Government of the Republic of Maldives
Ministry of Fisheries, Marine Resources and Agriculture
Velaanaage, 7th Floor, Ameer Ahmed Magu
Malé - 20096, Republic of Maldives

MALDIVES NATIONAL REPORT TO THE SCIENTIFIC COMMITTEE OF THE INDIAN OCEAN TUNA COMMISSION, 2020

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Maldives National Report to the Scientific Committee of the Indian Ocean Tuna Commission, 2020

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INFORMATION ON FISHERIES, RESEARCH AND STATISTICS

In accordance with IOTC Resolution 15/02, final scientific data for the previous year was provided to the IOTC Secretariat by 30 June of the current year, **for all fleets other than longline** [e.g. for a National Report submitted to the IOTC Secretariat in 2020, final data for the 2019 calendar year must be provided to the Secretariat by 30 June 2020)	NO 02/09/2020
In accordance with IOTC Resolution 15/02, provisional **longline data** for the previous year was provided to the IOTC Secretariat by 30 June of the current year [e.g. for a National Report submitted to the IOTC Secretariat in 2020, preliminary data for the 2019 calendar year was provided to the IOTC Secretariat by 30 June 2020). **REMINDER:** Final longline data for the previous year is due to the IOTC Secretariat by 30 Dec of the current year [e.g. for a National Report submitted to the IOTC Secretariat in 2020, final data for the 2019 calendar year must be provided to the Secretariat by 30 December 2020).	NO 29/07/2020
If no, please indicate the reason(s) and intended actions:	

Summary

The Maldives tuna fishery comprises of four main components; pole-and-line, handline, longline and troll line. In terms of total landings, livebait pole-and-line is still the most important. The main target species is skipjack tuna (*Katsuwonus pelamis*) and yellowfin tuna (*Thunnus albacares*), but small amounts of juvenile bigeye tuna (*Thunnus obesus*), (about 5-10%) is caught along with yellowfin tuna. Handline fishery is now well-established as a major component, which targets large yellowfin tuna (> 70 cm FL) from the surface (<10m). The longline fleet has been operational intermittently in the past with foreign licensed vessels operating in the past, with a domestic fleet being in operation from 2011, licensing of which has been suspended since July 2019. Troll fishery is minor and used to target primarily neritic species of kawakawa (*Euthynnus affinis*) and frigate tuna (*Auxis thazard*), but occasionally also caught skipjack and yellowfin tuna.

The pole-and-line and handline fleets operate within about 100 miles although historically, the fleet operated much closer, and conducted daily trips, returning to the home island after the trip. The Longline Regulation which came in force in 2011 restricted its operation from within 100 from the shore to protect the pole-and-line and handline operations

Maldives reported 134,300 t of tunas in 2019, comprising of skipjack, yellowfin, bigeye, frigate and kawakawa. Of these 66% (89,042 t) was skipjack tuna and 33% (44,700 t) was yellowfin tuna. The remaining constituted bigeye tuna, frigate and kawakawa. Pole-and-line fishery landed 99% of skipjack tuna in 2019, and was the second most important gear for yellowfin tunas, landing 38% (17,240 t) of all yellowfin tuna caught in 2019. Handline gear almost exclusively lands yellowfin tuna (26,932 t in 2019) which represented 99% of all species landed by the gear. Longline catch of tunas decreased by 41% from 2018, landing 564 t comprising of 479 t of yellowfin tuna and 83 t of bigeye tuna. Catch of other tunas and billfish were below 8 t in 2019.

Catches of skipjack registered a drop in 2019 relative to 2018, by about 11%. Recent catches have been of the order of 69,000 – 100,000 t, yet, substantially less than the catch recorded in 2006. Caches of yellowfin observed a general decline in the past five years. No specialized vessel is required for handline fishing hence many pole-and-line vessels now carry both sets of gears and switch target fishery and gear depending on fishing opportunities.

Maldives pole-and-line and handline tuna fishery have minimal impact on the ecosystem. Catch and interactions with Endangered, Threatened and Protected (ETP) species and other species of ecological importance is virtually non-existent. Shark bycatch and turtles are reported from the longline fishery, which has strict measures to report and release those that are caught. In addition, measures to mitigate bird entanglement in the longline gear are mandated by law. Logbooks for all the tuna fisheries have provisions to report catch and interactions of non-targeted and ETP species. Maldives Marine Research Institute currently conducts scientific observations of fishing trips in accordance with the relevant IOTC Conservation and Management Measures.

Collection of data from logbooks is now fully established. A revision to the Regulation enforced early in 2019 requires mandatory reporting of logbook before the catches are sold for processors and exporters. An electronic logbook is being trialled which has been rolled out by during December 2019. Full implementation of electronic logbook has been delayed due to travel restrictions imposed due to the current pandemic. A new vessel monitoring system is being procured which will replace the old VMS on the vessels. It is expected by the end of 2021 all licensed tuna fishing vessels will be equipped with the new VMS in accordance with Resolution 15/03 On establishing a vessel monitoring system (VMS).

A new fisheries act (14/2019) was enacted in 2019 and superseded the previous act of 5/87. The Act requires development and implementation of management plans for all commercial fisheries including those on tunas and tuna-like species. It is expected that management plans will strengthen monitoring and management of the fisheries.

A number of donor and local funded programs are being implemented to improve fishery and biological data collection, monitoring and management of the fisheries. The programs are geared towards improving national reporting and compliance to IOTC Conservation and Management Measures and towards understanding and minimising impacts of fisheries on the ecosystem.

1. Background / General Fishery Information

Maldives is a tuna fishing nation with a history dating back hundreds of years. Tuna fishery was the mainstay of the Maldivian economy, providing employment and income, until the establishment of the tourism industry. Tuna fishery is still the most important source of employment and income for a substantial proportion of the population. Tunas are the main source of protein for Maldivians and remain the single most important export commodity from the Maldives earning a substantial proportion of foreign income.

The Maldives enacted a new fisheries act (14/2019) on 15th September 2019. This Act supersedes the Fisheries Act of 1987 (5/87). The Act is structured as a framework law, in that it covers the various multidisciplinary aspects of the sector and serve as the legislative backbone for the sector while leaving the more detailed codification to the regulations and management plans made pursuant to the Act. The Act requires development and implementation of management plans for all commercial fisheries including those on tunas and tuna-like species. It is expected that management plans will strengthen monitoring and management of the fisheries.

The Act applies to all Maldivian fishing vessels and foreign fishing and fishing related vessels entering the maritime zones of the Maldives and vessels flagged to the Maldives operating beyond the maritime zones of the Maldives. It also applies to all fishing and fishing related activities of such vessels and Maldivian and foreign nationals on these vessels.

The most important component of the Maldivian tuna fishery is the livebait pole-and-line fishery. The fishery exploits, in the order of importance, skipjack tuna (*Katsuwonus pelamis*), yellowfin tuna (*Thunnus albacares*), frigate tuna (*Auxis thazard*) and kawakawa (*Euthynnus affinis*). Small amounts of juvenile bigeye tuna are also caught along with yellowfin tuna. With the modernization of the fleet, fishing trips which used to be single day, have mostly become multi-day operations, especially during times of poor bait and tuna fishing. While the majority of trips are restricted to coastal areas, within about 100 miles from shore, modern vessels have the capacity to venture even further. To assist the pole-and-line fishers, the Maldives government maintains a network of some 50 Anchored Fish Aggregating Devices (AFADs) located 12-20 miles from the coast.

The second most important component of the tuna fishery is the multi-day handline fishery, targeting large yellowfin tuna (>70 cm FL) from the surface (<10m deep) (Adam and Jauharee, 2009, Adam et al., 2015, Ahusan et al., 2016). The export oriented commercial fishery is a relatively recent fishery that began in the late 90's or early 2000. Prior to this, seasonal fisheries targeting large sized yellowfin tuna existed in different parts of the country (refer to MRS, 1996) Handline fishing does not require modifying of the pole-and-line vessel except for addition of handline gear and having facilities for fresh-storage of catch. Ease of conducting the fishery off pole-and-line vessels, the ready availability of ice and the high market price has boosted expansion of the fishery.

Longline fishery has been a minor component in the Maldives tuna fisheries. Maldives used to have a licensed foreign longline fleet operating in the outer EEZ (75 miles and beyond) since 1985 (Anderson, Hafiz and Adam, 1996). All longline licenses at the time were terminated by the Government of The Maldives in 1994 partly due to non-compliance with the data submission requirement of the license (Anderson et. al, 1996). Licensing was resumed and longline vessels operated under the Maldives flag until mid-2010. The Government of Maldives resumed licensing fully local longline vessels and businesses to fish from 75 miles from shore, within the Maldives EEZ, in 2011. The Longline Fishery Regulation (No. 2014/R-388) allowed vessels to target yellowfin and bigeye tuna from 100 miles and on the high seas and regulated the fishery with a total allowable catch (TAC) based on the fleet development plan submitted to

IOTC, a quota system to distribute the TAC, mandatory VMS and logbook reporting of catch and effort. The longline fishery was closed for a third time in 2019 to ensure full compliance with the established regulations and requirements.

The troll fishery is the smallest component of the tuna fisheries and targets neritic species of kawakawa and frigate tuna. Importance of the fleet, which landed substantial proportions of the species in the past, significantly declined due to mechanization of the fishing fleet during 1970s and 80s. Trolling activity peaked during the period of transition during the mechanization of the pole and line fleet (1975-1982) (Anderson et al., 1996). More recently, troll activity seems to have picked up due to the wide availability of small crafts, popularity of recreational fishing and availability of markets for the catch. However, it is thought that these operations mostly target non-tuna species such as sailfish (*Istiophorus platypterus*), wahoo (*Acanthocybium solandri*) and other large species.

2. Fleet structure

The fishing fleet has undergone several changes following the mechanization beginning in 1974. The current fleet is a mix wooden hulled and fibre reinforced plastic (FRP) vessels. Vessels are characterized by having long and open-deck at the stern with a high-rise super structure forward of the vessel. Historically, Maldives tuna vessels were gear specific. Pole-and-line fishery was conducted off mechanized tuna vessels (*masdhoni*) while troll fishing was conducted from smaller versions of the pole-and-line tuna vessels, locally called a *vadhu dhoni*. With the introduction of the handline yellowfin tuna fishery in the 1990s, mechanized tuna vessels accommodated handline fishery with minor modifications to the vessel and minimal extra costs. In majority of cases, the mechanized tuna vessels are used exclusively for pole-and-line or handline operations. Occasionally, vessels may switch between pole-and-line and handline operations during high abundance of catch. However this is not common practice as both fisheries require different types and sized bait.

Longline fleet used to be foreign-owned and operated in the outer waters of the Maldives EEZ, beyond 75 miles since 1985 (Anderson, Hafiz and Adam, 1996). Although mandatory catch reporting was provided for in the license agreement, there was poor reporting rates and access to the data proved to be difficult (Adam, 2007). During the height of the fishery some 30-40 vessels operated in the Maldivian waters. In May 2010, the Government of Maldives ceased foreign licensing to allow for a fully local longline fishery.

The Ministry of Fisheries and Agriculture resumed licensing local longline vessels in 2011 to operate from 75 miles from shore. Nineteen Maldivian-owned longline fishing vessels were licensed in the first year. However, these vessels did not start operation until May 2012. The Longline Fishery Regulation (No. 2014/R-388) was enacted in 2014, to allow locally owned vessels and businesses to fish from 100 miles from the archipelagic baseline, targeting yellowfin and bigeye tuna. A total allowable catch was set for every year broken down into equal number of 20 t quota blocks offered at or above a baseline fee. VMS and logbook reporting of catch and effort data is made mandatory under MCS programme jointly being implemented by Coast Guard and Maldives Customs. In 2018, 27 longline vessels were in operation. The fishery was suspended in 2019 due to low-compliance and irregularities in the data reporting.

Table 1: Number of vessels operating in the IOTC area of competence, by gear type and size (2013-2019).

Year	Vessel type	Length Range (LoA, meters)							
		< 07.5	> 07.5 < 12.5	> 12.5 < 17.5	> 17.5 < 22.5	> 22.5 < 27.5	> 27.5 < 32.5	> 32.5 < 37.5	> 37.5
2013	Engine row boat	4	--	--	--	--	--	--	--
2013	Longline vessel	--	1	5	2	--	--	--	7
2013	Mecha nized masdhoni	--	23	117	141	224	68	11	--
2013	Mechanized vadhu dhoani	1	6	--	--	--	--	--	--
2014	Engine row boat	2	2	1	1	1	3	--	--
2014	Longline vessel	7	34	10	9	2	--	--	9
2014	Mechanized masdhoni	--	--	132	163	277	94	12	--
2014	Mechanized vadhu dhoani	1	2	1	2	--	--	--	--
2015	Mechanized masdhoni	11	50	161	182	302	108	14	1
2015	Longline vessels	-	-	9	17	2	-	-	-
2016	Mechanized masdhoni	9	43	116	155	273	93	16	-
2016	Longline vessel	-	-	14	21	3	-	-	4
2017	Mechanized masdhoni	-	66	140	170	320	104	17	1
2017	Longline vessel	-	1	13	23	3	-	-	4
2018	Mechanized masdhoni	11	38	94	134	297	95	19	-
2018	Longline vessel	-	-	6	20	1	-	-	
2019	Mechanised masdhoni	14	47	132	155	320	102	20	
2019	Longline vessel			6	21	1			

3. Catch and effort (by species and gear)

Total tuna catches reached an all-time high of about 167,000 t in 2006 (Figures 1a and 1b). This was followed by a 53% decline in catch until 2010. Total tuna catches have since been recovering with 2019 recording a 31% increase from 2010. Catch of skipjack tuna in the recent five years (2015-2019) have increased by 26%, although the catch of 2019 was 11,000 tons less than 2018. Yellowfin tuna catch reported a 14% decline in the recent five-year period, and was 2,515 t less than 2018. Nominal catch of kawakawa declined by 79% and in contrast to frigate tuna which increased by 13% over the same period.

Total tuna landings (skipjack, yellowfin, bigeye, frigate and kawakawa) in 2019 were around 134,300 t. Of these 66% was skipjack tuna and 33% was yellowfin tuna. The remaining constituted bigeye tuna, frigate and kawakawa. Historically juvenile bigeye tuna caught in pole-and-line fishery was estimated, in part due to the low numbers in the *Thunnus* catches (YFT+BET). Earlier estimates by Anderson, 1996 showed the bigeye component to be between 3-4% while more recent analysis of tag release data has shown that the estimates of bigeye tuna caught in the pole-and-line fishery may be 3 times more, particularly in the south (Adam et al., 2014).

Pole and line tuna fishery landed nearly all of skipjack tuna in 2019 (88,174 t), representing 99% of all skipjack tuna landed. Yellowfin tuna is the second most important species in the tuna fishery. Catches have increased, peaking in 2016 at 53,000 t and have since been decreasing gradually. Total catch of yellowfin tuna were 44,700 t in 2019. Close to 61% of the yellowfin catch was from the handline fishery. Yellowfin tuna is also an important species in the pole-and-line fishery landing 38% of the catch in 2019. Both pole-and-line and handline fisheries operate quite close to the atolls, although there is a difference in the predominant fishing regions of the two fisheries. Most of the pole-and-line catch is taken from the south of the country while the handline catch is mainly taken from the north and central atolls.

The small-scale trolling fleet targets kawakawa (*Euthynnus affinis*) and frigate tuna (*Auxis thazard*) in the coastal areas and atoll lagoons. The main trolling fleet effectively died in the late 1980s due to improved socio-economic changes. These days catch of kawakawa and frigate is mainly from pole-and-line vessels. Combined average catch of both species was 178 t in 2019 by all gears.

Longline fleet used to be foreign-owned and operated in the EEZ, beyond 75 miles under licensed and joint venture arrangements. Licensing scheme for foreign vessels was scrapped in March 2010. However, in 2011 Maldives re-started a longline fishery exclusively for Maldivian-owned vessels, which was suspended again in 2019.

Except or longline fishery, effort is measured in number of fishing days. This was the most natural and easiest since fishing takes place on day-trips leaving early in the morning and returning by evening. In the past, the uniform fleet structure and use of essentially pole-and-line method for most of the tuna catches makes the choice for unit of effort satisfactory. However, with increasing efficiency of vessels (size, engine horse power, fish hold and bait capacity, and other operational factors) fishers are taking longer trips, hence, the day of fishing should be standardized to use the CPUE data (Kolody and Adam., 2011; Sharma et al. 2014, Medley et al. 2018).

Combined effort for pole-and-line, handline and trolling has fluctuated between about 50,000 and 79,600 days in the most recent five-year period. Gear-wise changes in effort also observed similar pattern. For the two most important gears (pole-and-line and handline), effort seems to have decreased slightly from 79,400 in 2018 to 58,400 days in 2019.

Catch and effort by gear and species for the recent five years is presented in Table2. Figures 1a and 1b present the historical catch and catch of main tuna species for the national fleet by gear respectively. Spatial maps of effort by gear are presented for 2019 (Figure 2a) and average for the most recent 5 years (Figure 2b). Catch by gear and for the main species is presented for 2019 in Figures 3a (1-4) and average for the most recent five years in Figure 3b (1-4).

Table 2. Annual catch (t) and effort (days) by gear and primary species in the IOTC area of competence 2014-2019.

Year	Gear	Effort (days)	SKJ (t)	YFT (t)	BET (t)	KAW (t)	FRI (t)
2014	PL	36,269	67,301	18,481	304	741	578
	HL	24,861	1,015	30,246	525	103	50
	LL	na	0	183	1,501	0	0
	TR	4,533	181	181	3	45	22
2015	PL	22,877	68,965	15,796	184	180	96
	HL	24,045	1,057	36,299	1,433	19	8
	LL	na	0.33	112	231	0	0
	TR	1,960	252	231	2	23	14
2016	PL	29,061	68,711	8,550	781	26	124
	HL	31,291	866	44,384	1,066	2	16
	LL	na	2.41	726	624	0	0
	TR	929	9	44	9	2	4
2017	PL	25,042	88,617	17,500	269	142	334
	HL	24,321	198	30,562	113	9	1
	LL	na	1	1,269	691	0	0
	TR	299	9	28	0.3	8	8
2018	PL	45,601	99,886	17,619	221	74	328
	HL	33,797	209	28,960	46	5	4
	LL	Na	3.66	633	163	0	0
	TR	242	0	3	0.27	11	5
2019	PL	31,409	88,174	17,240	224	35	129
	HL	27,006	797	26,932	86	5	1
	LL	Na	1.46	479.21	83.6	0	0
	TR	494	69	49	2	5	2

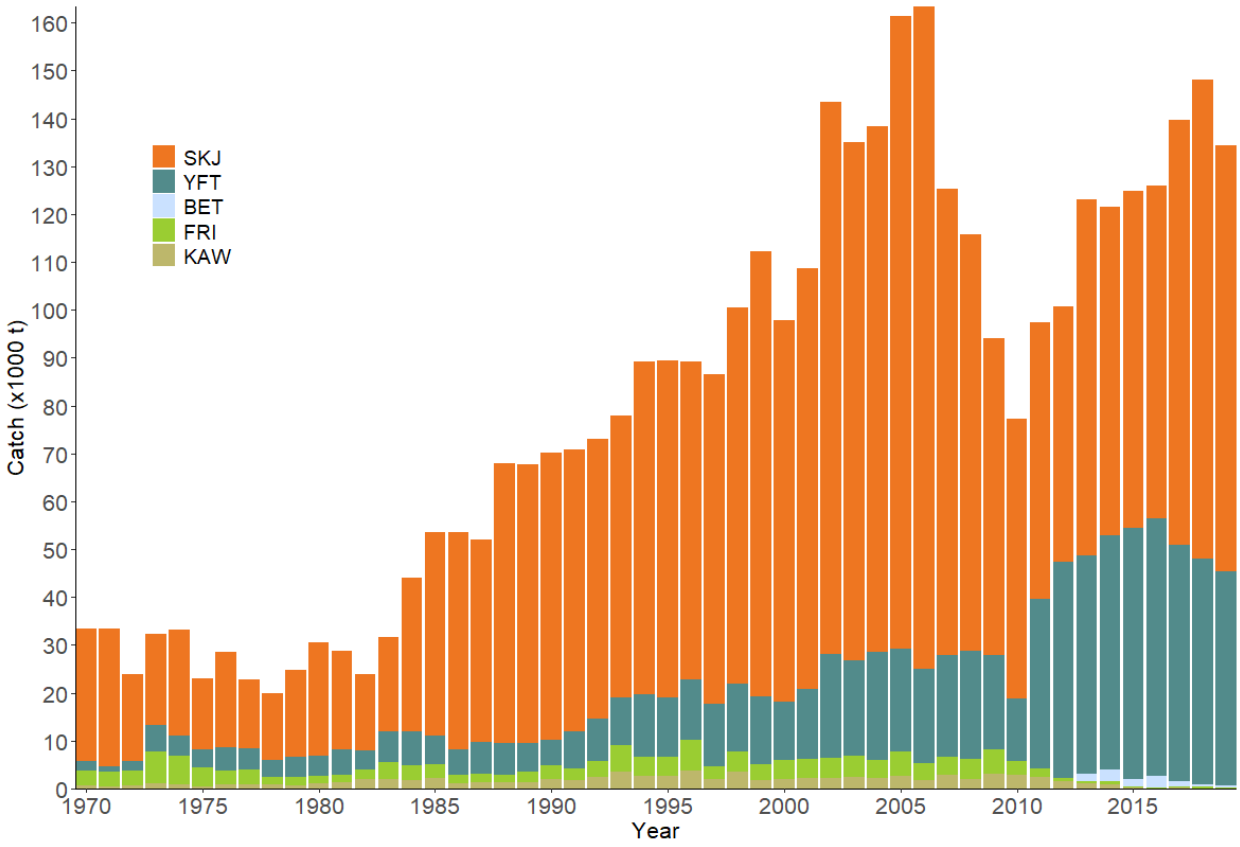


Figure 1a: Historical tuna catch for the national fleet by species (1970-2019). Note that bigeye tuna began to be recorded separately in 2013.

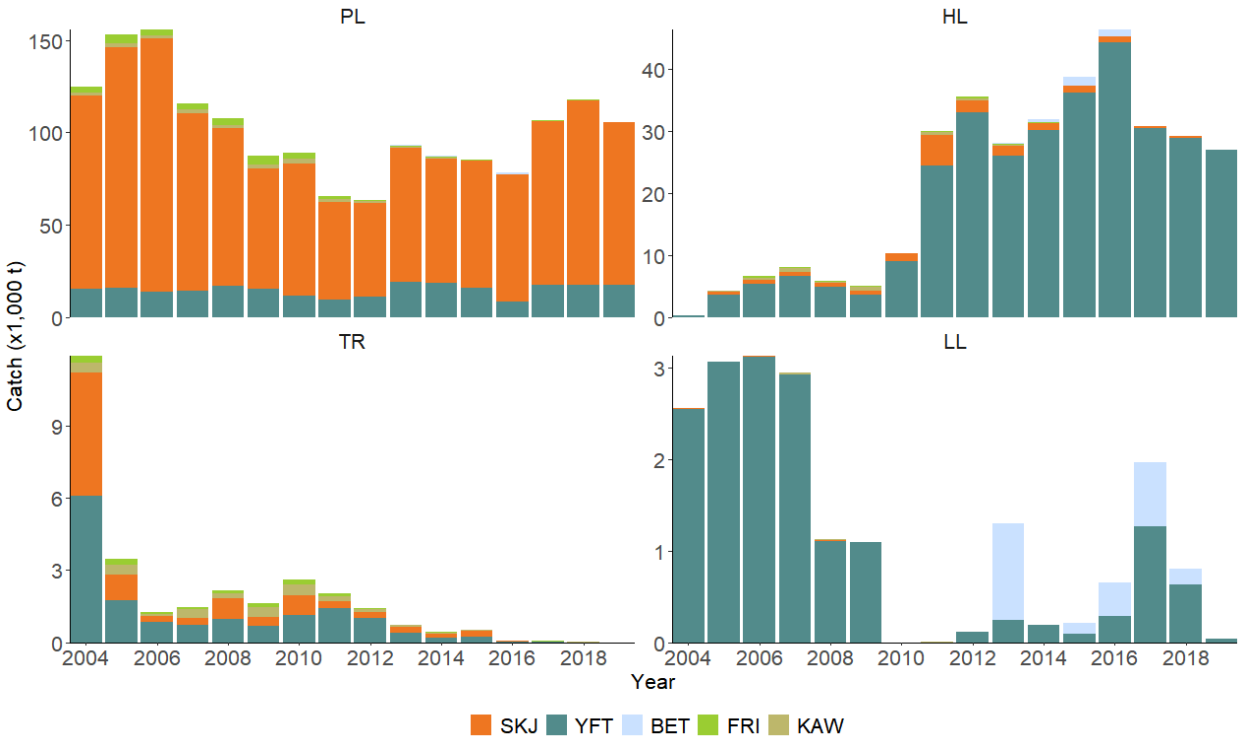
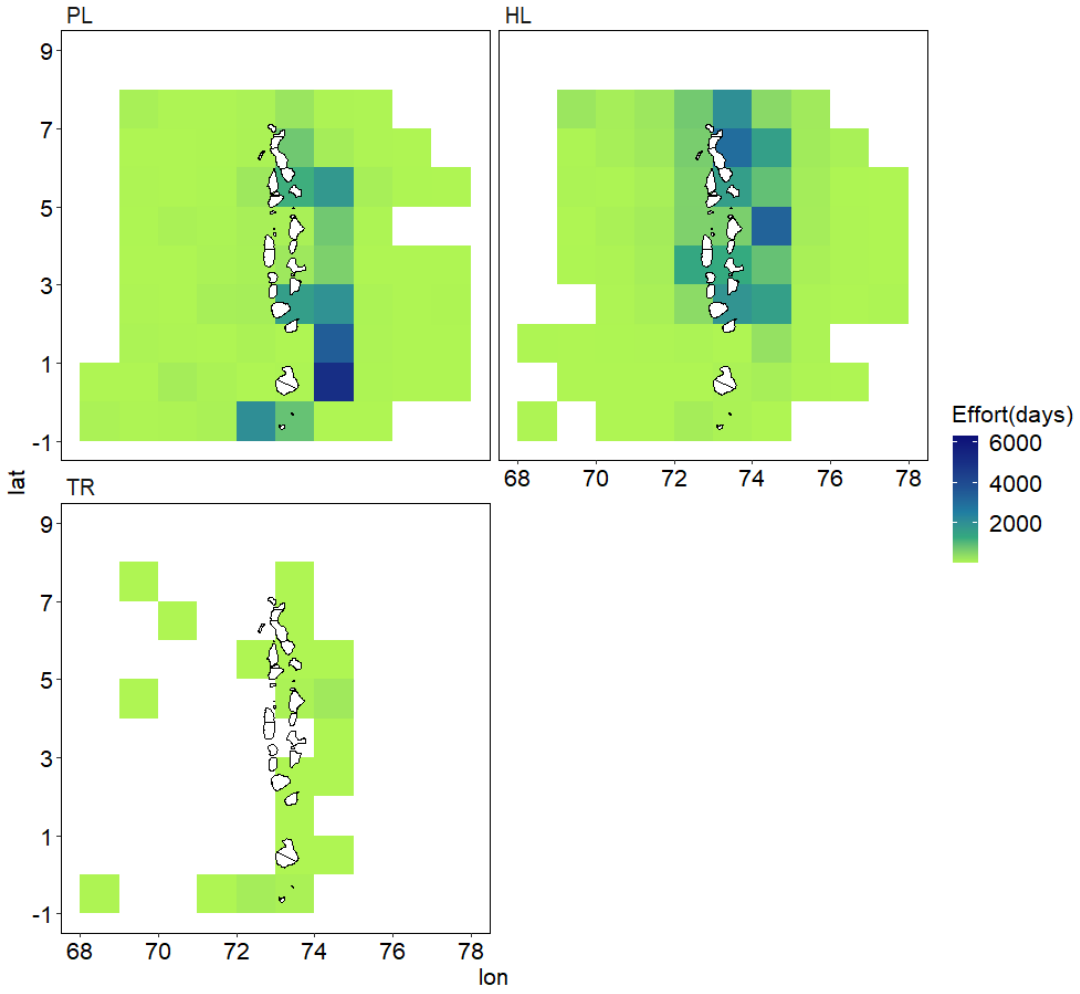


Figure 1b: Catch of main tuna species for the national fleet by gear (2004-2018). Note that bigeye tuna began to be recorded separately in 2013.


PL
HL
TR
lat
lon
9
7
5
3
1
-1
68
70
72
74
76
78
Effort(days)
6000
4000
2000

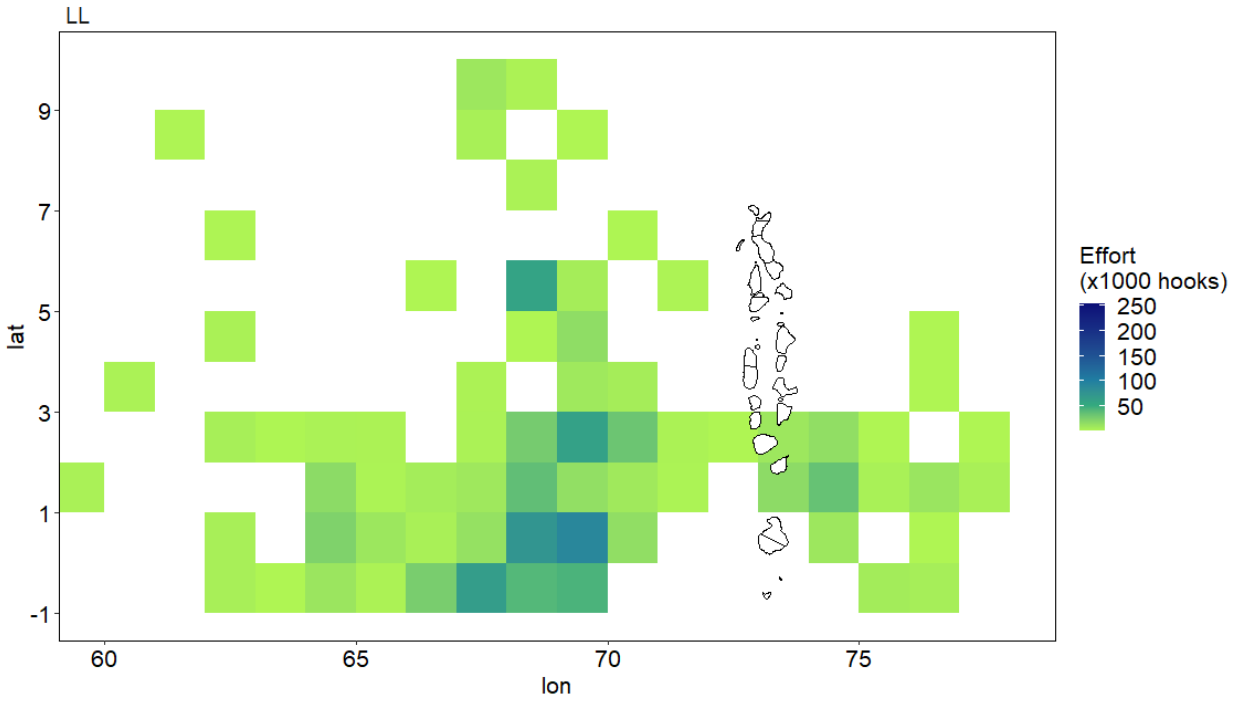
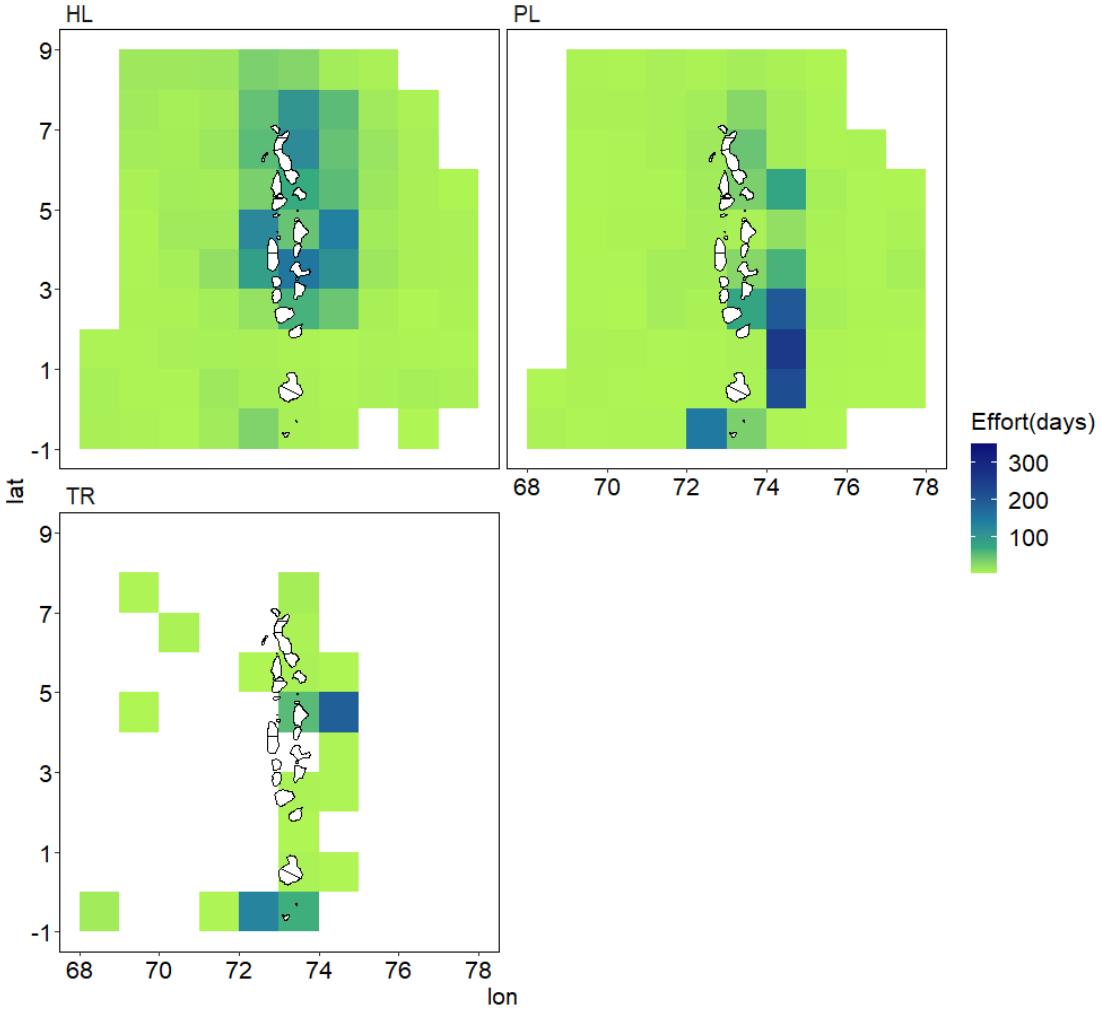

LL
lat
lon
9
7
5
3
1
-1
60
65
70
75
Effort
(x1000 hooks)
250
200
150
100
50

Figure 2a. Map of distribution of fishing effort for pole-and-line, handline, trolling and longline gears for 2019.



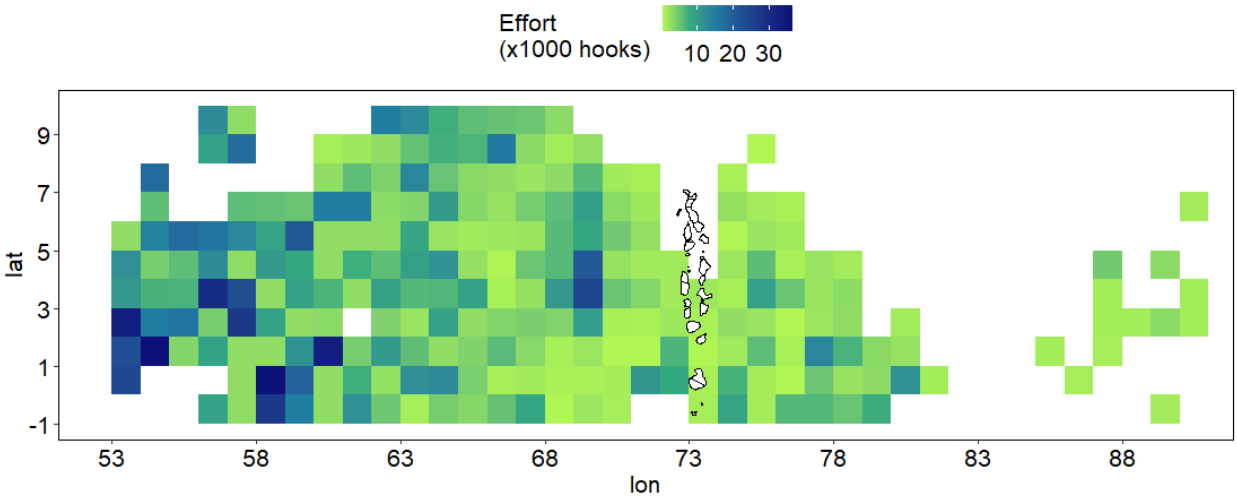


Figure 2b. Map of distribution of fishing effort for pole-and-line, handline, trolling and longline gears (average of the period 2015- 2019).

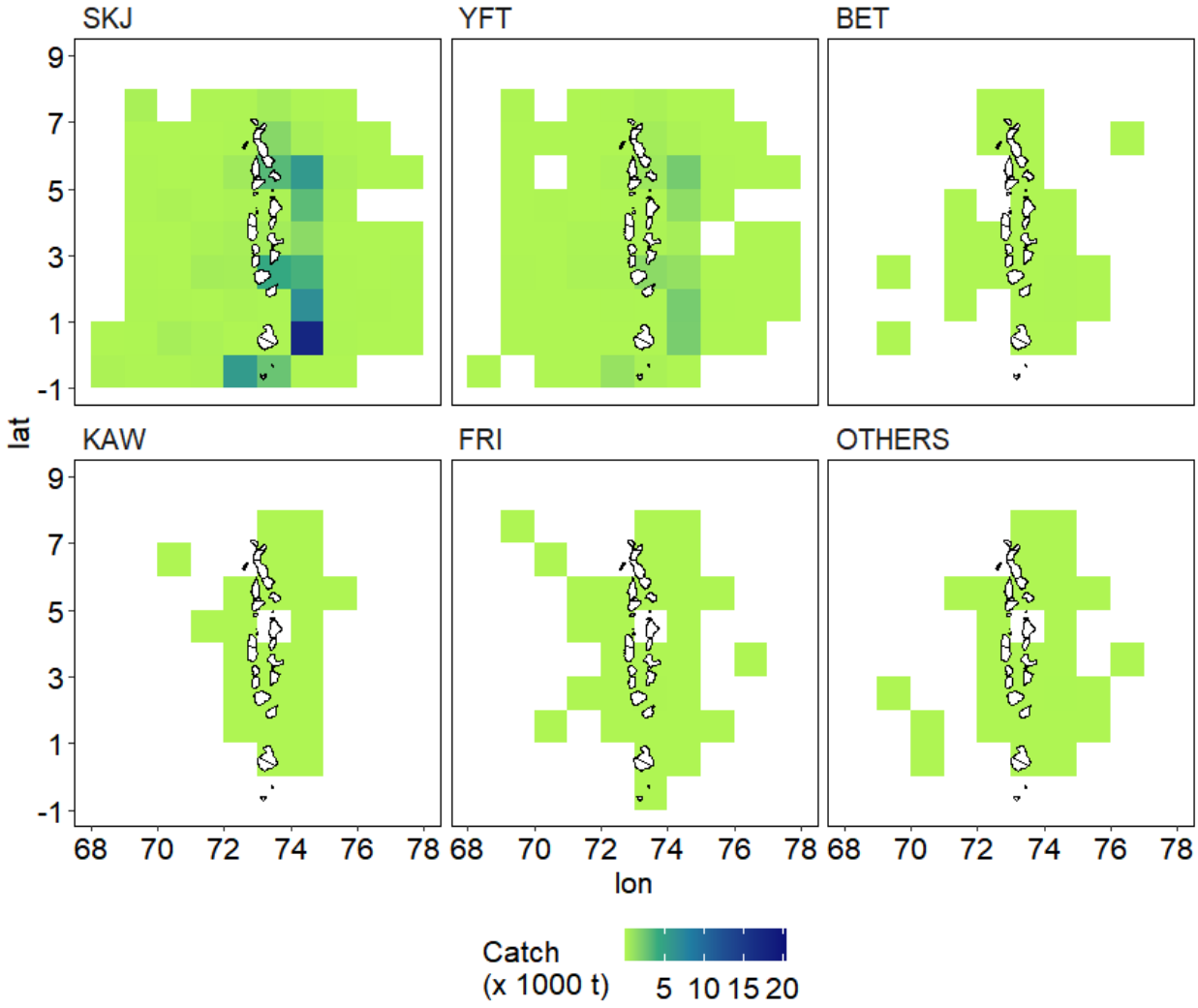


Figure 3a-1. Map of distribution of fishing catch by species for pole-and-line for 2019.

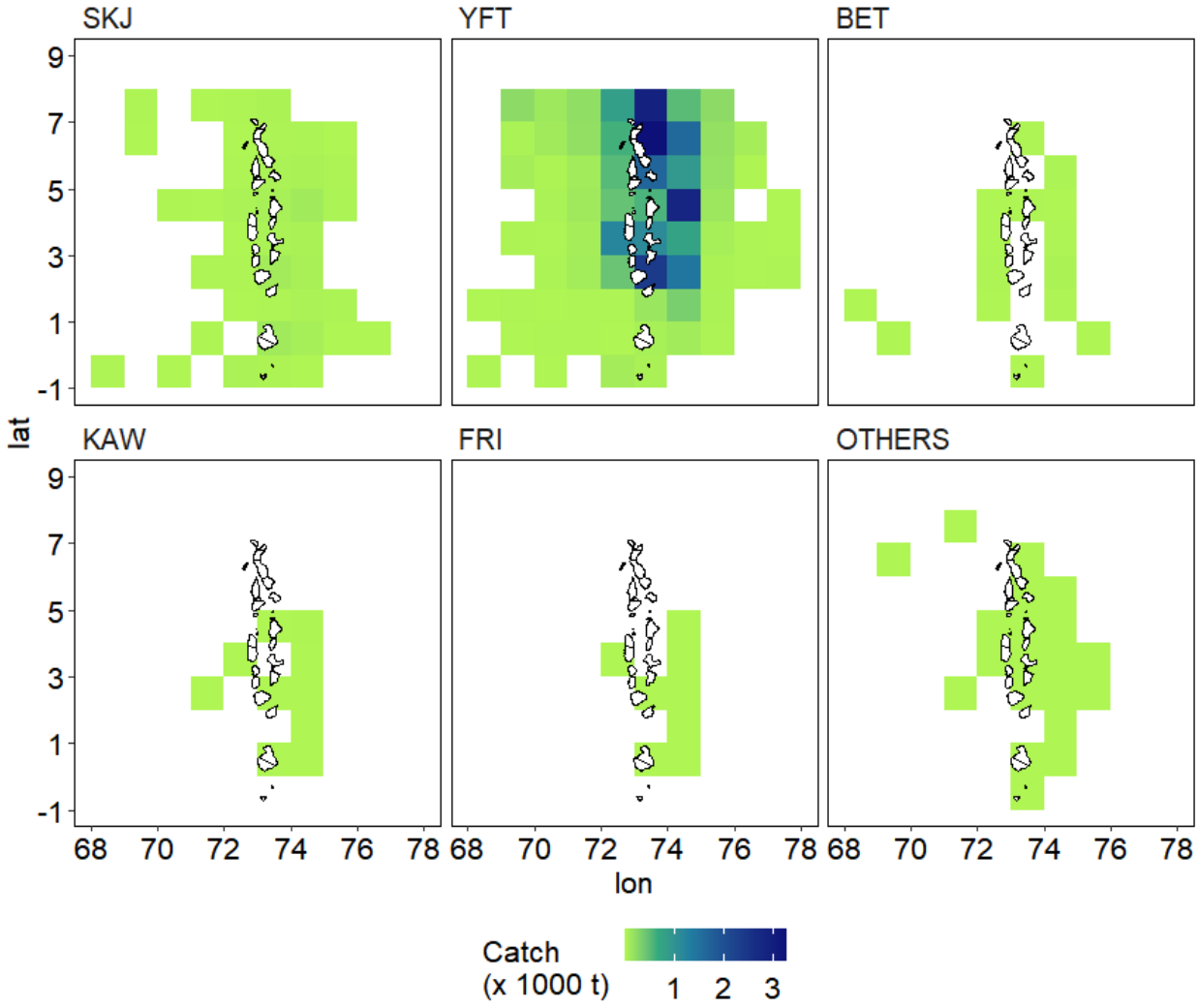


Figure 3a-2. Map of distribution of catch by species for handline for 2019.

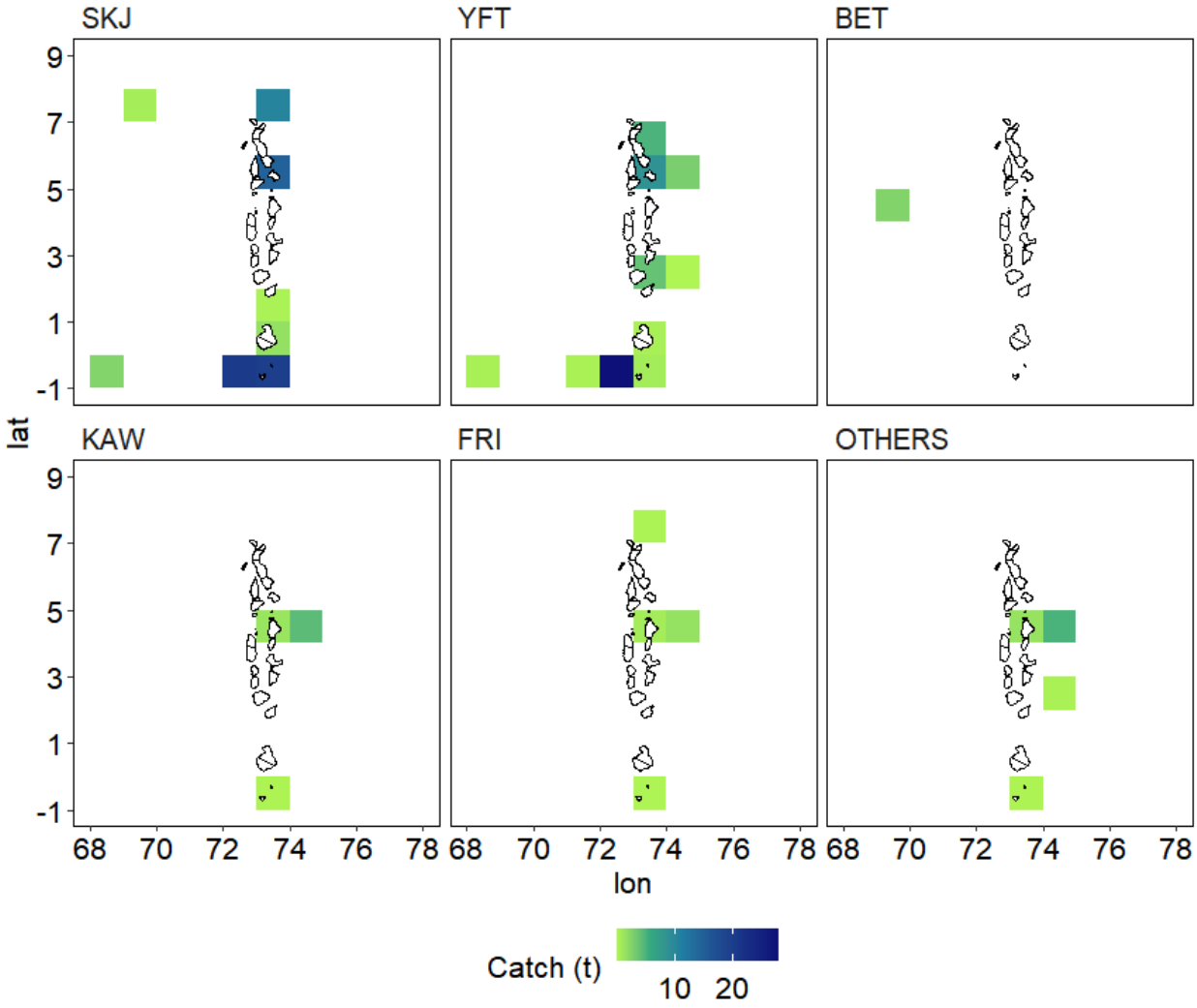


Figure 3a-3. Map of distribution of catch by species for trolling for 2019.

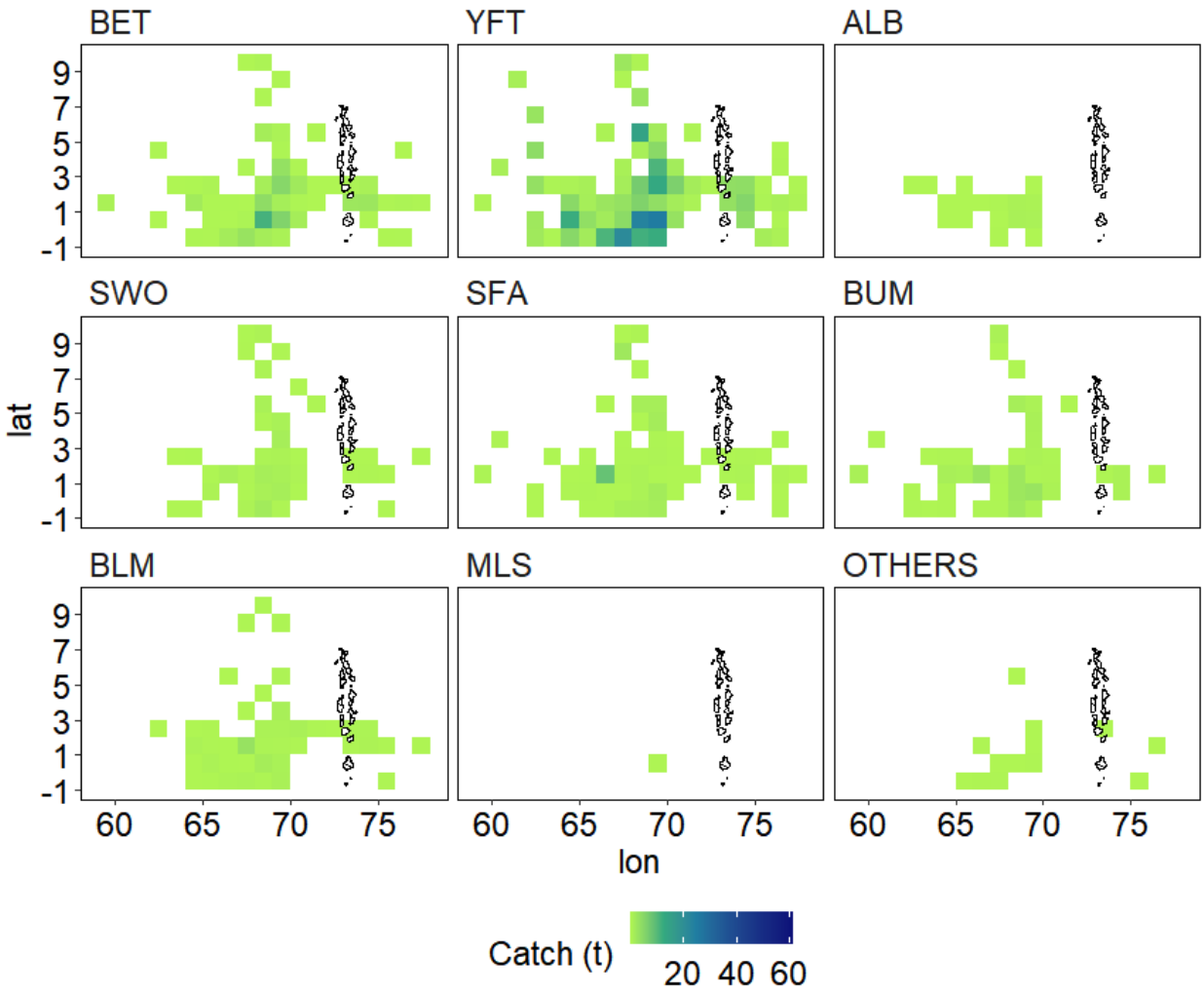


Figure 3a-4. Map of distribution of catch by species for longline for 2019.

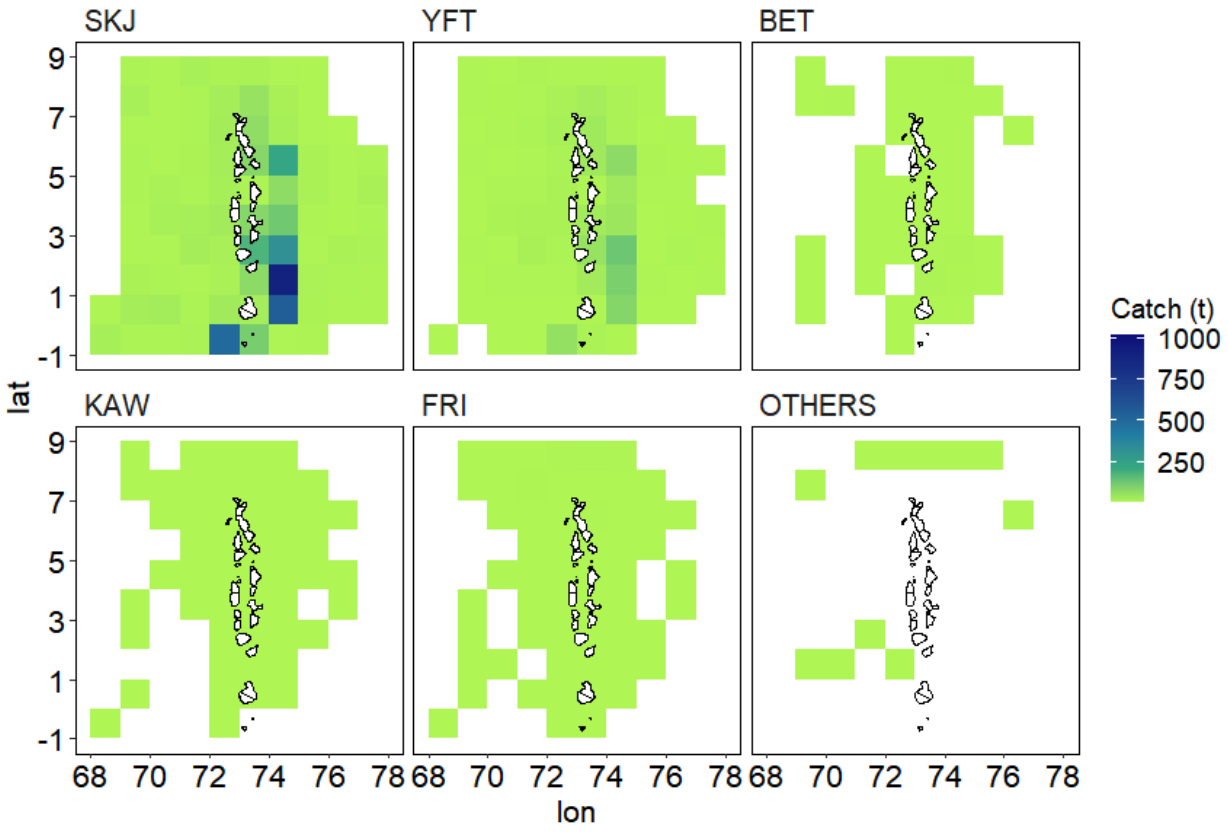


Figure 3b-1. Map of distribution of catch by species for pole-and-line gear (average of the 5 previous years, 2015-2019).

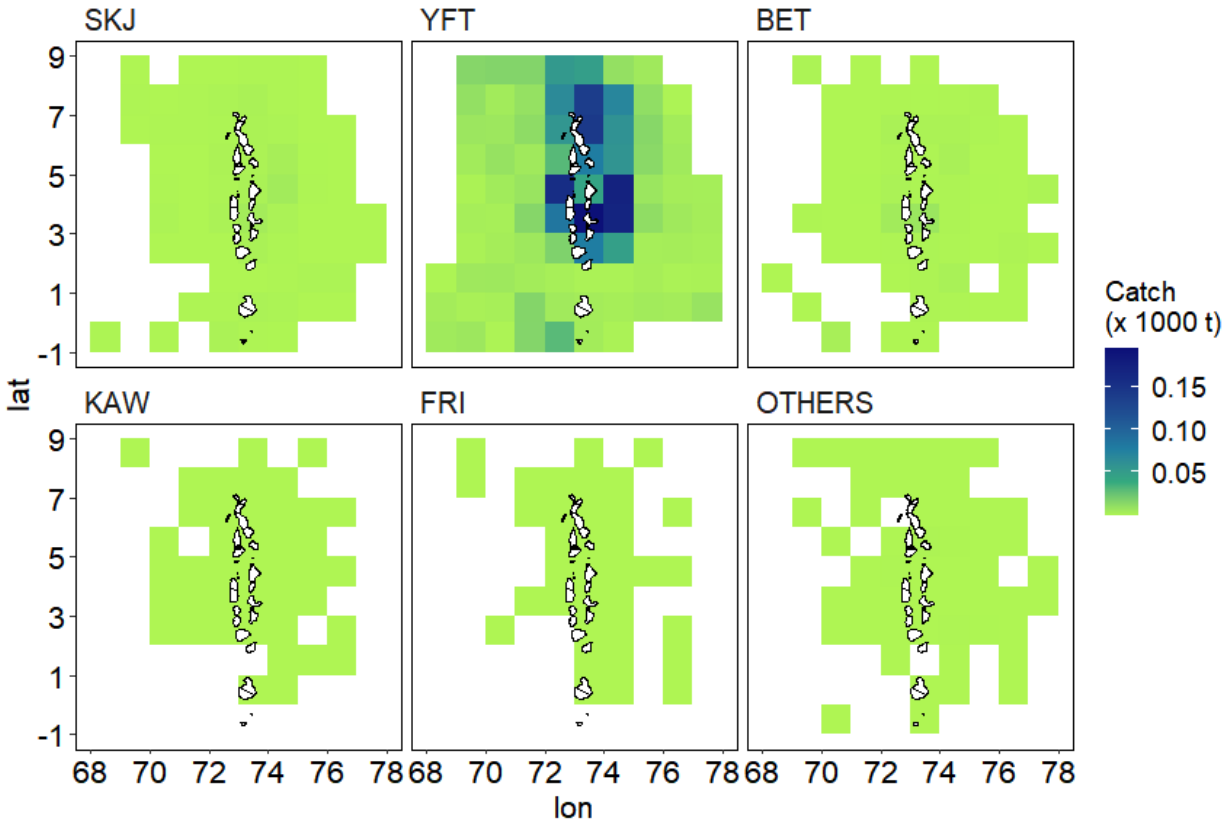


Figure 3b-2. Map of distribution of catch by species for handline gear (average of the 5 previous years, 2015-2019).

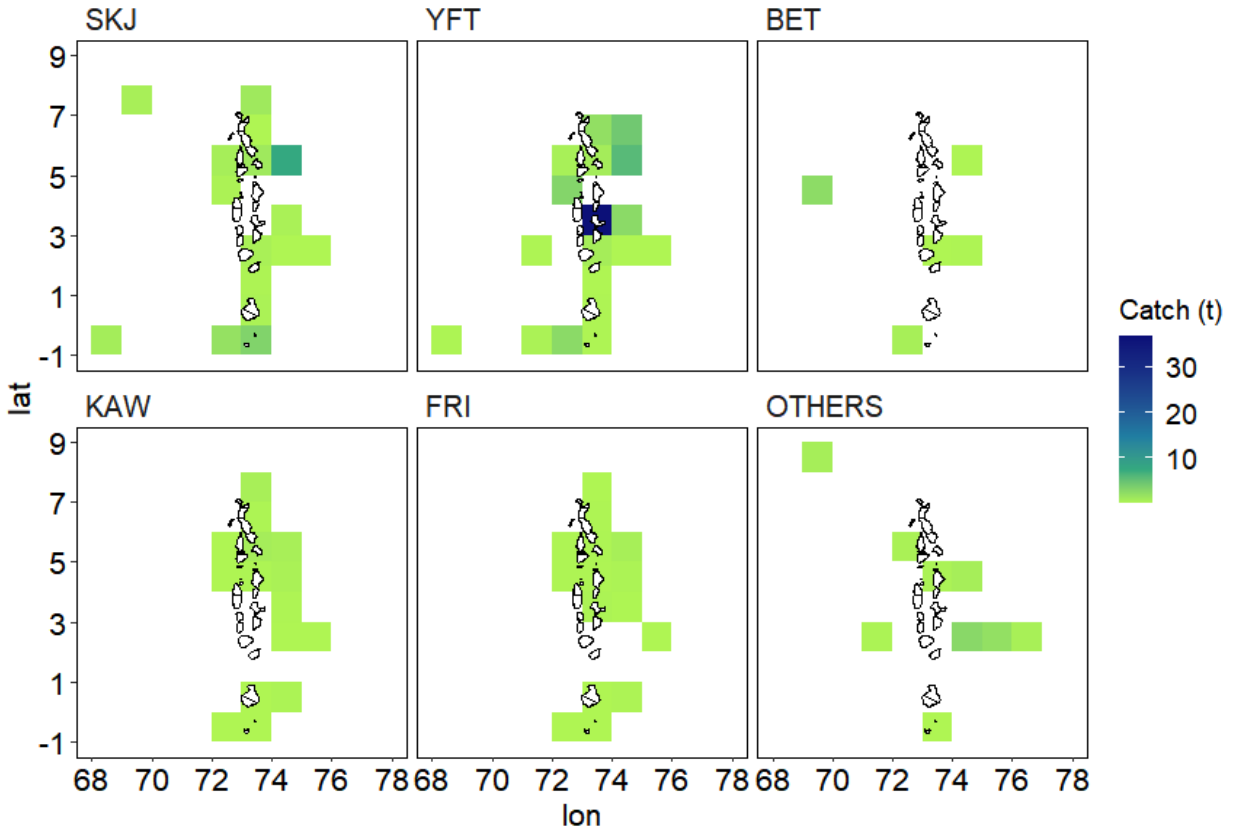


Figure 3b-3. Map of distribution of catch by species for trolling gear (average of the 5 previous years, 2015-2019).

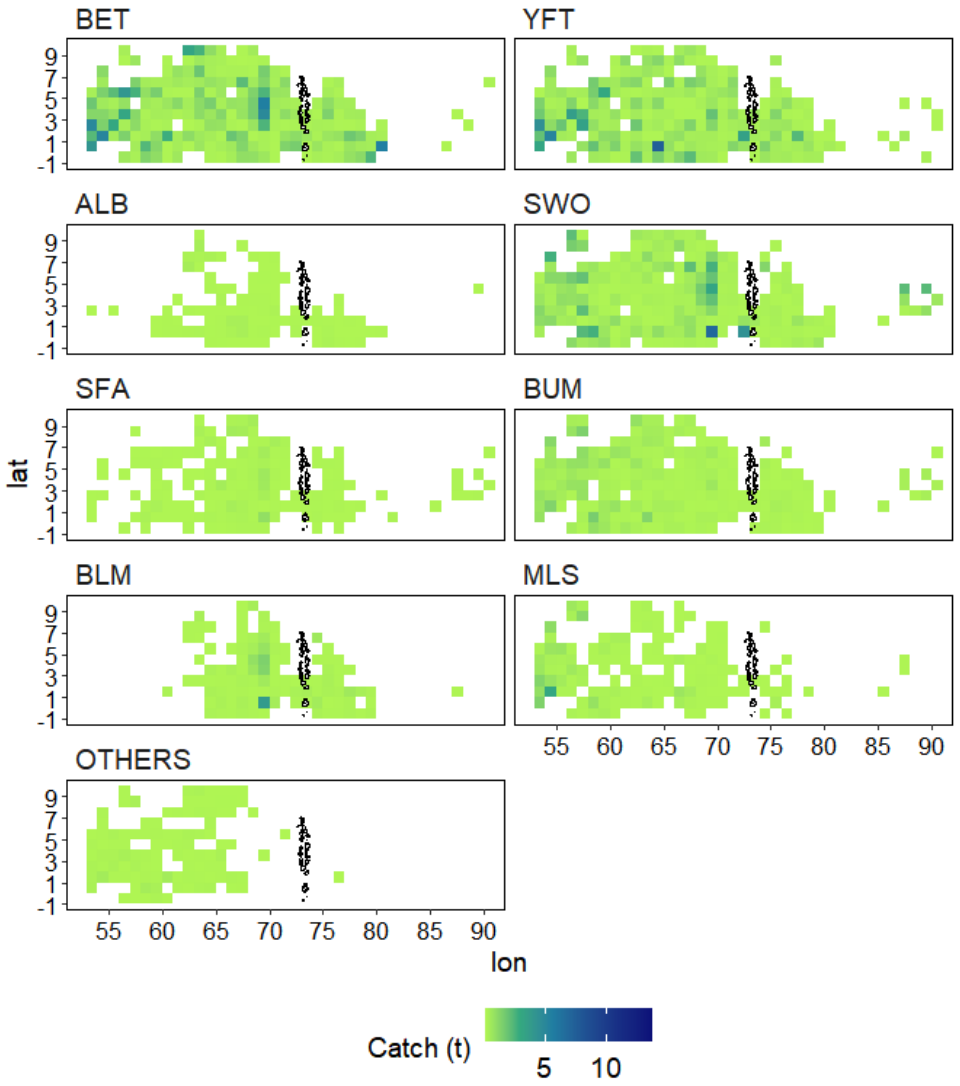


Figure 3b-4. Map of distribution of catch by species for longline gear (average of the 5 previous years, 2015-2019).

4. Recreational fishery

Big game fishing is popular among tourists and locals and it is now common practice to have an outfit in almost every resort. Common target species are sail fish (*Makaira* spp.), marlins and wahoo (*Acanthocybium solandri*) but also large yellowfin to some extent. Dogtooth tuna (*Gymosarda unicolor*) are often caught on the troll lines operated off the outer atoll reef. Casting using poppers, rod and reel is also popular game fishing activity targeting mainly large jacks, snappers and other similar fish off the reef and seamounts. The fishery is mostly a catch and release fishery.

Maldives Marine Research Institute (former Marine Research Centre) is currently working towards understanding the recreational fishery and devising a data collection mechanism.

Reef fishing logbooks have been introduced and are being enforced slowly. Although not reef associated species, the logbook has provisions to report billfish catch and effort. In addition, MoFMRA is currently in the process of preparing management plans and improving the fishery statistics of billfish and implement the necessary changes to incorporate species of interest. These activities are expected to improve the data on billfish landings in the Maldives and follows the Scientific Committee's request (Paragraph 79 - 81, IOTC–2012–SC15–R[E], 2012).

5. Ecosystem and bycatch issues

Maldives has a highly selective form of fishing with virtually no by-catch and no discards. Miller et al, 2017, observed 161 pole-and-line fishing events and reported a figure of 0.65% of total tuna catch by weight. The pole-and-line method alone contributed close to 80% of the total tunas in 2019. Similarly, handline and troll fishing methods are also highly selective with almost no bycatch and discards. Ali (2016) noted that at the time, less than 1% of tuna was caught from longline which contributes bycatch such as sharks etc. The longline fishery was suspended in 2019, which has resulted in further minimizing the impact of Maldives tuna fisheries on non-targeted, associated and dependent species and the ecosystem.

Livebait is critical for the tuna pole-and-line fishery and is considered as retained species. The species exploited by tuna fleet are characterized by short generation times and high intrinsic rates of population growth. These are species that are not easily overexploited. Maldives has recently intensified monitoring and conducted a review of the livebait fishery. It has also produced a management plan for the livebait fishery.

5.1. Sharks

Shark fishing is banned in Maldives waters, since March of 2010. However, shark bycatch is inevitable in the longline fishery which operates from 100nm and beyond into high seas. Provisions are in place in the "Longline Fishery Regulation (2014/R-388)" to minimise bycatch of sharks and other ecologically important species, in adherence to relevant IOTC Conservation and Management Measures. The Regulation prohibits use of sharks caught in the fishery and ensures that that all live sharks caught are released and reported. The Regulation has further provisions to retain the dead shark by-catch for subsequent confiscation at the port. However, as Maldives is yet to make the required arrangements, all sharks caught in the longline fishery are released or discarded at sea. This information is reported through the mandatory logbooks and are regularly presented to the IOTC Working Party on Ecosystem and Bycatch (WPEB). It should be noted that the longline fishery was suspended in 2019.

NPOA-Sharks: Maldives' National Plan of Action on the Conservation and Management of Sharks (NPOA-Sharks) was formulated and presented to the stakeholders in April 2014. It was subsequently endorsed by the Ministry of Fisheries and Agriculture on April 2015. With the aim to ensure the implementation and observation of the shark fishery ban, the NPOA-Sharks addresses six key areas: mitigating the impacts of shark fishery ban; improving data collection and handling of shark by-catch; improving scientific research on shark populations; raising awareness on life-history characteristics of

sharks; improving coordination, consultation and monitoring of shark ban; and cooperating on international agreements pertaining to sharks and with relevant RFMOs on research and management of shark species.

Shark interactions in tuna longline fishery: Logbooks for tuna longline fishery currently record shark bycatch as species-complexes; mako sharks, thresher sharks, hammerhead sharks, oceanic white tip and other sharks. Due to the shark fishery ban, sharks caught in the longline fleet, is not retained (Table 3). Table 4 lists the numbers of sharks by species/groups, released/discarded by the national fleet in the IOTC area of competence.

Table 3: Total number and weight of sharks, by species, retained by the national fleet in the IOTC area of competence.

Not Applicable: Maldives imposes a fishery ban on sharks and therefore does not retain sharks caught in any of the fisheries.

Table 4: Total number of sharks, by species/group, released/discarded by the national fleet in the IOTC area of competence. HH: Heamerhead sharks (Sphyrnidae), THR: Threasher sharks (Alopiidae), MAK: Mako sharks (Lamnidae), OCS: Oceanic whitetip shark (Carchahinidae), OTH: Other sharks).

Year	Fleet	HH	THR	MAK	OCS	OTH
2014	LL	18	822	875	1525	1763
2015	LL	14	44	72	221	264
2016	LL	78	374	534	464	1964
2017	LL	34	86	141	86	457
2018	LL	0	6	5	3	5
2019	LL	0	23	14	1	38

5.2. Seabirds

The interaction with seabirds is minimal in handline, pole-and-line, troll fisheries and longline fisheries. New logbook data collection system allows the fishermen to report such interactions. “Longline Fishery Regulation” mandates longline fishing vessels to implement at sea, bird mitigation measures in adherence to IOTC Resolution nos: 10/06 and the new 12/06.

5.3. Marine Turtles

Maldives imposed a 10 year moratorium on catching or harming of turtles in 1995. The moratorium was renewed in 2005 extending further 10 years with a ban on egg-harvesting from 14 turtle nesting islands (Ali & Shimal, 2016). With the termination of the second ten-year moratorium in 2016, a new legislation on marine turtles under the Environment Protection and Preservation Act (4/93) came into effect in April 2016, declaring all species of marine turtles as protected and prohibits harvest of turtle eggs throughout the Maldivian archipelago. Maldives is also a signatory to the IOSEA Marine Turtles MoU, signed on April 2010.

Longline Fishery Regulation describes turtle mitigation measures during longline fishing operations, including release of live turtles and having de-hookers and line cutters on vessels.

The *FAO Guidelines to Reduce Sea Turtle Mortality in Fisheries Operations* is carefully considered for the longline fishery which is the only fishery with shark interactions in the Maldives. Use of offset circle hooks and fish bait is encourage in the longline fishery. The Regulation on longline fishing also stipulates that the hooks be set below a depth of 60m to minimize the interaction of sharks and turtle bycatch. Best practices for handling and release of sea turtles are also prescribed by the Regulation.

5.4. Other ecologically important species

Whale sharks and dolphins are protected by the fisheries law in the Maldives. Even though handline fishermen target yellowfin tuna from dolphin associated schools, the interactions are minimal and fishermen avoid hooking dolphins as there is no value in it.

Table 5. Reported annual bycatch of special interest species (seabirds, marine turtles and marine mammals) as reported for the longline fishery.

Year	Fishery	Seabirds	Marine Turtles	Marine Mammals
2014	LL	NA	22	0
2015	LL	0	53	0
2016	LL	15	424	0
2017	LL	1	56	0
2018	LL	0	4	0
2019	LL	0	5	0

6. National data collection and processing systems

Data collection from the tuna fishery began in 1959, with species level data being collected since 1970 and vessel specific catch and effort data being available from 1995 onwards. The system was based on total enumeration of catches, requiring conversion factors for estimating weight. Vessels reported catch by species and effort data (number of days fished) to their respective island offices where the vessels are registered. The data were then aggregated by vessel and month providing catch by species/species groups and effort in number of days fished.

6.1. Logbook data collection and verification

Logbooks were introduced to the tuna fisheries in 2010 and refined twice, with the most recent revision in 2012 and the revised logbooks being introduced in January 2013. Following successful establishment of the logbooks, the enumerated system of data reporting was ceased in 31st December 2017, which was gradually being phased out since 2010. The logbook data allowed Maldives to report data by the required spatial resolution improving compliance with the data reporting requirements.

To address the issue of inadequate returns, changes have been brought to the regulatory framework and fishing license conditions, making it mandatory for the completed logbooks to be returned to the processing or purchase facilities prior to the unloading operations. This change was put into effect on 1st March 2019 and the return rates have improved considerably since.

A web-enabled fishery information system, "*Keyolhu"* is now fully functional and all catch data are recorded and analysed through the system. This is a major improvement to the old database for data recording. The system facilitates vessel registration, issuing fishing licenses & fish processing licenses, data entry of fish purchase (by the commercial companies) and logbook data to provide a comprehensive system of compilation and reporting. The system is also designed to computerize the process of issuance of catch certificates required for the exports of all frozen, fresh or canned tuna from the Maldives.

Logbook data could be verified through different mechanisms. The observer data collected by the Maldives Marine Research Institute (former Marine Research Centre), with donor funding, allow verification of all aspects of logbook reported data. Further, landings data, obtained through the tuna exporting companies is used to verify and used in situations of non-reporting. Additionally, the Fisheries Information System, *Keyolhu,* allows near real-time tracking of landings and purchases as well as licensing.

A mobile catch reporting application has also been developed to allow electronic catch reporting and rolled out in December 2019. This would allow for near real time reporting of catches electronically and it is anticipated that this change will improve the quality and timeliness of the data reported by the fishers.

6.2. Vessel Monitoring System

Maldives implements a VMS system on 100% of the longline vessels (which was suspended from June 2019) and on a number of PL/HL vessels. The World Bank funded Sustainable Fisheries Resources Development Project's activities to revamp the existing VMS system is already underway. Consequently, a major overhaul of the VMS System is anticipated over the next 18 months as vessel units are replaced by new technology that would allow reporting at sea with additional benefits such a crew social welfare messaging etc.

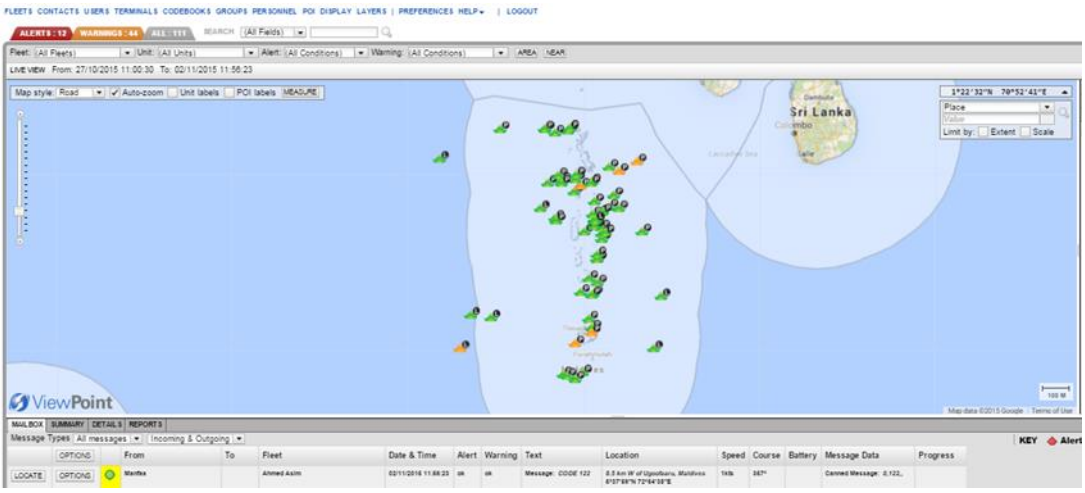


Figure 6. Screen capture of the Maldives VMS System. Currently 121 vessels have VLDs, continuously monitored by the Fishery Management Division, of the Ministry of Fisheries and Agriculture

6.3. Observer Programme

The National Observer program was established in 2015, but had to be suspended for various reasons. The program has proven to be costly and due to high staff turn-over, it has been problematic to train and deploy observers on board fishing vessels. To overcome these difficulties the focus is now to shift to an electronic observer system to comply with the requirements of the relevant resolutions of the IOTC. A World Bank funded project is being developed and is expected to start this year.

The bycatch sampling program by MMRI and IPNLF that started in 2014 continues and observer reports are submitted to IOTC. The objective of the programme is to take part on fishing trips to observe and collect data, including biological and operational data. A sampling protocol is established for the observer on sampling and recording on database of both the catch and bycatch, including the livebait fishery. These observations are consistent with the IOTC observer requirements and seventeen observer reports was submitted in 2019. As stated, it has been difficult to train and place observers on-board vessels, and therefore, the program fails to meet the required observer coverage.

Table 6. Number of trips observed for the years 2017-2019 for the pole-and-line fleet.

Year	Fishery	Number of trips observed
2017	Pole-and-line	1
2018	Pole-and-line	2
2019	Pole-and-line	54

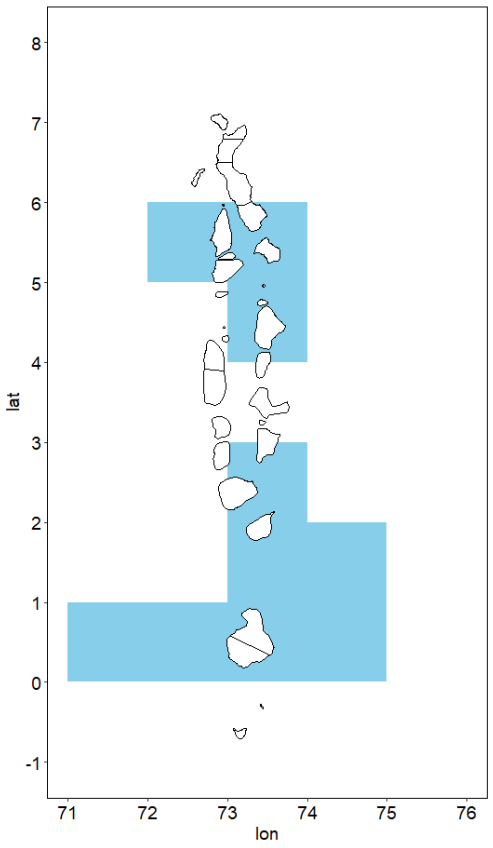


Figure 4. Spatial distribution of observer coverage for 2019.

A World Bank (WB) funded project to implement Electronic Monitoring (EM) is on-going. Electronic Observer Systems have been installed on 14 fishing vessels to achieve the required level of 5% coverage for the fishing fleet. Full-fledged implementation of Electronic Monitoring has been delayed due to delays in training of the video analysis staff and due to delays in customization of the video analysis software.

6.4. Port sampling programme

A systematic port-sampling programme to monitor artisanal landings is not in place yet. However, size sampling of catch landed at the ports are conducted regularly through samplers at the three main PL tuna landing ports, by fishermen samplers on their vessels, and scientific observer and MMRI staff. Furthermore, MMRI implements a program to self-report fishery information and size samples by contracting fishermen samplers from the artisanal fleet.

All fish processing and purchasing facilities are required to obtain a processing license to process fish for the export market as stipulated by the Licensing Regulation. Changes have been made to the license conditions and data reporting requirements to make it mandatory for all licensed fish processing facilities to record and report size frequency data. This will ensure that Maldives complies with length frequency data reporting requirements to the IOTC in the future. Table 7 provides a summary of the size data for the year 2019.

Table 7: Number of individuals measured, by species and gear for 2019.

Gear	SKJ	YFT	BET	KAW	FRI	Total
PL	93,487	70,172	169	774	10,417	**175,019**

6.5. Unloading/Transhipment

This section is not applicable to Maldives as at-sea transhipments are banned in Maldivian waters and Maldivian-flagged vessels do not tranship at sea in the IOTC Convention Area.

7. National research programs

Table 8 provides a summary of the major research program being implemented. They are primarily geared towards improving national reporting and compliance to IOTC Conservation and Management Measures.

Table 8: Summary table for national research programs currently underway.

Project title	Period	Countries involved	Budget total	Funding source	Objectives	Short description
Maldives yellowfin and SKJ CPUE standardization	Ongoing Starting from September 2016	Maldives	US$ 15,500	IPNLF & World Wise Foods	To improve and extend analyses of SKJ CPUE and develop PL/HL YFT CPUE for IOTC Working parties	The project aims to make use of available data and information on operational aspects of the fishery to develop a standardized CPUE series for possible use in stock assessment of tropical tunas, particularly yellowfin and skipjack. Maldives submitted revised standardize series for the more recent WPTT (DP/AS) meetings.
Behavior and fishery dynamics of tuna around anchored FADs of the Maldives	36 moths, (starting date: October 2017)	Maldives, France (French IRD) UK	US$ 300,000	IPNLF, Marks & Spencer (UK), MARBEC (IRD, France). MRC/MoFA	To characterize behaviour and residence time of skipjack an yellowfin in the Maldives aFAD array and also compare behaviour around dFADs / aFADs	Research is linked to a PhD (staff of MMRI). One key objective is to explore possibilities of using presence/absence data of tunas around anchored FADs as a means to estimated abundance proxies independent of the fisheries.
Bycatch sampling Programme	2014-2020	Maldives	US$ 100,000	IPNLF	To observe and sample bycatch in pole-and-line fishery	Observers take part on regular fishing trips to observe and sample the catch/bycatch. A sampling protocol consistent with IOTC;s relevant CMMs has been established for observations, sampling, and recording on database of both the catch and bycatch including the livebait fishery. Data collection encompasses the PL and HL fisheries.
Sustainable Fisheries Resources Development Project – Tuna Sampling Programme	2017-2020	Maldives	US$ 70,000	World Bank	To increase the size sampling effort in the Maldives	Port-samplers are based in 3 major landing sites in the Maldives, where size sampling takes 5 days a week. Samplers are based in major tuna landing ports. Additionally, fishermen samplers recruited from the artisanal fleet report fishery and size data regularly.

8. Implementation of Scientific Committee Recommendations and Resolutions of the IOTC relevant to the SC

Table 9 below summarises the progress on recommendations of the Scientific Committee and Specific Resolutions relevant to the work of the Scientific Committee.

Table 9: Scientific requirements contained in Resolutions of the Commission, adopted between 2005 and 2018.

Res. No.	Resolution	Scientific requirement	CPC progress
11/04	On a regional observer scheme	Paragraph 9	The Observer program that was established in 2015 proved to be costly and due to high staff turn-over, it was problematic to train and deploy observers on board fishing vessels. To overcome these difficulties the focus has been to shift to an electronic observer system to comply with the requirements of the relevant resolutions of the IOTC. The World Bank funded SFRDP Electronic Observer Systems have been installed on 14 tuna fishing vessels. The full-fledged implementation of Electronic Monitoring has been delayed due to delays in training of the video analysis staff and also due to delays in customization of the video analysis software. The EM units will be rotated randomly to cover all vessel types and sizes. It is expected that the number of units being installed will be sufficient to achieve the required 5% observer coverage. In the meantime, MMRI and deploys scientific observers since 2014. The information collected by the observers are consistent with the IOTC requirements are submitted to IOTC regularly.
12/04	On the conservation of marine turtles	Paragraphs 3, 4, 6–10	With the termination of the second ten-year turtle moratorium in 2016, a new legislation on marine turtles under the Environment Protection and Preservation Act (4/93) came into effect in April 2016 which fully protects marine turtles in the Maldives.
12/06	On reducing the incidental bycatch of seabirds in longline fisheries.	Paragraphs 3–7	Longline is the only gear with potential for incidental bycatch of seabirds. Appendix 2 of "Longline Fishery Regulation" stipulates adoption of one of the 6 mechanisms to mitigate incidental bycatch of seabirds as per the relevant IOTC resolutions. Interactions with seabirds should also be reported as per the IOTC requirements through the logbooks.
12/09	On the conservation of thresher sharks (family alopiidae) caught in association with fisheries in the IOTC area of competence	Paragraphs 4–8	All species of sharks are protected in the Maldives. Incidental catch of sharks is reported from all tuna fisheries through the logbooks. All data relating to shark interactions and catch is reported to IOTC. Shark fishing is prohibited in Maldivian waters. See section on Resolution 13/06 for details. An observer scheme is established and the information on shark interactions will be verified through these observer schemes
13/04	On the conservation of cetaceans	Paragraphs 7– 9	Maldives is part of the International Whaling Commission's Indian Ocean Sanctuary established in 1979. Furthermore, all whales and dolphins are protected by law in the Maldives and their interactions with the fisheries are minimal. The observer & bycatch sampling

Res. No.	Resolution	Scientific requirement	CPC progress
			programme records all interactions with cetaceans during fishing trips. Reports from the observer program will present all, if any, interactions with cetaceans. Maldives recently completed the progress report on List of Foreign Fisheries and Marine Mammals to comply with US Marine Mammal Protection Act's Import Provisions. MMPA requires exporting countries to maintain risks of mortality to cetaceans in par with US regulation by 2023.
13/05	On the conservation of whale sharks (*Rhincodon typus*)	Paragraphs 7– 9	Whale sharks are protected in the Maldives. None of fisheries of the Maldives are known to harm the whale sharks. Maldivian flagged vessels fishing on high seas are longline vessels and are unlikely to encounter any interaction with whale sharks. The logbooks which are mandatory, do have provisions to report interactions with non-targeted and bycatch species.
13/06	On a scientific and management framework on the conservation of shark species caught in association with IOTC managed fisheries	Paragraph 5–6	All species of sharks are protected in the Maldives. Observer data suggests that interactions with sharks in the pole-and-line, handline and troll fisheries are minimal. Shark interactions are recorded in the log books of all fisheries targeting tunas (PL, HL and LL) and information on shark interactions has been reported to the IOTC as required. The Regulation on longline fishing in Maldives stipulates that all live sharks must be released immediately should they be caught in the longlines and any dead sharks must be landed at an inspection site for verification. It should be noted that Maldives longline fishery was suspended in 2019
15/01	On the recording of catch and effort by fishing vessels in the IOTC area of competence	Paragraphs 1–10	Logbook data collection system is now fully established. To facilitate data compilation, the Fishery Information System has been developed and is now fully established.
15/02	Mandatory statistical reporting requirements for IOTC Contracting Parties and Cooperating Non-Contracting Parties (CPCs)	Paragraphs 1–7	Maldives tuna fishing fleet is subject to mandatory data reporting system to monitor catch, catch and effort as well as size frequency data. The data reporting system includes paper and electronic logbooks, licensing schemes, size sampling programs and VMS. Size sampling is conducted at key landing sites as well as reported through fishermen observers. A revision to the fishery regulation effective March 2019 require vessels to submit logbooks before the catch could be unloaded at the port. Maldives has been regularly providing nominal catch, catch and effort and size data to IOTC. To improve the system in place for collection of fisheries statistics, a mobile application has been developed and trialled. It is envisaged that the application will replace the paper-based reporting system to ensure catch and effort data collection is more efficient and reliable.

Res. No.	Resolution	Scientific requirement	CPC progress
17/05	On the conservation of sharks caught in association with fisheries managed by IOTC	Paragraphs 6, 9, 11	All species of sharks are protected in the Maldives including fishing and harming sharks. Shark interactions and incidental catches are recorded in the log books of all fisheries targeting tunas (PL, HL and LL) and information on shark interactions is reported as required. The Regulation on longline fishing in Maldives stipulates that all live sharks must be released immediately should they be caught in the longlines and any dead sharks must be landed at an inspection site for verification. It should be noted that Maldives longline fishery was suspended in 2019. The suspension remains as of November 2020. MMRI has conducted scientific research on sharks using Baited Remote Underwater Vehicle systems to inform the abundance and diversity of sharks in Maldives waters. Additionally, MMRI has a program to monitor shark catch, interactions and depredation in the tuna fisheries through fishermen reported data and through observer trips.
18/02	On management measures for the conservation of blue shark caught in association with IOTC fisheries	Paragraphs 2-5	All species of sharks are protected in the Maldives including fishing and harming sharks. The pole-and-line, handline and trolling fisheries of the Maldives has minimal interactions with sharks and non-targeted species as has been confirmed and validated through scientific studies and observer reports. Shark interactions are recorded in the log books of all fisheries targeting tunas (PL, HL and LL) and information on shark interactions is reported to the IOTC as required by relevant resolutions. The longline fishery has potential for shark bycatch. The fishery is regulated, and reporting of bycatch data is mandatory. It should be noted that Maldives longline fishery was suspended in 2019
18/05	On management measures for the conservation of the Billfishes: Striped marlin, black marlin, blue marlin and Indo-Pacific sailfish	Paragraphs 7 – 11	Maldives tuna fishing fleet is subject to mandatory data reporting system to monitor catch, catch and effort as well as size frequency data as required by Resolution 15/01. The pole-and-line, handline and trolling fleet has minimal by-catch including billfishes. All catch from the longline fishery is reported through the mandatory logbooks. The data is reported regularly to IOTC.
18/07	On measures applicable in case of non-fulfilment of reporting obligations in the IOTC	Paragraphs 1, 4	Maldives tuna fishing fleet is subject to mandatory data reporting system to monitor catch, catch and effort. Data is also reported on incidental catch and interactions with non-targeted species. With the change to the licensing conditions, fishers are required to submit logbooks prior to unloading the catch at the ports.

Res. No.	Resolution	Scientific requirement	CPC progress
			Shark interactions are recorded in the log books of all fisheries targeting tunas (PL, HL and LL) and information on shark interactions has been reported to the IOTC as required. All data as per Resolution 15/01 and 18/07 are reported to IOTC regularly including the matrix on zero catches.
19/01	On an Interim Plan for Rebuilding the Indian Ocean Yellowfin Tuna Stock in the IOTC Area of Competence	Paragraph 22	Paragraph 22 does not apply to Maldives as it does not have a gillnet fishery.
19/03	On the Conservation of Mobulid Rays Caught in Association with Fisheries in the IOTC Area of Competence	Paragraph 11	The pole-and-line, handline and trolling fishery of the Maldives has minimal bycatch and interactions with non-targeted species, which has been confirmed and validated by scientific studies and observer trips. All fisheries report catches and interactions with non-targeted species through the logbooks. The longline fishery, which has the potential bycatch species is also subject to monitoring, data reporting and VMS. It should be noted that Maldives longline fishery was suspended in 2019. Observer data and studies on bycatch in the pole-and-line and handline fisheries indicate both fisheries to have zero incidental catches of and interactions with Mobulid Rays. All rays are protected in the Maldives under the Environment Protection Act.

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