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منظمة الأغذية والزراعة للأمم المتحدة

ASIA-PACIFIC FISHERY COMMISSION

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Overview of and issues on fisheries in the Asia-Pacific Fishery Commission region

CONTENTS

SCOPE OF THIS REVIEW

This review covers the states, entities and areas of the Asia-Pacific region that report fisheries and aquaculture statistics to FAO, and which are within APFIC's area of competence. They are subdivided into the following subregions for capture fisheries and aquaculture:

Sub-region	Countries
China subregion	People's Republic of China (mainland), Hong Kong Special Administrative Region of China, Macao Special Administrative Region of China and Taiwan Province of China
East Asia subregion	Japan, Korea DPR (Democratic People's Republic of), Korea (Republic of), Mongolia
South Asia subregion	Bangladesh (the People's Republic of), Bhutan (the Kingdom of), India (the Republic of), Maldives (the Republic of), Nepal (Federal Democratic Republic of), Pakistan (Islamic Republic of) and Sri Lanka (the Democratic Socialist Republic of)
Southeast Asia subregion	Brunei Darussalam, Cambodia (the Kingdom of), Indonesia (the Republic of), Lao PDR (People's Democratic Republic), Malaysia, Myanmar (the Union of), Philippines (the Republic of the), Singapore (the Republic of), Thailand (the Kingdom of), Timor-Leste (the Democratic Republic of) and Viet Nam (the Socialist Republic of)
Oceania subregion	American Samoa, Australia, the Cook Islands, Fiji Islands (the Republic of the), French Polynesia, Guam, Kiribati (the Republic of), the Marshall Islands, the Federated States of Micronesia (FSM), Nauru (the Republic of), New Caledonia, New Zealand, Niue, Norfolk Island, Northern Mariana Islands (the Commonwealth of the), Palau (the Republic of), Papua New Guinea (PNG), Pitcairn, Samoa (the Independent State of), Solomon Islands, Tokelau, Tonga (the Kingdom of), Tuvalu, Vanuatu (the Republic of), Wallis and Futuna Islands

APFIC MEMBER COUNTRIES

Australia, Bangladesh, Cambodia, China, France, India, Indonesia, Japan, Malaysia, Myanmar, Nepal, New Zealand, Pakistan, Philippines, Republic of Korea, Sri Lanka, Timor-Leste, Thailand, United Kingdom of Great Britain and Northern Ireland, United States of America and Viet Nam.

SPECIES

Capture production data includes "nominal catches", which are landings converted to a live weight basis (tonnes), of aquatic organisms including fish, molluscs, crustaceans for all commercial, industrial, recreational and subsistence purposes. As in previous years a significant proportion of the region's capture production reported to FAO is not identified at species level but grouped as "not elsewhere included" (nei) in the statistics,

The harvest from mariculture, aquaculture and other kinds of fish farming is included although harvest for ornamental purposes is not included. Aquatic mammals, aquatic plants, corals, pearls, sponges and crocodiles/alligators from capture fisheries and aquaculture production are excluded throughout this report.

1 MARINE CAPTURE FISHERIES

Capture fisheries, both inland and marine, are important for APFIC Member countries, and provide food, nutrition, livelihoods, foreign exchange earnings, and cultural value. In 2017, based on reported figures, inland and marine capture fish production from APFIC Member countries[1] was 46.4 million tonnes, representing 50 percent of global capture production.[2]

Inland waters capture production contributed 16.4 percent and marine waters capture production, 83.6 percent. In terms of global inland waters capture production, APFIC Member countries contributed 64 percent, whereas for global marine waters capture production, 48 percent.

There were 16 million people involved in capture fisheries in 10 APFIC Member countries in 2017, representing 40 percent of the global total.[3] Many more are involved in auxiliary activities, in particular in the post-harvest sector, where women tend to play an important role.

1.1 MARINE CAPTURE FISHERIES TRENDS

1.1.1 CATCH

Overall marine capture fisheries production in the Asia and the Pacific region has remained relatively stable over the last decade (Table 1-1). Marine capture yield was 40.8 million tonnes in 2017. The Asia and the Pacific region continue to be the world's largest producer of fish and represented 51 percent of the global marine capture production in 2017.

Table 1-1: Total marine capture fishery production trend for countries in the Asia-Pacific region, 2007-2016

		Total marine capture fishery production		
Sub-region	**Average annual growth (2007 – 2017)**	**Catch 2017 (tonnes)**	**% of regional total**	**% of global total**
South East Asia	1.1	15,218,648	37	19
China	0.3	14,065,036	34	17
South Asia	2.5	5,420,681	13	7
East Asia	-2.8	4,734,789	12	6
Oceania	0.5	1,421,415	3	2
All countries	0.4	40,860,569	100	51

China and the Southeast Asia sub-regions drive the region's large marine capture figures (Table 1-1). South East Asia's catches are still increasing on average 1.1 percent per year; China's are more or less stable. East Asia's decreasing marine production (average annual growth -2.8 percent) resulted in South Asia now exceeding its catch. In 2017, South Asia marine fishery catch contributed to 13 percent of the total marine capture production of the countries of the Asia-Pacific and has the faster inter-annual average growth of 2.5 percent (Table 1-1). The

[1] Excludes France, United Kingdom and United States of America, as we cannot adequately disaggregate their Pacific territories.

[2] Based on statistics from FishStat Global Capture Production (online query), available at http://www.fao.org/fishery/statistics/global-capture-production/query/en
The term "fish" indicates crustaceans, molluscs and other aquatic animals, but excludes aquatic mammals, reptiles, seaweeds and other aquatic plants.

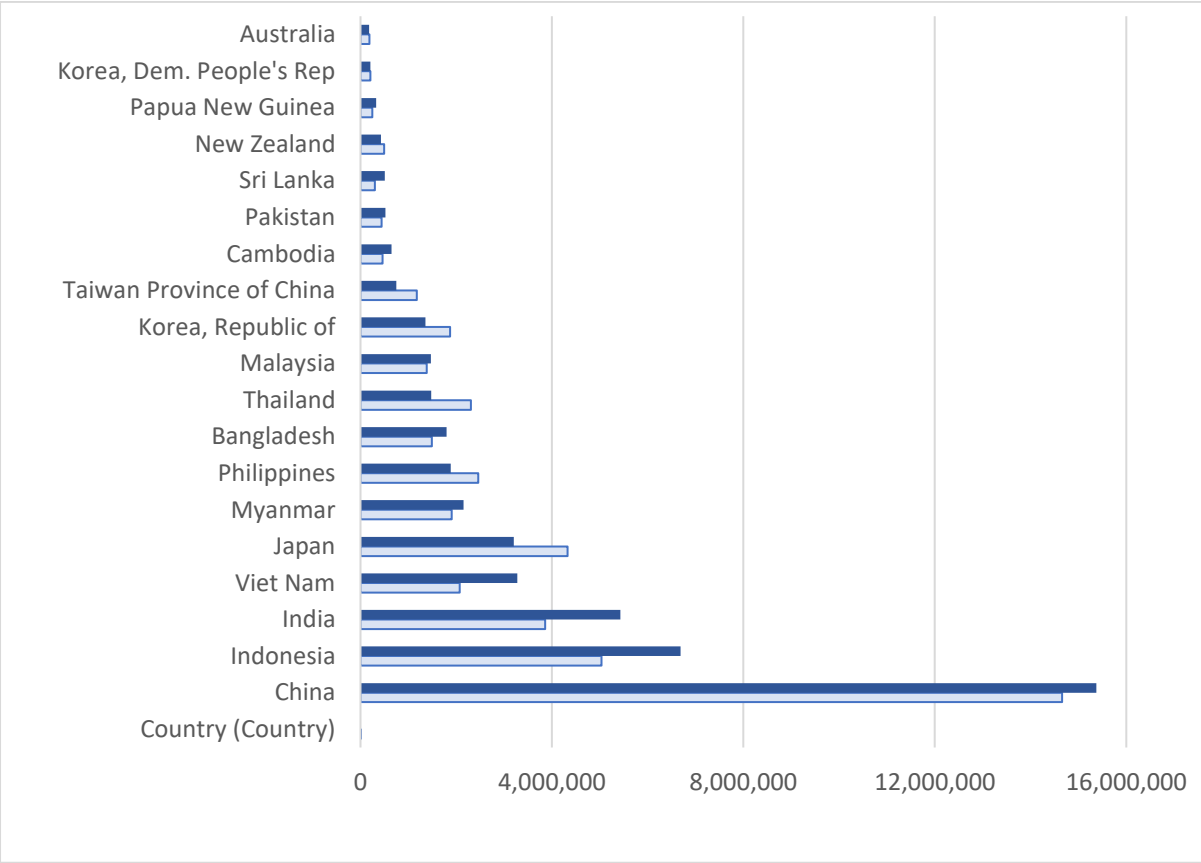
[3] Bangladesh, China, Indonesia, Japan, Malaysia, Myanmar, New Zealand, Pakistan, Republic of Korea, Sri Lanka. Data not available for other APFIC countries. Source: FAO. 2019. FAO yearbook. Fishery and Aquaculture Statistics 2017. Rome.

production of Oceania is relatively low at 3 percent of the regional catch and 2 percent of global catch.

Figure 1-1 presents the top 20 marine capture fishery producers in 2016 and compares 2016 figures with 2014 marine capture production. In 2016, China contributed 36 percent of the regional total marine capture quantities and has consistently been the largest producer for marine capture fisheries in the Asia-Pacific region. The second largest contributor to marine capture production is Indonesia. Indonesia contributed 14 percent of the regional total marine capture figure in 2016. India, the region's third largest producer overtaking Japan, has become a key marine fisheries producer in 2016 and contributed to 8 percent of the regional marine capture total.

Despite Oceania's production variabilities, sub-regional marine capture growth rate remains stable with an average annual growth rate of 0.13 percent from 2008 to 2016 (Table 1-1). Within Oceania countries such as Kiribati exhibited notable growth and Vanuatu had a decreasing marine capture trend.

Figure 1-1: Top 20 Asia-Pacific marine capture fisheries production countries, 2007 and 2017. (2007 light blue; 2017 dark blue)



1.1.2 DISTANT WATER FISHERIES

Table 1-2: Estimated catches of long-distance fishing by Asia-Pacific countries (2017)

Fishing region	Catch 2017 (tonnes)
Antarctic	81,382
Atlantic	336,085
Indian Ocean, Western	76,676
Pacific, Eastern Central	93,994
Pacific, Southeast	355,418
Pacific, Southwest	27,403
Pacific, Western Central	736,156
Grand Total	**1,707,114**

The majority of the catch of the Asia-Pacific countries comes from waters that lie within the region. There are catches in distant waters (Atlantic Ocean, Antarctic areas and the South east Pacific). In total these catches are about 1.7 million tonnes (Table 1-2), representing 4.2 percent of the total catch of the countries of the region. This figure is indicative and cannot be calculated accurately as some assumptions must be made regarding the extent of the EEZ fisheries for each country.

1.1.3 SUBREGIONAL TRENDS IN CAPTURE FISHERIES PRODUCTION

SPECIES COMPOSITION TRENDS IN ASIA AND THE PACIFIC REGION

The highest catch for the decade 2007-2017 reported by Asia-Pacific countries are those species that can be classified as "marine pelagic fish". This group accounts for 37 percent (14.8 million tonnes in 2017) of the total marine catch of the countries of the region in 2017 (Table 1-3).

Demersal species are the second largest contributor to capture fisheries. This group exhibited a slight decrease in production but average 21% over the decade 2007-2016. As described in section 1.2, the category "Not elsewhere included" (nei), represents 20% of the reported catch over the decade 2007-2016 and indicates the relatively high level of uncertainty of catch data. This effect is more pronounced at country level.

Table 1-3: Overall composition of the catch by Asia-Pacific countries

Species group	2017	average 2007-2016
Marine pelagic fish	39%	37%
Demersal fish	22%	21%
'Nei'	20%	21%
Crustaceans	11%	10%
Cephalopods	7%	6%
Molluscs (excl. Cephalopods)	3%	3%

The highest catch for a fishing region is that of the Pacific Northwest (16.8 million tonnes) and this catch is reported by China, Japan, Republic of Korea and Democratic People's Republic of Korea (Table 1-4). The Western Central Pacific area is second highest (12.3 million tonnes) with Indonesia, Viet Nam, the Philippines, Thailand and Malaysia reporting 87 percent of the catch in 2017. A further 23 countries report catches comprising the remaining 13 percent. The Eastern Indian Ocean includes the Bay of Bengal fisheries and is third highest in the region at 6.5 million

tonnes. 87 percent of the catch is reported by Indonesia, India, Myanmar Malaysia and Sri Lanka. The catch of the Western Indian Ocean is primarily that of India and to a lesser extent, Pakistan and the Maldives.

The Pacific southwest is primarily the marine demersal fish catch of New Zealand (91 percent). The Pacific southeast catch is mainly the cephalopod catches of China (83 percent). Taiwan Province of China, China, Republic of Korea and Japan report the highest catches for the Atlantic ocean (333,330 tonnes) and the catch is mainly cephalopods. This is still less than one percent of total catch reported for the Asia-Pacific countries. Catches in the Antarctic areas are low (79,969 tonnes), primarily krill and miscellaneous demersal fish, accounting for only 0.2 percent of the total catch of the Asia-Pacific countries.

Table 1-4: Catch composition of the catch by Asia-Pacific countries according to major species groupings and fishing areas (2017).

Sub-region	Cephalopods	Crustaceans	Demersal Marine Fish	Marine Fish 'nei'	Molluscs excl. Cephalopods	Pelagic Marine Fish	Total
Pacific, Northwest	**954,987**	**2,238,914**	**4,068,917**	**3,527,393**	**783,813**	**5,186,322**	**16,760,346**
China	685,368	2,080,974	3,419,010	3,196,102	443,420	2,650,152	12,475,026
Japan	135,500	55,400	333,768	170,000	283,800	1,833,505	2,811,973
Korea, Republic of	115,390	75,988	201,013	24,728	55,911	455,585	928,615
Taiwan Province of China	8,729	10,052	48,126	26,563	682	247,080	341,232
Korea, Dem. People's Rep	10,000	16,500	67,000	110,000			203,500
Pacific, Western Central	**640,127**	**938,498**	**1,836,400**	**2,629,726**	**117,492**	**6,102,203**	**12,264,446**
Indonesia	93,395	494,760	1,199,038	101,922	35,133	2,257,071	4,181,319
Viet Nam	362,089	241,411		1,967,881	57,234	490,081	3,118,696
Philippines	55,062	63,769	316,907	14,175	568	1,270,144	1,720,625
Thailand	85,057	57,015	99,714	252,462	9,681	404,354	908,283
Malaysia	38,387	42,085	201,095	137,984	3,620	301,418	724,589
Papua New Guinea		1,109	650	4,520		304,681	310,960
Others	6,137	38,349	18,996	150,782	11,256	1,074,454	1,299,974
Pacific, Southwest	**20,179**	**5,631**	**340,125**	**3,759**	**4,928**	**93,457**	**468,079**
New Zealand	18,973	4,186	325,859	66	4,604	71,669	425,357
Australia	306	1,445	5,302	3,048	324	4,891	15,316
Others	900		8,964	645		16,897	27,406
Pacific, Southeast	**306,894**		**789**	**800**		**46,935**	**355,418**
China	296,100			122		36,429	332,651
Others	10,794		789	678		10,506	22,767
Pacific, Eastern Central	**30**	**380**	**2,858**	**12,325**	**1,572**	**109,282**	**126,447**
Korea, Republic of			76	39		36,733	36,848
China				640		27,501	28,141
Taiwan Province of China			2,164	957		17,267	20,388
Others	30	380	618	10,689	1,572	27,781	41,070
Indian Ocean, Eastern	**198,393**	**682,704**	**1,290,836**	**1,778,453**	**67,407**	**2,504,823**	**6,522,616**
Indonesia	97,369	257,310	495,538	16,635	12,879	1,033,711	1,913,442
India	37,790	190,038	442,296		38,728	672,805	1,381,657
Myanmar		30,511		1,218,581		11,932	1,261,024
Malaysia	32,854	88,639	157,015	181,393	5,520	231,410	696,831

Sub-region	Cephalopods	Crustaceans	Demersal Marine Fish	Marine Fish 'nei'	Molluscs excl. Cephalopods	Pelagic Marine Fish	Total
Sri Lanka	7,930	29,670	38,601	49,604	1,040	294,666	421,511
Bangladesh		49,619	88,757	216,178		3,974	358,528
Thailand	20,088	11,822	46,354	81,580	238	160,018	320,100
Others	2,362	25,095	22,275	14,482	9,002	96,307	169,523
Indian Ocean, Western	**223,191**	**316,389**	**1,037,205**	**24,487**	**34,521**	**1,353,234**	**2,989,027**
India	213,889	293,346	902,263		31,690	948,296	2,389,484
Pakistan	9,302	23,043	127,041	20,645	2,831	196,846	379,708
Maldives				1,826		141,333	143,159
Others			7,901	2,016		66,759	76,676
Atlantic Ocean	**472,542**	**624**	**18,955**	**6,152**		**66,635**	**564,908**
Taiwan Province of China	296,100			122		36,429	332,651
China	127,580		287	395		6,901	135,163
Korea, Republic of	46,198	10	12,509	3,658		2,941	65,316
Japan		614	6,068	1,977		20,364	29,023
Others	2,664		91				2,755
All Antarctic areas		**72,619**	**7,350**				**79,969**
China		38,113	3				38,116
Korea, Republic of		34,506	1,294				35,800
New Zealand			1,263				1,263
Japan			359				359
Australia			4,431				4,431

PELAGIC FISH

The pelagic fish grouping includes herrings, sardines, anchovies, scads, mackerels, tunas, bonitos, and billfish. The pelagic fish overall catch trend for all countries in the region has grown slowly over the period 2007-2017, with an average annual growth rate of 0.4 percent reaching 15.5 million tonnes in 2017 (Table 1-5).

The Southeast Asia sub-region is the largest producer of pelagic fish throughout the period 2007 to 2017 and its catches have been relatively stable (only 0.8% average variation over the period). China has the second highest catch of pelagic fish catch, but this has declined on average over the period 2007 to 2017 (average annual growth rate of -1.6 percent). The South Asia sub region had the largest average annual growth rate for pelagic fish (3.8 percent), but this was driven by very high increase in catch in 2014. Oceania's pelagic fish catches have increased by 1.1 percent per year on average over the period 007-2017 (Table 3-7).

Throughout 2007 to 2016, the Skipjack tuna (*Katsuwonus pelamis*) has consistently been the most captured pelagic species in the Asia-Pacific region (Table 1-6) between 2007-2017, reaching 1.8 million tonnes in 2017. 82 percent of this is caught from the Western Central Pacific region. 85 percent of this catch is from ten countries (Indonesia, Republic of Korea, Japan, Papua New Guinea, Taiwan Province of China, Kiribati, Philippines, Maldives, Viet Nam, Micronesia, Fed States of).

The "Scads nei", group covers the Carangidae family of fish which includes jacks, pompanos, jack mackerels, runners, and scads. This grouping is second highest catch in the pelagic fish grouping. In 2017, 1.16 million tonnes of "scads nei" was reported by the Asia-Pacific countries. China, Indonesia, the Philippines and India produce 99 percent of the catch across the region.

Pacific chub mackerel (*Scomber japonicus*) is the third highest catch (1.14 million tonnes) with Japan, China PR, Republic of Korea and Taiwan Province of China producing 99 percent of the catch from the Pacific Northwest fishing region.

The Japanese anchovy (*Engraulis japonicus*) is the fourth highest captured pelagic species (in 1.1 million tonnes in 2017). China is the largest producer of this species, followed by Japan and Republic of Korea.

Table 1-5 Asia-Pacific marine pelagic fish, total catch (2007 and 2017) and average annual rate of change 2007-2017.

Sub-region	Catch 2007 (tonnes)	Catch 2017 (tonnes)	Average inter-annual variation 2007-2017 (%)
APFIC SouthEast Asian Countries	5,669,633	6,160,654	0.8
APFIC China	3,838,370	3,330,869	-1.6
APFIC East Asian Countries	3,033,737	2,827,624	-0.8
APFIC South Asian Countries	1,464,775	2,257,920	3.8
APFIC Oceania	749,364	874,137	1.1
Total	**14,755,879**	**15,451,204**	**0.41**

Table 1-6: Top captured pelagic species, Asia-Pacific region 2007 – 2016

Row Labels	Sum of Catch 2017 (Tonnes)	Sum of Percentage of total pelagic fish catch of countries
Anchovies, sardines	**3,700,725**	**24.1**
Anchovies, etc. nei	212,061	1.4
Clupeoids nei	588,601	3.8
Indian oil sardine	364,383	2.4
Japanese anchovy	1,063,903	6.9
Japanese pilchard	633,762	4.1
Sardinellas nei	397,218	2.6
Stolephorus anchovies nei	440,797	2.9
Carangids, jacks, pomfrets, pompano	**899,772**	**5.8**
Carangids nei	319,855	2.1
Jacks, crevalles nei	250,370	1.6
Silver pomfrets nei	329,547	2.1
Scads, mackerels	**4,556,236**	**29.5**
Indian mackerel	429,042	2.8
Japanese jack mackerel	211,459	1.4
Narrow-barred Spanish mackerel	283,951	1.8
Pacific chub mackerel	1,136,919	7.4
Pacific saury	253,863	1.6
Scads nei	1,159,357	7.5
Seerfishes nei	401,056	2.6
Short mackerel	479,401	3.1
Yellowstripe scad	201,188	1.3
Tuna	**4,080,094**	**26.4**
Bigeye tuna	285,956	1.9
Frigate and bullet tunas	235,700	1.5
Kawakawa	291,978	1.9
Longtail tuna	196,103	1.3
Skipjack tuna	1,799,363	11.6
Tuna-like fishes nei	460,773	3
Yellowfin tuna	810,221	5.2
Grand Total	**13,236,827**	**85.8**

DEMERSAL FISH

Table 1-7: Asia-Pacific demersal fish, total catch (2007 and 2017) and average annual rate of change 2007-2017.

Sub-region	Catch 2007 (tonnes)	Catch 2017 (tonnes)	Average inter-annual variation 2007-2017 (%)
APFIC China	3,412,408	3,482,937	0.1
APFIC East Asian Countries	1,055,024	633,864	-5.4
APFIC SouthEast Asian Countries	1,964,692	2,516,080	2.3
APFIC South Asian Countries	1,229,949	1,598,958	2.4
APFIC Oceania	382,655	376,021	-0.3
Total	**8,044,728**	**8,607,860**	**0.7**

The demersal fish overall catch trend for all countries in the region has grown slowly over the period 2007-2017, with an average annual growth rate of 0.7 percent reaching 8.6 million tonnes in 2017 (Table 1-7). China has the largest catch of demersal fish quantities between 2007 to 2017 and with very little variation (0.1 percent), average annual catch was 3.7 million tonnes.

The catch of demersal fish in East Asia shows a steady decline between 2007 and 2017 (Table 1-7), driven chiefly by Japan and Republic of Korea. Demersal fish catch in SouthEast Asia has increased by an average of 2.3 percent per year driven by increases in catches from Malaysia and Indonesia and offset by decreases in Thailand. The Philippines is another contributor to this catch but has been stable over the period. South Asia has had a similar average annual growth rate (2.3 percent per year), driven primarily by India and to a lesser extent Bangladesh and Sri Lanka. Pakistan's catches have been stable. The Oceanian countries have declined slightly over the period, the majority of these catches are reported by New Zealand and to a lesser extent Australia. The smaller Pacific islands have very small shelf areas and have very limited demersal fish resources.

The Largehead hairtail (*Trichiurus lepturus*) is the largest contributing species (1.12 million tonnes) to demersal fish in Asia-Pacific. The second most captured marine demersal fish group in the Asia-Pacific are Croakers, drums nei (694,327 tonnes) followed by threadfin breams (615,779).

CRUSTACEANS

China accounts for 50 percent of the crustacean catch in 2017, with SouthEast Asia a further 30 percent. SouthEast Asia's catches have had a 6.1 percent average annual increase over 2007 to 2017.

Table 1-8: Asia-Pacific crustaceans, total catch (2007 and 2017) and average annual rate of change 2007-2017.

Sub-region	Catch 2007 (tonnes)	Catch 2017 (tonnes)	Average inter-annual variation 2007-2017 (%)
APFIC China	1,970,163	2,129,139	0.28
APFIC SouthEast Asian Countries	731,502	1,306,678	6.08
APFIC East Asian Countries	513,446	585,716	2.22
APFIC South Asian Countries	278,953	183,018	-3.23
APFIC Oceania	46,784	51,208	1.72
Total	**3,540,848**	**4,255,759**	**1.57**

East Asia's average annual growth rate is more modest at 2.2 percent. South Asia has seen a decline in the average annual growth of 3.2 percent per year (Table 1-8).

24 percent of the catch is unidentified Natantian decapods nei, followed by gazami crab (*Portunus trituberculatus*, 12 percent) and akiami paste shrimp (*Acetes japonicus*, 11 percent).

CEPHALOPODS

Cephalopod fisheries are highly driven by climate and this can result in inter-annual fluctuations in distribution and abundance. China is the largest producer of cephalopods over the period 207-2017 (1.2 million tonnes in 2017, Table 1-9) and over half of this is caught by long distance fishing fleets in the Atlantic and southeast Pacific oceans (Table 1-4). South East Asian countries have the second highest catch, mainly from the Western Central Pacific area, there has been some overall increase in these fisheries 2007 to 2017. South Asian cephalopod fisheries have declined with an annual average of -8.3 percent. Oceania's cephalopod fisheries are modest and have also declined (average annual change -7.2 percent) over the period 2007 to 2017.

Table 1-9: Asia-Pacific cephalopods, total catch (2007 and 2017) and average annual rate of change 2007-2017.

Sub-region	Catch 2007 (tonnes)	Catch 2017 (tonnes)	Average inter-annual variation 2007-2017 (%)
APFIC China	1,368,423	1,198,843	1.62
APFIC SouthEast Asian Countries	602,321	789,967	2.86
APFIC East Asian Countries	834,725	311,444	-8.33
APFIC South Asian Countries	79,158	268,911	17.73
APFIC Oceania	75,388	24,806	-7.18
Total	**8,044,728**	**8,607,860**	**-0.27**

MOLLUSCS EXCLUDING CEPHALOPODS

The largest reported catch in this group are 'marine molluscs nei', followed by Yesso scallop, calms nei and then blood cockle. China has the highest catch of Molluscs excluding Cephalopods (MEC) from 2007 to 2017, although the average inter annual growth rate was -4.9 percent, showing a considerable overall decline in production. Southeast Asia and East Asia also declined over this period. South Asian production has increased considerably at an average of 35 percent per year, but this is due to the extremely low baseline of only 7,200 tonnes in 2007 (Table 1-10).

Table 1-10 Asia-Pacific molluscs, excluding cephalopods, total catch (2007 and 2017) and average annual rate of change 2007-2017.

Sub-region	Catch 2007 (tonnes)	Catch 2017 (tonnes)	Average inter-annual variation 2007-2017 (%)
APFIC China	745,455	444,102	-4.85
APFIC SouthEast Asian Countries	437,676	339,711	-1.96
APFIC East Asian Countries	153,293	134,410	-0.81
APFIC South Asian Countries	7,207	74,289	35.83
APFIC Oceania	29,207	17,221	-4.08
Total	1,372,838	1,009,733	-2.88

1.1.4 MARINE FISHING FLEET

Table 1-11: Total estimated fishing vessels in Asia-Pacific fisheries, 2014-2016.

Sub-region	2014	2015	2016	Average 2014-2016	% of regional total
China	1,088,089	1,065,432	1,033,673	1,062,398	30.8
East Asia	562,972	308,100	302,389	391,154	11.4
South Asia	472,604	468,233	468,696	469,844	13.6
Southeast Asia	1,529,872	1,494,569	1,498,359	1,507,600	43.8
Oceania	14,560	14,471	14,249	14,427	0.4
Total	**3,668,097**	**3,350,805**	**3,317,366**	**3,445,423**	

The Asia-Pacific region has the largest number of fishing vessels in the world, and this in part drives the region's high capture production figures. This document showcases reported fleet data available from 2014 to 2016. In 2016, FAO estimated that the region's total fishing fleet was well over 3 million fishing vessels - with more than 2 million of the reported vessels collectively operating in the South China Sea and the Bay of Bengal. Here most of the fishing vessels are relatively small in scale and not highly motorized (SOFIA, 2018).

The fleet data presented in this review merges the combined length overall (LOA) variable (110 to 900 foot) into one criterion. This review also does not include tonnage and power (Kw) categories. This therefore means that this review will combine artisanal and industrial fishing vessels, as no distinction between small-scale and commercialized definitions are made in the data available.

The Southeast Asia subregion contains the highest number of fishing vessels with an average of 1.5 million vessels between 2014 and 2016. This represents 42 percent of the region's total fishing vessels (Table 2-11). China (including Hong Kong Semi-Autonomous Region, Macao Semi-Autonomous Region and Taiwan Province of China) represents a significant portion of the region's total fishing fleet with an average of 31 percent of the total regional fleet (estimated 1 million vessels). South Asia and East Asia subregions contained 14 and 11 percent of the regions fishing vessels respectively. Oceania contained 0.4 percent of the region's fishing vessels (14 thousand vessels).

The data on composition of fishing vessel types distributed across the Asia-Pacific region throughout 2014 to 2016 is presented in Table 1-12.

The majority of the region's fleet is categorized as "Other fishing vessels". This category includes smaller scale vessels, often poorly or non-motorized and certainly highlights the scale of small-scale fishing in the region. However, the fact that "other fishing vessels" category comprised 88 percent of the total fishing vessels in the Asia-Pacific region also highlights limitations in reporting, rather than lack of specialization of vessels to specific fishing gears.

Table 1-12: Breakdown of the fleet of the Asia-Pacific countries, by gear type

Fishing vessel type/gear	2014	2015	2016	% of total
Other fishing vessels	3,262,809	2,950,152	2,918,406	88.0
Multipurpose Vessels	126,339	124,438	124,351	3.7
Long Liners	118,959	118,065	118,845	3.6
Gill Netters	94,955	91,877	89,702	2.7
Trawlers	22,184	20,641	20,622	0.6
Trap Setters	18,427	19,193	18,949	0.6
Liners Others	14,701	15,135	14,968	0.5
Purse Seiners	6,382	6,258	5,645	0.2
Seiners others	5,285	4,668	5,422	0.2
Dredgers	436	374	402	0.0
Total	**3,670,477**	**3,350,801**	**3,317,312**	

1.2 THE NEED TO IMPROVE REPORTING IN MARINE CAPTURE FISHERIES

Despite a global picture of stagnating catch and increasing numbers of overfished stocks, the recorded landings from the two main fishing areas (57 and 71 comprising Eastern Indian Ocean and Western Central Pacific) indicate that the trends in marine capture fisheries has been one of steady growth.

Analysis at the national level provides a mixed picture. In general, coastal fishery resources in most APFIC countries are heavily fished and often show signs of over-exploitation. This is especially the case in areas close to population centres and for fishery products in demand by the rapidly-growing Asian economies. Increasing global seafood demand adds to this as some of these countries target resources for export, leading to further overfishing.

In the absence of a management framework and systematic monitoring, catch statistics do not typically provide a particularly reliable indication of the status of an inland fishery, merely an estimate of their contribution to food supply. The national production figure does not therefore provide much insight to the status of the fisheries that contribute to the production. Additional data such as survey data, or length frequency of the sampled catch would be important to examine and relate to the life history characteristics of the species studied. This would probably give us an estimate of exploitation on the resource.

Long-term trend analyses of national catches are also weak indicators of how well fisheries are managed and the sustainability of the fishing pressure. There are considerable challenges to deriving even an indication of the level of production from many important marine and inland fisheries, let alone detailed assessments as to the condition of the fisheries. This problem is compounded by limited detail in the composition of the catches and rather high level of "nei" (unidentified species) in the catch reports. There is a general need to improve reporting in capture fisheries across the region.

"NOT ELSEWHERE INCLUDED" (NEI) REPORTING

Unidentified figures at the species level, classified as "not elsewhere included" (nei) contributes uncertainty in Asia-Pacific marine capture fishery statistics. The top-level 'nei' groupings include species recorded as marine fishes nei, marine molluscs nei and marine crustaceans nei. Of these, 'marine fishes nei' is by far the largest part of these groupings. It consistently

represents about 19 percent of the total catch of the countries of the Asia-Pacific region (Table 1-13). Over half of this is within Southeast Asia and 40 percent is reported by China.

Table 1-13: Percentages of different 'nei' reported catch by sub-region

	Percentage of total marine catch			
Sub-region	**Marine fishes nei**	**Marine molluscs nei**	**Marine crustaceans nei**	**Total**
China	7.8	1.1	0.0	8.9
East Asia	0.8	0.0	0.1	0.8
South Asia	0.7	0.2	0.2	1.1
South East Asia	9.9	0.2	0.1	10.1
Oceania	0.2	0.0	0.0	0.2
Total	**19.4**	**1.4**	**0.3**	**21.1**

Table 1-14: Percentages of total 'nei' reported catch by sub-region over the decade 2007-2016

	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	Ave. 2007-2016
China	6.8	6.9	8.3	7.6	7.3	7.1	7.0	7.2	7.4	9.3	**8.9**
East Asia	1.2	1.2	1.3	1.1	1.0	1.0	1.0	0.9	0.9	0.8	**0.8**
South Asia	2.2	2.1	2.5	2.8	2.4	2.4	2.2	1.5	1.5	1.1	**1.1**
Southeast Asia	11.0	10.3	10.5	11.0	11.0	11.1	10.8	10.7	11.3	11.9	**10.1**
Oceania	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	**0.2**
Total	**21.4**	**20.8**	**22.8**	**22.7**	**21.9**	**21.8**	**21.3**	**20.6**	**21.3**	**23.4**	**21.1**

With the exception of South Asia, the quantity of reported 'marine fish nei' has been increasing in the Asia-Pacific region. This has risen consistently with the increasing catch so the percentage of 'nei' reported catch has remained relatively stable over the past decade ranging between 21 to 23% of the total catch (2007-2016) (Table 1-14)

CAPACITY TO ASSESS MARINE FISH STOCKS

The FAO SOFIA global marine fishery assessment is based on a sample of fish stocks, some of which are scientifically assessed, whilst others rely on expert knowledge. A little less than half of global marine catch comes from stocks that are scientifically assessed, and these data have been compiled in the RAM Legacy Database that is available online.

The majority of catch is assessed in Europe, Northwest Africa, North America, the largest South American countries, South Africa and Japan. Despite the importance of fisheries to the Asian economies, scientific monitoring and management of capture fisheries are modest, with most stocks lacking modern scientific stock assessments.

This is illustrated in Figure 1-2 which shows the major fishing countries of the world with a circle representing the total reported landings. The green shading represents the proportion of landings from that country that are from stocks that have public assessments of their status. The large circles with little green in South and Southeast Asia are the source of 48 percent of the worlds marine capture fisheries, but have few assessed stocks.

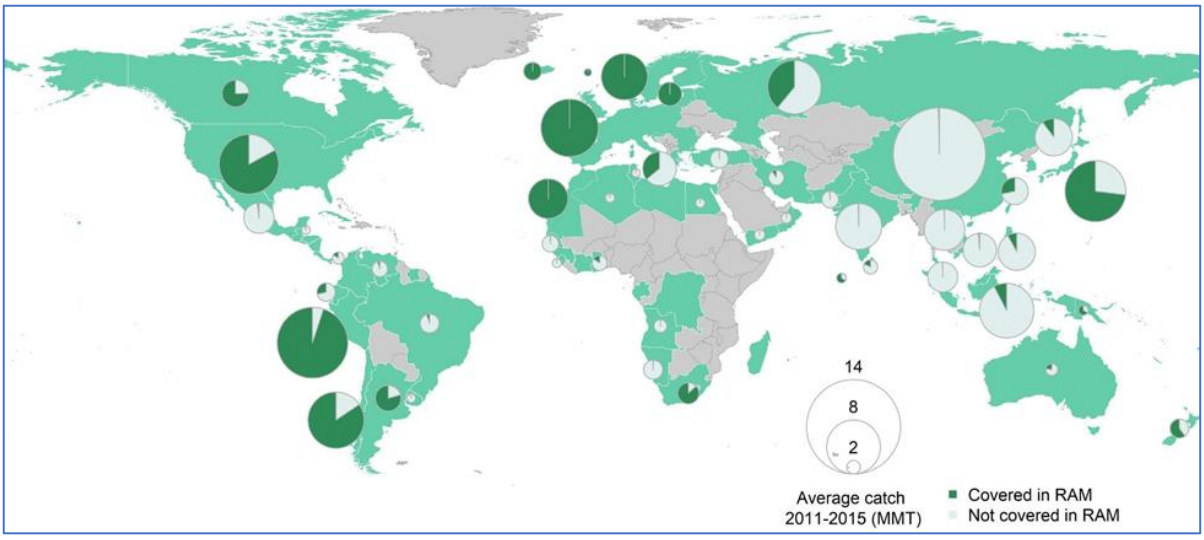


Figure 1-2: Source of assessed stocks globally and how they relate to production, note SE Asia has a large number of landings but very few stock assessments (Source: Ray Hilborn, University of Washington, Seattle, WA (USA)).

Whilst there are apparent increases in the landings from marine capture fisheries, there may be less confidence in the state of the stocks that underpin these fisheries. Without reliable stock assessments, it is impossible to determine whether fish populations are overexploited or, potentially, underexploited relative to their ability to support sustainable yields.

The analytical approaches for assessing stock status are often difficult and there is limited resourcing and capacity in many countries in the region. China, India, Indonesia and Thailand are changing their approaches to improve the assessment of some of their important stocks. However, there remains a strong need for far more comprehensive monitoring of marine fish stocks in the region, particularly those which are not covered by regional fishery management organization (RFMO) agreements.

Without marine stock assessments, it is impossible to determine whether fish populations are overexploited or, potentially, underexploited relative to their ability to support sustainable yields. Development of monitoring and assessment capacity remains a pressing need for marine fishery management in the Asian region.

FAO is putting a high priority on building capacity in these regions and is collaborating with multiple partners and countries to improve assessment of marine fisheries in the region. With improving regional cooperation there is greater understanding of the urgency of managing marine fisheries more effectively, but this will take time and requires the policy vision and investment to achieve results.

This is also particularly important for the small-scale sector that is poorly understood based on the sampling and coverage issues identified above.

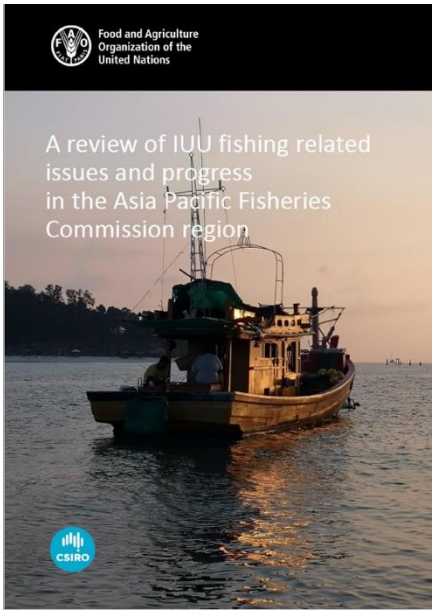
1.3 IUU FISHING IN THE APFIC AREAS OF COMPETENCE

Several studies had been conducted to estimate the global quantity and value of Illegal, Unreported and Unregulated (IUU) fishing, e.g. Pauly et al. in 2002[4] and MRAG in 2005[5] and also in 2008. MRAG looked at the impacts of IUU and made global estimates of 11.0 and 26.0 million tonnes valued between USD 10 and 23.5 bn annually. The study also found that there was a strong relationship between levels of IUU fishing and the World Bank governance indicators in 2003. Since then other studies have been done to estimate IUU fishing in the Asia-Pacific Region, namely MRAG (2016), where they found that IUU in the tuna sector was over USD 600 million[6], and the Bay of Bengal Large Marine Ecosystem (BOBLME) which estimated IUU catch was between 4.5 and 14.4 million tonnes and valued 6 and 21 billion USD annually.

1.3.1 REVIEW OF IUU FISHING RELATED ISSUES AND PROGRESS IN THE APFIC REGION

In 2015, the APFIC Secretariat conducted a study focusing on the illegal fishing component of IUU in the Asian region of APFIC member countries[7]. This study, presented to the APFIC 34th Session in Colombo, Sri Lanka, identified 33 hot spots where some sort of illegal fishing activity was occurring, within or adjoining the EEZs of APFIC Member States.

There were widespread issues across the APFIC region, with nearly every country in the region having some level of IUU fishing associated with foreign vessels or vessels with foreign beneficial ownership. The study also found that the main IUU target species were not subject to the Conservation and Management Measures (CMMs) of either IOTC or the WCPFC. Overall, the authors estimated between 2.0 and 2.5 million tonnes of catch valued between 3 and 5.2 bn USD were taken, representing 2.3 to 10.4 percent of the total reported catch.



This CSIRO study[8] developed a methodology that builds on the previous work, incorporating improved rigor on responding to questions and additional analytical method. The result is a method that can be used in situations of complex, multi- gear, multi species fisheries that can predict illegal fishing and indicate approximate scale of this activity in a transparent and repeatable manner.

It can also be used to track change in illegal fishing activity. It is therefore also possible to track change, both emerging IUU areas, as well as responses to

[4] Pauly D, Christensen V, Guénette S, Pitcher TJ, Sumaila UR, et al. (2002) Towards sustainability in world fisheries. Nature 418: 689–695.

[5] MRAG (2005) Review of Impacts of Illegal, Unreported and Unregulated Fishing on Developing Countries. London: MRAG. Available: http://www.dfid.gov.uk/pubs/files/illegal-fishing-mrag-report.pdf. Accessed 20 September 2008.

[6] MRAG Asia Pacific. 2016. *Towards the Quantification of Illegal, Unreported and Unregulated (IUU Fishing the Pacific Islands Region*. Toowong, Queensland. p. 36. Report available at: https://www.ffa.int/system/files/FFA%20Quantifying%20IUU%20Report%20-%20Final.pdf

[7] FAO (2016) APFIC Regional review of Illegal, Unregulated and Unreported fishing by foreign vessels. Information document presented to the 34th Session of the Asia-Pacific Fishery Commission, Colombo, Sri Lanka, 12-14 February 2016, APFIC/16/INF 07, 175p.

[8] FAO and CSIRO. 2020. *A review of IUU fishing related issues and progress in the APFIC region 2020*. Bangkok, FAO Regional Office for Asia and the Pacific and Hobart, CSIRO. 104 pp.

actions to combat IUU fishing. Many of the results of this update report validated the results of the 2015 report. Encroachment, breach of license conditions followed by non-compliant gear, and illegal transshipment were most prevalent in both studies. In addition, IUU was carried out by mainly illegal foreign fishing vessels. Differing from the 2015 study, the updates found that illegal landings were 6.6 million tonnes valued at USD 23.3 billion.

Key findings from the updated study are that generally, the hotspots for illegal fishing identified in 2015 were still found to be hotspots. Additional hotspot areas of illegal fishing activities include the southeast Bay of Bengal, the region at the border of Viet Nam's exclusive economic zone and the South China Sea, and the region between the Philippines and Indonesia in the Celebes Sea.

In both small-scale and industrial sectors, encroachment and breach of license conditions were the most common infractions; followed by non-compliant gear, illegal transhipment, and other premeditated activities.

Surveys suggested that illegal landings generally comprise less than half of the total landings, across the 25 species evaluated in this study.

Species, sectors and entities vary significantly in the level of illegal fishing associated with them, with some predictable patterns. The proportion of illegal catch for tunas was small; but the combined value is very high. Illegal fishing by domestic fleets represented less than 25% of the total reported illegal fishing (by value), suggesting illegal fishing is undertaken mostly by foreign vessels operating illegally. There was variation in this finding, with 9 countries having illegal fishing conducted entirely or up to 50% of the catch.

Major issues linked to illegal fishing identified by the study pertinent to the region and RPOA-IUU in particular are:

1. High levels of illegal fishing occur near borders, in shared zones, and disputed waters;
2. Frequent violation of bilateral agreements, particularly where there is asymmetry between parties;
3. The prominence of fish buyers or purchasers in illegal fishing;
4. The likelihood that many of the violations documented were related to stock depletion and profitability;
5. The lack of alignment in regulatory systems and industry structure as a key factor leading to illegal fishing; and
6. The role of international management regimes in reducing illegal fishing.

Some recommendations are made which could support efforts to reduce illegal fishing in the region:

1. Establishment of a transparent, repeatable, and cost-effective approach to benchmarking illegal fishing and the effects of interventions in the region;
2. Development of guidance for countries in legal and regulatory reform, particularly addressing structural alignment between industry and regulation;
3. Capacity building for enforcement agencies, aimed at increasing knowledge of fisheries regulations and embedding a view of fisheries violations as serious crimes meriting action;
4. Information sharing to support cost-effective technological innovation in monitoring and surveillance by members;
5. Development of a platform for sharing monitoring information near borders that facilitates cooperation and reduces barriers to information sharing;
6. Focused effort to increase monitoring, surveillance, and enforcement activities aimed at fish buyers.

The large variance between the studies is an indication of is the difficulties involved in identifying and quantifying illegal fishing. This variance may be attributed to the different methodologies, areas studied and variation in prices of fish used to estimate values over the various decades between the studies.

Estimated illegal fishing landings across the APFIC area of competence, excluding the South China Sea, totaled 6.6 million tonnes in 2019, with a value of US$23.3 billion. From these previous studies it is clear that the APFIC Member States are losing billions of dollars annually due to illegal fishing.

In general, at the APFIC Member State level, between January 2015 to December 2019, all APFIC Member States with one exception, exported fishery products to the European Union and/or the USA. To do so, the Member States have had to comply with the requirements for traceability, Catch Certificates, VMS, Logbooks, vessel registries, fishing licenses, and implementing flag, port and coastal state controls.

The main countries that import fish and fishery products from APFIC Member States are the 28 States of the European Union (now 27 after the exit of The United Kingdom on 01 February 2020), the United States of America, Japan, and indeed there is significant regional trade between APFIC members. Between January 2015 and December 2019 (5 years), APFIC Member States exported Euros 24,27 bn[9] to the 28 European member states. The USA, France and the United Kingdom are APFIC Members, however their trade data are not included in these figures.

As a Market State, the EU has made a number of regulations[10] [11] to combat, deter and eliminate IUU fish and fishery products from gaining access to the EU market. These regulations also apply to all EU Member States[12].

On 7 May 2020, the US Administration issued Executive Order[13] on Promoting American Seafood Competitiveness and Economic Growth. The Order directs relevant US Departments to:

- Propose rulemaking further implementing the FAO PSMA;
- Promote interagency, intergovernmental, and international cooperation in order to improve global maritime domain awareness, cooperation concerning at-sea transshipment activities, and the effectiveness of fisheries law enforcement;
- Prioritize training and technical assistance in key geographic areas to promote sustainable fisheries management; strengthen and enhance existing enforcement capabilities to combat IUU fishing and to promote implementation of the PSMA;

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[9] Eurostat Data Bases https://ec.europa.eu/eurostat/data/database

[10] Council Regulation (EC) No 1005/2008 of 29 September 2008 establishing a Community system to prevent, deter and eliminate illegal, unreported and unregulated fishing, amending Regulations (EEC) No 2847/93, (EC) No 1936/2001 and (EC) No 601/2004 and repealing Regulations (EC) No 1093/94 and (EC) No 1447/1999. Online https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=celex:32008R1005

[11] Commission Regulation (EC) No 1010/2009 of 22 October 2009, laying down detailed rules for the implementation of Council Regulation (EC) No 1005/2008 establishing a Community system to prevent, deter and eliminate illegal, unreported and unregulated fishing Online https://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=OJ:L:2009:280:0005:0041:EN:PDF

[12] Regulation (EU) 2017/2403 Of The European Parliament And Of The Council

of 12 December 2017on the sustainable management of external fishing fleets, and repealing Council Regulation (EC) No 1006/2008 Online https://eur-lex.europa.eu/legal-content/EN/TXT/?qid=1589444063029&uri=CELEX:32017R2403

[13] White House Executive Order Executive Order on Promoting American Seafood Competitiveness and Economic Growth Online https://www.whitehouse.gov/presidential-actions/executive-order-promoting-american-seafood-competitiveness-economic-growth/

- This Executive Order also orders the creation of the Seafood Trade Task Force which shall prepare a comprehensive interagency seafood trade strategy principally to improve access to foreign markets, resolves technical barriers to United States seafood exports, and supports fair market access for United States seafood products;
- Develop new strategies and plans to greatly increase aquaculture production in the territorial sea and in the entire EEZ.

It is not certain at this moment how this Executive Order will affect trade in fishery products from APFIC Member Countries. New regulations for accessing the US Market may present new challenges to APFIC seafood exporters and on the other hand assistance with combatting IUU fishing from the USA may make fisheries more sustainable. Whether the reduction of IUU fishing is tied to trade regulations is still not clear from the Order.

1.3.2 CURRENT ACTIVITIES IN THE REGION TO PREVENT, DETER AND ELIMINATE IUU FISHING

At the regional level, there are a number of ongoing processes to assist Member States in combatting IUU. These are as follows:

Fourteen of the 21 APFIC Member States[14] are parties to the Port State Measures Agreement.

The Regional Plan of Action to Promote Responsible Fishing Practices including Combating Illegal, Unreported and Unregulated Fishing (RPOA-IUU) continues its work with participating countries[15] in combatting IUU fishing in the Southern and Eastern Area of the South China Sea and Sulu-Sulawesi Seas, Gulf of Thailand, and the Arafura-Timor Seas. The RPOA held its Coordinating Committee Meeting in November 2019. The RPOA-IUU CC Meeting encouraged all RPOA-IUU countries and SEAFDEC to consider FAO agreements and guidelines when designing new measures, noting consistency reduces implementation burden.

The ASEAN Guidelines for Preventing the Entry of Fish and Fishery Products from IUU Fishing Activities into the Supply Chain were endorsed by ASEAN members in 2015.

The Joint ASEAN-SEAFDEC Declaration on Combating IUU Fishing and Enhancing the Competitiveness of ASEAN Fish and Fishery Products (2016) is a document setting out the commitments of ASEAN Member States to eliminate IUU fishing.

More recently in 2019, ASEAN members agreed to establish and operationalize an ASEAN IUU Fishing Network to enhance regional cooperation. The network aims to establish practical and operational tools to exchange information and intelligence in real time. All States are required to provide a self-evaluation of their performance in the implementation of the Guidelines. An interim report of the feedback and self-evaluation conducted on the implementation of the ASEAN Guidelines was published in the first quarter of 2019. SEAFDEC is assisting ASEAN with implementation of these Guidelines.

In August 2019, Representatives of Asia-Pacific Economic Cooperation (APEC) endorsed the Roadmap to Prevent, Deter and Eliminate IUU Fishing. The Roadmap includes important commitments to combat IUU fishing, such as the implementation of the PSMA; improving MSC activities; increasing the coordination among APEC economies; promoting research to support the development of technical indicators; improving the participation of APEC economies in relevant international fora; and strengthening public-private cooperation and fisheries management systems.

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[14] See Official List at: http://www.fao.org/port-state-measures/background/parties-psma/en/

[15] RPOA Member Countries Republic of Indonesia, Australia, Brunei Darussalam, Cambodia, Malaysia, Papua New Guinea, The Philippines, Singapore, Thailand, Timor-Leste and Vietnam.

1.3.3 FAO'S ASSISTANCE TO APFIC MEMBERS TO COMBAT IUU FISHING

FAO's Global Programme to prevent, deter and eliminate IUU fishing supports the implementation of the PSMA, complementary international instruments and regional mechanisms to combat IUU fishing. A growing number of countries in the region are eligible to receive support and have signed up to the PSMA. The support programme focuses on policy and legal frameworks, institutional arrangements and operational procedures to effectively fulfil their international obligations as port, flag, coastal and market states.

The purpose of the FAO Global Record of Fishing Vessels, Refrigerated Transport Vessels and Supply Vessels is to rapidly make available to the public certified up-to-date data from state authorities about vessels and vessel-related activities. To this end, the Global Record includes authorization, compliance and historical data, which can be used to disseminate, verify information, conduct risk assessment on a vessel-by-vessel basis and assist countries to prevent, deter and combat IUU fishing.

Table 1-15:

APFIC Member State	Party to the PSMA[16]	FAO's Global Programme to support PSMA and complementary international instruments[17]
Australia	✓	N/A
Bangladesh		
Cambodia	✓	✓
China		
France*	✓	N/A
India		
Indonesia	✓	✓
Japan	✓	N/A
Malaysia		✓
Maldives	✓	✓
Myanmar	✓	✓
Nepal		
New Zealand	✓	N/A
Pakistan		
Philippines	✓	✓
Republic of Korea	✓	N/A
Thailand	✓	✓
Timor-Leste		✓
United Kingdom*	✓	N/A
United States of America*	✓	N/A
Viet Nam	✓	✓

*Denotes an FAO member that has administrative territory in Asia and the Pacific region and participates in the biennial FAO Regional Conference for Asia and the Pacific.

FAO assists Member States through its Technical Cooperation Projects (TCP) at national and regional levels to strengthen capacity to address IUU fishing through review fisheries laws (e.g. Cambodia, Malaysia, Thailand), prepare and update national NPOAs-IUU, capacity building and training of Port Inspectors (Thailand, Sri Lanka, Maldives), assessment of electronics used in VMS and new technologies, assistance to members to delist from Market State listing (Sri

[16] See Official List at: http://www.fao.org/port-state-measures/background/parties-psma/en/

[17] Only available for states eligible for Official Development Assistance (ODA). Non-applicable (N/A) is marked for states not eligible for ODA.

Lanka). FAO convenes fora and meetings for information sharing and with emergency rehabilitation projects through the TCP facility.

The FAO Voluntary Guidelines for Catch Documentation Schemes (VGCDS)[18] is the first international policy document with comprehensive elaboration about CDS. The objective of the guidelines is to provide assistance and guidance to State, Regional and Global actors on harmonizing or reviewing existing CDS. The VGCDS were officially adopted by the FAO Conference in July 2017 which includes all APFIC Member States. The VGCDS guides States on how to develop and manage CDS systems so that fish is caught, transported and sold and delivered according to national, regional and international conservation and management and market state measures as established according to relevant international obligations. In the end, good and well-implemented CDSs facilitate exports to lucrative importing countries.

[18] FAO 2017 Voluntary Guidelines on Catch Documentation Schemes Online http://www.fao.org/3/a-i8076e.pdf

1.4 ABANDONED, LOST, OR OTHERWISE DISCARDED, FISHING GEAR (ALDFG)

1.4.1 WHAT IS ALDFG?

ALDFG is a collective term[19] for the various causes of loss of fishing gear.

The term "abandoned fishing gear" means fishing gear over which the operator/owner has control and that could be retrieved by owner/operator but is deliberately left at sea due to force majeure or other unforeseen reasons.

The term "lost fishing gear" means fishing gear over which the owner/operator has accidentally lost control and that cannot be located and/or retrieved by owner/operator.

The term "discarded fishing gear" means fishing gear that is released at sea without any attempt for further control or recovery by the owner/operator.

An FAO-UNEP report estimated that in 2009 ALDFG constituted around 10 percent (640,000 tonnes) of all global marine litter (Macfadyen et al., 2009).

1.4.2 CAUSES OF ALDFG

Fishing gear is expensive, and it is rare that fishers will deliberately abandon their gear. Gear is abandoned usually due to force majeure, such as when the safety of the vessel or crew is compromised due to weather, injury, mechanical failure and the gear cannot be retrieved. Vessels engaging in IUU fishing may also abandon their gears when at risk of being inspected, in order to move quickly or dispose of evidence.

Gear is often lost due to snagging on obstructions in or on the water, interaction between gears snagging on each other, and impossible to retrieve after all efforts are made.

Discarded gear is usually gear damaged beyond repair and the vessel has nowhere to dispose of it properly and it is just left at sea. Ports should provide adequate reception facilities for the disposal of fishing gear. However, accessible low-cost disposal facilities for plastics are still not available or are not properly maintained in many fishing ports; and where they do exist, fishers may have limited incentives to use them.

1.4.3 GHOST FISHING

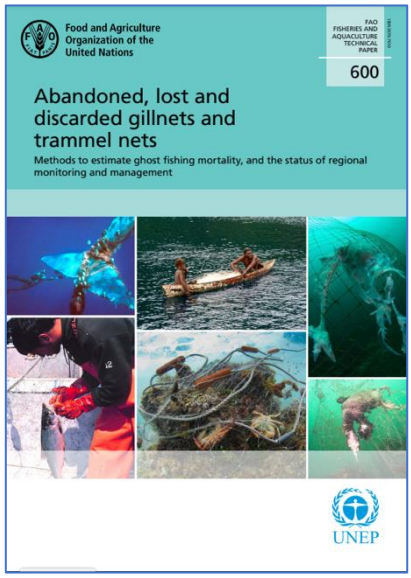
Ghost fishing is a related issue and occurs when ALDFG continues to catch and kill organisms. Various factors affect the ability, efficiency and duration of ALDFG to ghost fish. Organisms caught in derelict nets, traps and other gear types can attract scavengers, which subsequently are caught, causing long-term ghost fishing due to this self-baiting mechanism.

[19] FAO Definition of Abandoned Lost and Discarded Fishing Gear Online: TCMFG/2018/Draft Report, FAO, 2018 (MV841). Online http://www.fao.org/faoterm/viewentry/en/?entryId=86811

Table 1-16: The types of gears that cause the highest risk of ghost fishing[20]

Gear class	Likelihood	Impact	Total risk
Gillnets	5	5	25
Traps and pots	4	4	16
Fish Aggregating Devices	4	3	12
Hooks and lines	3	3	9
Bottom trawls	2	3	6
Mid-water trawls	1	2	2
Seine nets	1	2	2

Properly marked gear can help identify the owner, which may create a disincentive for intentional abandonment or discarding of gear, increase visibility of passive gear, which could reduce gear conflicts and damage by passing vessels to reduce accidental gear loss. Remedial methods to mitigate ghost fishing include, for example, programs to detect and remove ALDFG and the use of less durable and biodegradable gear to reduce their ghost fishing duration.



Gillnets and trap fisheries have the most impacts as a ghost fishing gear (Table 1-16) and to focus on this specifically, the FAO published "Abandoned, lost and discarded gillnets and trammel nets; Methods to estimate ghost fishing mortality, and the status of regional monitoring and management."[21]

1.4.4 INTERNATIONAL RESOLUTIONS

ALDFG has been on the Agenda of the FAO and its Members since 1991 and is specifically addressed by the CCRF[22] and MARPOL Annex V and its Implementation Guidelines[23].

UNEP, NOAA, IMO and many Donors, NGOs and CSOs have placed ALDFG on their agendas also. ALDFG has taken on a new level of urgency since reporting of the Giant Garbage Patch in the Pacific and with the heightened awareness of marine litter and microplastics in general.

The following United Nations General Assembly (UNGA) resolutions have been developed to help combat ALDFG:

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[20] GGGI webinar https://www.youtube.com/watch?v=tdXfrkdALHU

[21] FAO. 2016. Abandoned, lost and discarded gillnets and trammel nets: methods to estimate ghost fishing mortality, and the status of regional monitoring and management, by Eric Gilman, Francis Chopin, Petri Suuronen and Blaise Kuemlangan. FAO Fisheries and Aquaculture Technical Paper No. 600. Rome. Italy Online http://www.fao.org/3/a-i5051e.pdf

[22] FAO Code of Conduct for Responsible Fisheries Articles 7.2, 7.6 and 8.4 of the 1995 Code of Conduct for Responsible Fisheries (CCRF)

[23] IMO MARPOL. Annex V of the International Convention for the Prevention of Pollution from Ships (MARPOL) and article 2.2 of the 2017 Guidelines23 for the implementation of MARPOL Annex V

Resolution A/RES/59/25 (UNGA, 2004) calls upon States, FAO, the International Maritime Organization (IMO), UNEP, Regional Seas Program (RSP), regional/sub-regional fisheries management organizations and other intergovernmental organizations to take actions to address the to address the issue of lost or abandoned fishing gear and related marine debris, including through the collection of data on gear loss, economic costs to fisheries and other sectors, and the impact on marine ecosystems; and calls upon States, where relevant, to establish systems for retrieving lost gear and nets.

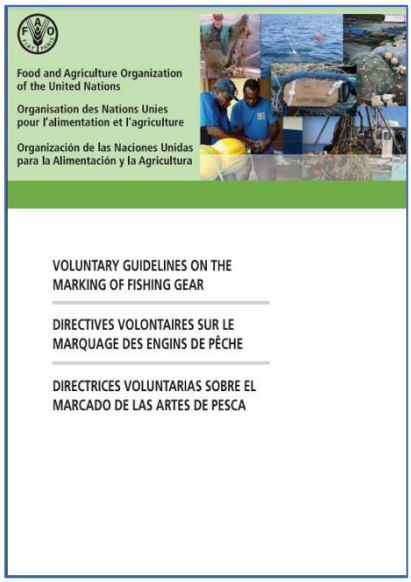
Resolution A/RES/60/30 (UNGA, 2006) acknowledged the lack of global information on marine debris. It encouraged States to integrate the issue of marine debris into national strategies when dealing with waste management.

Resolution A/RES/60/31 (UNGA, 2006) focused heavily on improving collaboration between States and international organizations (i.e. FAO to address ALDFG data collection) through both preventative and curative measures.

Resolution A/RES/61/222 (UNGA, 2007) continued the push and urged States to integrate marine debris into national strategies dealing with waste management with reviews done by MARPOL and IMO.

Resolution A/RES/61/105 (UNFGA, 2007) reiterated the importance of ALDFG and encouraged the Committee on Fisheries (COFI) to involve ALDFG into future meetings.

1.4.5 MARKING FISHING GEAR



Marking fishing gear, helps to identify its ownership and location and to ascertain its legality, and is an integral requirement of the Code of Conduct for Responsible Fisheries (FAO, 1995). However, the marking of fishing gear is still not universally applied.

Properly marked fishing gear with gear tracking technology and an associated reporting system can reduce ALDFG and its impacts, including ghost fishing. Gear marking and tracking is an important tool for recovery of lost gear and to facilitate management measures such as penalties for gear abandonment and inappropriate disposal, as well as incentives for the proper management of fishing gear, including its disposal.

In February 2018, FAO hosted the Technical Consultation for the Marking of Fishing Gear in Rome, Italy. This resulted in the publishing of The Voluntary Guidelines for the Marking of Fishing Gear in 2019[24].

FAO is working at the global level with various partners[25] to address ALDFG and Microplastics.

Consistent application of an approved gear marking system may also assist the application of measures to identify and prevent IUU fishing, which in turn should reduce gear abandonment and disposal[26].

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[24] FAO. 2019. Voluntary Guidelines on the Marking of Fishing Gear. Rome. 88 pp. Licence: CC BY-NC-SA 3.0 IGO. Online http://www.fao.org/3/ca3546t/ca3546t.pdf

[25] FAO Global Ghost Gear Initiative (GGGI), the Global Partnership on Marine Litter (GPML), the Global Programme of Action for the Protection of the Marine Environment from Land-Based Activities (GPA) and IMO amongst others.

1.4.6 ESTIMATING ALFDG IN THE APFIC REGION

Globally, FAO and UNEP have estimated that abandoned, lost or otherwise discarded (ALDFG) fishing gear in the oceans make up approximately 10 per cent (640,000 tonnes) of all marine litter. The Global Ghost Gear Initiative (GGGI)[27] reported in 2018 that The Ocean Cleanup[28] found ALFDG constitutes 46 % of surface debris and 70 % of macro plastic[29].

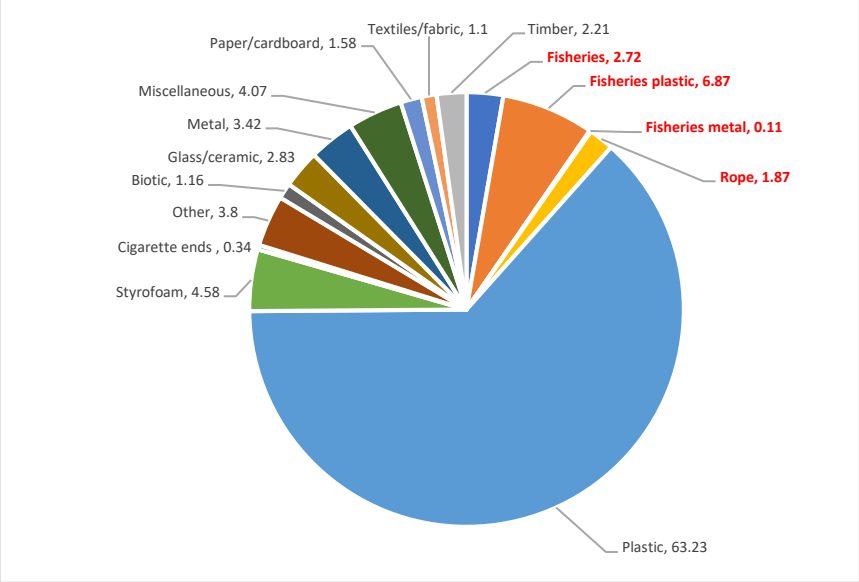
The large scale of fishing operations across the Asia-Pacific region generates abandoned, lost or otherwise discarded fishing gear (ALDFG), but this is so far unquantified. Because ALDFG is usually hidden under the water, it is seldom seen as a threat until some marine mammal washes up on a beach entangled in fishing gear or has died due to ingestion of plastic or fishing gear.

According to Macfadyen et al. (2009), "there are few sector-wide processes (i.e. institutional or vessel-based monitoring systems) to quantify gear loss at a national or regional level. Most existing information is from small-scale surveys and underwater censuses and is thus indicative and case-specific rather than systematic".

Consistent data on ALDFG in Asia-Pacific fisheries operation is limited. Currently, data is aggregated to marine litter information with no existing standardized and updated figures on fisheries ALDFG.

A global marine pollution assessment conducted by the Alfred Wegener Institute for Polar and Marine Research figure estimated that in 2018, fisheries related waste constituted 10.1 percent of the total marine litter types (Figure 1-3) (AWI Litterbase, 2018).

Figure 1-3: Global distribution of marine litter types, 2018 (%)



NOTE: The proportion of different litter types contributing to the global composition was calculated as the weighted means from all considered studies, irrespective of units from 611 publications across 4,358 locations. **Source of data:** AWI Litterbase 2018

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[26] FAO. SOFIA 2018

[27] Global Ghost Gear Initiative (GGGI) https://www.ghostgear.org/

[28] The Ocean Cleanup is a non-government engineering environmental organization based in the Netherlands,.
Online https://theoceancleanup.com/oceans/

[29] GGGI webinar https://www.youtube.com/watch?v=tdXfrkdALHU

Fisheries ALDFG studies are mostly conducted at the country specific level on costal marine litter often by industrialized nations that possess the capacity to conduct surveys. Few countries in the region such as the Republic of Korea, Japan and Australia treat ALDFG as a significant issue and have attempted to collect ALDFG data and have implemented activities to address ALDFG (Raaymakers, 2007).

ALDFG assessment highlights from certain Asia-Pacific countries conducted by Brainard et al. (2000) summarized that:

- Dedicated vessels, combined with vessels of opportunity were used in a Pacific ALDFG wide survey conducted by the Fisheries Agency of Japan from 1986 to 1991 (Matsumura and Nasu, 1997). It reported that fishing net density was highest in parts of the eastern Pacific Ocean. The survey also noted a high density of ALDFG fishing nets on the Pacific Ocean side of Japan.
- Altamirano et al. 2004, reported that data from the Inter-American Tropical Tuna Commission's (IATTC) On-Board Observer Program recorded sightings of discarded fishing gear have increased in the eastern Pacific from 1992 to 2002.
- Various studies in Australia (Alderman, et al., 1999; Kiessling and Hamilton, 2001) indicated that over three-quarters of fishing debris in Cape Arnhem, Northern Territory, Australia, consisted mostly of trawl nets from Southeast Asian manufacture origins (79 percent). Further, the ongoing Carpentaria Ghost Net Program specified throughout the 29 months of ALDFG collection, 73,444 meters of fishing net had been collected from the Gulf of Carpentaria, Australia with 41 percent from unknown origins; 17 percent Taiwanese origin; 7 percent Indonesian and Taiwanese/Indonesian origin; 6 percent Korean origin and 5 percent Australian origin.
- A 2002 marine debris survey in Japan highlighted that of the 35,000 objects recovered from a beach litter survey, 1 percent and 11 percent were comprised of fishing nets and fishing gear, respectively; the remaining portion consisted of Styrofoam (27 percent), petrochemical products (22 percent), wood (15 percent) and seaweed (17 percent) (Watanabe et al., 2002).

1.4.7 RECOMMENDATIONS

Develop regional ALDFG gear traceability programs when vessels are at sea and improve regional compliance with gear marking schemes. The source, impacts and the solutions for ALDFG are regional, thus there is a need to develop an Asia-Pacific gear marking standard that promotes the marking of fishing gear. The marking of gear should not be aimed at "identifying offenders" but prompted to better understand drivers of ALDFG for the identification of appropriate solutions and strategic resource allocations.

Improving standards in the reporting of lost gear by fishing vessels after vessels land: An important step in eliminating ALDFG in the Asia-Pacific region is the improved reporting of lost and/or discarded gear. Currently vessels are often not obligated to report ALDFG loss. Prioritizing the fisheries with the highest risk in producing ALDFG is contingent on information on vessel and gear types, countries and regions and incidence of ALDFG.

The goal of reporting ALDFG should be to improve awareness of its potential hazards to marine ecosystems and other users and the techniques and gear types that can be deployed to minimize the potential for ALDFG. Incentivizing the recovery and reporting of ALDFG is also expected to reduce ALDFG's impact. Economic incentives could encourage fishers to report their lost gear or bring to port old and damaged gear, as well as any gear and nets they might recover while fishing.

Ensuring on site facilities to dispose of ALDFG are available at ports across the Asia-Pacific region is also expected to facilitate fisher's participation in reducing ALDFG.

Apply relevant and scalable new technologies: Application of new technologies and materials offer opportunities for reducing ALDFG. A range of applicable technology (e.g. Sea-bed imaging used to avoid undersea snags and obstacles, application of novel gear materials, transponders, GPS, weather systems, and other ICT technologies) are available. Outreach describing the benefits of each technology to reduce ALDFG would assist vessel owners with optimizing the purchase of gears that best suits their needs and minimizes ALDFG.

IMO-FAO-Norway "GloLitter Partnerships Project"

The GloLitter Partnerships (GLP) Project is a Global Programme which will aim to assist developing countries prevent and reduce marine plastic litter from the maritime transport and fisheries sectors, and identify opportunities for the reduction of plastic uses in both industries.

IMO will lead activities related to the shipping industry, while FAO will lead activities related to the fishing industry with a particular focus on addressing concerns about Abandoned, Lost and otherwise Discarded Fishing Gear (ALDFG).

2 INLAND CAPTURE FISHERIES

Inland capture fisheries have an important role to play in the global challenge to sustainably feed a growing global population. They deliver quality nutrition to some of the world's most vulnerable populations in a manner that is both accessible and affordable. These nutritional and food security benefits are an integral part of the agricultural landscape of these countries; they are also increasingly impacted and changed as countries develop their agricultural water and land resources. Inland capture fisheries and their ecosystem services provide a broad range of benefits for development and contribute directly to the Sustainable Development Goals (SDGs). Despite these contributions, the inland fisheries sector is typically ignored or overlooked in policy and global debates on food security.

2.1 INLAND FISHERY CATCH AND HIDDEN CATCH

FAO reported the global inland fisheries catch reach 11.92 million tonnes in 2018, representing 12.7 percent of total global capture fishery production. The Asian region (excluding China) has the highest inland fishery catch representing 46 percent of the global total. China contributes an additional 18 percent to this (Table 2-1).

Table 2-1: Sub-regional breakdown of inland fishery catch

Subregion	Inland capture fishery catch (tonnes) (2015)	Population	Inland fishery catch per capita (kg/cap/yr)	Percent of global inland fishery catch
South Asia	2,998,809	1,756,042,806	1.71	25
Southeast Asia	2,471,352	648,355,695	3.81	21
China	2,188,954	1,394,165,000	1.57	18
East Asia	36,070	206,795,762	0.17	0.30
Oceania	18,132	38,987,351	0.47	0.15
TOTAL	**7,713,317**	**4,044,346,614**	**1.91**	**64**

Overall, inland fisheries represent 24 percent of the regional total marine and inland fishery catch. This high contribution is a function of the major inland fishery ecosystems and wetlands (including vast areas of managed ricefield ecosystems) that present extensive and productive habitats. It is also linked to high population densities capable of intensively exploiting these resources and a widespread, strong tradition of fish consumption.

Seventeen countries (8 APFIC countries) produce 80 percent of this global inland fishery catch and a further 10 percent of global catch is produced by 12 countries (4 APFIC regional countries). The remaining 10 percent is produced by 122 other countries. The catch of Oceania is largely confined to Papua New Guinea, New Zealand, Australia and Fiji.

Inland fisheries are predominantly small-scale in nature, but large-scale and commercial inland fisheries do make a contribution to livelihoods and food security. There are relatively few examples of these in the APFIC region. Commercial inland fisheries such as the Cambodian 'Dai' fisheries and Myanmar 'Inn' fisheries produce catch destined for extended or specialized commercial value chains (often preserved into salted and fermented products).

Table 2-2: Summary FAO statistics of reported inland fishery catch in the APFIC region and Oceania (2017)

Country	Inland capture fishery catch (tonnes) (2017)	Population (2017)	Per capita inland fishery production (kg/cap/yr)	Percentage of global inland fishery catch (%)
Myanmar	887,320	53,382,581	16.62	7.44
Cambodia	528,493	16,009,414	33.01	4.43
Indonesia	467,531	264,645,886	1.77	3.92
Thailand	190,510	69,209,858	2.75	1.6
Philippines	162,543	105,173,264	1.55	1.36
Viet Nam	158,878	94,596,642	1.68	1.33
Lao PDR	70,900	6,953,035	10.2	0.59
Malaysia	5,177	31,105,028	0.17	0.04
Brunei Darussalam	0	424,473	0	0
Singapore	0	5,612,253	0	0
Timor Leste	0	1,243,261	0	0
Regional sub-total	**2,471,352**			**21**
India	1,593,100	1,338,658,835	1.19	13.36
Bangladesh	1,163,608	159,670,593	7.29	9.76
Pakistan	139,215	207,896,686	0.67	1.17
Sri Lanka	81,870	21,444,000	3.82	0.69
Nepal	21,000	27,627,124	0.76	0.18
Bhutan	16	745,568	0.02	0
Regional sub-total	**2,998,809**			**25**
China	2,186,330	1,386,395,000	1.58	18.33
Taiwan POC	2,624			0.02
China, Hong Kong SAR	0	7,204,000	0	0
China, Macao SAR	0	566,000	0	0
Regional sub-total	**2,188,954**			**18**
Japan	25,222	126,785,797	0.2	0.21
Republic of Korea	5,726	51,466,201	0.11	0.05
Dem. People's Republic of Korea	5,100	25,429,985	0.2	0.04
Mongolia	22	3,113,779	0.01	0
Regional sub-total	**36,070**			**0.3**
Papua New Guinea	13,500	8,438,029	1.6	0.11
Fiji	2,600	877,459	2.96	0.02
Australia	1,161	24,601,860	0.05	0.01
New Zealand	818	4,793,900	0.17	0.01
French Polynesia	53	276,103	0.19	0
Regional sub-total	**18,132**			**0.15**

HIDDEN INLAND FISHERY CATCH

There are plausible reasons to consider that the total global inland fishery catch figure may be an underestimate. Based on modelling of inland fisheries catch using household consumption surveys applied to the 2008 reported figures, total global inland fishery catch was estimated to be 64.8 percent higher (13.93 million tonnes) than the 2008-reported figure (10.3 million tonnes). The confidence interval for this study (11.82 to 16.12 million tonnes) is still in excess of the current globally reported 2015 reported catch (11.47 million tonnes).

INLAND FISHERY CATCH TREND

The growth in global inland fisheries catch over the past decade (up to 2016) has been driven by 34 countries. There are 8 APFIC regional countries that indicated an increasing production trend over the past decade representing 70 percent of the regional inland fish catch (Table 2-3). The principal Asian countries driving this trend were China PR, India, Cambodia, and Indonesia. This may be due to improved assessment and reporting. It may also be due to increasing fishing effort as well as greater enhancement of man-made water bodies.

Table 2-3: Production trends and the relative contribution to the global catch

Catch trend Decade 2007 to 2016	Aggregate catch (tonnes)	Percentage of Asian regional catch	Countries
Increasing catch	5,102,047	70	China, India, Cambodia, Indonesia, Philippines, Pakistan, Sri Lanka, Malaysia
Decreasing catch	323,869	4.4	Thailand, Viet Nam, Japan, Australia, Taiwan Province of China, Mongolia
Stable catch	21,500	0.3	Nepal
No clear trend	1,082,305	14	Bangladesh, Nepal, Republic of Korea, Fiji, New Zealand, French Polynesia
Excluded from analysis	793,571	11	Major countries: Myanmar, Lao PDR, Papua New Guinea,

There were 7 APFIC region countries that indicated decreasing production but represent only 4.4 percent of regional inland fish catch, (the trend in this group is driven by Thailand and Viet Nam).

Several APFIC countries have no discernible trend of increase or decrease in their catch, the largest being Bangladesh. Even in countries that report declining catches, inland fisheries remain extremely important at the subnational level (e.g. the Mekong basin, the Amazon basin) and there is no case for complacency.

Table 2-4: Percentage of global fish catch allocated to major hydrological/river basin

Basin	% of global catch	Basin	% of global catch
Mekong (including Tonle Sap lake)	15.18	Kalimantan (Indonesia)	0.92
Ayayerwady/Irrawaddy	7.82	Huang He (Yellow)	0.71
Yangtze	6.83	Ziya He	0.71
Brahmaputra River and floodplains	5.52	India East coast	0.68
Ganges	3.51	Mahanandi (India)	0.52
Xun Jiang (Pearl)	3.27	Sabarmati (India)	0.46
China coast	2.75	Sri Lanka (all basins)	0.44
Hong (Red)	2.46	India south coast	0.41
Chao Phraya	2.37	Java - Timor (Indonesia)	0.38
Yasai (India)	1.64	Thailand South peninsular (sub-basins)	0.34
Indus	1.56	Cauvery (India)	0.29
Sumatra (Indonesia)	1.42	India West coast	0.23
Philippine (all islands)	1.33	Bay of Bengal Northeast coast	0.23
Salween	1.27	Brahamani	0.22
Krishna (India)	1.23	Japan (all basins)	0.21
Godavari (India)	1.20	Sulawesi (Indonesia)	0.13
Pennar (India)	0.94	India NE coast	0.10

2.1.1 INLAND FISHERY RESOURCES

DISTRIBUTION OF INLAND FISHERIES

The country distribution of inland fisheries catches is worldwide with catches concentrated around rich water resources such as lakes, rivers and floodplains, especially where there are higher population densities of rural people able to exploit these resources. The world's largest inland capture fisheries are particularly concentrated in the tropical and subtropical latitudes of the world. In regions that are economically more developed, the use of inland waters for capture fisheries tends to change to the use of these waters for recreational purposes. The basins of the Asian region, which sustain inland fisheries account for some 68 percent of total global inland fish production (Table 2-4, Figure 2-1).

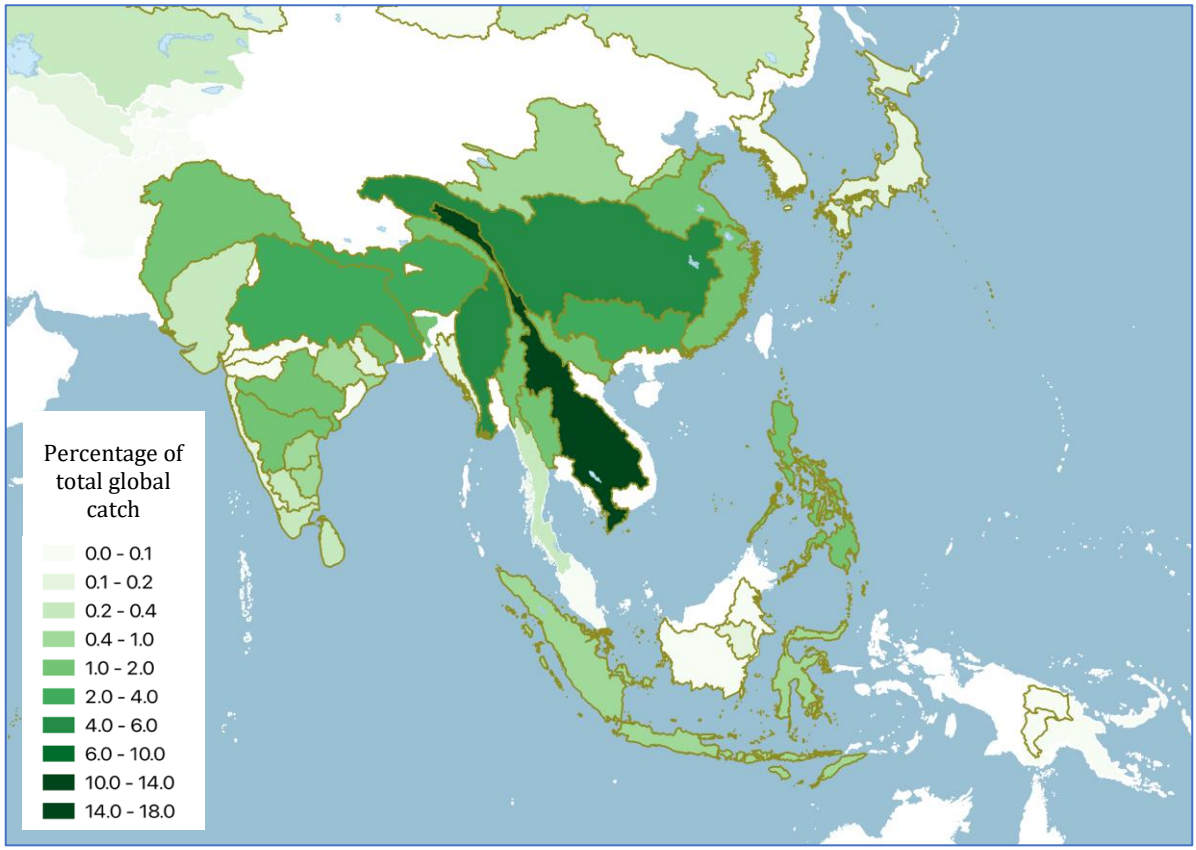
ENHANCED FISHERIES

There is an interface between some aquaculture systems and inland fisheries. This is most evident in the case of stocked systems, especially when the fish have been cultured in aquaculture hatcheries and released to open waters. It is a common activity in many countries in the APFIC region.

There are also systems where the parents are taken from the wild for reproduction and the fingerlings subsequently released back to the same waters. This activity is mainly directed at the enhancement of salmonid fisheries in rivers and lakes (Russia and North America). There are few examples in the Asian region, although release of juveniles raised from wilds adults in hatcheries may occur primarily for conservation purposes.

A further extension of enhanced fisheries towards full aquaculture systems is the introduction of fish to rice fields. Fisheries may also be enhanced through use of aggregation devices and habitat management and enhancement such as brush parks or management of the habitat in breeding grounds. Reporting of these enhanced fisheries may be problematic for statistical purposes and is often treated in aquaculture reporting.

Figure 2-1: Asian river basins with major inland fisheries as percentage of the global inland fishery catch.



Strictly speaking, culture-based fisheries are aquaculture activities, but in this case the stocked fish in the system are the only source of fish that are captured. In reality, it is often a mixture of stocked and wild recruited fish that is harvested.

RECREATIONAL INLAND FISHERIES

There is an average of 6.7 percent of the global population engaged in recreational fisheries in those countries where recreational fishing is a common activity (>174.5 million). There is very little data available for Asian countries, although it seems to be increasingly popular. In many countries, recreational fishing in rural areas may simply be an extension of occasional fishing for food. In peri-urban areas it may be more formalized as a recreational activity.

2.1.2 ENVIRONMENTAL INTEGRITY AND BIODIVERSITY

Freshwaters are one of the ecosystems most heavily impacted by humans. Major impacts on biodiversity include pollution, habitat loss and degradation, draining wetlands, river fragmentation and poor land management. Some of the world's largest inland fisheries come from basins or river systems that are facing severe threats from anthropogenic and natural environmental pressures. Inland fisheries are also strongly influenced by fluctuations in environmental and climate conditions, in addition to the effects of fishing and experience high inter- and intra-annual variation as a result.

Inland fisheries face a number of serious challenges. Decades of overfishing and habitat degradation have led to declines in many inland fisheries. In temperate waters lost fisheries have generally not recovered. In overfished waters in tropical countries, the fisheries are tending towards fast growing, short-lived or opportunist species that have high turnover rates and short recovery periods for biomass rehabilitation. Effort restrictions, habitat protection,

and other management actions have the potential to yield fairly immediate, positive, results in terms of stock recovery. Longer-lived species that have been overfished will take longer to recover, if ever, and will usually require specific additional management actions.

The degraded state of inland fisheries has arisen due to a tendency to focus on increasing system production, (either fish or other food production systems requiring large amounts of water, such as rice). If left unmanaged, fisheries usually develop to a point where the fisheries resources become so degraded that the socio-economic returns are much less than those potentially available. These declining returns affect food security, poverty alleviation, employment and national revenue (and rent). However, experience in several parts of the world has shown that major inland fishery ecological damage can be reversed and that economic waste from inland fisheries can be reduced.

INNOVATIVE WATER MANAGEMENT FOR INLAND FISHERIES

It is vital to recognize that in our efforts to irrigate water-hungry crops for cereals and feeds for livestock, or to provide hydropower energy for burgeoning cities, we are undermining the very basis of an existing and often important food production system. In some cases, it is possible to seek some co-existence or even capture synergies, but elsewhere decisions on trade-offs are necessary and this requires full awareness of who and what this will impact, in terms of livelihoods and food security. Unfortunately, the impacts of irrigation system design on fisheries or the potential for mitigation of the adverse impacts on fisheries or the enhancement of fisheries are more usually considered only after an irrigation system has been completed and has been operational for a while.

Examining irrigation systems for capture fisheries can find solutions to maximize system connectivity, thereby allowing for the unrestrained movement of aquatic animals through different components of the system. Engineering solutions such as fishways, diversion screens and fish friendly regulators offer substantial opportunities to gain productive outcomes for inland fisheries. Water control structures such as weirs and sluices can be designed to be “fish friendly” and aquatic resource refuges/buffer ponds with high levels of connectivity can form part of an overall irrigation system design.

There are also means to extend inland fisheries into man-made environments such as reservoirs and flood control systems.

NON-NATIVE AND INVASIVE SPECIES

Non-native aquatic species can contribute significantly to the production and value in inland fisheries and aquaculture. This is particularly seen in the case of the introduction of tilapia to man-made and natural water bodies in many countries.

The introduction and establishment of non-indigenous fish for recreational fishing is another source. This activity would benefit from more systematic reporting as their potential to become invasive often only becomes apparent a considerable time after the initial introduction.

In all instances, the use of international guidelines on species introductions and a precautionary approach are advised when considering moving species into new areas.

2.1.3 CONTRIBUTION TO SUSTAINABLE DEVELOPMENT

HUMAN NUTRITION AND FOOD SECURITY

Small-scale inland fisheries catch tends to be directed for local human consumption and plays an important direct role in food security in many parts of the Asian region. In particular, those areas which lack access to marine fishery resources and aquaculture.

At least 43 percent (4.9 million tonnes, 2015) of the world's inland fish capture harvest comes from 50 low-income food deficit countries (LIFDCs) (including India, Bangladesh, Nepal and Viet Nam)

At least 11 percent of global inland fishery production (1.3 million tonnes, 2015) comes from landlocked countries (including Lao PDR and Nepal).

Table 2-5 illustrates the catch of inland fish as a proportion of the total national population. It is immediately apparent that a number of countries that may not produce globally significant amounts of inland fish, may still have a production level that is important to the population of that country. The importance of inland fish in Southeast Asia is also clearly revealed when viewed as catch per capita.

Table 2-5: Inland fishery catch per capita population (2013)

Kg catch per capita of population	Country name
10 to 35	Cambodia, Myanmar
5 to 10	Bangladesh, Lao PDR
2 to 5	Sri Lanka, Thailand, Fiji RO, Viet Nam, Philippines
1 to 2	Papua New Guinea, China, Indonesia
0.1 to 1	India, Nepal, Pakistan, New Zealand, Japan, Korea (Dem. People's Rep), Malaysia, French Polynesia, Korea (Republic of)

Inland fish provides nutritional quality to countries where there are otherwise poor diets, due to poverty and limited access to other forms of quality food. Inland fisheries are efficient producer of food, with a far lower resource use footprint when compared with livestock or other protein dense foods. In low GDP countries with inland fisheries, the per capita supply of fish food produced from inland waters is greater than that of marine capture fisheries or aquaculture.

EMPLOYMENT IN INLAND FISHERIES

Throughout Asia inland fisheries play important roles in employment and food provision. For example, in Bangladesh some 10 million people fish and support a total of 50 million household members (WorldFish Center, 2008). In Cambodia 80 percent of the 1.2 million people living around Tonle Sap use the lake and its rivers for fishing (Ahmed *et al*., 1998). Of these people, there are an estimated 496 000 full-time and part-time inland fishers, some of whom are subsistence fishers. In addition, more than 920 000 people are involved in small-scale processing of inland catches. This activity takes place during the peak fishing period after the rainy season, and employment is mainly part time and often organized on a household basis (Thouk *et al*. cited in World Bank, 2012).

Table 2-6: Regional reported data* for inland fishers and sector-disaggregated data

Region	Inland fishers	Post-harvest	Percentage of global total inland fishers
Southeast Asia	9 871 379	1 303 853	58.5
South Asia	2 820 694	4 424 796	16.7
China	755 622	475 000	4.5
Oceania	342	n.a.	0.0
Total	**16 867 282**	**8 326 489**	**100**

Inland fisheries are predominantly rural, small-scale fisheries with limited commercial large-scale fisheries. Inland fisheries are generally less dangerous than marine capture fisheries but, because of the poverty of small-scale inland fishers, there are still problems with child labour and unsafe working conditions in some inland fisheries.

Women in Asia are key players in seafood trading and selling. Most of the estimated 5 000 to 6 000 fish markets throughout the lower Mekong basin are conducted by women (UNEP, 2010). Women are also highly engaged in foraging and gleaning of molluscs, crustaceans, small fish, aquatic plants in shallow waters, in floodplains and rice fields and wetlands as well as in shallow waters of waterbodies and streams. For example, surveys in the lower Mekong basin show that women are often heavily engaged in subsistence fishing and collection of aquatic animals and plants in inland waters. However, as with other data on inland fisheries, this is not always adequately reported.

Table 2-7: Examples of women as fishers around the world

Region	Country	Women's fishing activity	Reference
South East Asia	Cambodia	Some women participate directly in fishing activities with their family members in lakes, rivers and streams. Fish selling is almost exclusively the domain of women. However, despite their pervasive involvement, women's invaluable contribution is often overlooked and undocumented.	Siason *et al*. (2010)
		Tonle Sap	
	Thailand	Women fish or collect fish on lakes using their own boats.	World Bank (2012)
	Lao PDR	Women repair nets and catch fish. Lao women process the fish for preservation, eating and for selling at the markets.	Siason *et al*. (2010)
		Women highly involved in the collection of aquatic animals (ricefields and wetlands)	Meusch *et al.* (2003)
China	Yunnan	Women fish individually or assist men in fishing in Yunnan, China	Yu Xiaogang (2001)
South Asia	India	Hand collection, trapping and scoop gears are used by tribal and scheduled caste women in the wetlands (*beels*) and small waterbodies of Assam.	Baruah (2015)
	Nepal	Women of certain communities, e.g. Tharu, Majhi, Mukhiya and others, follow the traditional practice of catching fish with traditional gears in ditches, swamps, canals and paddy fields in small or large groups.	Siason *et al*. (2010)
	Bangladesh	Tribal women around the Kapati reservoir were involved in fish harvesting, marketing, drying and post-harvest activities such as carrying fish from the pontoon to land, sorting, icing, packing and loading the transport vehicle.	Ahmed, Rahman and Chowdhury, (cited in Suntornratana and Visser, 2003)
		Women are engaged in boat fisheries for hilsa in the Meghna River delta	Naznin (2016)

Women's engagement in inland fisheries is often invisible although they play a significant role in many fisheries. Women are often narrowly associated with post-harvest processing and marketing activity, but they also engage in fishing (Table 2-7).

Women's access to income from fish processing and marketing may have a stronger and more beneficial impact on household incomes than income from fishing by men. Despite their dependence upon the fishery, this may be poorly reflected in fishery management decision-making processes.

THE ECONOMIC VALUE OF INLAND FISHERIES

The economic value of inland freshwater fisheries catches (as reported to FAO) is estimated to be approximately USD 26 billion. A major contribution to this come from Asia (66.1 percent).

It is acknowledged that a significant proportion of the inland catch is "hidden" and therefore unreported, although this proportion has probably reduced over the past few years as a result of improved reporting.

The value of capture fisheries is somewhat dwarfed by the use values generated by recreational fishing. But this value is highly concentrated in North America and Europe, although it is rapidly emerging in many Asian countries.

2.1.4 ASSESSING THE STATUS OF INLAND FISHERIES

In the absence of a management framework and systematic monitoring, catch statistics do not typically provide a particularly reliable indication of the status of an inland fishery, merely an estimate of their contribution to food supply.

Inland fisheries are typically characterized as small-scale, remote, dispersed and informal; these characteristics present challenges when monitoring and evaluating fish catches (Lorenzen *et al*., 2016). This means that validation of actual catches is extremely difficult without a comprehensive national inland fishery monitoring system. Typically, if there is any monitoring of inland fisheries, only the major landing sites (e.g. reservoirs and large waterbodies, or large trap fisheries) in the fisheries are monitored. Dispersed catches from smaller fisheries and extensive floodplain fisheries are generally estimated using crude approximation methods or simply rely on local or expert opinion.

The remote and informal nature of much of the inland fishery sector also creates difficulty in capturing the social and economic contributions from surveys. Fisheries-related activities are often undertaken as part of a diversified livelihood strategy, at times of need and away from home, and such activities are difficult to capture reliably in survey questions (Needham and Funge-Smith, 2014). As a result, significant portions of fish catches are often under-reported and the true value of the sector to society is often invisible (Lynch *et al.*, 2016).

FAO national statistics provide an indication of fish production and consequently fish supply in individual FAO member countries. National inland fishery production statistics provide a record of the overall economic and nutritional contribution of inland fish to the country and is valuable as part of the normal processes of national statistical accounting.

However, they are an aggregate figure for the country and attribution to the source of the production is not provided. The national production figure does not therefore provide much insight to the status of the fisheries that contribute to the production. Long-term trend analyses of national catch are also weak indicators of how well fisheries are managed and the sustainability of the fishing pressure. There are considerable challenges to deriving even an indication of the level of production from many important inland fisheries, let alone detailed assessments as to the condition of the fisheries.

Assessing the status of individual fisheries may provide a clearer picture of how well the world's inland fisheries are managed, as well as their health or status. One possible way to

derive an aggregate picture of the state of the world's inland fisheries resources is to review the state of major inland fishery basins. If these are tracked over time, it should be possible to see the trend in the number of basins across a number of fishery-relevant indicators (e.g. environmental drivers and fisheries production).

Within a country, inland fisheries take place across a wide range of resources and areas and gains in one type of fishery may be offset by losses in another (e.g. declining river and floodplain fisheries production may be balanced or even outweighed by increasing production from stocked waterbodies). This requires monitoring across a range of waterbody and fishery types.

3 SUPPORT TO SMALL-SCALE FISHERIES

3.1 DEFINITION OF SMALL-SCALE FISHERIES

Within capture fisheries, small-scale and large-scale fisheries are usually distinguished and categorized according to a combination of factors such as boat size, fishing gears and practices, fishing areas, and other considerations. The definition of small-scale fisheries varies from country to country and there is no agreed standard definition. Therefore, what may be considered as small-scale in one country could be large-scale in another. The Voluntary Guidelines for Securing Sustainable Small-scale Fisheries in the Context of Food Security and Poverty Eradication[30] (hereinafter referred to as SSF Guidelines), endorsed by the FAO Committee on Fisheries in June 2014, recognize the diversity and dynamism of the small-scale fisheries subsector and emphasize that the subsector encompasses all activities along the value chain, i.e. pre-harvest, harvest and post-harvest. In this regard, the SSF Guidelines underscore the importance of "ascertain[ing] which activities and operators are considered small-scale, and to identify vulnerable and marginalized groups needing attention" which should be "undertaken at a regional, subregional or national level". Such identification as well as the application of the SSF Guidelines should be guided by "meaningful and substantive participatory, consultative, multilevel and objective-oriented processes so that the voices of both men and women are heard."

The questionnaire to monitor the implementation of the Code of Conduct for Responsible Fisheries (CCRF) is sent to FAO Member countries every two years prior to the meeting of the Committee on Fisheries (COFI) and reported at COFI. Since 2015, the CCRF questionnaire contains five questions on small-scale fisheries. Of 14 APFIC Member countries who responded to the 2018 CCRF questionnaire, 36 percent reported that small-scale fisheries (SSF) are legally defined in their country, 36 percent said that SSF are defined but the definition is informal and not legally supported, and the rest (29 percent) reported that SSF are not defined in their country.

3.2 CONTRIBUTION OF SMALL-SCALE FISHERIES

It is widely acknowledged that small-scale fisheries contribute significantly to food security, nutrition, employment and trade in the areas where they are located and beyond. However, it is difficult to estimate the contribution of small-scale fisheries because many countries do not collect sector-specific data for small-scale fisheries. For this reason, the catch from small-scale fisheries as well as the contribution of the small-scale fisheries value chain is oftentimes underestimated and undervalued, and therefore has low priority in social and economic development policy, programmes and initiatives.

In the 2018 CCRF questionnaire, of 10 APFIC Member countries that indicated that small-scale fisheries are legally or informally defined in their country, 90 percent responded that they are not collecting sector-specific data for small-scale fisheries. Ten[31] APFIC Member countries were able to provide percentage estimates of the contribution of small-scale fisheries to the total capture production, and this contribution ranged from 11 percent to 100 percent. Using these percentage estimates, small-scale fisheries in the 10 countries contributed 11.2–13.1 million tonnes to the total capture production, equivalent to 24–28 percent in 2017. In terms of value, eight APFIC Member countries who provided estimates indicated that 11 to 100 percent of the value of the total capture production originates from small-scale fisheries.

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[30] http://www.fao.org/3/a-i4356en.pdf

[31] The agreement with Member States says that never, for any reason, their individual responses should be disseminated by FAO.

Small-scale fisheries not only provide livelihoods for millions of people, but are also considered as a way of life in many parts of Asia. Of eight APFIC Member countries who were able to provide estimates of the percentage of people engaged in the SSF sub-sector in relation to all people involved in capture fisheries activities, seven responded 71 percent and above. For example, for four APFIC countries who were able to provide estimates, the total number of people engaged in the small-scale fisheries sub-sector was 2.8–4.6 million, representing 56–92 percent of the total number of people involved in capture fisheries in those countries. Within the SSF sub-sector, 25–80 percent are estimated to be engaged in fishing activities, 5–40 percent in post-harvest, and 5–65 percent in other related activities. Although full-time fishing activities in small-scale fisheries are male-dominated, with 70–95 percent of men engaged, it is estimated that 5–15 percent of women are engaged in full-time fishing. As regards full-time post-harvest activities in small-scale fisheries, 5–70 percent of men are estimated to be engaged and 30–95 percent of women.

The lack of sector-specific statistics on small-scale fisheries as well as the lack of sex-disaggregated data for both small-scale and large-scale fisheries are constraints in adequately ascertaining the contribution of small-scale fisheries to food security, nutrition and employment. Women are involved in all stages of the capture fisheries supply chain, i.e. pre-harvest, harvest, and post-harvest. Owing to the lack of sex-disaggregated statistics, the contribution of women to each stage of the capture fisheries supply chain is oftentimes not counted and valued, leading to their marginalization in access to productive resources and tools, financial services, and decision-making processes.

Twenty APFIC Member countries had either ratified or acceded to the Convention on the Elimination of All Forms of Discrimination Against Women or CEDAW, widely recognized as an international bill of rights for women. The SSF Guidelines recognize the important roles and contribution of women and men to the small-scale fisheries value chain, and various paragraphs as well as a chapter dedicated to gender equality (Chapter 8), provide guidance to States, civil society organizations and small-scale fishers towards achieving gender equality and women's empowerment. A handbook, "Towards gender-equitable small-scale fisheries governance and development," is available to assist governments and fisher/fishworker and civil society organizations in applying the provisions of the SSF Guidelines on gender equality.

FAO continues to work with SEAFDEC on supporting gender-sensitive value chain analysis and with selected Member countries to implement the SSF Guidelines.

Furthermore, in order to understand better and support the small-scale fisheries sector, FAO, in collaboration with WorldFish and Duke University, is preparing a study, "Illuminating Hidden Harvests: the contribution of small-scale fisheries to sustainable development (IHH)". The methodology for this includes country case studies based on secondary data, including from the following APFIC Member countries: Bangladesh, Cambodia, China, India, Indonesia, Philippines, Sri Lanka, Thailand, United Kingdom, United States of America, and Viet Nam. The IHH is expected to be released in 2021. [32]

3.3 VULNERABILITY TO SHOCKS, DISASTERS AND CLIMATE CHANGE

The vulnerability of small-scale fishers, fish workers and fishing communities can be due to their geographical location, social and economic situation, demographic characteristics, and the condition of the fishery and natural resources on which they depend. Other sources of vulnerability of small-scale fishers and fish workers relating in particular to their socio-economic situation include debt burden, increase in the cost of fishing operations, reduction in the price of their catch, occupational health risks, lack of access to basic services, and exclusion

[32] http://www.fao.org/voluntary-guidelines-small-scale-fisheries/resources/detail/en/c/1366529/

from decision-making processes. Another source of vulnerability could be the overfished condition of the fishery resources. Whereas poverty characterizes most small-scale fishing communities in APFIC Member countries, such fishing communities are not homogeneous, and some members may be better off than others, e.g. middlepersons and fish traders. However, because of their geographical location, their dependence on aquatic resources and their low adaptive capacity, the fishing communities in which they belong may be vulnerable to floods, storm surge, strong winds, extreme weather events and sea level rise, which could affect majority of the population.

In addition to the sources of vulnerability already mentioned, climate variability and change could affect the growth of fish habitats such as mangroves, coral reefs, and seagrass beds and that of fish and shellfish as well. The distribution of fish stocks could also be affected, with fish moving when water temperature changes. In this regard, small-scale fishers and fish workers would be negatively affected, and more so the old men and women depending on mangroves for food and livelihoods as well as women collecting shells and other aquatic plants and animals in the intertidal areas.

In light of the aforementioned vulnerabilities that affect fishers, fish workers and the ecosystems they depend on, there is an urgent need to strengthen the (adaptive) capacity of communities, i.e. the conditions that enable people to anticipate and respond to change/stresses, to minimize the consequences, to recover, and take advantage of new opportunities (Cinner et al., 2018).[33] In particular a key determinant is the availability of capital (for example, financial, social and human).

Table 3-1 presents the social assistance and social insurance schemes available to small-scale fishers in some APFIC Member countries. Among the reasons preventing fishing communities from accessing social protection measures include illiteracy, inordinate delay in receiving the benefits under social protection schemes and corruption, inadequate contribution of beneficiaries (to contributory schemes), poor targeting of beneficiaries, and lack of proper application and enforcement by government agencies of ensuring rights related to access, tenure, use and management of land and natural resources.[34]

In 2019, finance and fisheries experts from Bangladesh, China, India, Indonesia, Japan, Philippines, Thailand, United Kingdom, Canada and the United States of America met at a regional expert workshop, to discuss ways to improve access to financial services for small-scale fishers in Asia. The event was organized by the Asia-Pacific Rural and Agricultural Credit Association (APRACA) in close collaboration with FAO. It contributed to producing practical guidelines[35] in support of better access to financial services, and to design a capacity building programme for financial services to small-scale fisheries.

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[33] Cinner, J.E., Adger, W.N., Allison, E.H., Barnes, M.L., Brown, K., Cohen, P.J., Gelcich, S., et al. 2018. Building adaptive capacity to climate change in tropical coastal communities. Nature Climate Change, 8(2): 117–123. (also available at https://doi.org/10.1038/s41558-017-0065-x).

[34] International Collective in Support of Fishworkers, 2017. Fostering sustainable fisheries management and reducing poverty: The role of social protection of fishers and fishing communities. In: FAO. 2017. Social protection to foster sustainable management of natural resources and reduce poverty in fisheries-dependent communities. Report of the FAO Technical Workshop, 17–18 November 2015, Rome, pp. 37-190. FAO Fisheries and Aquaculture Department. Rome, Italy.

[35] Tietze U., van Anrooy, R. 2019. Guidelines for increasing access of small-scale fisheries to insurance services in Asia. A handbook for insurance and fishieries stakeholders. In support of the implementation of the Voluntary Guidelines for Securing Sustainable Small-Scale Fisheries in the Context of Food Security and Poverty Eradication. Rome, FAO. Available at http://www.fao.org/3/ca5129en/ca5129en.pdf

Table 3-1: Social assistance and social insurance schemes available to small-scale fishers, fishworkers, fishing communities and indigenous peoples, 2015.

	India (State**)	Indonesia	Philippines	Sri Lanka	Thailand	Cambodia
Social assistance schemes (in cash or kind)						
Disability allowance	AP, KAR, KER, MAH, MP, TN		✓			✓
Sickness allowance		✓	✓			✓
Employment injury allowance	KER	✓	✓			✓
Medical allowance	KAR, KER, MAH	✓	✓			✓
Maternity allowance	KER, MAH, MP	✓	✓			✓
Unemployment allowance	KER					✓
Old age pension	KAR, KER, MAH, MP	✓			✓	✓
Survivors' pension	KAR, KER, MP	✓				✓
School feeding or nutritional supplements	KAR, KER, MAH, MP	✓	✓		✓	✓
Natural disaster compensation	KAR, KER MAH, MP	✓	✓		✓	✓
Fisheries/fish plant closure allowance	KER					✓
Fishery failure assistance	KAR, MAH, TN	✓			✓	
Fishing holiday relief assistance	KAR, KER, TN					
Boat/fisher repatriation assistance			✓		✓	✓
Assistance to families of fishers arrested or detained or deceased in other countries for fishery violations	TN	✓			✓	✓
Worker adjustment payments (e.g. payment to assist displaced fishers and fishery workers to find alternative employment)	KER				✓	✓
Social insurance schemes						
Unemployment insurance		✓				
Accident insurance	AP, KAR, KER, MA, MP, TN	✓	✓	✓	✓	✓
Accidental death insurance	AP, KAR, KER, MAH, MP, TN	✓	✓	✓	✓	✓
Health insurance	KER, KAR	✓	✓		✓	✓
Life insurance	KAR, KER, MAH, MP		✓		✓	✓
Maternity health insurance	KER, TN	✓	✓		✓	
Retirement insurance	KER, KAR		✓			

**Indan states: Andhra Pradesh (AP), Karnataka (KAR), Kerala (KER), Maharashtra (MAH), Madhya Pradesh (MP), Tamil Nadu (TN)

Source: International Collective in Support of Fishworkers, 2017. Fostering sustainable fisheries management and reducing poverty: The role of social protection of fishers and fishing communities. In: FAO. 2017. Social protection to foster sustainable management of natural resources and reduce poverty

in fisheries-dependent communities. Report of the FAO Technical Workshop, 1 –18 November 2015, Rome, pp. 37-190. FAO Fisheries and Aquaculture Department. Rome, Italy.

Recent research has highlighted that developing communities' capacity is not only about having assets/resources at hand, but it is also about having the willingness and capability to turn these resources into action. Thus Cinner et al. (2018) encourage local and national governments, development agencies, and non-governmental organizations to build communities' capacity across five key domains. These are: (1) as above mentioned, the capital/assets (financial, social and human) that people can draw upon in times of need; in addition to, (2) the flexibility for individuals or organizations/institutions to change strategies (including rules, boundaries); (3) the ability to organize and act collectively (e.g. to exchange information or promote cooperation) ; (4) learning to recognize and respond to change; and (5) the agency to determine whether to change or not. Recognizing that these domains are cross cutting, Poulain, Himes-Cornell and Shelton[36] (2018) further suggest to use the following categorization as part of an FAO fisheries and aquaculture adaptation toolbox, which split adaptation to climate change in particular, into three non-mutually exclusive areas as follows:

1. Institutional adaptation: the actions of public bodies, that address policy, legal and institutional issues including public investments and incentives; they also include the planning, and management of fisheries and aquaculture in a manner that addresses the dynamic nature of natural systems and societal needs in the face of climate change, following the principles of the ecosystem approach to fisheries or the ecosystem approach to aquaculture.
2. Livelihood adaptation: a mix of public and private activities, within or among sectors, most commonly through diversification strategies within or outside the sector to reduce vulnerability.
3. Risk reduction and management for resilience: a mix of public and private activities that promote early warning and information systems, improve disaster risk reduction (DRR) strategies and enhance response to shocks (Watkiss, Ventura and Poulain, 2019[37]).

This adaptation toolbox is being used in the Philippines to support partner countries identify and implement adaptation pathways (under the FAO GCP/GLO/959/NOR project).

3.4 MANAGEMENT OF SMALL-SCALE FISHERIES

Registration of small-scale fishing vessels is a requirement in APFIC Member countries, but licensing may not be required. Where registration and licensing are required, these activities are often under the responsibility and jurisdiction of different government agencies or levels (e.g. local government units) making coordination between them a challenge. Moreover, the regulations for registration and licensing may not be adequately enforced. In this regard, the

[36] Poulain, F., Himes-Cornell, A. and C. Shelton. 2018. Methods and tools for climate change adaptation in fisheries and aquaculture. In: Barange, M., Bahri, T., Beveridge, M.C.M., Cochrane, K.L., Funge-Smith, S. & Poulain, F. eds. 2018. Impacts of climate change on fisheries and aquaculture: synthesis of current knowledge, adaptation and mitigation options. FAO Fisheries and Aquaculture Technical Paper No. 627, pp. 535-566, Rome, FAO.

[37] Watkiss, P., Ventura, A. and Poulain, F. 2019. Decision-making and economics of adaptation to climate change in the fisheries and aquaculture sector. FAO Fisheries and Aquaculture Technical Paper No. 650. Rome, FAO.

total number of small-scale fishing vessels and their associated fishing gears and practices is not known. In addition to this, catch reporting may not be required. Consequently, small-scale fisheries contribute to domestic illegal, unreported and unregulated (IUU) fishing through the use of prohibited fishing gears and fishing during closed season and in closed areas, among others. Small-scale fisheries have also the potential to contribute to IUU fishing through non-reporting and under-reporting of the catch.

The lack of data on the number of fishing vessels and gear as well as that of the catch are among the constraints to the development, implementation and monitoring of robust fisheries management plans in small-scale fisheries in many APFIC Member countries.

In recent years, there has been an uptake of the ecosystem approach to fisheries management (EAFM) and capacity at the national and local levels is gradually being developed. Fisheries management plans using EAFM are being developed and initiated by APFIC Member countries and through projects and programmes being implemented among others, by SEAFDEC and its Member countries. FAO contributes in developing the training and implementation capacity through its projects funded by the Global Environment facility, such as the Bay of Bengal Large Marine Ecosystem (BOBLME) project, Indonesian Sea Large Marine Ecosystem (ISLME) project, and FishAdapt: Strengthening the adaptive capacity and resilience of fisheries and aquaculture-dependent livelihoods in Myanmar.

In addition, co-management is gaining acceptability among governments as a way to improve and strengthen fisheries management, such as in Myanmar and Viet Nam, where the development and implementation of EAFM co-management plans are promoted.

3.5 DEMOGRAPHIC CHANGE IN FISHING COMMUNITIES

In a study of fishing communities in Japan, Miki et al. (2018)[38] found that the number of fishers and fish workers in fishing communities, both men and women, is decreasing, and also that the population in these communities is ageing. The study also showed that the rate of ageing in fishing communities is higher than that of the national average. In ASEAN Member States, it is projected that by 2035, the percentage of the population over 60 years old will be 21 percent in Brunei Darussalam; 12 percent in Cambodia; 15 percent in Indonesia; 9 percent in Lao PDR; 16 percent in Malaysia; 15 percent in Myanmar; 11 percent in the Philippines; 34 percent in Singapore; 30 percent in Thailand; and 20 percent in Viet Nam.[39]

FAO, in collaboration with the Network of Aquaculture Centers in Asia-Pacific (NACA) organized a regional consultation on "Demographic changes in fishing communities in Asia," on 6-7 November 2019 in Bangkok, Thailand. During the presentation, Parappurathu (2019)[40] showed that in 2017, 16.1 million people are engaged in fisheries and allied activities in India, of which 65.4 percent are males and 34.6 are females. The presentation revealed, among other things, that between 1980 and 2016, there has been a steady increase in the number of fisherfolk villages, a moderate decline in fish landing centres, a notable increase in the number of fisher households, as well as an increase in poverty rate (between 2010 and 2016). However, although there had been an increase in the total fisherfolk population between 1980 (1.8 million) and

[38] Miki, N, Soejima, K, and I Seki. 2018. Changes in fishing communities and fisher women in Japan. Presentation during the 7th Global Conference on Gender in Aquaculture and Fisheries. Expanding the Horizons. 18-21 October 2018, Asian Institute of Technology, Thailand.

[39] Zen, F. 2017. Wither social protection and human development in an integrating ASEAN? In Baviera, A. and Maramis, L. 2017. ASEAN@50. Volume 4. Building ASEAN Community: Political-Security and Socio-cultural Reflections, pp. 337-345. Economic Research Institute for ASEAN and East Asia.

[40] Parappurathu, S. 2019. Demographic changes in fishing communities in India. Presentation at the NACA/FAO Workshop on demographic changes in fishing communities, 6-7 November 2019, Bangkok, Thailand.

2016 (3.7 million), there had been a decrease between 2010 (almost 4 million) and 2016. Literacy rates for fisherfolk had also improved but these are still lower than the national average. The percentage of the population living below the poverty line among fisherfolks is twice as high as the national average (29.5 and 61 percent, respectively).

In Indonesia, Koeshendrajana (2019)[41] revealed that there had been a decrease in the number of fisher households between 2003 and 2018, from 1.6 million to 780 037. In terms of the number of inland fishers, there had been a decrease from 2.7 million in 2012 to 2.6 million in 2016; for marine fisheries, from 2.27 million in 2012 to 2.26 million in 2016. Many fishers are in the 40-49 age group; however, there is an increasing number of fishers in the 50-59 and over 60 age group, with many of them using non-motorized fishing vessels.

In a case study in Cambodia and Thailand, Kusakabe[42] (2019) found that in Thailand, young people are not attracted to fishing as an occupation, the number of fishers is decreasing, and fishing communities are moving towards ageing communities. However, in Cambodia, young people still remain in fishing but there are increasing opportunities outside of fishing that drive them to leave the fishing communities.

In an overexploited fishery, a decreasing number of fishing households and fisher population may be good for the fishery resources to recover. However, these trends in combination with an ageing population may have implications on fisheries management, livelihoods diversification, and adaptation to climate change, among others. Moreover, these trends may also pose challenges to the identity of fishing communities. More information is needed on the demographic change and the drivers, impacts and outcomes of such demographic change in fishing communities.

3.6 SUSTAINABLE DEVELOPMENT GOAL 14.B

SDG indicator 14.b.1 measures the "Progress by countries in adopting and implementing a legal/regulatory/policy/institutional framework which recognizes and protects access rights for small-scale fisheries." It is aimed at ensuring countries provide equitable access for small-scale artisanal fishers to marine resources and markets.

FAO is supporting its member countries in working towards the achievement of the Sustainable Development Goals, including SDG target 14.b. Reporting against this SDG target is based on three questions in the FAO Code of Conduct for Responsible Fisheries (CCRF) questionnaire.

The first question is, "Are there any laws, regulations, policies or strategies that specifically target or address the small-scale fisheries sector?" Table 3-2 shows the responses to this question for the 2018 CCRF questionnaire.

Table 3-2: Responses to the question, "Are there any laws, regulations, policies or strategies that specifically target or address the small-scale fisheries sector?" in the 2018 CCRF questionnaire

	Of 14 APFIC Member countries who responded to the question
Laws	8 (57 percent)
Regulation	8 (57 percent)
Policy	11 (78 percent)
Plan/strategy	9 (64 percent)

[41] Koeshendrajana, S. 2019. Demographic change in fishing communities of Indonesia. Presentation at the NACA/FAO Workshop on demographic changes in fishing communities, 6-7 November 2019, Bangkok, Thailand.

[42] Kusakabe, K. 2019. Study on demographic changes in fishing communities in Cambodia and Thailand. Presentation at the NACA/FAO Workshop on demographic changes in fishing communities, 6-7 November 2019, Bangkok, Thailand.

The second question is, "The Voluntary Guidelines for Securing Sustainable Small-scale Fisheries in the Context of Food Security and Poverty Eradication (SSF Guidelines) were endorsed by COFI in June 2014. Does your country have a specific initiative to implement the SSF Guidelines?"

For the 2018 CCRF questionnaire, six APFIC Member countries responded positively that they have a specific initiative to implement the SSF Guidelines (see Table 3-3), and four reported that they do not have. All four who did not have specific initiatives indicated that they intend to implement the SSF Guidelines.

Table 3-3. Specific initiatives to implement the SSF Guidelines, 2018 (from the responses to the 2018 CCRF questionnaire)

Specific initiative	Of 6 APFIC Member countries who responded that they have specific initiatives
Improving tenure security for small-scale fishers and fish workers in accordance with SSF Guidelines paras 5.2-5.12	3 (50 percent)
Supporting small-scale fisheries actors to take an active part in sustainable resource management in accordance with SSF Guidelines paragraphs 5.13-5.20	5 (83 percent)
Promoting social development, employment and decent work in small-scale fisheries in accordance with SSF Guidelines paragraphs 6.2-6.18	4 (67 percent)
Enhancing small-scale fisheries value chains, post-harvest operations and trade in accordance with SSF Guidelines paragraphs 7.1-7.10	5 (83 percent)
Ensuring gender equality in small-scale fisheries in accordance with SSF Guidelines paragraphs 8.1-8.4	4 (67 percent)
Addressing disaster risks and climate change in small-scale fisheries in accordance with SSF Guidelines paragraphs 9.1-9.9	4 (67 percent)
Strengthening institutions in support of SSF and to promote policy coherence, coordination and collaboration in accordance with SSF Guidelines paragraphs 10.1-10.8	4 (67 percent)
Improving information, research and communication on the contribution of SSF to food security and poverty eradication in accordance with SSF Guidelines paragraphs 11.1-11.11	4 (67 percent)
Implementing capacity development of fisheries organizations and other stakeholders in accordance with SSF Guidelines paragraphs 12.1-12.4	3 (50 percent)
Establishing or improving monitoring mechanisms and promoting SSF Guidelines implementation in accordance with SSF Guidelines paragraphs 13.1-13.6	2 (33 percent)

The third question is, "Does your country have mechanisms through which small-scale fishers and fish workers contribute to decision-making processes?" Ten APFIC Member countries reported that they have (Table 3-4), and two responded that they do not have. Of the ten who responded that they have, six reported that the mechanisms encourage the active participation of women.

Table 3-4: Mechanisms through which small-scale fishers and fish workers contribute to decision-making processes (from the responses to the 2018 CCRF questionnaire)

	Of 10 APFIC Member countries who responded that they have mechanisms
Existence of advisory/consultative body to the Ministry/Department of Fisheries in which fisher/fishworker participate (representation at national or provincial level)	10 (100 percent)
Involvement of small-scale fishers in fisheries management (representation at fishery level)	10 (100 percent)
Involvement of fishers and fishworkers in data collection and research	8 (80 percent)
Involvement of fishers in monitoring, surveillance and control	10 (100 percent)
Involvement of fishers and fishworkers in local development processes (e.g. councils, etc.)	8 (80 percent)

The responses showed that more work needs to be done with regards to the formulation of laws, policies and strategies specifically targeting small-scale fisheries as well as on specific initiatives to implement the SSF Guidelines, including mechanisms to encourage the active participation of women. Furthermore, to be able to get a good picture of the achievement of SDG 14.b, there is a need to increase the response rate and encourage Member countries to respond to the CCRF questionnaire.

FAO, as custodian of SDG indicator 14.b.1, has developed an e-learning course to assist Member countries in assessing this indicator, which can be accessed at https://elearning.fao.org/course/view.php?id=348&lang=en

3.7 INTERNATIONAL YEAR OF ARTISANAL FISHERIES AND AQUACULTURE 2022

2022 has been declared by the United Nations General Assembly as the International Year of Artisanal Fisheries and Aquaculture (IYAFA), with FAO as lead agency. The overall goal of IYAFA 2022 is to promote the sustainable development of small-scale fisheries and aquaculture food systems to enhance the wellbeing of producers as well as consumers.[43] The main objectives are:

[43] Draft planning roadmap for the international year of artisanal fisheries and aquaculture 2022. COFI/2020/Inf.12.2. http://www.fao.org/3/nd951en/nd951en.pdf

- Enhance global awareness about, understanding of, and action to support the contribution of small-scale fisheries and aquaculture to sustainable development, and more specifically in relation to food security and nutrition, poverty eradication and the use of natural resources; and
- Promote dialogue and collaboration between and among small-scale fishers, fish farmers, fish workers, governments and other key partners along the value chain, as well as to further strengthen their capacity to enhance sustainability in fisheries and aquaculture.

An International Steering Committee has been established with representation from each FAO region to support the planning and celebrations of IYAFA. Member countries as well as their regional organizations are invited to engage in the planning and celebrations of IYAFA. More information about IYAFA 2022 can be accessed at http://www.fao.org/artisanal-fisheries-aquaculture-2022

3.8 INFORMATION AND COMMUNICATION TECHNOLOGIES FOR SMALL-SCALE FISHERIES

The right information reaching the right audience at the right time has the potential to be life changing and empowering. The collection, analysis, sharing and accessing of information in small-scale fisheries has the potential to bridge the science-policy divide, provide equal opportunities and economic benefits for fisheries value chain actors, and save lives and livelihoods. Within the context of participation, equitable access, appropriateness, transparency, and accountability, information and communication technologies (ICTs) have a critical role in this process of collection, analysis and dissemination of data and information for the sustainable management and development of small-scale fisheries.

ICTs traditionally refer to television, telephone and radio but now include digital technologies, sensors and services connected to the Internet or the cloud.[44] Information and communication technologies can be powerful tools for supporting the implementation of the Voluntary Guidelines for Securing Sustainable Small-Scale Fisheries in the Context of Food Security and Poverty Eradication (SSF Guidelines) and advancing the achievement of the Sustainable Development Goals (SDGs).

Table 3-5: Examples of information and communication technologies (ICTs) for small-scale fisheries

Benefit/purpose	Country/region	Information Communication Technology application*
Management, tenure and ecological sustainability	Timor Leste	PeskAAS: A near real-time monitoring system for small-scale fisheries
		Information System on Small-Scale Fisheries
	Lakshadweep, India	Open Data Kit for community fisheries monitoring
		Abalobi (Fisher app, Monitor app, Manager app)
		Voyage data recorder
Well-being, decent work and gender equality	India	Fisher Friend Mobile App mKrishi Fisheries app WhatsApp groups VHF radios
		Hi-Chat application
	Bangladesh	bKash Live and pre-recorded videos for training Meena Communication Initiative Meena Game
Value chains, benefit distribution and poverty alleviation		Trafiz, a mobile catch documentation application
		Blockchain initiatives in fisheries
		Enhanced Fish Market Information Service (EFMIS)
		Abalobi (Co-op tool, Marketplace app)

*ICTs may have more than one use.

Source: FAO and WorldFish. 2020. Information and communication technologies for small-scale fisheries (ICT4SSF) - A handbook for fisheries stakeholders. In support of the implementation of the Voluntary Guidelines for Securing Sustainable Small-Scale Fisheries in the Context of Food Security and Poverty Eradication. Bangkok. https://doi.org/10.4060/cb2030en

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FAO and WorldFish recently released a joint publication, *Information and communication technologies for small-scale fisheries (ICT4SSF): A handbook for fisheries stakeholders in support of the implementation of the Voluntary Guidelines for Securing Sustainable Small-Scale Fisheries in the Context of Food Security and Poverty Eradication*.

The publication showcases examples of ICTs (see Table 3-5) and looks at their background, context, process, participation, capacity building, as well as achievements and failures, broader outcomes and sustainability, and key lessons and recommendations.

Whereas ICTs have the potential to empower small-scale fisheries actors and communities, ICTs can also be instruments of exclusion and marginalization, widen existing gender and other inequalities, and deepen the geographical and rural-urban divide. Information and communication technologies could reinforce existing inequalities and worsen the situation of small-scale fisheries value chain actors. Many small-scale fishing communities are remote and lack access to basic services such as clean water, health, education, and electricity. The intersection among gender, socioeconomic status, literacy, (dis)ability, and age could pose barriers to the successful implementation and adoption of ICTs for small-scale fisheries. To address these concerns and issues, Table 3-6 presents guide questions that may assist governments, development workers and relevant stakeholders in developing and evaluating ICTs for small-scale fisheries.

Table 3-6: Guide questions to frame the evaluation, design and development of information and communication technologies for small-scale fisheries (ICT4SSF) initiatives as a platform that enables broader human-rights objectives of the SSF Guidelines according to the three categories of use.

Category of use	Guiding questions for assessment/evaluation
Management, tenure and ecological sustainability	
1.1 Catch data, monitoring, analysis and management 1.2 Fisheries effort tracking	• Who is providing/generating the data? Who owns it? Who holds it? • Does the data include gendered traditional knowledge? • Will users trust the source of the data? Is there a way to use technology to amplify local efforts? • How will data be checked and validated to ensure accuracy? • Can the technology be used to both share and collect information? • How can the technology increase insights and trust from fishers and be used to set targets, create strategies and track progress on improving well-being and governance? • Are initial and ongoing costs of the technology and data sustainable for small-scale fisheries actors? • Is it using a platform that stakeholders use or are already familiar with? • What are the user benefits to incentivize and encourage continued use? • Are there issues of literacy or awareness that could influence understanding, uptake and benefit sharing? • How will the data be used for decision-making? Is the process transparent and inclusive? • Is the technology a shared and multipurpose platform, or can it interact with them?
Well-being, decent work and gender equality	
2.1 Extension and Information services, networking and facilitation 2.2 Safety at sea,	• Who are the users? What are their expectations and needs? • What are the priorities and aspirations of women and men users for their own social, economic and environmental well-being? • Are there issues of literacy or awareness that could influence understanding, uptake and benefit sharing? Will any groups be excluded or disadvantaged?

reducing risk, disaster response and preparedness	• Are initial and ongoing costs of the technology sustainable for small-scale fisheries actors? Is it using a platform that stakeholders use or are already familiar with? • Does the technology build on local systems and infrastructure or use a platform that stakeholders are already familiar with and trust? • Will users trust the information provider? Is there a way to use the technology to amplify local efforts to build trust and legitimacy? • Is the technology a shared and multipurpose platform, or can it interact with them?
Value chains, benefit distribution and poverty alleviation	
3.1 Value chains, fair benefit distribution and post-harvest preservation 3.2 Traceability	• Who are the users? What are their expectations and needs? • Does the technology facilitate pathways for financial inclusion? • How will users apply the technology in their established networks transactions? • Does the system secure rights to data privacy and protection? • Are payment mechanisms selected for recipient empowerment? • Are there any requirements of information held by private sector companies or individuals? • What are the user benefits to incentivize and encourage continued use? • Are initial and ongoing costs of technology and communication sustainable for small-scale fisheries actors? Will these costs exclude any groups? • Are there issues of literacy or awareness that could influence understanding, uptake and benefit sharing? Will any groups be excluded or disadvantaged? • Does the technology build on local systems and infrastructure or use a platform that stakeholders are already familiar with? • Is the technology a shared and multipurpose platform, or can it interact with them?

Source: FAO and WorldFish. 2020. Information and communication technologies for small-scale fisheries (ICT4SSF) - A handbook for fisheries stakeholders. In support of the implementation of the Voluntary Guidelines for Securing Sustainable Small-Scale Fisheries in the Context of Food Security and Poverty Eradication. Bangkok. https://doi.org/10.4060/cb2030en