea		Outside Thai waters
	Artisanal	Commercial	Artisanal	Commercial	
Demersal fish	88,788	545,140	30,184	175,491	139
Anchovies	1,860	110,076	1	31,281	-
Other pelagic fish	30,303	263,891	10,327	123,073	112
Subtotals	**120,951**	**919,107**	**40,512**	**329,845**	**251**
Totals	**1,040,058**		**370,357**		
	Artisanal		**Commercial**		
Totals	**161,463**		**1,248,952**		**251**
Grand total	**1,410,666**				

Catch composition by vessel category and species groups

The artisanal fishery takes a wide range of species (Figure 8), the major categories being pelagic fish, demersal fish, squid, and a large group of "other" catch. These "others" consist of mantis shrimp, shellfishes, crabs, jellyfish, sergestid shrimp, sea cucumber, etc. The commercial catch consists of pelagic fish, demersal fish, anchovies, and trash fish. The largest group is pelagic fish, which makes up 31% of the total.

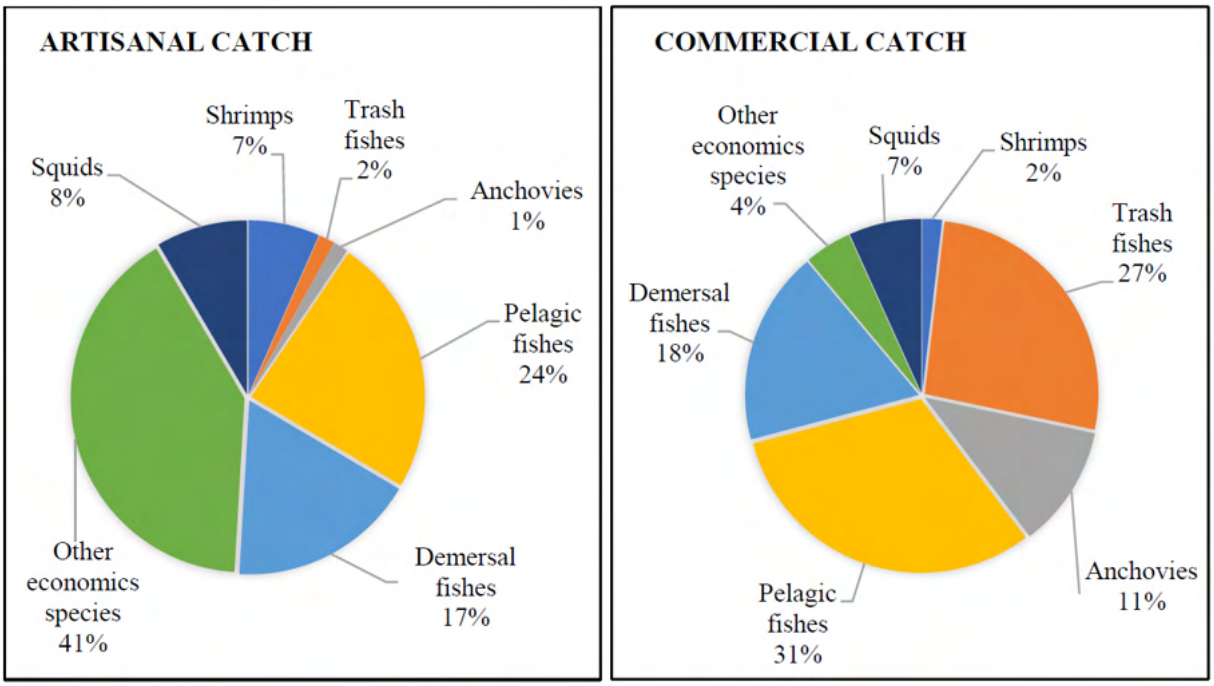


Figure 8 Catch composition of the artisanal and commercial fleets in 2019 (DOF 2019)

Trash fish made up 27% of the commercial catch in 2019, but only 2% of the artisanal catch. Trash fish has accounted for 20-26% of the total catch in Thailand marine waters between 2010 and 2019. Trash fish are taken mainly by trawling (pair trawls and otter board trawls), and these gears account for 80-90% of all the trash fish caught. Pair trawling catches has the highest percentage of trash fish (~ 50%), followed by otter board trawling (~ 30-40%) and then purse seines.

An important conclusion from the analysis of fleet and catch profile is that commercial fishing vessels make up only 25 percent of the number of fishing vessels but take about 90 percent of the catch tonnage. In applying management measures, there is a focus on controlling the commercial fleet because it is the major cause of the degraded fisheries resources. On the other hand, the majority of fishing vessels and fishers are artisanal fishers and their catches support an important food supply chain that involves a large number of women in buying/selling and in processing. This artisanal sub-sector requires better recognition and management.

4 Fishing areas and seasons

The trawl fishery in the Gulf of Thailand consists of (i) otter board trawlers, (ii) pair trawlers and (iii) beam trawlers. The beam trawl catch is less than 5% of the total trawl catch and contains only a small amount of trash fish for the fish meal/oil market. The area of operation is the Gulf of Thailand. The area extends from the outer boundary of the coastal zone (6nm to 12nm depending on the province in Thailand) up to the EEZ border.

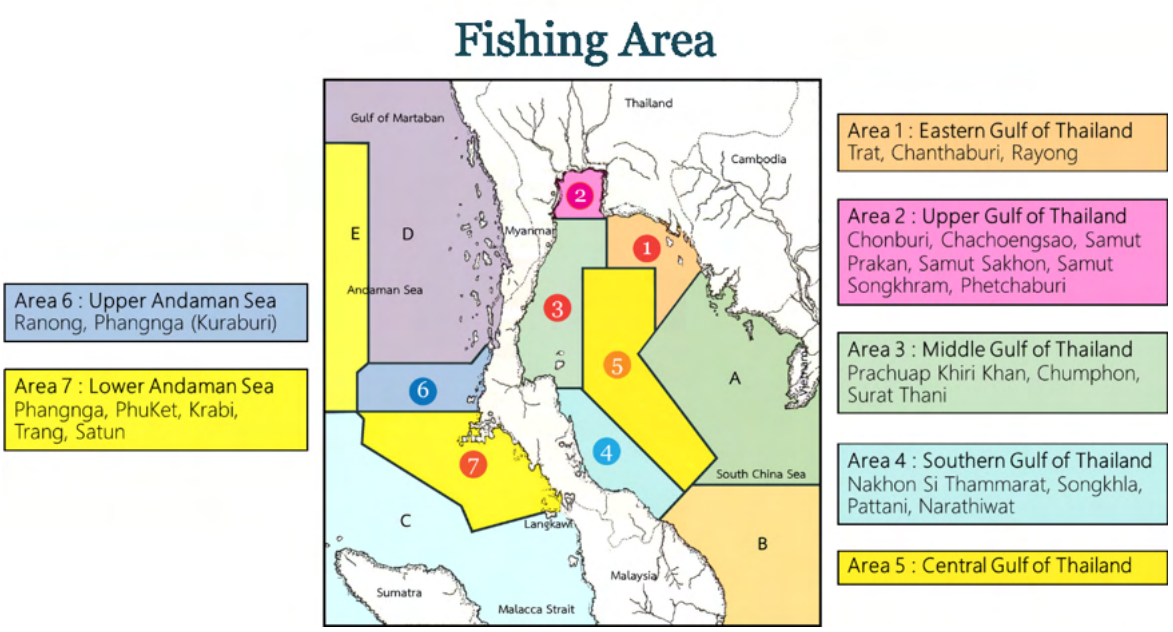


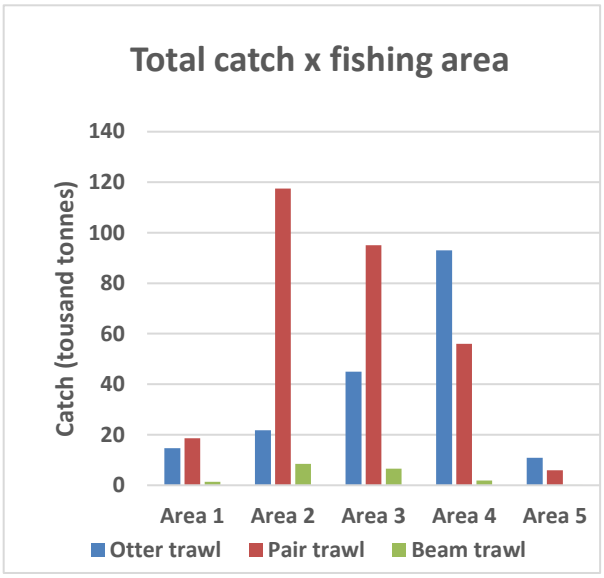
Figure 9 Gulf of Thailand and Andaman Sea marine fishing areas

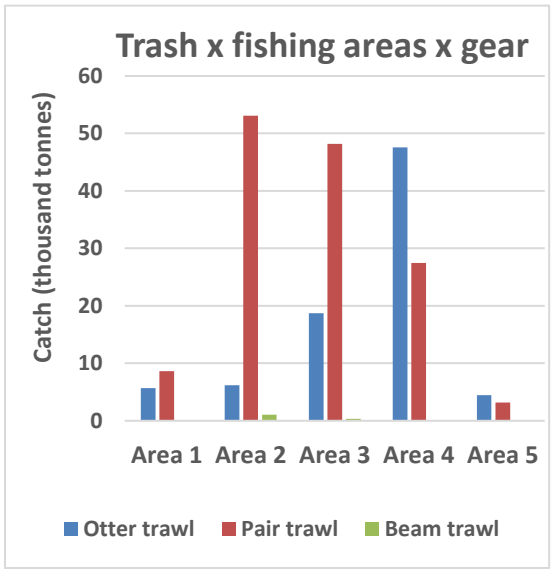
This fishing area has changed over time for Thai fishing vessels: 1960s to 1980s. During this period before the declaration of the EEZs of the countries surrounding the Gulf of Thailand (Vietnam, Cambodia, Thailand and Malaysia (and also Indonesia) Thai trawlers operated freely throughout the whole Gulf of Thailand. Catch and effort of fish landed in Thailand was recorded by the Thai DOF and allocated into 7 fishing areas (Areas 1-5 in Thai waters; Area A off Cambodia and Vietnam; and Area B off the eastern peninsular of Malaysia and central and eastern Indonesia.
1980 - 2015: Following the declaration of the EEZ of Vietnam, Cambodia, Malaysia and Indonesia, some vessels returned to fish in Thai waters while others remained fishing in neighbouring countries either under a "license" issued by that country (often issued by provincial governors or through joint companies) or fishing illegally. Fish caught in the countries and landed in Thailand by licensed vessels were recorded as coming from either Area A or B.

After 2015: After the fishery reforms that were initiated in 2015, all fishing vessels were ordered back to Thailand and unregistered/unlicensed were removed from the fishery. However, an unknown number of vessels continued fishing under the flag of neighbouring country. Under the Royal Ordinance on Fisheries 2015/amended 2017, these vessels are illegal. The Thai government is currently acting to eliminate this IUU fishing.

Officially, the area of operation is now confined to Fishing Areas 1-5, as no vessels have been issued a license to fish in other countries of the Gulf of Thailand or Indonesia.

Figure 10, a) shows the fishing catch by fishing area (1-5) in 2018 by the three type of trawl gear. Beam trawl catch was the highest in area 2 in the upper gulf, while the highest pair trawl catches were in area 2 and 3, and highest otter trawl catch was in area 4. The Figure 10, b) shows that most of the trash fish comes from areas 2, 3 and 4, with pair trawl trash catches dominating in areas 2 and 3.





a) b)

Figure 10 Catch by the three type of trawl in fishing area (1-5) in 2018, a) total catch, b) trash fish.

The fisheries resource survey in the GOT was carried out by M.V. SEAFDEC 2 during 17 August to 11 October 2018[3]. Result of catch composition from trawl survey in the GOT composed of 51.55% economic fish and 48.45% trash fish. The high proportion of economic fish was found in the Eastern GOT (area 1) and Inner GOT (area 2), 81.30% and 79.12% of the total catch respectively; while, low proportion of economic fish was found in the Lower Western GOT (area 4) and Central GOT (area 5), 42.16% and 38.80% of the total catch respectively (Table 3).

Table 3. Catch composition (%) from trawl survey in the Gulf of Thailand, 2018.

Area	Composition (%)	
	Economic fish	Trash fish
Gulf of Thailand	**51.55**	**48.45**
1) Eastern GOT	81.30	18.70
2) Inner GOT	79.12	20.88
3) Upper Western GOT	68.31	31.69
4) Lower Western GOT	38.80	57.84
5) Central GOT	78.79	61.20

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[3] Kongpornprattana P., Thitipongtrakul, W., Pheaphabrattana, S., and Noranarttragoon, P. (2108). Fisheries Resource Survey in the Gulf of Thailand (Thaiwaters and Cambodian waters) by Using Bottom Trawl. E-Thai Fisheries Gazette, Volume3 Number 2 April-June2020, P 46-62 https://www4.fisheries.go.th/local/pic_activities/202012071538101_pic.pdf

Thailand has a monsoon climate with a wet season (90 percent of the annual rainfall) from April to September during the south-west monsoon and a dry season from October to May with dry continental northerly winds (north-east monsoon).

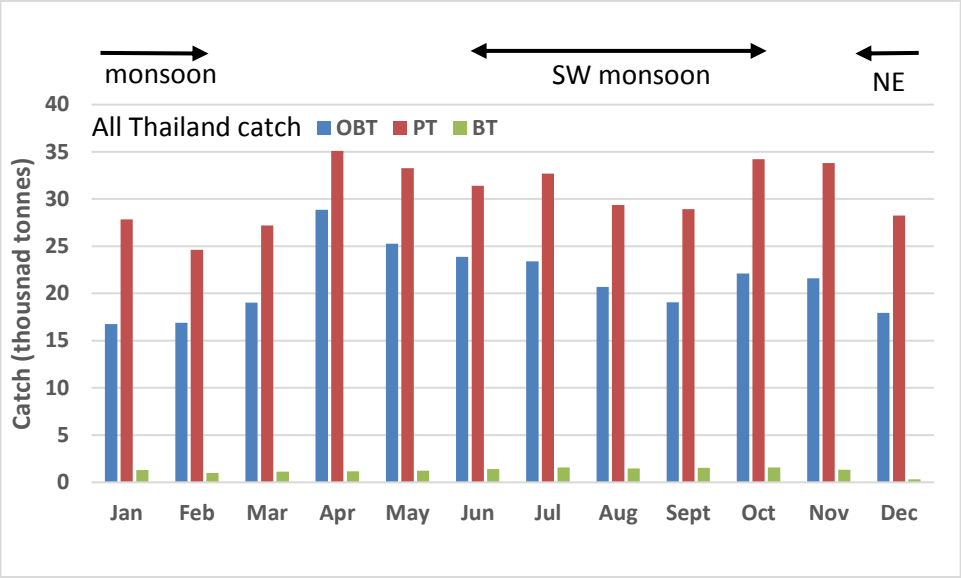

Figure 11 Catch by the three type of trawl in different fishing season

Figure 11 show the catches from otter trawls and pair trawl (all Thailand EEZ) were year-round in 2019, but with highest catches between the monsoon seasons.

Report on seasonal capture of trawlers by Kongprom[4] *et. al.,* 2008, during 2004 - 2005 for commercial trawlers in the Gulf of Thailand, indicated that Small sized otter board trawler (OBT <14 m) showed no significant different in catches among northeast–inter–southwest monsoons. The CPUE of all months showed no significant in seasonal variation. The highest catch rate (CPUE) was 29 kg/hr in May. Among Area 1- 5, the Area 3 was more abundant than other areas.
Medium sized otter board trawler (OBT 14-18 m) showed no significant different in catches among northeast–inter–southwest monsoons. This medium trawler was more advanced to fish farther in the deeper part of the gulf. The highest capture month was in September with 47.9 kg/hr, the most abundant area was in area 5 (central gulf).
Large sized pair trawler (PT 18-25 m) showed the highest capture month was 212.5 kg/hr in May. There was no significantly in catches among northeast–inter– southwest monsoons.

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[4]Kongprom A., P. Khaemakorn, M. Eiamsa-ard and M. Supongpan. 2008. Status of demersal fishery resources in the Gulf of Thailand p. 137 - 152. In G. Silvestre, L. Garces, I. Stobutzki, M. Ahmed, R.A. Valmonte-Santos, C. Luna, L. Lachica-Aliño, P. Munro, V. Christensen and D. Pauly (eds.) Assessment, Management and Future Directions for Coastal Fisheries in Asian Countries. WorldFish Center Conference Proceedings 67, 1 120 p.

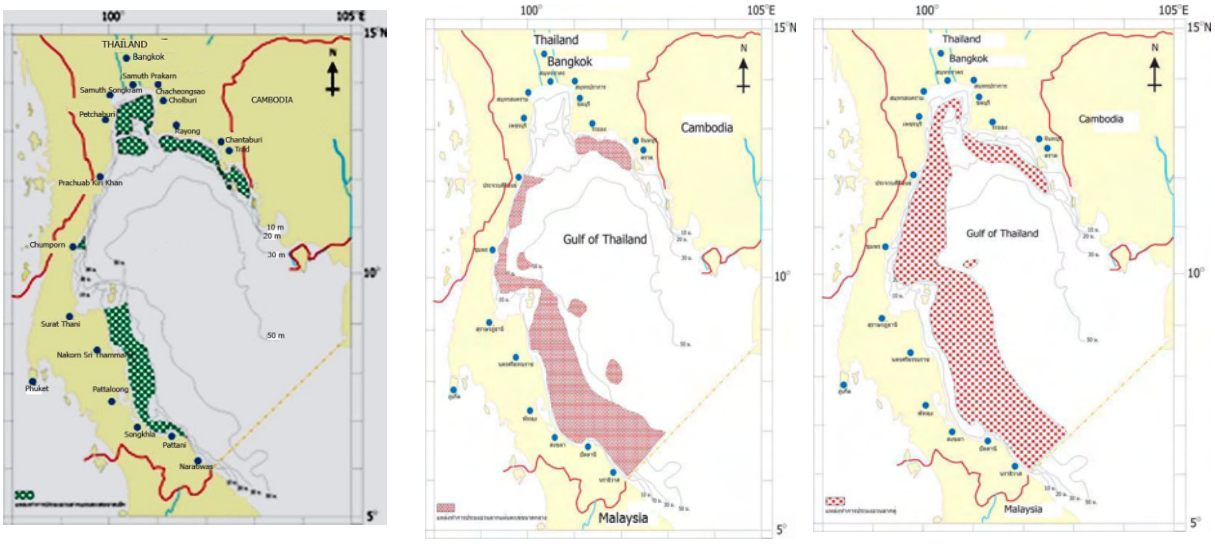
5 Gears and operation of the fishery

Types of trawler

There are 3 types of trawler in Thailand, i.e. otter board trawler, pair trawler and beam trawler.
Otter board trawler (OBT) has a pair of wooden otter boards and some of them has 2 small timbers or steel plate installing aside of the vessel for net opening. The main target species are fish and shrimps. The vessel sizes are 6-43 m LOA, the majority is 10-18 m LOA. Horse power for this vessel ranges from 10 HP to 1,700 hp. The number of crew per vessel is varied from 2-20 persons depending on size of vessel. Otter board trawler of the size more than 25 m LOA mainly operates fishing in neighboring countries waters with bilateral agreements and joint venture.
Pair trawlers (PT) have two vessels for net opening. The main target species are fish and squids. The vessel sizes are 14-25 m LOA. The majority size is 18-25 m LOA. The horse power ranges from 250 hp to 550 hp. The number of crew per vessel varies from 18-22 persons. Pair trawlers are in normal operation for fishing in Thai waters.
Beam trawler (BT) has a pair of metal beams installed on either side of vessel and in front of net for net opening. Target species is shrimp. The vessel sizes are 6-20 m LOA. The horse power ranges from 5 hp to 250 hp. Due to target catch is shrimp, they are normally operate fishing in coastal areas.

In previous day, mesh sizes of all sizes of trawlers in Chumphon province using cod end mesh 2.0 cm (stretch mesh) while pair trawlers using double twine (double thread to make it more strong and rigid). Single trawlers use monofilament to capture both fish and shrimp. Trawlers in another place use cod end mesh 2.5 cm. The current mesh size regulation, DoF notification regarding prohibition of using trawl net with cod end mesh size under 4 cm , dated 25 December, B.E. 2558 (2015).

The fishing ground of small otter board trawlers are within 20 m depth at near shore and medium size trawlers are within 30 m at coastal zone. Pair trawlers are in deeper water up to 50 m depth (Figure. 12).



a) b) c)

Figure 12 Fishing ground of a) small Otter Board Trawler, b) medium size Otter Board Trawler, and c) Pair Trawlers in the Gulf of Thailand. (Sources: Kongprom *et.al,* 2008.)

6 Objectives for the fishery (referring to any or all of the following if relevant)

Marine fisheries are important both socially and economically for Thailand. In order to maintain the sustainable development of the sector, a number of challenges still need to be addressed. These include rebuilding and maintaining the fish resources at a level commensurate with the MSY, reducing the large quantities of small low value/trash fish, including juveniles of larger commercial species that are taken, further reducing illegal, unreported and unregulated fishing (IUU), improving the status of critical marine habitats (mangroves, sea grasses, and coral reefs), improving the well-being of artisanal fishers and strengthening the capacity for effective fisheries management.

Based on these challenges, the goals of the FMP (2020-2022) related to trawl fisheries are:

1. Fisheries resources restored to a level that can support the MSY in Thai waters and sustainable fishing expanded into deep-sea and overseas waters;
2. IUU-free fishery;
3. Healthy habitats and environment; and
4. Effective fisheries management capacity.

In order to achieve the Goals of the FMP (2020-2022), DoF set up for 15 objectives as follow;

1) to control fishing effort to a level that is commensurate with the MSY
2) to reduce the catch of juvenile economic species
3) to rebuild fish resources through artificial reefs and restocking programs
4) to promote and control a deep-sea fishery in Thai waters
5) to develop/improve MCS to be more efficient
6) to strengthen traceability systems
7) to improve international and regional cooperation in combatting IUU
8) to restore and maintain critical habitats
9) to reduce marine debris
10) to resolve conflicts between resource users
11) to improve the quality and accessibility of fisheries data and information

The above 11 objectives will improving on the relevance trawl fisheries issues on concerning aspects such as,

a. Resources

Marine fisheries are important both socially and economically for Thailand. In order to maintain the sustainable development of the sector, a number of challenges still need to be addressed. These include rebuilding and maintaining the fish resources at a level commensurate with the MSY, reducing the large quantities of small low value/trash fish, including juveniles of larger commercial species that are taken, further reducing illegal, unreported and unregulated fishing (IUU), improving the status of critical marine habitats (mangroves, sea grasses, and coral reefs).

b. Environmental

The DOF will collaborate with the Department of Marine and Coastal Resources (DMCR) to improve the status of critical habitats and rebuild biodiversity as well as to reduce marine debris which affects ecosystems and sustainability of fisheries resources. A new important initiative of the FMP 2020-2024 will be the application of the FAO Voluntary Guidelines for Securing Sustainable Small-Scale

Fisheries in the Context of Food Security and Poverty Eradication (FAO SSF Guidelines) to further improve the well-being of artisanal fishers and fishing communities.

c. Biodiversity and ecosystem

The Department of Marine and Coastal Resources (DMCR) is the government agency responsible for coastal habitat restoration. Management of National Parks is the responsibility of Department of National Parks, Wildlife and Plant Conservation, and mangrove protection is also a responsibility of the Royal Forest Department, all under the Ministry of Natural Resources and Environment. Thailand has 9.81% of its marine waters (territorial waters plus the EEZ) under some form of MPA. Of these, 38.1% are Fisheries Reserve Areas administered by the Thailand DOF.

To supplement the fleet and fishing effort reduction measures, rebuilding the fish resources is also occurring through constructing artificial reefs and restocking schemes. DOF has been installing artificial reefs in both the Gulf of Thailand the Andaman Sea since 1978. The main objective is to rehabilitate the resources, but they also act as a deterrent from fishing close to the shore and can be very effective in preventing conflict between small - scale and commercial fisheries. Restocking programs have been implemented in the country through the DOF, local administration organizations, provincial agencies, the Electricity Generating Authority of Thailand and other private sector, and government agencies. 'Crab banks' are a popular tool for breeding gravid crabs, one of the most important economic species for coastal communities.

d. Social

As outlined in the Royal Ordinance on Fisheries B.E. 2558 (2015) and its amendment B.E.2560 (2017) the marine fisheries in Thailand are managed using input controls that limit the number of fishing vessels to ensure sustainable use as determined by the examination of best scientific evidence and balanced by economic, social and environmental considerations, in line with the ecosystem-based approach and precautionary approach. The input controls are also to ensure that fisheries resources are maintained or restored to a level that can produce the maximum sustainable yield, as well as to prevent and eliminate overfishing and overcapacity and ensure that the level of fishing effort does not undermine the sustainability of fisheries resources. Licenses are issued every two years.

e. Economic

Aquatic animals from domestic fisheries and importation of fisheries products, which are altogether more than 4.6 million tonnes, are important food source and raw material for domestic consumption, processing, and exportation. There are continuing businesses throughout the supply chain; therefore, fishery is important to Thailand in terms of economy and society. The important continuing businesses in fisheries sector include fish market, fishing port, cold storage, wholesale market, primary fish processing establishment, and processing factory. Currently there are altogether 345 processing factories and cold storages which employ more than 240,000 workers in the middle stream of fisheries industry.

7 Data availability

The FMP also recognizes the importance of better data and information to inform management decision making and proposes several important changes on research, data and information that can be used in the future management of Thailand's marine fisheries. Lastly the FMP recognizes

the need for institutional changes and strengthening the human capacity to improve future fisheries management.

The data and information will need to come from a number of sources including DOF Statistics, Marine Department, DOF Research Bureaus, MCS agencies, other government agencies such as DMCR, central statistics agencies (e.g. National Census). The research program of the different agencies, especially those attached to DOF will also have to be re-focused at providing data and information relevant to this FMP. Most importantly the trawl surveys will need to be continued. Other important research topics include (i) cost benefits of TACs and ITQs for selected species, (ii) cost benefits of artificial reefs as a means of increasing fish abundance and (iii) cost benefits of restocking for rebuilding fish resources.

There are seven different datasets that provide data on Thailand's Gulf of Thailand catches and effort. These datasets are:

- The Statistical Yearbooks of the Fisheries Statistical Group of the Thailand Department of Fisheries (DOF), both aggregated summery data Fisheries statistics and marine catch disaggregated to species/species groups, all fishing gears, vessel size classes, areas and months. (Available online 2009 – 2020)
- DOF Statistical Unit digitized sub-set of the disaggregated marine catch data for the main fishing gears (1971 -2020).
- Marine Fishery Research and Development Division (MFRDD) time series data used for calculating the maximum sustainable yield (MMSY) (1971-2017).
- Food and Agriculture Organization of the United Nations (FAO) Fishstat database, (1950 – 2019).
- Reconstructions of FAO data, provided by the Sea Around Us Project (SAUP) database, (1950 – 2018).
- DOF annual trawl research surveys database (1961 – 2020).
- Length-based stock assessments for selected species; EwE model (previously up to 2004, and recently updated).

In addition, there are also a number of early reports (e.g. Boonyubol, M. and S. Pramokchutima. 1982. Trawl fisheries in the Gulf of Thailand. Paper presented at the Second Seminar on Marine Science, 8-11 September 1982. Bang Saen Hotel, Cholburi, Thailand. Also as: Demersal Fisheries Report No. 9/1982. Demersal Fish Section, Marine Fisheries
Division, Department of Fisheries, Thailand) that report catch and effort data for the early years of development in the Gulf of Thailand fishery that can be used for cross-validation.
There is no one available data set that contains all the information collected by the DOF Statistical Unit. Some are aggregations and some are sub-sets extracted for the user's needs All the datasets have strengths and weaknesses.

There are some mention of the reliability of the data such as, misreporting that occurred from 1996 to 2015 during the trawl licence freeze (see Kulanujaree, N., Salin, K. R., Noranarttragoon, P. & Yakupitiyage, A. 2020. *The Transition from Unregulated to Regulated Fishing in Thailand.* Sustainability, 12, 1-26 and Leadbitter D, Fulton EA, Kulanujaree N, Noranarttragoon P, Nguyen KB, Phoonsawat R, Porobic J, Sainsbury K, Staples D, VH Vu and Ye Y (2021). *Managing multi-species and multi-gear fisheries – a toolbox for scientists, managers and stakeholders*. FAO Technical Guidelines in press (copy available from the author).

The habitat impacts by demersal trawl net was reported by Supongpan, M. and Boonchuwong, P., 2010, THAILAND**:** National Report Bycatch management in Trawl Fisheries in the Gulf of

Thailand. The comprehensive literature review to assess current knowledge and gaps about ecological impacts of common fishing gears used in Thailand during 1995 to 2015 was reported by Suebpala, W., Chuenpagdee, R., Nitithamyong, C. and Yeemin, T., 2017. Ecological Impacts of Fishing Gears in Thailand: Knowledge and Gaps. Asian Fisheries Science 30 (2017):284–305 ©Asian Fisheries Society ISSN 0116-6514

Improve data collection and information dissemination systems to a level that can be easily used to monitor the performance of this FMP in two years.[5]
The main measure to achieve this objective is to develop a FMIS as a more systematic system for collecting and collating basic fisheries statistics and information. This will involve developing a Portal/database system that links different sources of data for use in both stock assessment and fisheries management that is readily accessible to all.

Management measure

1 Conduct a gap analysis between the data and information needed for KPIs data FMP and the actual available data
2 Portal/database system that links different sources of data for use in both stock assessment and fisheries management
3 Develop a more systematic system for collecting and collating basic fishery statistics
4 Implement continuous capacity development for all technical and scientific staff
5 Implement continuous capacity development for key staff in how to communicate scientific results to policy makers and stakeholders
6 Strengthen data quality assurance systems by cross validating data from different sources
7 Ensure that data required by RFMOs is of high quality and timeliness

8 Current status of the fishery resources, ETPs, habitats and the ecosystem

Current status of the fishery resources

Assessment Report for the Marine Fisheries Management Plan of Thailand (2015-2019). The assessment is based on trends in the catch per unit effort (CPUE) in research trawl surveys, and recent and past stock assessments. Standardized research vessel surveys have been carried out in both the Gulf of Thailand since the 1960s. The CPUE declined dramatically during the 1960s at the time the fishery was developing rapidly and the CPUE is now only 11% of the original CPUE in the Gulf of Thailand. However, since 2016, the CPUE shows increasing trend in the Gulf of Thailand (Figure 13).

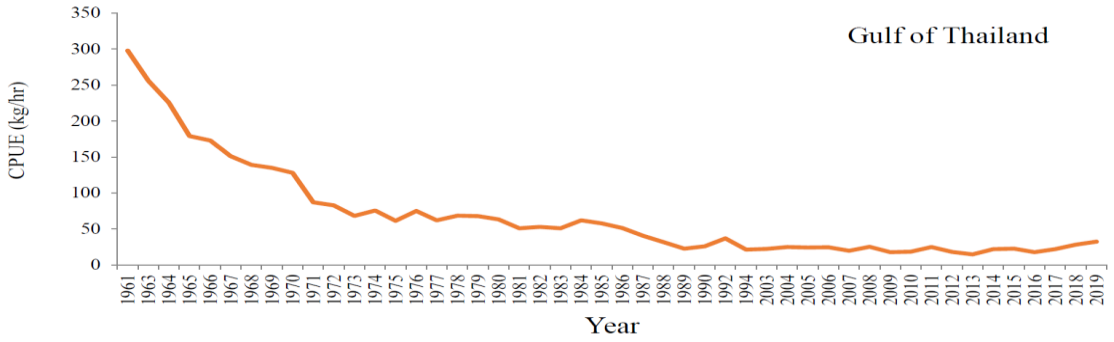


Figure 13 CPUE (kg/hour) trends of demersal trawl surveys in the Gulf of Thailand 1960s – 2019

[5] Marine fisheries management plan of Thailand; A national policy for marine fisheries management, 2015-2019. Department of Fisheries, Ministry of Agriculture and Cooperatives. http://extwprlegs1.fao.org/docs/pdf/tha165156.pdf

Stock assessments for demersal, anchovy, and pelagic fish for 2019 have been carried out based on the analyses of the main fishing gear in Thailand marine waters (about 80% of the total catch). The maximum sustainable yield (MSY) estimate is 1.6 million tonnes and the current catch is below the MSY in all these species groups in the Gulf of Thailand (Table 4). Also, because of recent reductions in fishing effort, the fishing effort is now below the fishing effort at MSY (FMSY), especially for anchovies which the fishing effort reduced more than other groups.

The 2019 estimate of MSY was 790,985t. This matches up relatively closely to historical estimates of 500-750,000t calculated between 1972 and 1982[6,7]. A paper from the same period concluded that the trawl fishery had reached maximum sustainable yield in the early 1970s and (as of 1982) had become overfished[8]. It is therefore likely that the GoT trawl fishery has been overfished for roughly the last 45 years. A 2003 paper concluded that excess demersal fishing effort was equivalent to around 50% of the number of registered boats in 1995[9].

The 2020-2022 FMP includes a summary of the results of these analytical activities carried out to quantify an appropriate level of catch in the GoT. For demersal fish, current fishing effort has now been reduce to a level that produces the MSY. The current fishing effort is estimated as FMSY by around 76.7%; for anchovies 30.4%; and for other pelagic fish around 84.9%.

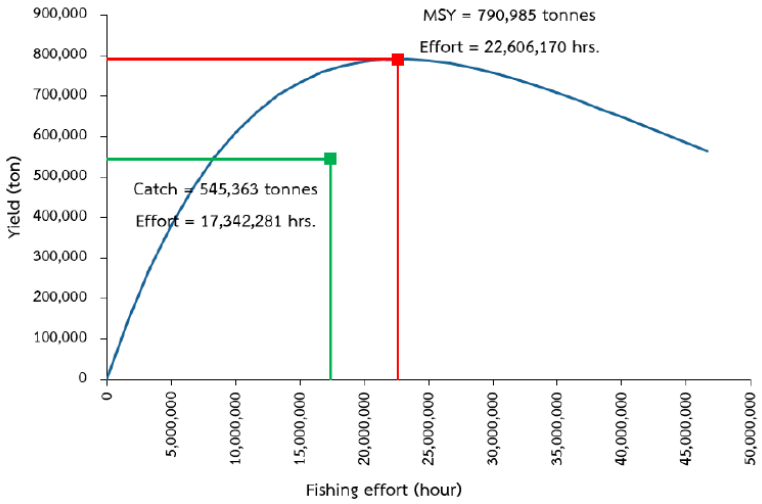


Figure 14 Estimated MSY curve for demersal fish in the Gulf of Thailand. MSY is estimated to be 790,895t, with landings at the time of the stock assessment of 545,363t. Total effort is substantially below the MSY level and indicated that although overfishing has been controlled, the fisheries resources are still overfished and will take time to recover. Taken from the 2020-2022 FMP.

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6 Boonyubol, M and Pramokchutima, S, 1982. Trawl fishery in the Gulf of Thailand. Rep. of Demersal Fish. Invest. Unit No. 9/1982:7p.

7 Menasveta, D, 1980. Resources and fisheries in the Gulf of Thailand. Text/Reference book training dept. SEAFDEC (8):103p.

8 Meemeskul, Unknown year (presumed early 1980s). Consequences of Excessive Fishing Effort on Fishery Resources in Thailand.

9 Kongprom A., P. Khaemakorn, M. Eiamsa-ard and M. Supongpan. 2003. Status of demersal fishery resources in the Gulf of Thailand p. 137 - 152. In G. Silvestre, L. Garces, I. Stobutzki, M. Ahmed, R.A. Valmonte-Santos, C. Luna, L. Lachica-Aliño, P. Munro, V. Christensen and D. Pauly (eds.) Assessment, Management and Future Directions for Coastal Fisheries in Asian Countries. WorldFish Center Conference Proceedings 67, 1 120 p

Table 4 Maximum sustainable yield of marine fisheries resources in Thai waters 2019 and recent changes in catch and effort of the main gears.

(MSY = Maximum sustainable yield; FMSY = Fishing effort at MSY)

Location	MSY (tonnes)	F_{MSY}	Current catch (tonnes)	Current fishing effort	Percent change in catch 2015 to 2019	Percent change in fishing effort 2015 to 2017	Current effort as percentage of F_{MSY}
	(1) Demersal Fish*						
Gulf of Thailand	790,985	22.61 mh **	545,363	17.34 mh	+8.4	-52.1	76.7
	(2) Anchovy						
Gulf of Thailand	202,077	172,480 days	112,701	52,476 days	-38.5	-54.6	30.4
	(3) Pelagic Fish***						
Gulf of Thailand	251,547	133,991 days	246,496	113,705 days	+0.2	-36.4	84.9

* Demersal fish refers to all bottom-dwelling fish including crustaceans and molluscs
** mh = million hours
*** Other pelagic fish refers to all pelagic fishes excluding anchovies

The fishing effort has declined during 2015-2017 in the Gulf of Thailand; whereas, the catch has increased in demersal fish group in the Gulf of Thailand (see Table 4). Because the decline in effort was greater than the change in catch, the CPUE has increased in all groups.

The demersal fish in the Gulf of Thailand has recovered to a level near MSY; while, for the anchovy and pelagic fish, their abundance is slightly higher than MSY.
However, for the demersal fish in the Gulf of Thailand and pelagic stocks in the Gulf of Thailand where significant overfishing was taking place, the MSY model predicts that a decrease in effort would result in an increase in catch, but this has not occurred. For the demersal fish, a complicating factor was that the increase in the mesh size of the trawl cod end to 4 cm could have resulted in decreased catch. More importantly, the MSY model is based on an assumption of equilibrium and does not take into account changes in the environment, such as those associated with climate change, changes in the fish community structure (fishing down the food chain that has been demonstrated to have occurred in Thailand) and the time needed to increase the fish abundance through increased recruitment of young fish. The model is also fitted to a large number of species grouped together, which makes it even more difficult to predict responses to reduced fishing effort. Stock assessments for 11 single species in the Gulf of Thailand using length-based methods carried out in 2017 were consistent with the species group assessments. The main conclusion that can be drawn from the MSY analyses and the CPUE trend of the research trawl surveys is that, although the effort has been reduced and overfishing controlled, the demersal groups in the Gulf of Thailand are still overfished and it will take time to rebuild. However, recent assessment in 2019 showed that all other groups recovered to MSY level (Table 5).

Table 5 Status of the fisheries resources in the Gulf of Thailand

	Demersal fish	Anchovy	Pelagic fish
2015			
Gulf of Thailand	Overfishing*	Fished at MSY	Overfishing*
2017			
Gulf of Thailand	Overfishing controlled Overfished**	Fished at MSY	Overfishing controlled Overfished**
2019			
Gulf of Thailand	Overfishing controlled Overfished**	Fished at MSY	Fished at MSY

**Overfishing is defined as excessive fishing that has produced a decline of the abundance of spawning fish and consequently low recruitment of young fish back into the population.*
*** Overfished is defined as a stock with an abundance below the sustainable level. A fish resource can remain overfished for a period of time after overfishing has been controlled.*

ETP Overview

The 2015 FMP[10] includes limited reference to ETP species, and does not appear to contain any measures specifically designed to quantify or reduce the impacts of Thai fisheries on ETP species, beyond noting that the protection of critical habitats will be beneficial in this area. The Royal Ordinance on Fisheries (2015) also does not appear to mention ETP species or any efforts to reduce the impact of fisheries on them[11].

The summary of technical measures currently in place in the fishery provided by the FMP does not mention any requirement for fishers to report ETP interactions, nor is there any explicit evidence of educational programmes to ensure that fishers can identify ETP species when interactions occur.

Thailand is a signatory to CITES, which is implemented via the Wildlife Reservation and Protection Act BE 2535 (1992)[12]. The Act prohibits the hunting, breeding, possession, trading, import and export of two lists of species. The only marine organism in the list of protected species in the Act itself is the dugong. The second list could not be obtained by the assessment team and it is not clear which species are listed. A report by the Thailand DoF on sharks and rays in Thai fisheries indicated 2 Endangered shark species, 6 Endangered ray species, and 3 Critically Endangered ray species were recorded as appearing in Thai fisheries in 2014[13].

Additionally, 36 species of sharks and rays categorised as Vulnerable were recorded. Endangered species included scalloped hammerhead (*Sphyrna lewini*), great hammerhead (*S. mokarran*), Maekong freshwater stingray (*Dasyatis laosensis*), Maeklong whipray (*Himantura kittipongri*), longnose marble whipray (*H. oxyrhynchus*), white-edge freshwater whipray (*H. signifier*), mottled eagle ray (*Aetomylaeus maculatus*) and ornate eagle ray (*A. vespertilio*).

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[10] Marine fisheries management plan of Thailand; A national policy for marine fisheries management, 2015-2019. Department of Fisheries, Ministry of Agriculture and Cooperatives. http://extwprlegs1.fao.org/docs/pdf/tha165156.pdf
[11] Royal Ordinance on Fisheries, BE 2558 (2015), translated by Bhumibol Adulyadej, Rex. Provided by the TSFR.
[12] Wildlife Reservation and Protection Act, 1992. https://www.unodc.org/res/cld/document/wildlife-preservation-and-protection-act--b-e--2535_html/Wildlife_Preservation_and_Protection_Act_B.E._2535.pdf
[13] Country Report – Sharks and Rays in Thailand. Tassapon Krajangdara, Andaman Sea Fisheries Research and Development Center (Phuket), DoF, Thailand. 2014.

The report concluded that there is a lack of regular data collection on sharks and rays, a lack of programmes for raising stakeholder awareness, and a lack of stock assessment and database activities in relation to sharks and rays. A 2005 paper summarising the IUCN Red List status of fish species in Thailand listed 18 Critically Endangered, 42 Endangered, and 155 Vulnerable species in Thai waters (although this includes species in fresh water and the Andaman Sea)[14].

Habitats Overview

There is some evidence that habitat interactions are taken into account during the decision-making process. The FMP sets out three 'Urgent Issues' and five 'Other Issues'. One 'Other Issue' is identified as "restoring and maintaining critical habitats". The FMP also sets out the intended approach over the 2015-2019 period, which includes increasing the total area of MPAs, improving engagement between the DoF and the DMCR, and implementing an ecosystems-based approach for local fisheries management programmes[15].

Waters within 6nm of the mainland shore (or 3nm around islands) are defined as the Coastal Fishing Zone, within which commercial vessels are not permitted to operate. The rationale for this zoning includes the protection of juveniles and their habitats, although reducing conflict between commercial and artisanal fleets is also a consideration[16].

The FMP also recognises that around 80-90% of mangroves on the GoT coast have been lost in the last 30 years, and that only around 12% of coral reefs are in 'good' condition. The negative impacts of bottom trawling on the physical environment, particularly delicate habitats such as coral reefs, are well documented.

Ecosystems Overview

There are clear references to implementing an ecosystem approach to fisheries management (EAFM) throughout the recent fishery documentation[17,18], but it is not clear how thoroughly these intentions have been implemented at this stage. There is extensive evidence that the GoT fishery has already had an impact on ecosystem structure and the relative prevalence of species in the catch, dating back at least as far as the early 1980s[19]. A 1990 paper noted an increasing prevalence of plankton bloom, deterioration of Thai bivalve fisheries, and the changing species composition in demersal and benthic fish communities[20]. A 2001 paper notes that the natural balance of multispecies groups has been disrupted by fishing pressure[21].

There is clear evidence that a variety of studies have been conducted to improve understanding of the ecosystem interactions in the GoT, including trophic level analysis, ecopath and ecosim modelling, and also projects explicitly aimed at analysing the potential impact of implementing the EAFM. One such project was conducted between 2005-2009 titled "Ecosystems, Societies, Consilience, Precautionary principle: Development of an assessment method of the societal cost for best fishing practices and efficient public policies".

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[14] Vidthayanon C., 2005. Thailand Red Data : Fishes. Office of Natural Resources and Environmental Policy and Planning, Bangkok, Thailand. 108 p

[15] Marine fisheries management plan of Thailand; A national policy for marine fisheries management, 2015-2019. Department of Fisheries, Ministry of Agriculture and Cooperatives. http://extwprlegs1.fao.org/docs/pdf/tha165156.pdf

[16] "Highlights of Thailand's New Fisheries Legislation", excerpts from a Department of European Affairs document dated 18 November 2015. Provided by the TSFR.

[17] Royal Ordinance on Fisheries, BE 2558 (2015), translated by Bhumibol Adulyadej, Rex. Provided by the TSFR.

[18] Marine fisheries management plan of Thailand; A national policy for marine fisheries management, 2015-2019. Department of Fisheries, Ministry of Agriculture and Cooperatives. http://extwprlegs1.fao.org/docs/pdf/tha165156.pdf

[19] Meemeskul, Unknown year (presumed early 1980s). Consequences of Excessive Fishing Effort on Fishery Resources in Thailand.

[20] Suvapepun, S, 1990. Long term ecological changes in the Gulf of Thailand. EMECS Volume 23, 1991.

[21] Poonsawat, R, Supongpan, M, & Christensen, V, 2001. Trophic levels of multi-species in the Gulf of Thailand (DRAFT). [Full reference unknown, provided by TSFR]

As part of this project, a paper was produced titled "Introducing ecosystem-based management in the Gulf of Thailand"[22]. This paper analysed fishery data from 1973-2005 using Ecopath and Ecosim, and produced recommendations for the future management of the fishery. These recommendations included a ban on push net and beam trawl gears, a reduction in otter board and pair trawl gear effort, area and seasonal closures, and other measures. While some of these recommendations may have been implemented, some have clearly not been (for example, beam trawling still occurs).
Similarly, a 2001 paper from the FAO titled "Report of a bio-economic modelling workshop and a policy dialogue meeting on the Thai demersal fisheries in the Gulf of Thailand" describes a workshop meeting held in Hua Hin in June 2000[23]. During the workshop fishery data were analysed using, among other methodologies, Ecopath, and recommendations for the management of the fishery were made. Again, it is not clear to what extent, if any, the recommendations of this workshop were implemented. The report also notes that long-term overfishing in the GoT has "resulted in a change in catch composition with a higher share of short-lived species in the catch". As the fishery catches a wide range of species, it is highly likely that some species in the catch play a key role in the ecosystem. The assessment team has not been made aware of any efforts to identify these key species or implement efforts specifically to minimise the impacts of the fishery on them.

9. Current management arrangements and measures, including details of those individuals or groups granted rights of access to the fishery and particulars of the nature of those rights.

The FMP identifies **two pressing threats** to the sustainable management of fisheries resources: **(1) overfishing and overcapacity of the fishing fleet and (2) IUU fishing.** It also outlines other challenges, including catching of large quantities of juvenile fish, conflicts between artisanal and commercial fishers, degradation of critical fish habitats, and inadequate fisheries data and management capacity.

The FMP's principal goals are to:

- reform Thailand's marine fisheries from an open access regime into a limited access regime where the fishing effort is commensurate with the maximum sustainable yield (MSY);
- prevent, deter and eliminate IUU fishing;
- increase benefits for and reduce conflicts among major stakeholders;
- improve the marine environment; and
- strengthen capacity to sustainably manage the fisheries.

The FMP aims to **reduce the fishing capacity and fishing effort** to limit the catch at or near the MSY. The specific capacity reduction targets are (i) for demersal fish, 40% in the Gulf of Thailand and (ii) for pelagic fish, 30% in the Gulf of Thailand. The main measures to achieve these targets are the removal of currently illegal commercial fishing vessels, plus a series of temporal closures to remove any excess fishing effort. Compensation incentives will be used, as well as buy-back scheme.

[22] Mala, Ratanawalee & Villy, 2005 (DRAFT). Introducing ecosystem-based management in the Gulf of Thailand [Full reference unknown, paper provided by TSFR]
[23] FAO Field Report F-16, 2001, Report of a bio-economic modelling workshop and a policy dialogue meeting on the Thai demersal fisheries in the Gulf of Thailand. GCP/INT/648/NOR,

The FMP is also designed to **deter and curtail IUU fishing** to a level that can be controlled through regular monitoring, control and surveillance (MCS) arrangements in the future. Fishing vessel registration and licensing systems are to be improved, so as to establish a complete and accurate database of fishing vessels and to prevent vessels with a history of IUU fishing from being registered. The Thai Government commits to allocate financial, technical and human resources required to enhance Thailand's MCS capacity and ensure effective implementation of the FMP.

Other aspects of overfishing and IUU fishing are being managed through a number relevant measures. The high catch of juveniles of commercial species is being managed through mesh size limitations and spatial and temporal closures. Conflicts between sub-sectors are being managed through declaration of exclusive fishing rights to different zones (distance from the coast). Critical habitats will be restored through increased collaboration and cooperation with other agencies mandated to protect and conserve the marine environment.

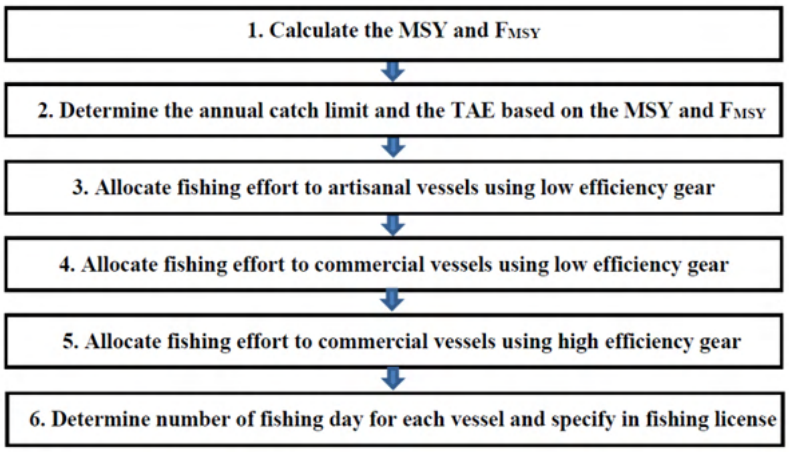
The Royal Ordinance on Fisheries B.E. 2558 (2015) also introduced broader measures that included the use of marine protected areas/sanctuaries as a management tool. The new law also provides for much better participation of stakeholders, including the private sector, through a National Fisheries Committee and Provincial Fisheries Committees in each coastal province.

Current management arrangement

The marine fisheries in Thailand are managed using input controls that limit the number of fishing vessels to ensure sustainable use as determined by the examination of best scientific evidence and balanced by economic, social and environmental considerations, in line with the ecosystem-based approach and precautionary approach. The input controls are also to ensure that fisheries resources are maintained or restored to a level that can produce the maximum sustainable yield, as well as to prevent and eliminate overfishing and overcapacity and ensure that the level of fishing effort does not undermine the sustainability of fisheries resources. Licenses are issued every two years.

Commercial and artisanal fishing vessels that use high efficiency gears are limited to only one type of fishing gear and handline. Commercial fishing vessels that use low efficiency gears are restricted to a maximum of three with only one of these three fishing gear allowed for each fishing trip. A handline can be used as a fourth fishing gear on all vessels. Artisanal fishing vessels that use low efficiency gears are not required to have a license.

The steps taken to allocate licenses and fishing days are:



A total of 10,765 fishing vessels applied for a commercial fishing license in 2018 and licenses were issued to 10,645. Commercial vessels using high efficiency gear were allocated 83% of the annual catch limit.

A combination of input controls, technical measures and broader ecosystem protection measures are used to manage the marine fisheries in Thai waters. Based on the Royal Ordinance on Fisheries B.E. 2558 (2015) and its amendment in B.E 2560 (2017), the Director General is authorized for issuing DOF notifications on seasonal and area closure. Therefore, adaptive management has been applied in the Thai marine fisheries management.

Input controls

- Licenses issued for commercial vessels up to the TAE based on the MSY and FMSY;
- Allocation of a number of fishing day for vessels using high efficiency gears; and
- Restrictions on the size and characteristics of fishing gear.

Technical measures

- Seasonal closures to protect Indo-Pacific mackerel and other economic species during their spawning season and juvenile stage in the Gulf of Thailand and the Andaman Sea;
- Demarcation zone where only artisanal vessels are allowed to fish (i.e. commercial fishing vessels are excluded) that ranges from 3 nm to 12 nm along the coast;
- Legal mesh size for trawl net cod end of 4 cm, for purse seines 2.5 cm and for anchovy purse seines 0.6 cm;
- Bans on fishing methods including electric currents, explosives, multi-entrance collapsible trap, set bag nets, push nets except for sergestid shrimp.
- Ban on some fishing gears in some areas, e.g. beam trawl not allowed in Chonburi Province; and
- Control of fishing through zoning, especially for anchovies.

10 Arrangements and responsibilities for monitoring, control and surveillance (MCS) and enforcement.

Monitoring, Control and Surveillance (MCS)

Since 2015, a comprehensive set of MCS measures have been implemented to facilitate compliance with the new fisheries law and regulations to prevent and combat IUU fishing. This includes MCS measures at port (Port-In and Port-Out (PIPO) Control Centers), inspections at sea, logbooks, installation of vessel monitoring systems (VMS) for all vessels greater than or equal to 30 GT, observers on board operating outside of Thai waters, and tighter control at seafood processing establishments throughout the whole supply chain. A national traceability system for both marine catch from Thai-flagged vessels and imported fish and fisheries products to ensure that their origin and movements (from vessels, landing and transport, entry into factories, processing and export) are accurately tracked, monitored and inspected has been developed. Transshipment control has also been strengthened and PSM for foreign-flagged vessels (both fishing and carrier) wishing to land their catch at Thai ports in accordance with the guidelines from FAO and the IOTC have been formalized.

The FMP is designed to reduce the level of IUU fishing to a level that can be controlled through regular MCS arrangements in the future. Specific management measures to achieve this include a review of the National Plan of Action to Prevent, Deter and Eliminate IUU fishing (NPOA-IUU) and the further strengthening of Thailand's coastal State, flag State and port State responsibilities. The traceability systems already in place will also be improved and international and regional MCS networking adopted.

Target: Reduce the level of IUU fishing through MCS arrangements
More detailed management measures to meet the objective of minimizing IUU fishing are contained in Thailand's National Plan of Action to Prevent, Deter and Eliminate IUU (NPOA-IUU). Building on the progress made since 2015, the measures to strengthen MCS in Thailand will include (i) possible further restructure of MCS activities in DOF; (ii) advanced electronic reporting and monitoring systems, including cameras, sensors and CCTVs for overseas fishing and transshipment vessels; (iii) improved collaboration among MCS agencies with better data and information sharing.

Target: Share IUU information through the regional MCS network
Thailand will continue to provide information on IUU vessels under the regional RPOA-IUU and share the IUU list (blacklist) with other RFMOs. Also, through active participation in regional and sub-regional MCS activities, such as the Gulf of Thailand MCS network, facilitate the sharing of IUU information.

Responsible Agencies
Thai-MECC (Thai Maritime Enforcement Command Center)
DOF: Legal Affairs Division (LAD), Fishing Control and Surveillance Division (FCSD), Fishing and Fleets Management Division (FMD), Fisheries Foreign Affairs Division (FAD), Fisheries Resources Management and Measures Determination Division (FRMD).

The Fisheries Monitoring Center (FMC) was set up in 2017 and is fully operational on a 24-hour basis as the command center for all monitoring control and surveillance (MCS) activities. The FMC coordinates and works closely with Port-in Port-out (PIPO) Centers. It establishes connections with all fishing vessels via the Vessel Monitoring System (VMS) which is used to monitor the vessels' activities, including areas of fishing, use of legitimate fishing gears, catch transshipment at sea, and labor treatment on board. The VMS transmits data including location, route, and pattern of activities of the fishing vessels to the FMC which will then be transferred to 30 PIPO Centers for reference for Port-in Port-out inspections.

Thailand has upgraded VMS equipment and developed the software used by the FMC/VMS for better data processing, including (1) sorting fishing vessels by vessel license and type of vessel and displaying vessel locations in real time; (2) recording navigation routes and comparing the routes of up to 10 vessels at the same time; (3) automatically notifying when there are any regulation violations, or when risky activities are detected, including when two vessels are moving closer than a distance of 50 meters, or when the vessel enters the Exclusive Economic Zone of a third country, or when the vessel fails to return to port within 30 days as set in the regulation; (4) keeping track of notifications and violation records to be used as inputs for risk analysis; and (5) categorizing fishing behaviors into different level of risk. Each risk group indicates different levels of intensity of MCS procedures to be conducted by FMC officials.

In addition, the Thai Government further developed the data storage system and linked the FMC/VMS database of the Fisheries Department with those of other concerned agencies including the Marine Department, the Command Centre for Combatting Illegal Fishing (CCCIF), the Ministry of Labor, and the Royal Thai Police, to make the most of the pooled information on fishing vessels' activities for risk analysis. This will in turn support the vessel inspections and the law enforcement against illegal vessels more accurately and swiftly.

11 Arrangements for monitoring and evaluation of management performance, including reporting requirements.

Mechanism of the Thailand FMP

The FMP will operate from 2020 to 2022. During this period the Thailand Department of Fisheries will use this plan to implement the measures and to develop the regulations for the fishery. The FMP will cautiously be reviewed biennially, based on the best scientific information available, with a report to the Minister of Agriculture and Cooperatives and the National Committee on Fisheries Policy on the performance of the fishery against all indicators and benchmarks. An assessment team will be formed and the Fisheries Management Information System, which would be able to alert, monitor and evaluate the performance, will be developed.

Review of the plan

An evaluation of the performance of this plan against its objectives will be made every second year and submitted to the National Committee on Fisheries Policy. The biennial evaluations may trigger a review and adaptive responses in the management and MCS arrangements.

Monitoring and evaluation

Lists of all the critical indicators that need to be monitored to be able to access the success of the FMP 2020 – 2022 were indicated including benchmark and data source.

Section 1 – Management/governance framework

This section considers the legislation, policy and planning (M1); management frameworks (M2); and monitoring, control and surveillance mechanisms (M3) in place in the fishery. The Fishery Action Plan (FAP) should include improvements which work towards meeting all of the requirements in this section.

M1	**Legislation, policy and plans**		
	M1.1	The fishery is covered by modern comprehensive legislation that includes primary legislation (law and acts) and subsidiary legislation (rules and regulations).	Pass
	M1.2	The legislation is based on relevant international law, instruments and standards.	Pass
	M1.3	The legislation and/or overarching policies outline the overall broad objectives for the fishery (ecological, social and economic).	Pass
	M1.4	The legislation legally empowers the responsible organisations to manage the fishery, including undertaking monitoring, control and surveillance and implementing management actions.	Pass
	M1.5	The policies and plans publicly commit the fisheries management organisations to sustainable development of the fishery (sustainability).	Pass
	M1.6	The legislation and national policies include arrangements for stakeholder engagement and consultation.	Pass
	M1.7	The fishery has an up-to-date fisheries management plan (or linked to such a plan) that incorporates the main principles of the ecosystem approach to fisheries, covering the ecological, social and economic dimensions of sustainable development.	Pass
	M1.8	The fishery management plan specifies goals and operational objectives.	Pass
	M1.9	The fishery management plan outlines the roles and responsibilities of the different fishery management and partner organisations.	Pass
M1 outcome:			Passes
Evidence:			
M1.1 The purposes of Royal Ordinance[24] compliance with obligations to which Thailand is committed to be bound by international organisations and conventions related to fisheries conservation and management to which Thailand is a state party or the rules or measures of relevant international organisations related to fisheries conservation and management. The National Fisheries Committee was established with comprising Prime Minister as its chairperson, and relevance concerns Ministers representatives, and fisheries related association as committee members.[25] The Committee shall have the power and duty to determine fisheries policies and supervise fisheries management for submitted to the Council of Ministers for deliberation and approval. Upon the approval thereof by the Council of Ministers, all state agencies shall implement any such policy and ensure that any such policy is undertaken.			

There shall be a provincial fisheries committee in each of the provinces prescribed by the Minister.[25] Any such provincial fisheries committee shall comprise the Provincial Governor as Chairperson, and relevance concerns Ministers representatives in provincial, and fisheries related association as committee members. The Provincial Fisheries Committee shall have the power to issue notifications pursuant to section 56, section 71, and section 77 which are to be published in the Government Gazette.

The FMP also identifies two pressing threats to the sustainable management of fisheries resources: (1) overfishing and overcapacity of the fishing fleet and (2) IUU fishing**.** It also outlines other challenges, including catching of large quantities of juvenile fish, conflicts between artisanal and commercial fishers, degradation of critical fish habitats, and inadequate fisheries data and management capacity.

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[24] Royal Ordinance on Fisheries (No.2) 1 B.E.2017
http://extwprlegs1.fao.org/docs/pdf/tha195358.pdf
[25] Royal Ordinance on Fisheries B.E.2558 (2015)
http://extwprlegs1.fao.org/docs/pdf/tha159730.pdf
…….

M1.2

The purposes of Royal Ordinance compliance with obligations to which Thailand is committed to be bound by international organisations and conventions related to fisheries conservation and management to which Thailand is a state party, any wrongdoing pursuant to this Royal Ordinance or the laws of a coastal state or in accordance with criteria or measures based on relevant international laws, or the rules or measures of relevant international organisations related to fisheries conservation and management, whether being committed in Thai waters or outside Thai waters, and using a Thai fishing vessel, a non-Thai fishing vessel, or a stateless vessel, shall be regarded as a wrongdoing within the Kingdom, and shall be subject to a sanction prescribed in this Royal Ordinance[26].

The provisions of Royal Ordinance on Chapter 4 aim to secure fulfillment of Thailand's international obligations with regard to the conservation and management of aquatic resources, cooperation with other states and private agencies, as well as international organisations, with a view to achieving the objectives under this Royal Ordinance.

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[26] Royal Ordinance on Fisheries (No.2) 1 B.E.2017
http://extwprlegs1.fao.org/docs/pdf/tha195358.pdf
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M1.3

The provisions of Royal Ordinance[27] purposes of conservation and management designed to achieve a natural balance and the preservation of aquatic animal resources and the ecosystem in a sustainable manner based on a precautionary approach, persons engaging in fishing operations. The provisions also promote aquaculture as an alternative source of aquatic animal products in accordance with the overall objective of achieving long-term economic, social and environmental sustainability and ecosystem balance, whilst also ensuring the proper quality and hygienic standards for consumption.

The provisions of Royal Ordinance[28] on Chapter 4 aim to secure fulfillment of Thailand's international obligations with regard to the conservation and management of aquatic resources, cooperation with other states and private agencies, as well as international organisations, with a view to achieving the objectives under this Royal Ordinance.

Thailand has ratified 18 ILO conventions,[29] including two conventions during the past 12 months. The Kingdom ratified the original Forced Labour Convention in 1969 and the 2014 Protocol updates that strengthens the earlier convention to take into account today's problems and changing conditions. The Thai government also ratified the ILO Work in Fishing Convention and is planning two other conventions on collective bargaining and the right to organize for both national and migrant workers.

The provisions of Royal Ordinance [27] section concern on factory operator under the law on factories who engages in a business relating to aquatic animals is prohibited from employing a person in violation of the law on labour protection or an alien who does not hold a licence under the law on working of aliens.

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[27] Royal Ordinance on Fisheries B.E.2558 (2015)
http://extwprlegs1.fao.org/docs/pdf/tha159730.pdf
[28] Royal Ordinance on Fisheries (No.2) 1 B.E.2017
http://extwprlegs1.fao.org/docs/pdf/tha195358.pdf
[29] Marine fisheries management plan of Thailand (2020-2022)
https://drive.google.com/drive/folders/1paucb10bk4qSSXaOPsWfOErx8EIWdmen
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M1.4

The management of marine fisheries in Thailand falls under the jurisdiction of both the Department of Fisheries (DoF), within the Ministry of Agriculture and Cooperatives (MOAC), and the Department of Marine and Coastal Resources (DMCR) within the Ministry of Natural Resources and the Environment (MNRE). The DoF is responsible for implementing the Royal Ordinance on Fisheries BE 2558 (2015), including licencing and registering vessels, carrying out fishery research, and supporting fisheries development activities.

The Thailand DoF is empowered to manage Thai fisheries under a range of legislation including the new Royal Ordnance on Fisheries 2015[30] and 2017[31], but also the Fisheries Act 1947, the Act Governing the Right to Fish Within Thai Waters 1939, the Act Organising the Activities of Fish Market 1953, and the Wildlife Reservation and Protection Act 1992[32].

The provisions provide competent officials with sufficient powers for the implementation of this Royal Ordinance [30], in particular with regard to the exercise of effective monitoring, control and surveillance functions, as well as to ensure that complete and accurate data concerning fisheries activities are collected.

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[30] Royal Ordinance on Fisheries B.E.2558 (2015)
http://extwprlegs1.fao.org/docs/pdf/tha159730.pdf
[31] Royal Ordinance on Fisheries (No.2) 1 B.E.2017
http://extwprlegs1.fao.org/docs/pdf/tha195358.pdf
[32] FAO country factsheet, Thailand. http://www.fao.org/fishery/facp/THA/en, 2009
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M1.5

The mission of the DoF includes "Controlled aquatic resource management to ensure sustainable use and maintenance of diversity, via the involvement of fishermen and the public sector"[33]. The mission of the DMCR is more explicitly focussed around promoting and maintaining the sustainable use of marine and coastal resources[34]. The Royal Ordnance on Fisheries (2015)[35], the central legal instrument through which these government bodies operate, also includes a focus on the conservation of aquatic resources through the utilisation of the precautionary approach, the tackling of IUU fishing, and the prevention of overfishing and excess capacity.

At the national level, the overall policy framework[36] is guided by the 20-year National Strategy. This is implemented through the five-year National Economic and Social Development Plans (NESDP). NESDP (2017-2021) recognises that natural resources and the environment have rapidly deteriorated in both quantity and quality, resulting in higher economic costs and devastating negative impacts on people's quality of life. Marine fisheries are important both socially and economically for Thailand. In order to maintain the sustainable development of the sector, a number of challenges still need to be addressed. These include rebuilding and maintaining the fish resources at a level commensurate with the MSY, reducing the large quantities of small low value/trash fish, including juveniles of larger commercial species that are taken, further reducing illegal, unreported and unregulated fishing (IUU), improving the status of critical marine habitats (mangroves, sea grasses, and coral reefs), improving the well-being of artisanal fishers and strengthening the capacity for effective fisheries management.

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[33] Thailand DoF website, "Mission". http://www4.fisheries.go.th/index.php/dof/view_li/125
[34] Thailand Department of Marine and Coastal Resources website, "Mission". http://www.dmcr.go.th/aboutus/ms/
[35] Royal Ordinance on Fisheries B.E.2558 (2015) http://extwprlegs1.fao.org/docs/pdf/tha159730.pdf
[36] Marine fisheries management plan of Thailand (2020-2022) https://drive.google.com/drive/folders/1paucb10bk4qSSXaOPsWfOErx8EIWdmen

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M1.6

The provisions of Royal Ordinance on Fisheries 2015[37] aim to provide for policies and oversight of fisheries management by way of promoting the participation of all stakeholders in the management and conservation of aquatic animal resources, as well as to establish a system of good governance in order to ensure sustainable use as determined by the examination of best scientific evidence and balanced by economic, social and environmental considerations, in line with the ecosystem based approach and precautionary approach, and also to ensure that fisheries resources are maintained or restored to a level that can produce the maximum sustainable yield. The Royal Ordinance on Fisheries provides for participation of stakeholders, including the private sector, through a National Fisheries Committee and Provincial Fisheries Committees in each coastal province on the decision making process on legislation and nation policies frame work.

New regulations require the Thailand National Fisheries Committee and provincial fishing industry groups to set up rules and manage the fisheries within their areas of authority. Membership of the national and local committees is specified under the law and includes government agencies, the private sector, and various fisheries committees and associations.

The Marine Fisheries Management Plan of Thailand (2020-2024)[38]
is indicate objective to resolve conflicts between resource users. Currently, each Province has a demarcation zone where only artisanal vessels are allowed to fish, but it is not easy to

police. More detailed demarcation of different gears and areas are required. The Provincial Fishery Committees with the Provincial Governor as Chairperson and consisting of representatives of DOF, DMCR, artisanal, commercial vessels and other key stakeholders need to be strengthened and become a forum for conflict resolution in all coastal provinces. Implementation of community conservation zones will continue.

There is several evidence that fishery stakeholders are participated as a member of the Provincial Fishery Committees meeting on consultation processes for decision-making on the fisheries management law and regulation. There is an example of the Trat Provincial Fisheries Committee Meeting No. 1/2564 on 14 September 2021. The meeting chaired by Governor of Trat Province in which Trat Provincial Fisheries Office as secretary of the committee, Experts in various fields who are the committees attending this meeting at Trat City Hall.[39, 40]

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[37] Royal Ordinance on Fisheries B.E.2558 (2015)
http://extwprlegs1.fao.org/docs/pdf/tha159730.pdf
[38] Marine fisheries management plan of Thailand (2020-2022)
https://drive.google.com/drive/folders/1paucb10bk4qSSXaOPsWfOErx8EIWdmen
[39] Trat Provincial Fisheries Committee Meeting No. 1/2564 (English Translation)
https://drive.google.com/drive/folders/1jX5qxxEN_ynK0vWhvOf1Fu291nVka8k-
[40] Trat Provincial Fisheries Committee Meeting No. 1/2564 (Original Thai version)
https://thainews.prd.go.th/th/news/detail/TCATG210914163834899
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M1.7

The FMP (2015-2019)[41] is based on international best practice and Thailand's international fisheries obligations and applies the Ecosystem Approach to Fisheries Management (EAFM) that aims to balance ecological well-being (fish resources and the environment) with human wellbeing (social and economic benefits).

The FMP (2020-2022)[42] is developed based on the success of the FMP of 2015-2019 and taking into consideration changes in the status and nature of the fishery and newer approaches to management. Assessment and review of progress against the objectives and targets of the FMP (2015-2019) were also carried out and a summary of results is at Table 1 of FMP (2020-2022) and full details are in the assessment report. The report concluded that many of the management measures specified in the FMP (2015-2019) had already been implemented and that the FMP needed to be updated by revising objectives and targets of management in the next 3 years. Excellent progress was made against the urgent issues of (i) overfishing and overcapacity, and (ii) IUU fishing. For the other less urgent issues, good progress has been made against all objectives.

The Food and Agriculture Organization (FAO), Southeast Asian Fisheries Development Center are implement the GEF supported project "Strategies for trawl fisheries by-catch management" (REBYC-II CTI; GCP/RAS/269/GFF).[43] Which works with the five participating countries (Indonesia, Papau New Guinea, Philippines, Thailand and Vietnam). Under the project work plan for Thailand, the Department of Fisheries, Marine Fisheries Research and Development Bureau is implementing the project at two sites; Prachuab Kiri Khan and Chumphon. The Central Gulf Marine Fisheries Research and Development Center (CMDEC), located in Chumphon is taking the lead in research into trawl fisheries and enlarged cod-end mesh size experiments. The second site in Trad province, is being used to pilot management measures for closed areas and closed seasons, to protect fish larvae and spawners. The Eastern Marine Fisheries Research and Development (EMDEC), located in Rayong province is taking the lead for this research work. Research at both project sites involves the participation of stakeholder and the DOF actively seeks cooperation between officials and stakeholders, in data sharing, analysis & presenting results for improved

understanding between fishers and officials. Thailand's new 'Marine Fisheries Management and Fisheries Act 2015' was brought into force in on 27th June 2015. This was the first significant change in Thailand's fishery laws since 1947. The new fishery law is essential knowledge for those researchers, enforcement persons, fishers, and the private sector. The new Law issuance of the Government Gazette, on 6 August 2015, became effective on the day of issuance. Other highlights from the law include the banning of set nets and purse seines with mesh size less than 2.5 cm, Octopus traps, Trawlers with a cod end mesh size of less than 5.0 cm, and other illegal gears. Violent offenders will be imprisoned for up to 5 years or fined 100,000 -500,000 Baht or both imprisoned and fined.

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[41] Marine fisheries management plan of Thailand; A national policy for marine fisheries management, 2015-2019. Department of Fisheries, Ministry of Agriculture and Cooperatives. http://extwprlegs1.fao.org/docs/pdf/tha165156.pdf
[42] Marine fisheries management plan of Thailand (2020-2022), https://drive.google.com/drive/folders/1paucb10bk4qSSXaOPsWfOErx8EIWdmen
[43] The Meeting on Marine Fisheries Management and Fisheries Acts 2015 related to Trawl fisheries and By-catch Management REBYC-II CTI; GCP/RAS/269/GFF) http://repository.seafdec.or.th/bitstream/handle/20.500.12067/1225/TH_20150820_Thai_Fishery_%20Law_Meeting.pdf?sequence=1&isAllowed=y
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M1.8

The vision for the future of Thailand marine fisheries [44] is: *Sustainably managed marine fishery that contributes to increased national prosperity, livelihoods and environmental well-being.* This broad vision can be broken down into 5 goals that address major issues:

Goals:

1. Fisheries resources restored to a level that can support the MSY in Thai waters and sustainable fishing expanded into deep-sea and overseas waters
2. IUU-free fishery
3. Healthy habitats and environment
4. Improved livelihoods of fishers and fishing communities
5. Effective fisheries management capacity

Under these numbers of goals are contain of 15 operation objectives for FMP 2020-2022. The 15 objectives are compose of following issues;
Objective 1: To control fishing effort to a level that is commensurate with the MSY,
Objective 2: To reduce the catch of juvenile economic species,
Objective 3: To rebuild fish resources through artificial reefs and restocking programs,
Objective 4: To promote and control a deep-sea fishery in Thai waters,
Objective 5: To promote and control a more diversified overseas fishery,
Objective 6: To develop/improve MCS to be more efficient,
Objective 7: To strengthen traceability systems,
Objective 8: To improve international and regional cooperation in combatting IUU,
Objective 9: To restore and maintain critical habitats,
Objective 10: To rebuild marine biodiversity,
Objective 11: To reduce marine debris,
Objective 12: To resolve conflicts between resource users,
Objective 13: To improve the well-being of artisanal fishers and fishing communities,
Objective 14: To improve the quality and accessibility of fisheries data and information,
Objective 15: To increase financial and human capacity of officials, NGOs and key stakeholders,

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[44] Marine fisheries management plan of Thailand (2020-2022), https://drive.google.com/drive/folders/1paucb10bk4qSSXaOPsWfOErx8EIWdmen

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M1.9

Thailand's marine fisheries are managed by the DOF of the Ministry of Agriculture and Cooperatives (MOAC) who also have overall responsibility for fisheries management and MCS. The DOF has 24 Divisions, six of which are directly involved in marine fisheries management. These include fisheries management policy and planning, control and surveillance, fishing and fleet management, foreign affairs, research and development and information and communication. The DOF also set up a new Fisheries Monitoring Center (FMC) with a new structure in May 2016.[45]

The Thailand Maritime Enforcement Coordinating Center (Thai-MECC) was established in March 1997. THAI-MECC is led by the Royal Thai Navy as the focal point, with another five law enforcement agencies, namely, the Royal Thai Marine Police, Customs Department, Marine Department, DOF and the Department of Coastal and Marine Resources. The THAI-MECC has been upgraded to have full authority at sea, having its own budget and a combined maritime task force. Information is shared through a Maritime Information Sharing System (MISS) manned by personnel from all six agencies.

The Thai government established the Command Center for Combating Illegal Fishing (CCCIF), located at the Royal Thai Navy Command Center, in May 2015. The government also set up Port in-Port out (PIPOs) Centers in 22 coastal provinces, with the goal of improving control of fishing vessels over 30 GT and fishing vessels less than 30 GT that use high efficiency fishing gears. There are currently 30 PIPO centers and 21 forward inspection points (FiPs) at more convenient locations. The PIPO Centers are under the supervision of the Thai-MECC, which also coordinates Anti-IUU Fishing Task Forces in three areas, which are multi-disciplinary inspection teams at sea, ports and seafood processing factories.

The Marine Department is mainly responsible for vessel registrations, vessel use permits, change of vessel type, vessel demolition, seaman books, seafarer's certification and other matters relation to marine safety. Management of the marine environment is the responsibility the Department of Marine and Coastal Resources (DMCR) under the Ministry of Natural Resources and Environment (MNRE).

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[45] Marine fisheries management plan of Thailand (2020-2022), https://drive.google.com/drive/folders/1paucb10bk4qSSXaOPsWfOErx8EIWdmen

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M2	**Institutions and stakeholder's engagement**		
	M2.1	The organisation identified in the initial screening has an effective management framework in place.	Pass
	M2.2	The management decision-making is based on the best scientific evidence available.	Pass
	M2.3	There is an organisation charged with the identification, management and conservation of ETPs with jurisdiction over the fishery.	Pass
	M2.4	There is an organisation responsible for the conservation and protection of fishery habitats.	Pass
	M2.5	The fishery has some form of governance arrangements in place that can be used to	Pass

		coordinate management between the government organisation and key stakeholders of the fishery.	
	M2.6	There is a consultation process through which fishery stakeholders are engaged in all aspects of planning and decision-making.	Pass
	M2.7	The decision-making process is transparent, with processes and results publicly available.	Pass
M2 outcome:			Passes

Evidence:

M2.1

The management of marine fisheries in Thailand falls under the jurisdiction of both the Department of Fisheries (DoF), within the Ministry of Agriculture and Cooperatives (MOAC), and the Department of Marine and Coastal Resources (DMCR) within the Ministry of Natural Resources and the Environment (MNRE). The DoF is responsible for implementing the Royal Ordinance on Fisheries BE 2558 (2015), including licencing and registering vessels/gears, carrying out fishery research, and supporting fisheries development activities.

The Thailand DoF is empowered to manage Thai fisheries under a range of legislation including the new Royal Ordnance on Fisheries 2015[46] and 2017,[47] but also the Fisheries Act 1947, the Act Governing the Right to Fish Within Thai Waters 1939, the Act Organising the Activities of Fish Market 1953, and the Wildlife Reservation and Protection Act 1992.[48]

The Royal Ordinance on Fisheries provides for participation of stakeholders, including the private sector, through a National Fisheries Committee and Provincial Fisheries Committees in each coastal province on the decision making process on legislation and nation policies frame work.

Enforcement of fishery regulations, including carrying out inspections, is the responsibility of the Thailand Maritime Law Enforcement Coordinating Centre (Thai-MECC), which was created in 1998. Thai-MECC is led by the Royal Navy but also involves the Royal Thai Marine Police, Customs Department, Maritime Department, Department of Fisheries, and the Coastal and Maritime Resources Department. Thai-MECC reportedly has limited effectiveness with regards to ensuring cooperation between the member agencies, and as of 2017 was undergoing an upgrade and rename to the Thailand Maritime Laws Enforcement Administration Center (THAI-MLEAC).[49]

The Thai government established the Command Center for Combating Illegal Fishing (CCCIF), located at the Royal Thai Navy Command Center, in May 2015. The government also set up Port in-Port out (PIPOs) Centers in 22 coastal provinces, with the goal of improving control of fishing vessels over 30 GT and fishing vessels less than 30 GT that use high efficiency fishing gears.[50]
PIPO having the duty to control the entry and exit of fishing vessels in accordance with the established rules and procedures, Monitoring, Controlling and Surveillance (MCS) of fisheries, labor use in the fishery sector as well as inspecting the source of aquatic animals from catching fish to consumers.

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[46] Royal Ordinance on Fisheries B.E.2558 (2015) http://extwprlegs1.fao.org/docs/pdf/tha159730.pdf

[47] Royal Ordinance on Fisheries, B.E. 2560 (2017), Bhumibol Adulyadej, Rex. BHUMIBOL ADULYADEJ, REX; Given on the 13thDay of November B.E. 2558; Being the 70th Year of the Present Reign. https://www4.fisheries.go.th/dof_en/view_message/224

[48] FAO country factsheet, Thailand. http://www.fao.org/fishery/facp/THA/en, 2009

[49] The Australian Naval Institute website, "Coordination: the Kingdom of Thailand's example", April 2017. https://navalinstitute.com.au/coordination-the-kingdom-of-thailands-example/

[50] Marine fisheries management plan of Thailand (2020-2022), Appendix C: Categories of fishing vessels in Thailand https://drive.google.com/drive/folders/1paucb10bk4qSSXaOPsWfOErx8EIWdmen

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M2.2

The DoF is responsible for implementing the Royal Ordinance on Fisheries BE 2558 (2015), including licencing and registering vessels, carrying out fishery research, and supporting fisheries development activities.

- The FMP (2015-2019)[51] identifies two pressing threats to the sustainable management of fisheries resources: (1) overfishing and overcapacity of the fishing fleet and (2) IUU fishing. It also outlines other challenges, including catching of large quantities of juvenile fish, conflicts between artisanal and commercial fishers, degradation of critical fish habitats, and inadequate fisheries data and management capacity.

The FMP aims to reduce the fishing capacity and fishing effort to limit the catch at or near the MSY. The specific capacity reduction targets are (i) for demersal fish, 40% in the Gulf of Thailand and 10% in the Andaman Sea and (ii) for pelagic fish, 30% in the Gulf of Thailand and 20% in the Andaman Sea. The main measures to achieve these targets are the removal of currently illegal commercial fishing vessels, plus a series of temporal closures to remove any excess fishing effort. Compensation incentives will be used, as well as buy-back scheme.

The FMP is also designed to deter and curtail IUU fishing to a level that can be controlled through regular monitoring, control and surveillance (MCS) arrangements in the future. Fishing vessel registration and licensing systems are to be improved, so as to establish a complete and accurate database of fishing vessels and to prevent vessels with a history of IUU fishing from being registered. Other aspects of overfishing and IUU fishing are being managed through a number relevant measures. The high catch of juveniles of commercial species is being managed through mesh size limitations and spatial and temporal closures. Conflicts between sub-sectors are being managed through declaration of exclusive fishing rights to different zones (distance from the coast). Critical habitats will be restored through increased collaboration and cooperation with other agencies mandated to protect and conserve the marine environment.

The FMP 2020-2024[52] also recognizes the importance of better data and information to inform management decision making and proposes several important changes on research, data and information that can be used in the management of Thai fisheries. The FMP will be reviewed every second year with a report 0n progress against the objectives, and if appropriate, the challenges, goals and objectives and management measure will be modified.

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[51] Highlights of Thailand's Marine Fisheries Management Plan, 2015-2019 https://www.thaiembassy.be/2015/11/18/highlights-of-thailands-marine-fisheries-management-plan-2015-2019/?lang=en

[52] Marine fisheries management plan of Thailand (2020-2022), https://drive.google.com/drive/folders/1paucb10bk4qSSXaOPsWfOErx8EIWdmen

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M2.3

The DoF adopts responsibility for the identification, management and conservation of ETP species within the fishery. There are regulations requiring interactions with ETP species such as Fisheries Ordinance 2015; Section 66: No person shall catch aquatic mammals, rare aquatic animals or aquatic animals near extinction as prescribed by the Minister or take any such aquatic animal on board a fishing vessel, except where it is necessary to do so in order to save the life thereof.[53]

Department of Marine and Coastal Resources[54] has a mission to conserve, restore and manage marine and coastal resources. including preventing and solving coastal erosion problems for the wealth, balance and sustainability of the Thai sea to strengthen the social and economic stability of the country with duties and powers as follows:

1. To propose opinions for consideration in the formulation of policies and plans for the management of conservation and restoration of marine and coastal resources.
2. Suggest improvements Amend the rules, regulations and measures related to conservation and restoration. Management and utilization of marine and coastal resources and sustainable coastal erosion prevention.
3. Oversee, assess and monitor the conservation, restoration, management and utilization of marine and coastal resources. and preventing coastal erosion in compliance with regulations and related measures
4. **Study, research and develop the conservation and restoration of marine and coastal resources including rare and endangered marine plants and animals**
5. Propose opinions for consideration on determining the conservation of mangrove forest areas Marine and Coastal Resource Protection Areas and areas to take measures to prevent coastal erosion for the benefit of preserving, conserving and reviving marine and coastal resources. as well as solving coastal erosion problems.
6. Promote participation and support of people, coastal communities and local government organizations. in the management, planting, maintenance, conservation, restoration and exploitation of marine and coastal resources.
7. It is an information center for the country's marine and coastal resources.
8. Coordinate with international and international organizations in marine and coastal resources
9. to perform any other duties as required by law to be the duties and powers of the Department or as assigned by the Minister or the Council of Ministers.

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[53] Royal Ordinance on Fisheries B.E.2558 (2015) http://extwprlegs1.fao.org/docs/pdf/tha159730.pdf

[54] Department of Marine and Coastal Resources https://www.dmcr.go.th/downloadLib/?file=qTMcMUujpP5gBKp2GQMgBTpmqQAcBUtkpQSgYKp3GQMgZzpgqTIcoUucpTMgY3qyGTkgnJqzqP9cqUuxpP9gMUquGT9goTqjqUIcY3u0pT9go3qlGUqgq2q3qP9cBauQ&n=Department%20of%20Marine%20and%20Coastal%20Resources&t=GT5gq2qxqS9cMUug&type=rQR%3Q&up=rQR%3Q&id=qQqcAatl

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M2.4

The Department of Marine and Coastal Resources (DMCR)[55] is a department funded under the Ministry of Natural Resources and Environment (MoNRE). Responsibilities and tasks related to marine and coastal resources, which were previously under the supervision of the Department of Fisheries, the Royal Forestry Department and the Land Development Department, these being agencies under MoNRE, especially those task concerned with coastal areas, mangrove, coral reefs, seagrass beds, and marine animals. The goal is to establish a balance in the execution of responsibilities and thus contribute to national economic and social security.

The Government Act on Restructuring the Government's Organization, B.E. 2545, stipulates the authority and duties of the Department of Marine and Coastal Resources as follows,

1. **Formulate managerial policy and planning in order to undertake marine and coastal resources conservation and rehabilitation;**

2. Amend rules, regulations and measure related to conservation, rehabilitation, management and use of marine and coastal resources, for sustainable use;
3. Control, oversee, evaluate and monitor to ensure that laws, regulation, and measures are complied with;
4. **Encourage study, research and development of marine and coastal resources in order to support conservation and rehabilitation, including rare and endangered marine flora and fauna;**
5. **Identify Marine and coastal sites that need to be conserved so these could benefit from resources protection; in addition, control and oversee initiatives**;
6. Promote understanding and public participation in resources conservation and rehabilitation;
7. Serve as an information center on national Marine and coastal resources;
8. Serve in the international arena by engaging in Marine and coastal resources collaboration with international organizations and governments;
9. Perform other function as required by law, observing the authority and duties of the Department of Marine and Coastal Resources or as designated by the Ministry or the Cabinet.

To achieve the objective on Restoring and maintaining critical habitats, DOF will have to become more involved in habitat protection and restoration activities carried out by other agencies at the national, provincial and district levels, especially on-going Integrated Coastal Management (ICM) activities. DOF can also Initiate Ecosystem Approach for Fisheries Management (EAFM) Programs for coastal communities.[56]

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[55] Department of Marine and Coastal Resources https://www.dmcr.go.th/downloadLib/?file=qTMcMUujpP5gBKp2GQMgBTpmqQAcBUtkpQSgYKp3GQMgZzpgqTIcoUucpTMgY3qyGTkgnJqzqP9cqUuxpP9gMUquGT9goTqjqUIcY3u0pT9go3qlGUqgq2q3qP9cBauQ&n=Department%20of%20Marine%20and%20Coastal%20Resources&t=GT5gq2qxqS9cMUug&type=rQR%3Q&up=rQR%3Q&id=qQqcAatl

[56] Marine fisheries management plan of Thailand; A national policy for marine fisheries management, 2015-2019. Department of Fisheries, Ministry of Agriculture and Cooperatives. http://extwprlegs1.fao.org/docs/pdf/tha165156.pdf

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M2.5

The Royal Ordinance on Fisheries provides for participation of stakeholders, including the private sector, through a National Fisheries Committee and Provincial Fisheries Committees in each coastal province on the decision making process on legislation and nation policies frame work.

The National Fisheries Committee was established with comprising Prime Minister as its chairperson, and relevance concerns Ministers representatives, and fisheries related association as committee members.[57] The Committee shall have the power and duty to determine fisheries policies and supervise fisheries management for submitted to the Council of Ministers for deliberation and approval. Upon the approval thereof by the Council of Ministers, all state agencies shall implement any such policy and ensure that any such policy is undertaken.

There shall be a provincial fisheries committee in each of the provinces prescribed by the Minister.[59] Any such provincial fisheries committee shall comprise the Provincial Governor as Chairperson, and relevance concerns Ministers representatives in provincial, and fisheries related association as committee members. Expert committee members shall be appointed from the representatives of local fishing community organisations in the fields of coastal fisheries, offshore fisheries, freshwater fisheries, aquaculture or aquatic animal processing. The Provincial Fisheries Committee shall have the powers and duties as compile recommendations and propose approaches to the promotion of the fishing

profession, the management, maintenance, conservation, restoration and sustainable utilization of aquatic animal resources by local fishing community organisations in its jurisdiction and submitting them to the Committee for deliberation in the preparation of policies pursuant to the National Fisheries Committee for determining policies for the development of fisheries in Thai waters in line with aquatic animal resource stocks and the country's fishing capability based primarily on the points of reference. The Provincial Fisheries Committee shall have the power to issue notifications pursuant to section 56, section 71, and section 77 which are to be published in the Government Gazette.

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[57] Royal Ordinance on Fisheries B.E.2558 (2015)
http://extwprlegs1.fao.org/docs/pdf/tha159730.pdf
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M2.6

There is several evidence that fishery stakeholders are participated as a member of the Provincial Fishery Committees meeting on consultation processes for decision-making on the fisheries management law and regulation. There are fisheries management decisions made by the Provincial Fisheries Committee Meeting and announces to public through the Government Gazette (Thai language) [58] of 76 provinces during 2016-2021.

The Provincial Fisheries Committee, in collaboration with the Provincial Fisheries Office, provide a forum to discuss and develop local management arrangements. Trat is one of the first Provinces in the country to conduct a community-based consultative process following the FAO SSF Guidelines to discuss the implication of the Royal Ordinance on Fisheries (2015) for small-scale fisheries. The decisions and compromises made at the meetings of the Provincial Fisheries Committee of Trat, especially when the requests were well justified that included provisions made to minimize fishing impacts on ecosystems, illustrate how responsible fisheries and sustainable development, as promoted in the FAO SSF Guidelines, can potentially be achieved through a community-based consultative process. [59]

There is an example of the Trat Provincial Fisheries Committee Meeting No. 1/2564 on 14 September 2021. The meeting chaired by Governor of Trat Province in which Trat Provincial Fisheries Office as secretary of the committee, Experts in various fields who are the committees attending this meeting at Trat City Hall. [60, 61]

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[58] Government Gazette of 76 provinces during 2016 - 2021 (Original Thai version)
https://www4.fisheries.go.th/local/index.php/main/view_activities/84/76178
[59] Marine fisheries management plan of Thailand (2020-2022),
https://drive.google.com/drive/folders/1paucb10bk4qSSXaOPsWfOErx8EIWdmen
[60] Trat Provincial Fisheries Committee Meeting No. 1/2564 (English Translation)
https://drive.google.com/drive/folders/1jX5qxxEN_ynK0vWhvOf1Fu291nVka8k-
[61] Trat Provincial Fisheries Committee Meeting No. 1/2564 (Original Thai version)
https://thainews.prd.go.th/th/news/detail/TCATG210914163834899
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M2.7

The fisheries management decisions are made by the Provincial Fisheries Committee Meeting and announces to public through the Government Gazette.

There is the Government Gazette No. 8/137 [62, 63] Announcement of the Fisheries Committee of Trat Province, Re: Determination of Aquaculture Areas for Controlled Aquaculture Businesses, Types of Shellfish Cultivation B.E. 2020, with resulting from Trat Provincial Fisheries Committee Meeting No. 1/2564 on 14 September 2021. Other evidence of Government Gazette No. 14/134 [64, 65] Announcement of the Fisheries Committee of Satun Province Re: Prescribing Fishing Tools fishing method and fishing areas forbidden from fishing in fisheries, B.E. 2017.

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[62] Government Gazette No. 8/137 (English Translation) https://drive.google.com/drive/folders/1jX5qxxEN_ynK0vWhvOf1Fu291nVka8k-

[63] Government Gazette No. 8/137 (Original Thai version) https://www4.fisheries.go.th/local/pic_activities/202002261207021_pic.PDF

[64] Government Gazette No. 14/134 (English Translation) https://drive.google.com/drive/folders/1jX5qxxEN_ynK0vWhvOf1Fu291nVka8k-

[65] Government Gazette No. 14/134 (Original Thai version) http://www.ratchakitcha.soc.go.th/DATA/PDF/2560/E/194/14.PDF

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M3	**Monitoring, control and surveillance**		
	M3.1	The MCS organisation identified in the initial screening provides effective compliance and enforcement mechanisms that ensure management measures are complied with.	Pass
	M3.2	There are adequate sanctions for illegal activities that can be applied when rules and regulations are broken.	Pass
	M3.3	There is no substantial evidence of widespread non-compliance in the fishery, and no substantial evidence of illegal, unreported and regulated (IUU) fishing.	Pass
	M3.4	Surveillance is conducted through a regime that includes a range of activities, for example, at-sea and portside inspections, observer programmes and VMS, as appropriate.	Pass
	M3.5	Stakeholders in the fishery are aware of, and understand, the laws and regulations.	Gap
M3 outcome:			Gaps

Evidence:

M3.1

The Thailand Maritime Enforcement Coordinating Center (Thai-MECC) was established in March 1997.[66] THAI-MECC is led by the Royal Thai Navy as the focal point, with another five law enforcement agencies, namely, the Royal Thai Marine Police, Customs Department, Marine Department, DOF and the Department of Coastal and Marine Resources. The THAI-MECC has been upgraded to have full authority at sea, having its own budget and a combined maritime task force. Information is shared through a Maritime Information Sharing System (MISS) manned by personnel from all six agencies.

The Thai government established the Command Center for Combating Illegal Fishing (CCCIF), located at the Royal Thai Navy Command Center, in May 2015. The government also set up Port in-Port out (PIPOs) Centers in 22 coastal provinces, with the goal of improving control of fishing vessels over 30 GT and fishing vessels less than 30 GT that use high efficiency fishing gears. There are currently 30 PIPO centers and 21 forward inspection points (FiPs) at more convenient locations. The PIPO Centers are under the supervision of the Thai-MECC, which also coordinates Anti-IUU Fishing Task Forces in three areas, which are multi-disciplinary inspection teams at sea, ports and seafood processing factories. The Marine Department is mainly responsible for vessel registrations, vessel use permits, change of vessel type, vessel demolition, seaman books, seafarer's certification and other matters relation to marine safety.

PIPO Controlling Center having the Command Center for Combating Illegal Fishing (CCCIF) as the main unit to drive compliance with the law, NCPO orders, ministerial regulations, announcements

and related regulations. CCCIF is also coordinating with the Department of Fisheries, Marine Department, Department of Employment and the Department of Labor Protection and Welfare under supervision at the local level by the Thai Maritime Enforcement Command Center. PIPO having the duty to control the entry and exit of fishing vessels in accordance with the established rules and procedures, Monitoring, Controlling and Surveillance (MCS) of fisheries, labor use in the fishery sector as well as inspecting the source of aquatic animals from catching fish to consumers.

MCS requirements will include developing the Electronic Reporting System (ERS), and the Electronic Monitoring System (EMS), which will allow continuous monitoring of the vessel's activities - from port to port. The vessels will be authorized to port out and port in only at designated ports. The measures to strengthen MCS in Thailand will include (i) possible further restructure of MCS activities in DOF; (ii) advanced electronic reporting and monitoring systems, including cameras, sensors and CCTVs for overseas fishing and transshipment vessels; (iii) improved collaboration among MCS agencies with better data and information sharing.

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66 Marine fisheries management plan of Thailand (2020-2022), https://drive.google.com/drive/folders/1paucb10bk4qSSXaOPsWfOErx8EIWdmen

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M3.2

The Administrative Sanctions Committee [67] consisting of the Director-General of the Department of Fisheries as Chairman, a representative of the Office of the Council of State, a representative of the Royal Thai Police, a representative of the Department of Employment, representative of the Marine Department, representative of the Department of Industrial Works and representative of the Labour Protection and Welfare Department as members. The Administrative Sanctions Committee shall have the power to issue the orders against any person engaging in a fishing operation which constitutes a serious infringement. The provisions of Chapter 11 on sanctions aim to provide criminal sanctions which are adequate in severity to be effective in securing compliance and to discourage violations wherever they occur and to deprive offenders of the benefits accruing from their illegal activities.

Potential sanctions set out in Thai fisheries legislation include suspension or removal of fishing licence, seizure of catch, vessel or fishing gear, addition of the vessel to the IUU blacklist, or a fine of up to 30 million baht (around US $900,000).[68]

In 2018 the Department of Labour Protection & Welfare (DLPW) reported almost 75,000 fishing vessel inspections and almost 880,000 worker inspections. In total 5,800 labour violations were identified across these vessel and worker inspections (an identification rate of 7.7%). The vast majority of these cases were settled through administrative adjudication whilst there were zero prosecutions. The majority of these labour offences were related to ‘payment document issues’ (45%), ‘rest time issues’ (33%), and ‘employment contract issues’ (9%). Zero cases of child labour, forced labour, or human trafficking were identified through these inspections.[69]

Discussion with DoF officials indicate that there are sanctions associated with trawl fisheries in place During 2020 to 2021 total 85 cases comprising of 5 type of case as following 1) Thai fishing boats under 30 GT (37), 2) Thai fishing boats from 30 GT (20), 3) Foreign fishing boats under 30 GT (3), 4) Foreign fishing boats 30 GT upwards (9), and 5) In the case of seizing tools for trawls fishing (boats and the accused fled), (15).[70]

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67 Royal Ordinance on Fisheries (No.2) 1 B.E.2017 http://extwprlegs1.fao.org/docs/pdf/tha195358.pdf

68 “Highlights of Thailand’s New Fisheries Legislation”, excerpts from a Department of European Affairs document dated 18 November 2015. Provided by the TSFR. https://www.thaiembassy.be/2015/11/18/highlights-of-thailands-new-fisheries-legislation/?lang=en

[69] Thailand's progress in combating IUU, forced labour & human trafficking EJF observations and recommendations volume 7, spring 2019 https://ejfoundation.org/resources/downloads/EJF-PIPO-Technical-Report-update-spring-2019.pdf

[70] The sanctions associated with trawl fisheries Summary table of law enforcement results under the Fisheries Royal Ordinance 2015 related to trawl fishing between 2020 - May 31, 2021 (Data as of 11 Jun 2021) https://drive.google.com/drive/folders/1BGQEqnYLZoQtOEqxBh0A-izX7HEtkQ2m

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M3.3

Monitoring, control and surveillance (MCS) has also been strengthened. The Fisheries Monitoring Center (FMC), where the Vessel Monitoring System (VMS) is overseen, now operates with state-of-the-art equipment and manpower to detect high-risk fishing operations. The monitoring done by the FMC is complemented with the inspections at ports and at sea, where officers are on hand to eliminate the risks of illegal activities and, when applicable, prosecute them.[71]

There is an evidence on the Criminal Court sentenced the owner of the fishing vessels "Mook Andaman 018" and "Mook Andaman 028" for the following charges: taking the vessels out to the waters of a foreign state and high seas without permission or taking refrigerated fishery cargo carriers to the waters of a foreign state without permission; failing to bring the vessels back to port within the deadline set by the Notification of the Department of Fisheries; exceeding the time limit to return to port without notifying the Port-in Port-out (PIPO) Control Centre.[72]

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[71] Marine fisheries management plan of Thailand (2020-2022), https://drive.google.com/drive/folders/1paucb10bk4qSSXaOPsWfOErx8EIWdmen

[72] Thai Court Issued a Fine of over 223 Million Thai Baht in an Illegal Overseas Fishing Vessels Case, Royal Thai Embassy, Budapest, Hungary https://budapest.thaiembassy.org/en/content/90188-thai-court-issued-a-fine-of-over-223-million-thai-baht-in-an-illegal-overseas-fishing-vessels-case?cate=5d6634e815e39c439c00003b

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M3.4

The 2015-2019 FMP mandates the use of VMS in all vessels over 30 GT, and describes the creation of a 'warning VMS system' which will alert vessels when they are about to enter a prohibited area. The FMP also plans the creation of an observer programme and an IUU blacklist of vessels which are prohibited from fishing for previous transgressions. In addition to developing the 2015 FMP and Royal Ordinance, the Thai government also established the Command Center for Combatting Illegal Fishing (CCCIF), plus 28 Port in Port out (PiPo) control centers in 22 coastal provinces, aimed at improving control of medium and large commercial vessels.[73]

The PIPO Centers are under the supervision of the Thai-MECC, which also coordinates Anti-IUU Fishing Task Forces in three areas, which are multi-disciplinary inspection teams at sea, ports and seafood processing factories.[74] Since 2016 EJF has taken part in 15 at-sea patrols on-board vessels from the Royal Thai Navy, Department of Marine and Coastal Resources (DMCR), Marine Department and DoF – all agencies with patrol capabilities under the jurisdiction of THAI-MECC. These patrols have taken place in Phuket, Songkhla, Sattahip, Samut Songkram, Phetchaburi. This has allowed EJF to assess a wide variety of at-sea inspections and differing methodologies over the years, agency, and region.

Random catch checking when a vessel ports in is one of the critical procedures required by the PIPO SOP. DoF officials conduct this inspection to verify that the catch on-board corresponds with the amount recorded in the vessel logbook. EJF has observed recently a random catch checking procedure conducted without such verification taking place.

On the patrol conducted by the DoF, officials inspected the gears of each fishing vessel to ensure that they were in accordance with the regulations. This is an important measure to ensure ongoing fisheries compliance. On the at-sea patrol conducted by the DMCR, officials inspected the species of fish that were caught and a sample of different species was also taken to be inspected back at the Marine Research Centre.

The Fisheries Monitoring Centre (FMC) houses Thailand's VMS and is responsible for monitoring the activity of almost 5,500 fishing vessels 24 hours a day. The FMC divides this task across four desks; Upper Gulf of Thailand, Lower Gulf of Thailand, Andaman Sea; and Distant water fleet. If a vessel is seen to be operating suspiciously, the vessel owner is notified and details are sent to THAI-MECC in the form of a daily report. Vessels under 30GT are exempt from having VMS installed. As of February 2020 the total commercial fleet as defined by the RTG was comprised of 10,448 vessels measuring from 10GT and above. VMS is currently compulsory only for vessels over 30GT – 5,603 vessels – meaning that approximately 46% of the Thai commercial fleet is currently unmonitored. There have in the past been preliminary plans to extend VMS requirements to vessels over 20GT and eventually to vessels over 10GT however progress has been slow.

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[73] EU Reporter article on Thailand efforts to combat IUU, January 2016. https://www.eureporter.co/world/2016/01/25/thailands-progress-in-combating-iuu-fishing/

[74] Thailand's progress in combating IUU, forced labour & human trafficking EJF observations and recommendations volume 8, spring 2020. https://ejfoundation.org/resources/downloads/EJF-tech-report-spring-2020-EN.pdf

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M3.5

There are a management measures on increase human capacity of officials, NGOs and key stakeholders by training and knowledge provided for stakeholder; especially in the area of maritime policy and regulation program for 2020-2022.[75]
DoF provided update law and regulation to public through website of DoF in Thai language.[76]

No clear evidence was made available to the assessment team to suggest that awareness rising activities to stakeholder have been conducted.

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[75] Marine fisheries management plan of Thailand (2020-2022), https://drive.google.com/drive/folders/1paucb10bk4qSSXaOPsWfOErx8EIWdmen

[76] Public relation on daily update fisheries law (ประชาสัมพันธ์ อัพเดตกฎหมายประจำวัน) https://www4.fisheries.go.th/local/index.php/main/view_activities/84/74291

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Section 2 – Fishery risk ratings: Catch, ETPs, habitats and ecosystem

Section 2a: Catch

The first of the four Fishery Risk Ratings relates to the species caught in the fishery, and is named "Catch". This represents the risk posed by the fishery to the populations of the stocks it exploits, including discards, and particularly the risk of overfishing. Mitigation measures involve understanding the effects of the fishery on the fished species, determining appropriate levels of catch, restricting the total fishing effort, and others. The most effective way to reduce the risk posed by the fishery is to reduce total effort and/or fishing mortality, and this is reflected in the potential mitigation scores.

The catch of the multi-species fishery is divided into two parts:
Part A: Total aggregate catch (based on a target reference point = multi-species maximum sustainable yield (MMSY))
Part B: High-risk species/species groups (based on a limit reference point = PRI). Note: These species or groups of species do not include ETPs that are assessed separately below.

Part A: Total aggregate catch

Part A: Total Mitigation Value	75
Part A: Catch Risk Value (100 minus mitigation value)	25
Part A: Catch Risk Rating	Low

A1: Management objectives and references points	
	Mitigation Score
The fishery has not developed any objectives or target reference points to ensure that the total multi-species assemblage is maintained or restored to levels capable of producing the multi-species maximum sustainable yield (MMSY) as qualified by relevant environmental and economic factors.	0
The fishery has inforbmally adopted objectives and target reference points to ensure that the total multi-species assemblage is maintained or restored to levels capable of producing the MMSY.	8
The fishery has formally adopted objectives and target reference points to ensure that the total multi-species assemblage multi-species assemblage is maintained or restored to levels capable of producing the MMSY.	17
Evidence	
Under FMP goal on "Fisheries resources restored to a level that can support the MSY in Thai waters and sustainable fishing expanded into deep-sea and overseas waters", with set up an objective in "control fishing effort to a level that is commensurate with the MSY". The main management measure for this objective is to allocate a limited number of fishing licenses based on the FMSY, as shown in Appendix D of Marine fisheries management plan of Thailand (2020-2022).[77] The precautionary approach is used to determine the TAE (set at around 95% of the FMSY in 2018) taking into account the uncertainty in the MSY estimate. In addition, each boat is allocated a number of allowable fishing day and fishing is stopped when the limit is reached. To supplement fishing capacity reduction measures, in consultation with Fisheries Associations and fishers, a new standard for the size and characteristics of fishing gear has been agreed and strictly implemented. Stock assessments for demersal, anchovy, and pelagic fish for 2019 have been carried out based on the analyses of the main fishing gear in Thailand marine waters (about 80% of the total catch). The	

maximum sustainable yield (MSY) estimate is 1.6 million tonnes and the current catch is below the MSY in all these species groups in both the Gulf of Thailand and the Andaman.[77] Also, because of recent reductions in fishing effort, the fishing effort is now below the fishing effort at MSY (FMSY), especially for anchovies which the fishing effort reduced more than other groups.

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[77] Marine fisheries management plan of Thailand (2020-2022), Appendix D: Fleet management: controlling number of fishing vessels through licensing, allowable fishing days and fishing gears, https://drive.google.com/drive/folders/1paucb10bk4qSSXaOPsWfOErx8EIWdmen

A2. Data and information	
	Mitigation Score
The fishery does not monitor any indicators relating to total catch nor collect sufficient data and information to assess the current status of the resources.	0
The fishery monitors indicators relating to total catch with a low degree of certainty and frequency and collects some information that could be used to estimate the status of the fishery resources through proxies.	8
The fishery monitors indicators relating to total catch with a high degree of certainty and frequency and also collects sufficient data and information to formally assess the current status of the fishery resources.	17

Evidence

Total landings estimates were provided by the TSFR for every year since 1995, and it is likely that the time series extends even further into the past. However there is evidence that these are substantial under-estimates and actual catch may be as much as three times the estimated quantity.

There is a substantial quantity of information collected from the GoT trawl fishery, including total landings estimates but also CPUE data, catch composition, size frequency data, and other fishery-dependent and fishery-independent sources. Estimates of total MSY across the fishery have been reasonable consistent over 40 years.

There have been multiple estimates of an appropriate level of total removals in the fishery, ranging from around 500,000t to 750,000t. The most recent estimate, produced in 2015 and currently in use by the DoF, was 794,771t.

Total Removal data collection process through port base landing site collection and other research activities, related using statistical methods were conducted during fishing at sea, fishing boats returned to the port, and aquatic animals entering the factory.[78] Steps taken to ensure the reporting of fish landing weights for commercial fishing vessels to be used as data science in management. Every commercial fishing vessel must provide a fishing log book and fishing vessel tracking system (VMS) information to fishing port authority. Fishing boats that notify port in/out. the captain must reported Total weight of aquatic animals and the weight of the fish caught in the top three prior to the notification in accordance with Section 81(2) to ensure that the catch results are recorded during fishing. The Officers need to inspect the process of unloading the fish at the fishing port by examining the type and quantity of marine species at port (LD) compared to the data recorded in the fishing log book (LB).

As shown by the assessment, the overall situation in the marine fisheries of Thailand has improved significantly since the adoption of the FMP (2015-2019). Fishing effort in the demersal fleet has

been reduced by more than 30% to a level below the fishing effort needed to produce maximum sustainable yield (MSY), thus allowing rebuilding of the fisheries resources.

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[78]:Total Removal Data Collection Report
https://drive.google.com/drive/folders/1g1qW_ZZDv9qYsaa1FM843FH5KyRN0qkz

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A3. Fishery resource assessment	
	Mitigation Score
There is no recent or reliable assessment of the status of the fishery resource.	0
The status of the fishery resource is based indirect evidence from indicators or proxies of stock status.	8
The fishery resource status has been recently assessed using a scientifically defensible methodology.	17

Evidence

The Maximum Sustainable Yield (MSY) assessment aims to estimate the biological reference point at which stocks can be harvested without any negative effect on resources and equilibrium with the production of nature in Thai waters. MSY for the Gulf of Thailand and the Andaman Sea was estimated by using the Fox surplus production model (Fox, 1970).[79] This model requires statistical data and information on catch, CPUE and effort data of all fishing operations, particularly small-scale fishing gears and large-scale fishing gears of demersal fish, pelagic fishes and anchovies. The MSY assessment was conducted for three species groups 1) demersal fish that referring to all demersal species including demersal fishes, squids, cuttlefishes and shrimps; 2) pelagic fishes; and 3) anchovies. Both artisanal fishing vessels and commercial fishing vessels were used in the assessment.

The assessment is based on trends in the catch per unit effort (CPUE) in research trawl surveys, and recent and past stock assessments. Standardized research vessel surveys have been carried out in both the Gulf of Thailand and the Andaman Sea since the 1960s. Stock assessments for demersal, anchovy, and pelagic fish for 2019 have been carried out based on the analyses of the main fishing gear in Thailand marine waters (about 80% of the total catch). The maximum sustainable yield (MSY) estimate is 1.6 million tonnes and the current catch is below the MSY in all these species groups in both the Gulf of Thailand and the Andaman.[80]

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[79] Marine fisheries management plan of Thailand; A national policy for marine fisheries management, 2015-2019. Department of Fisheries, Ministry of Agriculture and Cooperatives. http://extwprlegs1.fao.org/docs/pdf/tha165156.pdf

[80] Marine fisheries management plan of Thailand (2020-2022), https://drive.google.com/drive/folders/1paucb10bk4qSSXaOPsWfOErx8EIWdmen

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A4. Status of fishery resource	
	Mitigation Score
The status of the fishery resource with respect to the TRP is unknown.	0
The status of the fishery resource with respect to the TRP is known with a low level of certainty, and is based on proxies.	8
The fishery status with respect to the TRP is known with a high level of certainty.	17
Evidence	
As shown by the assessment, the overall situation in the marine fisheries of Thailand has improved significantly since the adoption of the FMP (2015-2019). Fishing effort in the demersal fleet has been reduced by more than 30% to a level below the fishing effort needed to produce maximum sustainable yield (MSY), thus allowing rebuilding of the fisheries resources. In 2018, the total catch volume from trawl fisheries were 476,915t in Gulf of Thailand, and 155,277t in Andaman sea.[81, 82] Where as, the estimated MSY and Catch allocated for 2018 are 795,869t, 688,002t in GoF, and 240,916t, 209,396t in Andaman sea, respectively.[83] The allocated catch ranged from 83.0 to 90.1% of the estimated MSY, while the allocated fishing effort ranged from 38.7 to 62.3% of the estimated fishing effort at MSY. …… [81] Amount of catches of saltwater fish from commercial fisheries trawl fishing equipment. (English Translation) https://drive.google.com/drive/folders/1J0zkvd9csBRyPQAqFF1Xanoe4eZPF2ne [82] MARINE CAPTURE PRODUCTION OF COMMERCIAL FISHERY 2019 (page 9): Amount of catches of saltwater fish from commercial fisheries trawl fishing equipment. (Original Thai Language) https://www4.fisheries.go.th/local/file_document/20200731160737_new.pdf [83] Marine fisheries management plan of Thailand (2020-2022), https://drive.google.com/drive/folders/1paucb10bk4qSSXaOPsWfOErx8EIWdmen, ……	

A5. Management measures and their compliance	
	Mitigation Score
There are no management measures in place to control total catch.	0
There are management measures in place to control total catch, but they are poorly complied with.	8
There are management measures in place to control total catch, which are complied with to a high level.	17
Evidence	
Thailand has put in place a range of management and technical measures through the Fisheries Act B.E. 2558 (2015), and the subordinate Ministerial Regulations and Department Rules. The management measures include registration of fishing vessels, licensing of fishing vessels, licensing of some types of fishing gears, freezing the number of trawlers, anchovy purse seiners and anchovy lift nets. There is also a ban on the use of push nets except for catching *Acetes* (Sergestids).[84] Thailand's marine fishery is managed through a combination of input controls, technical measures and ecosystem protection and conservation. Input controls consist of limiting the number of vessels using high efficiency gears by allocating licenses to vessels up to total allowable effort (TAE) . In addition, each vessel is allocated a number of allowable fishing days through a fishing day scheme.	

Fishing for a given vessel is stopped when that limit is reached. There is also a restriction on the number and size of gears that can be used.[85]

Technical measures include protection of spawning stock and juveniles through closed seasons and areas, demarcation zones between artisanal and commercial fisheries, minimum mesh sizes for purse seines, anchovy purse seines, trawls, anchovy lift/falling nets and collapsible crab traps. There is also a ban on the use of push nets except for catching sergestid shrimp. Legal mesh size for trawl net cod end is 4 cm, for purse seines 2.5 cm and for anchovy purse seines 0.6 cm. Push nets are now banned except for catching sergestid shrimp.

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[84] Marine fisheries management plan of Thailand; A national policy for marine fisheries management, 2015-2019. Department of Fisheries, Ministry of Agriculture and Cooperatives. http://extwprlegs1.fao.org/docs/pdf/tha165156.pdf

[85] Marine fisheries management plan of Thailand (2020-2022), https://drive.google.com/drive/folders/1paucb10bk4qSSXaOPsWfOErx8EIWdmen

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A6. Management performance	
	Mitigation Score
The fishery has failed to achieve the objectives it has set in relation to the aggregate catch OR there are no such objectives.	0
The fishery is making progress to meeting the objectives it has set in relation to the aggregate catch.	8
The fishery has achieved the objectives it has set in relation to the aggregate catch.	17

Evidence

The FMP goal on "Fisheries resources restored to a level that can support the MSY in Thai waters and sustainable fishing expanded into deep-sea and overseas waters", with set up an objective in "control fishing effort to a level that is commensurate with the MSY".

The Assessment Results for 20014 indicated that the total number of fishing vessels used for MSY assessment of demersal fish in the Gulf of Thailand was 28,279 vessels, consisting of 4,425 commercial vessels and 23,754 artisanal vessels. The result shows that the MSY of demersal fish is 794,771 tonnes with the optimum fishing effort of (F_{MSY}) 24.33 million hours. The 2014 catch of demersal fish was 503,276 tonnes with fishing effort of 36.20 million hours.[86]

However, the assessment result for 2019 show that following a period of severe overfishing in the Gulf of Thailand in the 1990s up to 2015, the fishing effort has now been reduced to a level that produces the MSY. The MSY of demersal fish is 790,985 tonnes with the optimum fishing effort of (F_{MSY}) 22.61 million hours. The 2019 catch of demersal fish was 545,363 tonnes with fishing effort of 17.34 million hours.[87] The catch is still less than the MSY, indicating that although overfishing has been controlled, the fisheries resources are still overfished and will take time to recover.

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[86] Marine fisheries management plan of Thailand; A national policy for marine fisheries management, 2015-2019. Department of Fisheries, Ministry of Agriculture and Cooperatives. http://extwprlegs1.fao.org/docs/pdf/tha165156.pdf

[87] Marine fisheries management plan of Thailand (2020-2022), https://drive.google.com/drive/folders/1paucb10bk4qSSXaOPsWfOErx8EIWdmen

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Part B: High-risk species/species groups

Click on the spreadsheet icon below and save a copy on your computer with your file name. Fill in the data and scores for the species/species groups of interest. The spreadsheet will automatically calculate the PSA score based on the productivity/susceptibility scores.

Part B Total Mitigation Value	24
Part B: Catch Risk Value (100 minus mitigation value)	76
Part B: Catch Risk Rating	High

B1: Management objectives and references points	
	Mitigation Score
The fishery has not identified high-risk species/species groups and has not developed any objectives or limit reference points to ensure that these species or groups of species are not being pushed past their PRI.	0
The fishery has identified high-risk species/species groups with a low degree of certainty and the fishery has informally adopted objectives and limit reference points for only some species or groups of species.	8
The fishery has identified high-risk species/species groups with a high degree of certainty and the fishery has formally adopted objectives and limit reference points for all of these species or groups of species.	17
Evidence	
Discussions with DoF officials indicate that there is a risk-based methodology in place to identify particularly vulnerable species. However, identification of high-risk species/species group in Thailand based on the resources situation and generate economic value of particular species such as Indo-Pacific mackerel, anchovies, and swimming crab. Nootmorn P.[88] reported that Indo-Pacific mackerel (*Rastrelliger brachysoma*) is an important pelagic fish in Southeast Asian Countries, particularly in Thailand. The amount of Indo-Pacific mackerel caught in Southeast Asian Region during 2009 - 2018 ranged from 405,455 to 679,481 tons, equal to 5.14 percent of the total catch in the region. Catches of Indo-Pacific mackerel in all Southeast Asian countries were also found decreased during 2015 – 2018. Management of Indo-Pacific mackerel resources in Thai Waters has been conducted on the basis of Notifications of the Department of Fisheries under Section 70 in Royal Ordinance on Fisheries B.E. 2558 (2015) and its amendment B.E. 2560 (2017). There have been three Notifications regarding prohibition of fishing in a certain areas and period of times in the middle Gulf of Thailand, Inner Gulf of Thailand, and the Andaman Sea, covering the area of 38,680 square kilometers, resulted in the recovery trend of Indo-Pacific mackerel resources in Thai Waters. As for the management approach of Indo-Pacific mackerel resources in the region, international cooperation should be taken into consideration. The FMP (2020-2022)[89] applies to all marine capture fisheries taken by both artisanal and commercial vessels in Thai waters as well as marine capture fisheries conducted by Thai vessels in the territorial waters and EEZs of other States and the high seas. The FMP covers the species of all pelagic species, all demersal species, all highly migratory tuna and tuna-like species, and other non-target, associate or dependent species taken while fishing, such as endangered and threatened species. Based on the MSY and FMSY estimates, restrict vessel numbers to a fishing effort not greater than the TAE every two years, giving priority to low efficiency fishing gears. Fishing effort of all six species groups does not exceed the TAE (three groups in the Gulf of Thailand and three groups in the Andaman Sea).	

At the moment TSFR is on process of doing the research, funding support by Agricultural Research Development Agency (ARDA) and High-risk species is one of the issue that the researcher is working on it. The report is expected to be finalized by Q2 of 2022 and hopefully it will be able to update which species are classified as high risk species. Also, Thailand has an NPOA that will play a part in supporting the research.

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[88] Proceeding of the Annual Conference on Fisheries 2021: Status of Indo-Pacific mackerel in South East Asian and management approach of Thailand, Praulai Nootmorn, Marine Fisheries Research and Development Division, page 11.
https://drive.google.com/drive/folders/1ye7CMVefiSqJ7LTX_NOsqcRLei3v9Vek

[89] Marine fisheries management plan of Thailand (2020-2022), https://drive.google.com/drive/folders/1paucb10bk4qSSXaOPsWfOErx8EIWdmen

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B2. Data and information	
	Mitigation Score
Monitoring does not include indicators that can be used for evaluating management performance or conducting stock assessments for high-risk species/species groups.	0
Monitoring includes some indicators that can be used for evaluating management performance or stock assessments for some high-risk species/species groups.	8
Monitoring includes indicators that can be used for evaluating management performance and conducting stock assessments for all high-risk species/species groups.	17
Evidence	
The extent to which additional data are collected on individual species or groups of species varies considerably, with some species relatively well studied and others barely present in the literature. TSFR in collaboration with National University are investigating the status of high-risk species/species groups.	

B3. Assessment of high-risk species/species groups	
	Mitigation Score
There is no or unreliable assessment of the status of high-risk species/species groups.	0
The status of the high-risk species/species group has been recently assessed based on indirect evidence from indicators or proxies of stock status.	8
The status of high-risk species has been recently assessed using a scientifically defensible methodology.	17

Evidence
Status of stock of Coastal trawl resources in the Gulf of Thailand are mainly considered on the demersal economical value fish e.g. lizard fish, threadfin bream, bigeye and low value trash fish of miscellaneous species both economical and non economical species with small sizes. The stock assessments are mostly done on the economic species in terms of species groups and individual species. In this connection, the demersal fish stocks have been assessed by several researchers, in several occasions and several options.[90] Stock assessments for 11 single species in both the Gulf of Thailand and the Andaman Sea using length-based methods carried out in 2017 were consistent with the species group assessments. The main conclusion that can be drawn from the MSY analyses and the CPUE trend of the research trawl surveys is that, although the effort has been reduced and overfishing controlled, the demersal groups in the Gulf of Thailand are still overfished and it will take time to rebuild. However, recent assessment in 2019 showed that all other groups recovered to MSY level.[91]

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[90] THAILAND: National Report Bycatch management in Trawl Fisheries in the Gulf of Thailand1 (Page 34) http://www.seafdec.or.th/home/rebyc-cti/countries-profiles

[91] Marine fisheries management plan of Thailand (2020-2022), https://drive.google.com/drive/folders/1paucb10bk4qSSXaOPsWfOErx8EIWdmen

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B4. Status of high-risk species/species groups.	
	Mitigation Score
The status of high-risk species/species groups with respect to the LRP is unknown.	0
The status of the high-risk species/species groups with respect to the LRP is known with a low level of certainty.	8
The fishery status with high-risk species/species groups with respect to the LRP is known with a high level of certainty.	17
Evidence	
Although the FMP does include some measures aimed at reducing catch of juveniles of commercially important species, and closed areas are likely to have an impact on catch composition, there is limited evidence of measures put in place to restrict the total catch of non-ETP species or groups of species. TSFR in collaboration with National University are investigating the status of high-risk species/species groups.	

B5. Management measures, and their compliance	
	Mitigation Score
There are no management measures in place aimed at preventing high-risk species/species groups falling below the PRI.	0

There are some management measures in place aimed at preventing specific species or groups of species, falling below the PRI.	8
There are management measures in place which could reasonably be believed to be capable of achieving the objectives relating to high-risk species/species groups.	17
Evidence	
The main management measure for this objective is to allocate a limited number of fishing licenses based on the FMSY, as shown in Appendix D. The precautionary approach is used to determine the TAE (set at around 95% of the FMSY in 2018) taking into account the uncertainty in the MSY estimate. In addition, each boat is allocated a number of allowable fishing day and fishing is stopped when the limit is reached.[92] Technical measures to reduce the catch of juvenile fish, caught and landed to 25% of current levels in three years, include minimum mesh sizes and spatial/temporal closures, along with awareness raising for the fishers. Legal mesh size for trawl net cod end is 4 cm, for purse seines 2.5 cm and for anchovy purse seines 0.6 cm. Push nets are now banned except for catching sergestid shrimp. …… [92] Marine fisheries management plan of Thailand (2020-2022), Appendix D https://drive.google.com/drive/folders/1paucb10bk4qSSXaOPsWfOErx8EIWdmen ……	

B6. Management performance	
	Mitigation Score
The fishery has failed to achieve the objectives it has set in relation to high-risk species/species groups OR there are no such objectives.	0
The fishery is making progress to meeting the objectives it has set in relation to high-risk species/species groups.	8
The fishery has achieved all of the objectives it has set in relation to high-risk species/species groups.	17
Evidence	
There do not appear to be any such objectives in place in the fishery TSFR in collaboration with National University are investigating the status of high-risk species/species groups.	

Section 2b: Endangered, threatened and protected species groups

The second of the four Fishery Risk Ratings relates to the impacts of the fishery on ETP species. Mitigation measures include monitoring and understanding the effects of the fishery on ETP species, minimising interactions, and mitigating other potential impacts.

Total ETP Mitigation Value	48
ETP Risk Value (100 minus mitigation value)	52
ETP Risk Rating	Moderate

Initial screening for ETPs

1. There is no list of ETP species for the fishery and no awareness of ETPs.
2. There is a list of ETP species but no awareness of this list by fishers.
3. There is a list of ETP species that is well-known and appreciated by fishers.

If the answer is 1 and there is no list and no awareness of ETPs, this needs to be rectified before the assessment can proceed.

T1. Interactions with ETPs are known	
	Mitigation Score
There are no observations or records pertaining to ETPs interaction with the fishery.	0
There are ad hoc observations or records of interactions with ETPs.	16
There are reliable and regular records of ETP interactions.	33
Evidence	
There are regulations requiring interactions with ETP species such as Fisheries Ordinance 2015; Section 66: No person shall catch aquatic mammals, rare aquatic animals or aquatic animals near extinction as prescribed by the Minister or take any such aquatic animal on board a fishing vessel, except where it is necessary to do so in order to save the life thereof.[93] Data collection process of rare sea creatures, ETP species caught by trawl fishery and the record by captain.[94] Every commercial fishing vessel must provide a fishing log book in accordance with Section 81(2) when intending to sail for fishing. In the event that the captain encounters rare marine animals during fishing, captain must records rare marine species in the fishing log book by date and time of sighting. When the captain brings the boat back to the port for embarking, a copy of the fishing logbook will be sent to the officers under section 81(2). The officer checked the accuracy of the fishing logbook and record the details of the details such as date, time, the fishery type and quantity of aquatic animals including rare sea creatures found in the TFCC system. The results of helping beached sea turtles live during the year 2012 to September 2019,[95] sea turtles were found beached in total there were 2,202 live sea turtles. Among them sea turtles that died during transport and rehabilitation of 1,021 sea turtles and 158 sea turtles in the process of being nursed and rehabilitated and released to the sea. This represents the number of sea turtles surviving with a survival rate of 84.52 percent, which is good. Most of the stranding of sea turtles is caused by fishing gear debris nets and marine debris including factors from infection in the blood. Results of rescue of stranded dolphins and whales alive between 2012 and September 2019,	

a total of 1,486 live dolphins and whales stranded were found. Dolphins and whales dying during transport and nursed and rehabilitation were 79 individual and during nursery, rehabilitation and released back into the sea are 63 individual, representing the number of dolphins and whales that survived, with a survival rate of 64.29 percent. Most of the dead remains were found to be very rotten, making it impossible to determine the exact cause of death. The most identifiable cause of stranding for dolphins and whales caused by infectious causes fishing gear including factors debris nets and marine debris.

Thailand have non specific shark fishing. Sharks are categorized as by-catch in from the Thai fishery sector, with very low levels, only 0 .7 2 % of total marine catches. According to national fisheries statistics of Thailand during 2002-2014, sharks catch from Thai waters was approximately 0.72% of the total catches which ranged between 842-10,492 metric tons/year, indicating very small proportion as compared to the total fish catches. Over 85% of sharks were caught by otter board trawl, which was the highest percentage of sharks caught in Thai marine fisheries.[96]

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[93] Royal Ordinance on Fisheries B.E.2558 (2015)
http://extwprlegs1.fao.org/docs/pdf/tha159730.pdf
[94] Legal Policies and Regulations Related to Endangered Species of Rare and Endangered Marine Species
https://drive.google.com/drive/folders/1QJk4qLjcjcp9oTYAWqUXTuGkSd498o65
[95] DMCR Annual Report 2019, page 34 (English Translation)
https://drive.google.com/drive/folders/1lB3fm1N08qIRNXgjcIlLOUMcvzuUiyok
[96] Thailand National Plan of Action for the Conservation and Management of Sharks (NPOA-Sharks, Thailand: Plan 1, 2020-2024)
https://dmcrth.dmcr.go.th/attachment/dw/downloadW.php?WP=rUqjMT05qmIZG22DM7y04TyerPMjAJ03qmSZAJ1CM5O0hJatrTDo7o3Q
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T2: Interaction effects	
	Mitigation Score
It is unknown whether the fishery has a significant negative effect on ETPs.	0
There is some evidence to show that the fishery has no negative effect on ETPs	16
There substantial evidence to show that fishery has no negative effect on ETPs.	33
Evidence	

There have historically been assessments of the potential impacts of the fishery on ETP species, and at least one of these reports indicates that such interactions are likely to be occurring.[97] As a first step towards EAF, a comprehensive literature review to assess current knowledge and gaps about ecological impacts of common fishing gears used in Thailand. Impacts from trawling are mostly reported in terms of amount of trash fish and undersized/juvenile economic fish. Among the literature related to bycatch, few studies mentioned fishing impacts on marine mammals (such as dolphins and dugongs) and sea turtles, and only in qualitative terms.

The assessment of shark resources in Thai waters was conducted by surplus production model method using CPUE (catch per unit effort) of sharks from otter board trawl, pair trawl, mackerel-gill net and purse seine during 2004-2014 from fisheries statistics by random sampling. The result of assessment indicated that fisheries in the Gulf of Thailand has affected to shark resources, the direction trend of which was opposite to fishing effort. Where as, the results could indicate that levels of shark catches in the Andaman Sea were over MSY.[98]

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[97] Ecological Impacts of Fishing Gears in Thailand: Knowledge and Gaps https://doi.org/10.33997/j.afs.2017.30.4.006

[98] Thailand National Plan of Action for the Conservation and Management of Sharks (NPOA-Sharks, Thailand: Plan 1, 2020-2024) https://dmcrth.dmcr.go.th/attachment/dw/downloadW.php?WP=rUqjMT05qmIZG22DM7y04TyerPMjAJ03qmSZAJ1CM5O0hJatrTDo7o3Q

T3. Management measures and their compliance	
	Mitigation Score
If the fishery is known to interact with ETP species and:	
There are no strategies or measures in place to minimise mortality of ETPs.	0
There are some strategies and measures in place to protect ETP species, and to mitigate the impacts of the fishery on ETP species, but they are not being complied with.	16
There are comprehensive strategies and measures in place to protect ETPs, and mitigate the impacts of the fishery on ETPs, which are being complied with.	33

Evidence

There are regulations requiring interactions with ETP species such as Fisheries Ordinance 2015; Section 66: No person shall catch aquatic mammals, rare aquatic animals or aquatic animals near extinction as prescribed by the Minister or take any such aquatic animal on board a fishing vessel, except where it is necessary to do so in order to save the life thereof.[99]

The Wildlife Reservation and Protection Act protects dugongs, and it is possible that it also protects other species potentially impacts by the fishery. Thailand is a signatory to CITES; however, the assessment team has not been made aware of any other mechanisms by which ETP species are protected. No evidence was made available to the assessment team to determine the extent to which the fishery impacts ETP species or the effectiveness of any mechanisms in place to reduce these impacts.

The Goal of NPOA Shark is "To ensure that Thailand has sharks conservation and management measures for sustainable utilization and the long-term socioeconomic development of sharks". [100]
Thailand has enforced a number of laws, which either directly or indirectly affect fisheries resource management and conservation with the objective of sustainable utilization of aquatic animal resources, including sharks resources.

- With regard to conservation of sharks, Ministry of Agriculture and Cooperatives notified "definitions for marine mammals and endangered or nearly extinction species that are prohibited to fish or bring up onboard fishing vessels" dated 7 April 2016. Under Article 66 of The Royal Ordinance on Fisheries, B.E. 2558, only Whale shark (*Rhincodon typus*) was listed as number 4 in the Annex of this notification.

- The Wildlife Preservation and Protection Act, B.E. 2562: Whale shark, declared as preserved wildlife species in the fish group, and 1 2 ray species including 6 devilrays (Mobulidae; *Manta* and *Mobula* spp.), 4 sawfishes (Pristidae: *Anoxypristis cuspidata* and *Pristis* spp.), Bowmouth guitarfish (*Rhina ancylostoma*) and Giant freshwater stingray (*Urogymnus chaophraya* or original name is *Himantura chaophraya*) declared as protected wildlife species in the fish group.

- Listing aquatic animals under CITES Appendices is used as a way to conserve aquatic animal resources. According to the meeting results of CITES CoP18 (Krajangdara *et al.,* 2019), 33 species of sharks found in Thai waters are listed under CITES Appendices, including 11 shark species

namely Whale shark, Silky shark, Oceanic whitetip shark, 3 hammerhead sharks (*Sphyrna* spp.), 3 thresher sharks, 2 mako sharks, and 19 ray species namely 6 devilrays (Mobulidae), 13 guitarfishes (Rhinidae, Rhinobatidae and Glaucostegidae) under CITES Appendix II, while 3 sawfishes (Pristidae) under CITES Appendix I.

- The IUCN Red List of threatened species in 2019 (Krajangdara *et al.,* 2019), many species of sharks in Thai waters are categorized in this groups (i.e., CR, EN, VU), including 25 shark and 41 ray species in Thai waters.

DMCR categorizes endangered marine species into three groups, namely 1) marine endangered species defined under a framework of DMCR, 2) marine threatened species listed under Office of Natural Resources and Environmental Policy and Planning (ONEP) and international organizations, 3) marine endemic species as the first record of the world. Objectives of these actions with regard to sharks are as follows: 1) Preserved and protected wildlife species in fish group under the Wildlife Preservation and Protection Act, B.E. 2562, i.e. Whale shark, sawfishes, Bowmouth guitarfish, Giant freshwater stingray and devilrays. 2) Species to be proposed as protected wildlife species in fish group under the Wildlife Preservation and Protection Act, B.E. 2562, i.e. hammerhead sharks, Zebra shark, and other sharks. 3) Species with the first record of the world, i.e. Magnificent catshark.

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[99] Royal Ordinance on Fisheries B.E.2558 (2015) http://extwprlegs1.fao.org/docs/pdf/tha159730.pdf

[100] Thailand National Plan of Action for the Conservation and Management of Sharks (NPOA-Sharks, Thailand: Plan 1, 2020-2024) https://dmcrth.dmcr.go.th/attachment/dw/downloadW.php?WP=rUqjMT05qmIZG22DM7y04TyerPMjAJ03qmSZAJ1CM5O0hJatrTDo7o3Q

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Section 2c: Habitats

The third of the four Fishery Risk Ratings relates to the impacts of the fishery on benthic habitats. Mitigation measures include monitoring and understanding the effects of the fishery on habitats, protecting critical habitats, and mitigating other potential impacts.

Total Habitats Mitigation Value	42
Habitats Risk Value (100 minus mitigation value)	58
Habitats Risk Rating	Moderate

Initial screening for habitats

1. Critical habitats that the fishery normally encounters have not been identified.
2. Critical habitats have been identified in a general sense, but not specifically for that fishery.
3. Critical habitats have been defined for the UoA.
4. The fishery does not interact with critical habitats.

If the answer is "1. No definition of critical habitat", this needs to be rectified before the assessment can proceed.

H1. Habitat consideration	
	Mitigation Score
There is no consideration of potential habitat interactions in the management of the fishery.	0
There some consideration of potential habitat interactions in the management of the fishery.	16
There full consideration of potential habitat interactions in the management of the fishery.	33

Evidence

The overall situation in the marine fisheries of Thailand has improved significantly since the adoption of the FMP (2015-2019). Critical fisheries habitats and biodiversity are being restored through the planting of mangroves and seagrass and the maintenance and expansion of marine protected areas (MPAs).[101]

Under the FMP (2015-2019) specify that Critical habitats will be restored through increased collaboration and cooperation with other agencies that are mandated to protect and conserve the marine environment. Marine Protected Areas (MPAs) have been declared as aquatic sanctuaries, non-hunting areas, marine national parks, mangrove swamps, coral reef areas, sea grass bed etc. The total area of MPA in Thailand is around 79,756.72 km^2; about 25.23 % of the total sea area of Thai waters (316,118.24 km^2). DOF is carrying out other conservation measures including, stablishing artificial reefs for spawning grounds, fish shelter; and promoting community based fishery management and EAFM.

In order to achieve the objective on restore and maintain critical habitats, DOF will collaborate in habitat protection and restoration activities carried out by other agencies at the national, provincial and district levels, especially the DMCR that is the government agency responsible for coastal habitat restoration and management. DOF will also collaborate with on-going Integrated Coastal Management (ICM) activities. DOF is also implementing Ecosystem Approach for Fisheries Management (EAFM) Programs for coastal communities.

DMCR reported that the area of mangrove forests, seagrass beds, and coral reefs have remained constant. The status of mangroves has improved slightly due to strong law enforcement over illegally claimed areas. Seagrass beds have also improved slightly with higher percentage cover, while considerably deterioration in coral reefs has occurred due to widespread coral bleaching in 2016.[102]

There is some limited evidence to suggest that the potential impacts of the fishery on habitat are considered during the management process.

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[101] Marine fisheries management plan of Thailand; A national policy for marine fisheries management, 2015-2019. Department of Fisheries, Ministry of Agriculture and Cooperatives. (page 21) http://extwprlegs1.fao.org/docs/pdf/tha165156.pdf

[102] Marine fisheries management plan of Thailand (2020-2022), https://drive.google.com/drive/folders/1paucb10bk4qSSXaOPsWfOErx8EIWdmen

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H2. Impacts of the fishery on critical habitats	
	Mitigation Score
There is no information on the impacts of the fishery on the critical habitats it encounters.	0

There is limited information collected on the impacts of the fishery on the main critical habitats.	10
There is comprehensive information collected on the impacts of the fishery on main and critical habitats.	20
Evidence	
Habitat impacts by Demersal trawling involves towing nets, ground chains, ropes and otter-boards ("trawl doors") over the sea floor and this can negatively affect benthic habitats. This issue is most extreme in shallow coastal waters and around hard structures (submerged reefs, rocky outcrops). Information on trawl footprints and critical habitat distributions is known to exist. The fishing ground of small otter board trawlers in the Gulf of Thailand are within 20 m depth at near shore and medium size trawlers are within 30 m at coastal zone. Pair trawlers are in deeper water up to 50 m depth.[103] The previous comprehensive literature review to assess current knowledge and gaps about ecological impacts of common fishing gears used in Thailand during 1995 to 2015. Of the 134 documents found on the topic, about 70 % were technical reports produced by the Department of Fisheries of Thailand, focusing largely on trawl fisheries, particularly otter board trawls. There are significantly less studies on habitat damage from fishing gears than on bycatch. Studies on habitat impacts were related to seagrass beds (50 %), impacts on coral reefs (18 %), reduction of seawater quality (18 %), impacts on benthic communities (9 %), and seafloor destruction (5 %).[104] ..... [103] THAILAND: National Report Bycatch management in Trawl Fisheries in the Gulf of Thailand1 http://www.seafdec.or.th/home/rebyc-cti/countries-profiles [104] Ecological Impacts of Fishing Gears in Thailand: Knowledge and Gaps https://doi.org/10.33997/j.afs.2017.30.4.006	

H3. Management measures	
	Mitigation Score
If the fishery is known to interact with physical habitats AND:	
There are no measures in place to minimise and mitigate negative impacts.	0
There are some measures in place to minimise and mitigate negative impacts, but they are not complied with.	16
There are comprehensive measures in place to minimise and mitigate negative impacts that are fully complied with.	33
Evidence	
Thailand does have a large number of closed areas and has banned commercial fishing within 6nm of shore. Thailand currently has 7.3% of its marine waters under some form of marine protected area (MPA) (25,593 km2). These include Fisheries Reserve Areas (41.5%), Environment Protected Areas (37.6%), Marine National Parks (19.1%), Non-hunting Areas (1.7%) and Wetlands (0.1%). There is also 2,550 km2 of mangrove reserve area and biosphere reserve.[105] The Ministry of Agriculture and Cooperatives has issued several Notifications to protect nursing area and spawning season for marine animals in several areas both in the Gulf of Thailand and in the Andaman Sea, this Notification has been issued on 2 November 1984 and has been developed to cover the present fishery situation.[106] At first this closed area and season measure was covered only for Indo-Pacific mackerel, since from the intensive studies on the life history, fish larvae, the mortality and the migratory routes of this species that were clearly shown and documented via several research works. The Department of Fisheries decided to protect the Indo-Pacific mackerel for sustainable used. Later on there were several research work evidences that not only Indo-Pacific	

mackerel has its nursing area and spawning ground but also several demersal and invertebrate animals have spawning grown and nursing at this area.

DOF will collaborate in habitat protection and restoration activities carried out by other agencies at the national, provincial and district levels, especially the DMCR for coastal habitat restoration and management. DOF will also collaborate with on-going Integrated Coastal Management (ICM) activities. DOF is also implementing Ecosystem Approach for Fisheries Management (EAFM) Programs for coastal communities.[104] There are anecdotal reports on loss of seagrass, but no figures are available. For the period 2015 to 2017, DMCR reported that the area of mangrove forests, seagrass beds, and coral reefs have remained constant. The status of mangroves has improved slightly due to strong law enforcement over illegally claimed areas. Seagrass beds have also improved slightly with higher percentage cover, while considerably deterioration in coral reefs has occurred due to widespread coral bleaching in 2016.

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[105] Marine fisheries management plan of Thailand (2020-2022), https://drive.google.com/drive/folders/1paucb10bk4qSSXaOPsWfOErx8EIWdmen

[106] THAILAND: National Report Bycatch management in Trawl Fisheries in the Gulf of Thailand1 http://www.seafdec.or.th/home/rebyc-cti/countries-profiles

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Section 2d: Ecosystems

The last of the four Fishery Risk Ratings relates to the impacts of the fishery on ecosystems. Mitigation measures include monitoring and understanding the effects of the fishery on ecosystems, protecting ecologically important species, and mitigating other potential impacts.

Total Ecosystem Mitigation Value	36
Ecosystem Risk Value (100 minus mitigation value)	64
Ecosystem Risk Rating	High

E1. Ecosystem consideration	
	Mitigation Score
The impact of the fishery on the broader ecosystem within which the fishery occurs is not considered in management.	0
The impact of the fishery on the broader ecosystem within which the fishery occurs is considered in a superficial way in management.	12
The impact of the fishery on the broader ecosystem within which the fishery occurs is considered fully in management.	25
Evidence	
The Royal Ordinance on Fisheries B.E. 2558 (2015) and its amendment in B.E 2560 (2017), strengthened Thailand's international obligations and broadened the concept of fisheries management under an ecosystem approach.[107] Based on the Royal Ordinance on Fisheries (2015),[108] Section 19 reference that the National Fisheries Committee shall have the power and duty to determine fisheries policies and supervise fisheries management to conserve, preserve and prevent the extinction of aquatic animals, and to enable the	

exploitation of aquatic animal resources in a sustainable manner, which will culminate in the achievement of a balanced ecological system and biodiversity.

There is some evidence that ecosystem information is used in the decision-making process. Some recommendations arising from ecosystem analysis have been implemented, and the FMP includes a commitment to implementing an ecosystem-based approach.

There is clear evidence that the amount of fishery data collected is sufficient to enable extensive study of the GoT marine ecosystem. There are also steps being taken by the DoF to implement an ecosystem-based approach to management of the fishery, although the extent to which this has already occurred is not clear.

Report on assessment of progress against the objectives and targets of the Marine Fisheries Management Plan (2015-2019) with achieved critical fisheries habitats and biodiversity are being restored through the planting of mangroves and seagrass and the maintenance and expansion of marine protected areas (MPAs).[107]

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[107] Marine fisheries management plan of Thailand (2020-2022), https://drive.google.com/drive/folders/1paucb10bk4qSSXaOPsWfOErx8EIWdmen

[108] Royal Ordinance on Fisheries B.E.2558 (2015) http://extwprlegs1.fao.org/docs/pdf/tha159730.pdf

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E2. Impacts on the ecosystem	
	Mitigation Score
There is no or inadequate information on the impacts of the fishery on the ecosystem.	0
There is limited information on impact on the ecosystem, especially with respect to key ecological species.	12
The impact on the ecosystem is well known, especially with respect to key ecological species.	25

Evidence

There is extensive evidence that the commercial trawl fishery has changed the population structure in the GoT, and is likely to be continuing to do so.

There is clear evidence that the amount of fishery data collected is sufficient to enable extensive study of the GoT marine ecosystem. There are also steps being taken by the DoF to implement an ecosystem-based approach to management of the fishery, although the extent to which this has already occurred is not clear.

The DoF evaluated alternative management options by developed an ecosystem model of the Gulf in connection with a European Union project aimed at evaluating the societal cost of fishing. [109] The objective are to propose and evaluate possible fishery management measures based ecosystem analysis. The model, which was constructed using the Ecopath with Ecosim approach and software, relies on extensive data series collected in the Thai sector of the Gulf. Time series of catch per unit effort of the various fish groups were obtained from research vessel data, while fishing effort of the six fleets in the model (otter board trawl, pair trawl, beam trawl, push net, purse seine and other gear) were obtained from statistical record from

the years 1973 to 2005. Outputs from the simulations were used to compare the fishery status and changes during 1973, 2005 and to evaluate the prediction for 2010.

The results indicated that pressure caused by overexploitation, the excessive number of fishing boats, the lower catch levels, values, profits, the effects on economic, social and ecosystem, the yield and biomass of the fisheries in the Gulf of Thailand, it was concluded that a reduction in effort would be beneficial in the Gulf, and that in order to evaluate tradeoff between fisheries, the management of the fisheries in the Gulf of Thailand need to include an ecosystem-approach. Recommendations were made on a ban of push netter and beam trawler, reduction in effort of otter board trawler and pair trawler on a voluntary bases, introduction of a tenure system for purse seiner apart from bottom trawler and pair trawler that remains active, required registration for other gear, more areas and season closures (or introduction of MPAs), stock enhancement, and promotion of co-management for coastal small-scale fisheries.

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[109] Phoonsawat, R, Supongpan, M. & Christensen, V. 2009 (Draft). Introducing ecosystem-based management in the Gulf of Thailand. ECOST Project; Ecosystems, Societies, Consilience, Precautionary principle: Development of an assessment method of the societal cost for best fishing practices and efficient public policies. https://drive.google.com/drive/u/1/folders/1IGodI7ZhsZskbecHuDtKbA0svOj64WeF?usp=sharing_eip_se_dm&ts=6218d887

E3. Management measures and strategies	
	Mitigation Score
There are no measures in place for the management and conservation of ecosystem structure and function.	0
There are some plans/strategies and measures in place for the management and conservation of ecosystem structure and function.	12
There is a comprehensive set of plans/strategies and measures in place for the management and conservation of ecosystem structure and function.	25

Evidence

Report on assessment of progress against the objectives and targets of the Marine Fisheries Management Plan (2015-2019) with achieved critical fisheries habitats and biodiversity are being restored through the planting of mangroves and seagrass and the maintenance and expansion of marine protected areas (MPAs).[110]

The MPAs currently in place (Fisheries Reserve Areas, Environment Protected Areas, Marine National Parks, Non-hunting Areas and Wetlands) need to be maintained and controlled. The DMCR is establishing more MPAs with a predicted increase in area to cover 10% of Thai marine waters by 2022.

The Marine and Coastal Resources Management Promotion Act, B.E. 2558(2015), Section 18 indicated that " For the purposes of reservation, conservation and restoration of a mangrove forest to retain its natural condition, and to attain its healthy environment and ecosystem, the Minister, upon the approval of the Committee, shall have power to prescribe the Ministerial Regulations specifying any mangrove forest as a mangrove conservation area." [111]

For the period 2015 to 2017, DMCR reported that the area of mangrove forests, seagrass beds, and coral reefs have remained constant. The status of mangroves has improved slightly due to strong law enforcement over illegally claimed areas. Seagrass beds have also improved slightly with higher

percentage cover, while considerably deterioration in coral reefs has occurred due to widespread coral bleaching in 2016.[110]

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[110] Marine fisheries management plan of Thailand (2020-2022), https://drive.google.com/drive/folders/1paucb10bk4qSSXaOPsWfOErx8EIWdmen

[111] The Marine and Coastal Resources Management Promotion Act, B.E. 2558(2015). https://www.dmcr.go.th/download/?file=pRMgEUqDGP5gZzp4qQAcZKtkpQMgZUp1GQWgZ2plqQIcZKt5pQOgAUpjGQugZJpjqQWcYKtjpQSgZaplGQWgYJqyqTkcnKuzpP9gMKqfGTygMzpiqUAcq3uhpP9gMUquGT9goTqjqUIcY3u0pT9go3qlGUqgq2q3qP9cBauQ&n=พระราชบัญญัติส่งเสริมการบริหารจัดการทรัพยากรทางทะเลและชายฝั่ง%2พ&t=GTMgoJqwqS9cMUug&type=rQR%3Q&up=rQN%3Q

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E4. Impacts on key ecological elements	
	Mitigation Score
If the impact on any key ecological species is unacceptable AND:	
No additional precaution is included in recommendations relating to the total permissible fishery removals and no target management measures are in place.	0
Some additional precaution is included in recommendations relating to the total permissible fishery removals and some target management measures are in place.	12
Comprehensive additional precaution is included in recommendations relating to the total permissible fishery removals and target management measures are in place.	25
Evidence	
No evidence was made available to the assessment team to indicate any such measures are in place. TSFR in collaboration with National University are investigating the impact of fishery on ecosystem..	

Part C to Section 2a: Catch

Part C: Reduction component of the catch

Part C: Total Mitigation Value	**42**
Part C: Catch Risk Value (100 minus mitigation value)	**58**
Part C: Catch Risk Rating	**Moderate**

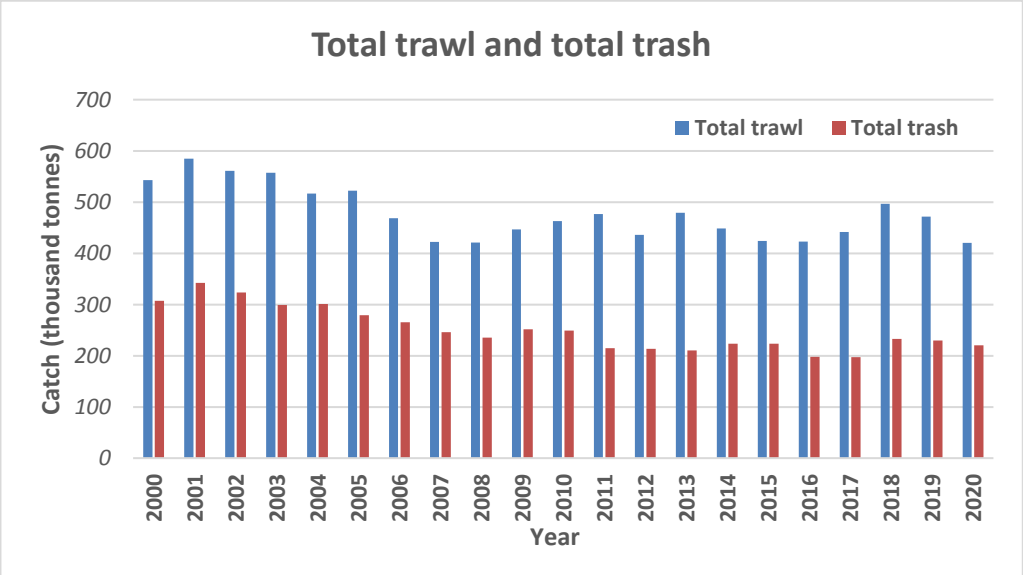
C1: Management objectives and references points (MMSY)	
	Mitigation Score
The fishery has not developed any objectives or target reference points for the reduction component to ensure that this multi-species assemblage is maintained or restored to levels capable of producing the TRP (e.g. multi-species maximum sustainable yield (e.g. MMSYc) as qualified by relevant environmental and economic factors).	0
The fishery has informally adopted objectives and target reference points to ensure that the component's multi-species assemblage is maintained or restored to levels capable of producing the TRP (e.g. MMSYc).	7
The fishery has formally adopted objectives and target reference points to ensure that the component's multi-species assemblage multi-species assemblage is maintained or restored to levels capable of producing the MMSY.	14
Evidence	
There is no explicit reference point for the reduction component. However, the target reference point for the total catch is the MMSY (see Part A). This could imply that the target for the reduction component is also its MMSYc, but that has not been explicitly stated.	

C2: Management objectives and references points (juvenile catch)	
	Mitigation Score
The fishery has not developed any objectives or target reference points for the catch of juvenile commercial fish in the reduction component to ensure that the catch of juveniles is having a minimal impact on the commercial species.	0
The fishery has informally adopted objectives and target reference points for the catch of juvenile commercial fish in the reduction component to ensure that the catch of juveniles is having a minimal impact on the commercial species.	7
The fishery has formally adopted objectives and target reference points for the catch of juvenile commercial fish in reduction component to ensure that the catch of juveniles is having a minimal impact on the commercial species.	14
Evidence	
Both the FMP 2015-2019 and FMP 2020-2022 both adopted a target to reduce the proportion of juvenile caught to 50% of current levels in five years. However, in the case	

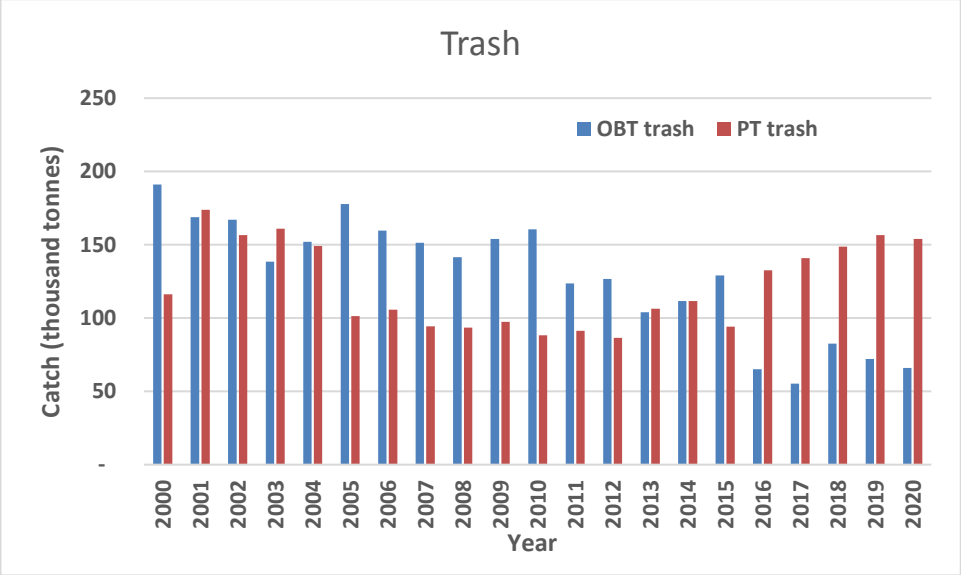
of the FMP 2015-2019 the baseline year is 2015 and for the FMP 2020-2022, the baseline year is 2019. This shifting baseline makes the target uncertain.

C3. Data and information	
	Mitigation Score
The fishery does not monitor any indicators relating to catch of the reduction component nor collect sufficient data and information to assess the current status of the reduction component, nor any data on the catch and impacts of juvenile commercial fish.	0
The fishery monitors indicators relating to the catch of the reduction component with a low degree of certainty and frequency and collects some information that could be used to estimate the status of the reduction component through proxies and the catch and impact of juvenile commercial fish.	7
The fishery monitors indicators relating to total catch with a high degree of certainty and frequency and also collects sufficient data and information to formally assess the current status of the reduction component and the catch and impact of juvenile commercial fish.	14
Evidence	

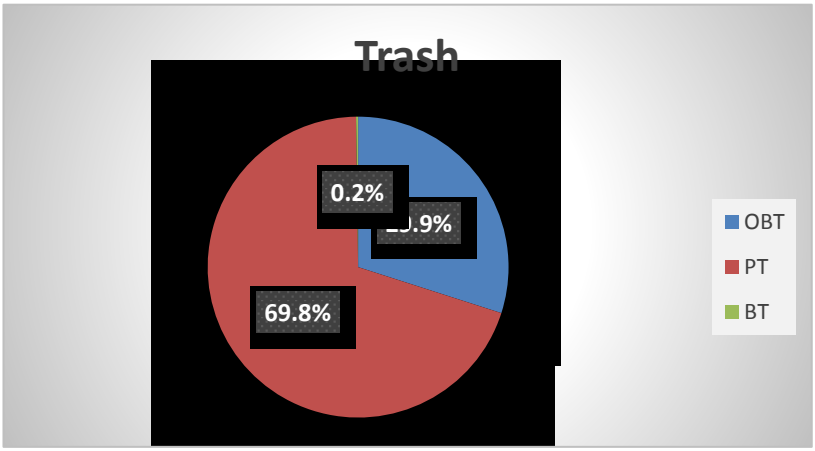
There is an annual estimate of the total trash taken by the three trawl gears (otter board trawl, pair trawl and beam trawl) starting in 1971. Since the year 2000, the catch of trash fish has ranged from 340,000 tonnes (2001) to 260,000 (2020) tonnes, noting that this data refers only to reported catch.



The catch of trash in otter trawls has declined over the years, especially after 2015, but the catch in pair trawls increased after this year. It is thought that this was a result of changes pair trawlers made to the body of their nets to compensate for cod end mesh size increases.



In 2020, the otter trawlers contributed 29.9%, pair trawls 69.8% and beam trawls (0.2%) of the trash fish caught in the UoA.



The composition of the trash was described by Kaewnern, Wangvoralak - 2005 [112] in the Gulf of Thailand. The pelagic species of juvenile of high value species found in trawl and push nets are Stolephorus spp. (anchovy), Sardinella spp. (sardine), Rastrelliger spp (mackerel). and Caranx spp (trevally), and demersal species are Sciaenidae (croakers), Cynoglossidae (tongue fish), Upeneus spp. (goatfish), Saurida spp (lizardfish). and Sillago spp (whiting). True trash fish species caught by trawl fisheries are Leiognathus bindus (pony fish), Apogonidae (cardinal fish), Gobiodae (gobies), Callionymidae (dragon nets), Balistidae (trigger fish), and Platycephalus spp (flathead).
Mugil spp. (mullet) is the juvenile economic species found only in push net fisheries production (now banned). Other bycatch species from trawl compose of cuttlefish, shrimp, krill and crab, while in push net, only swimming crab is bycatch.
The species/species groups making up 90% of the catch is shown below.

[112] Kaewnern, M. and S. Wangvoralak. 2005. Status of trash fish and utilization for aquaculture in Thailand. Kasetsart Journal (Natural Science) 39:70-77.

Family	Species	Common name	%	Accumulated %
Leiognathidae	*Leiognathus bindus*	Pony fish	25.1	25.1
Misc trash			7.4	32.5
Engraulidae	*Stelohorus spp.*	Anchovy	7.2	39.7
Mullidae	*Upeneus spp*	Goatfish	5.7	45.4
Synodontidae	*Saurida spp.*	lizardfish	5	50.4
Apogonidae		Cardinal fish	4.5	54.9
Crab trash			4.4	59.3
Bothidae		Flounders	3.9	63.2
Carangidae	*Caranx spp.*	Trevally/scads	3.6	66.8
Tetradonitdae		Puffer fish	3.1	69.9
Nemipteridae		Threadfin bream	2.7	72.6
Priacanthidae		Bigeye	2.6	75.2
Penaeidae		Shrimps	1.7	76.9
Platycephalidae	*Platycephalus spp.*	Flatheads	1.6	78.5
Misc demersal			1.4	79.9
Sepiidae		Cuttlefish	1.3	81.2
Loliginidae		squid	1.3	82.5
Sciaenidae		Croakers	1.3	83.8
Cynoglossidae		Tonguefish	1.2	85.0
Trichiuridae		Largehead hairtail	1.1	86.1
Scombridae	*Rastrelliger spp.*	Indian mackerel	1.2	87.3
Stomatopoda		Mantis shrimp	1.1	88.4
Callionymidae		Dragon nets	0.9	89.3
Scorpaenidae		Scorpion fish	0.8	90.1

= juveniles of commercial catch

In 2007, about 35% of the trash was composed of juveniles of commercial fish species. [113]

[113] Supongpan, M. & Boonchuwong, P. 2010. Bycatch management in Trawl Fisheries in the Gulf of Thailand. *Department of Fisheries: Bangkok, Thailand.*

C4. Fishery resource assessment	
	Mitigation Score
There is no recent or reliable assessment of the status of the fishery resource of the reduction component and no estimates of juvenile commercial fish.	0
The status of the fishery resource in the reduction component is based indirect evidence from indicators or proxies of stock status and there is limited assessment on the catch and impact of juvenile commercial fish.	7

The fishery resource status has been recently assessed using a scientifically defensible methodology and the catch of juvenile commercial fish is known with a fair degree of accuracy	14
Guidance	
There is no estimate of the MMSY of the reduction component. Preliminary modelling[114] suggests that the $MMSY_C$ for the reduction component could be as high as 1.5 million tonnes. However, because the overall fishery needs to be maintained at MMSY (without depleting the high-risk species (e.g. rays and sharks) see Part A) the catch of the reduction component needs to be well below the $MMSY_C$. There is no reliable assessment on the catch or impact of juvenile commercial fish. …… [114] D Leadbitter, EA Fulton, VV Ha, N Kulanujaree, P Noranarttragoon, KB Nguyen, R Phoonsawat, J Porobic, K Sainsbury, D Staples and Y Ye (in press): Managing multi-species and multi-gear fisheries – a toolbox for scientists, managers and stakeholders.	

C5. Status of fishery resource	
	Mitigation Score
The status of the fishery resource with respect to the TRP is unknown and the impact of the juvenile catch is unknown.	0
The status of the fishery resource with respect to the TRP is known with a low level of certainty, and is based on proxies. The impact of the juvenile catch is known with a low degree of certainty.	7
The fishery status with respect to the TRP and the impact of the juvenile catch is known with a high level of certainty.	14
Evidence	
The catch and fishing effort of trash fish is probably below the MMSY for the reduction component, but more analyses are needed. It is also possible that the reduction fishery is also taking some high-risk species that need to be considered in Part B of this assessment. There is no reliable information on the trends of juvenile fish catch.	

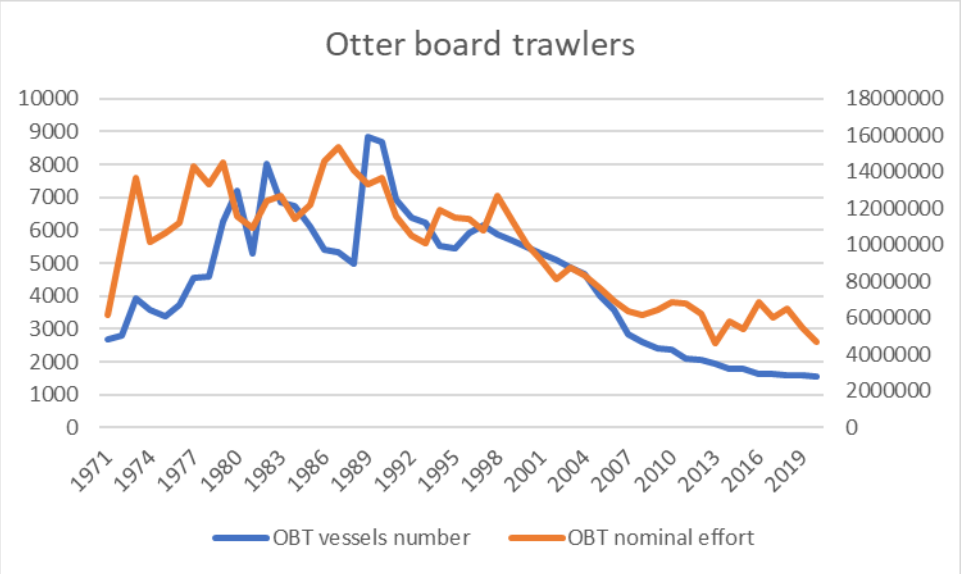
C6. Management measures and their compliance	
	Mitigation Score
There are no management measures in place to control the catch of the reduction component nor the amount of juvenile commercial fish taken.	0
There are management measures in place to control the catch of the reduction component and the amount of juvenile commercial fish taken, but are not effective.	7
There are management measures in place to control the catch of the reduction component and the amount of juvenile commercial fish taken, which are very effective.	14
Evidence	

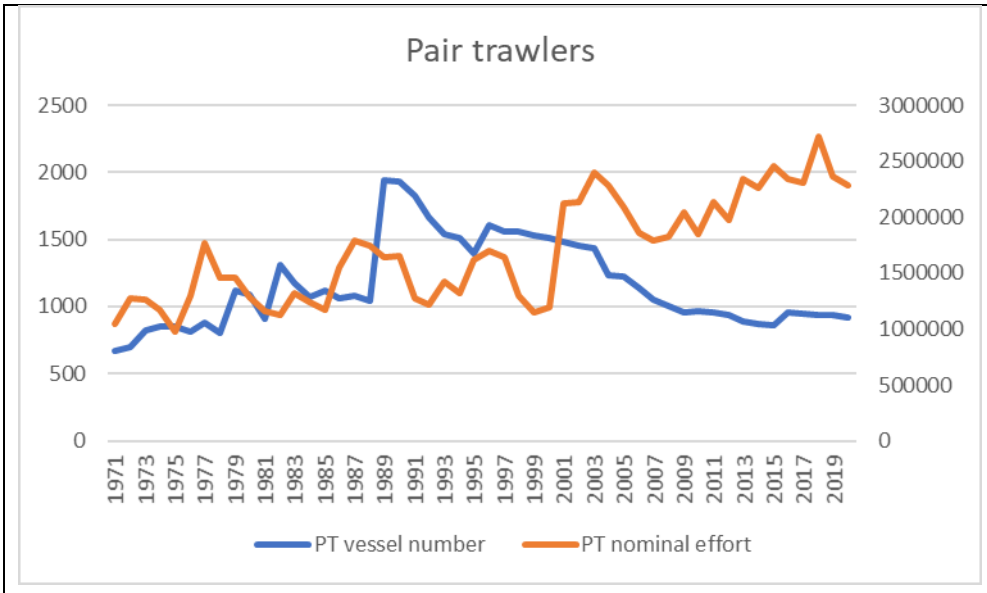
As described in Part A, the FMP 2015-2019 and FMP 2020-2022 both set out management measures to control the fishing effort of the trawl vessels and the total aggregate catch. These in turn, will also limit the catch of the reduction component catch.
The DOF have also increased the size of the mesh in the cod end of the otter board and pair trawl nets from 2.5 to 4cm (5cm in 2016).

C7. Management performance	
	Mitigation Score
The fishery has failed to achieve the objectives it has set in relation to the reduction component OR there are no such objectives.	0
The fishery is making progress to meeting the objectives it has set in relation to the reduction component.	7
The fishery has achieved the objectives it has set in relation to the reduction component	14

Evidence

As seen in the graph in C5 and C5, the catch of trash fish has been declining since 1990. This has coincided with the decrease in the number of otter board trawlers (not pair trawlers) and fishing effort since this time. Again, note that these are reported data that underestimate the catch and effort from 1996 to 2015.





The percentage trash remained relatively stable since 2000, although a slight decrease in the since the management measures were introduced in 2016 may have occurred.

	Otter trawl	Pair trawl	Trawl
2000-2005	52.3%	62.6%	56.4%
2006-2010	56.2%	56.3%	56.1%
2011-2015	50.9%	58.3%	53.7%
2016-2020	42.1%	53.8%	45.3%

There is no information available to assess the progress towards reducing the percentage of juveniles, although indirect evidence would suggest that increasing the cod-end mesh size would reduce the catch of juveniles of some species.

Socio-economic Criteria

In addition to the areas examined above, applicants to full MarinTrust RS approval must commit to ensuring that vessels operating in the fishery adhere to internationally recognised guidance on human rights. They must also commit to ensuring there is no use of enforced or unpaid labour in the fleet(s) operating upon the resource.

Improver Programme Notes

In the current version of the MarinTrust RS fishery assessment, the social component is limited to a commitment from applicants. The extent to which this commitment is 'tested' is limited. However, applicants to the Improver Programme should be aware that this section will be under continuing development over the coming year(s), and additional social requirements are likely to be added before the end of any FIP process.

Because the overall goal of fisheries management To maximise socio-economic benefits while minimising impacts on the fishery resources and the ecosystem integrity, structure and functioning, a set of economic criteria is also being considered so the costs (impacts on the fishery resources and the ecosystem) can be balanced with socio-economic benefits.