Programme for Sustainable and Inclusive Growth in the Fisheries Sector: Capture Component (CAPFISH-Capture)

Catch Monitoring Assessment Survey of Marine Fisheries Production at Landing Sites in Cambodia

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ANNUAL STATISTICAL REPORT OF MARINE FISHERIES PRODUCTION IN 2022

Prepared: Marine Fisheries Research and Development Institute (MaFReDI)

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Fisheries Administration (FiA). 2023. 2022 Annual Statistical Report for Marine Fisheries Production in Cambodia. Marine Fisheries Research and Development Institute of the Fisheries Administration, Phnom Penh, Cambodia. 37 pages.

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Executive Summary

The scientific Fish Catch Monitoring Assessment Survey (FCMAS) was executed diligently over an extensive 8-month period in 2022, undertaken by the dedicated personnel from MaFReDI, with essential support from FiAC staff. Encompassing all 8 targeted landing sites across the four coastal provinces, the survey yielded valuable insights from a robust sample of 408 small-scale and 1383 middle-scale vessels, resulting in 1791 landings documented for the year.

Noteworthy is the absence of significant seasonal variation in the recorded catches, though there were occasional peaks in May and July, primarily attributed to chance events of landings by encircling seines and middle-scale trawlers. Predominantly, trawlers accounted for nearly 60% of the total recorded weight, with encircling seines (8.7%) and fish gillnets (6.2%) trailing at a considerable distance. In terms of catch per unit effort (CPUE), trawlers demonstrated the highest performance, boasting an impressive figure of over 210 kg/day, trailed by halfbeak gillnets (151 kg/day) and mackerel gillnets (101 kg/day).

Fishing effort remained consistently high, ranging from 17 to 21 fishing days per month, with the only exceptions observed in Kep, where all non-trawl operations exhibited lower effort, and in Kampot, where middle-scale vessels exceeding 18 meters displayed notably higher fishing effort than in other provinces.

Among the various species caught, Shorthead anchovy dominated the landscape, representing an astounding 31% of the total catch. Other unspecified fish contributed 12%, while trash fish accounted for 8%. Prawns and swimming crabs each contributed approximately 4%.

A closer examination of the operating costs revealed that fishing operations in Kampot and Kep were predominantly profitable, while all trawler operations in Koh Kong and Preah Sihanouk faced challenges in this aspect. Notably, salary and fuel costs emerged as the largest components of the operational expenses for all vessel-gear classes.

Based on the comprehensive data collected and assessment of 80% active fishing vessels, the total estimated catch for 2022 stands at an impressive 232,755 MT.

In conclusion, the report highlights several recommendations to enhance the FCMAS, including the involvement of FiAC staff in data collection and validation. These proposed improvements are set to be implemented throughout 2023, promising to further refine the accuracy and depth of future assessments.

Table of Contents

Acronyms

AP	Aquatic Plants
CAPFISH	Cambodia Programme for Sustainable and Inclusive Growth in the Fisheries
CPUE	Catch per Unit of Effort
DPFIC	Department of Planning, Finance and International Cooperation
EU	European Union
FAC	Fishing Activity Coefficient
FAO	Food and Agriculture Organisation
FCMAS	Fish Catch Monitoring Assessment Survey
FiA	Fisheries Administration
FiAC	Fisheries Administration Cantonment
GFC	Gross Cash Flow
GP%	Gross Profit magin
kg	Kilogram
KoBo	
MAFF	Ministry of Agriculture, Forestry and Fisheries
MaFReDI	Marine Fisheries Research and Development Institute
MEF	Ministry of Economy and Finance
MFMP	Marine Fisheries management Plan
MT	Metric Ton
NA	Not Applicable
nei	not elsewhere included
NIS	National Institute for Statistics
OAA	Other Aquatic Animals
RGC	Royal Government of Cambodia
RPOA	Regional Plan of Action
SD	Standard Deviation
SEAFDEC	South East Asian Fisheries Development Centre
SES	Socio-Economic Survey
UNCLOS	United Nations Conference on Law of the Sea
UNFSA	United Nations Fish Stock Agreement
USD	United States Dollars
VMS	Vessel Monitoring System
WSIM	Working Group on Statistics and Information Management
$\varepsilon\%$	Relative Standard Error

1. Introduction and Methodology

MaFReDI, with technical assistance from FAO CAPFISH project under EU budget support, is currently piloting scientific catch monitoring at marine landing sites in the four coastal provinces in Cambodia. The aim is to obtain better qualified information on catch and effort by marine fisheries in Cambodia, and to develop a sustainable catch monitoring methodology for implementation by provincial Fisheries Administration Cantonments, supported by MaFReDI.

Data collection was from May-December 2022, with full coverage of all target landing sites in the four coastal provinces. The analysis is largely based on the monthly statistical reports, but with the addition of a total catch estimate, reported catch for species included under the RPOA and the UNFSA, socio-economic data and recommendations for adjustments to the methodology.

A description of the methodology can be found in:
Fisheries Administration (FiA). 2021. Manual for Fish Catch Monitoring Assessment for Marine Fisheries in Cambodia. Marine Fisheries Research and Development Institute (MaFReDI) of the Fisheries Administration (FiA), Phnom Penh, Cambodia. 38 pages.

2. Statistical tables and results

Data collection during 2022 resumed from May onwards and has seen a good coverage for small- and middle-scale landings at all target landing sites. The low number of small-scale landings at some landing sites depends on the classification of trawlers as middle-scale vessels, regardless of size. The proportion reflects the relative occurrence of small- and middle-scale fisheries at the landing sites covered. The currently available data is best used by combining the data by vessel class for the entire marine fisheries. The statistical accuracy for calculating estimated CPUE, combining vessel-gear classes by provinces is investigated in more detail in Table 2.

Table 1.   Number of random selected landings, recorded by vessel class and landing site.

Province	Landing site	May-Jun		Jul-Sep		Oct-Dec		Annual		
		Small	Middle	Small	Middle	Small	Middle	Small	Middle	%Small
Koh Kong	Oknha Lyon Phat	8	48	9	75	21	62	38	185	17.0%
	Thmasar	31	25	40	44	45	39	116	108	51.8%
Preah Sihanouk	Stueng Hav		56		83	1	83	1	222	0.4%
	Tumnup Rolok	1	55	5	79	16	68	22	202	9.8%
Kampot	Kampong Kandal	2	54	2	82	6	78	10	214	4.5%
	Trapeang Ropov	35	21	49	35	40	44	124	100	55.4%
Kep	Ampeng	4	52	13	70	13	72	30	194	13.4%
	Oukrasar	17	40	25	59	25	59	67	158	29.8%
Grand Total		**98**	**351**	**143**	**527**	**167**	**505**	**408**	**1383**	**22.8%**

Middle-scale vessels included vessel length 12-24, all trawlers and all vessels operating blood cockle dragnet regardless of size.

2.1 Reported Catch

The reported catch is compared between months and provinces in **Figure 1.**   Total recorded landed weight (kg) by province and month. Figure 1, it is clear that there are 2 peaks for May and July 2022, both are for Koh Kong. There is no obvious seasonality, the peak for May is caused by inclusion of 4 landings for encircling seines, that are only recorded for May, while the peak for July is mainly due to recording of trawlers with a high average landed weight.
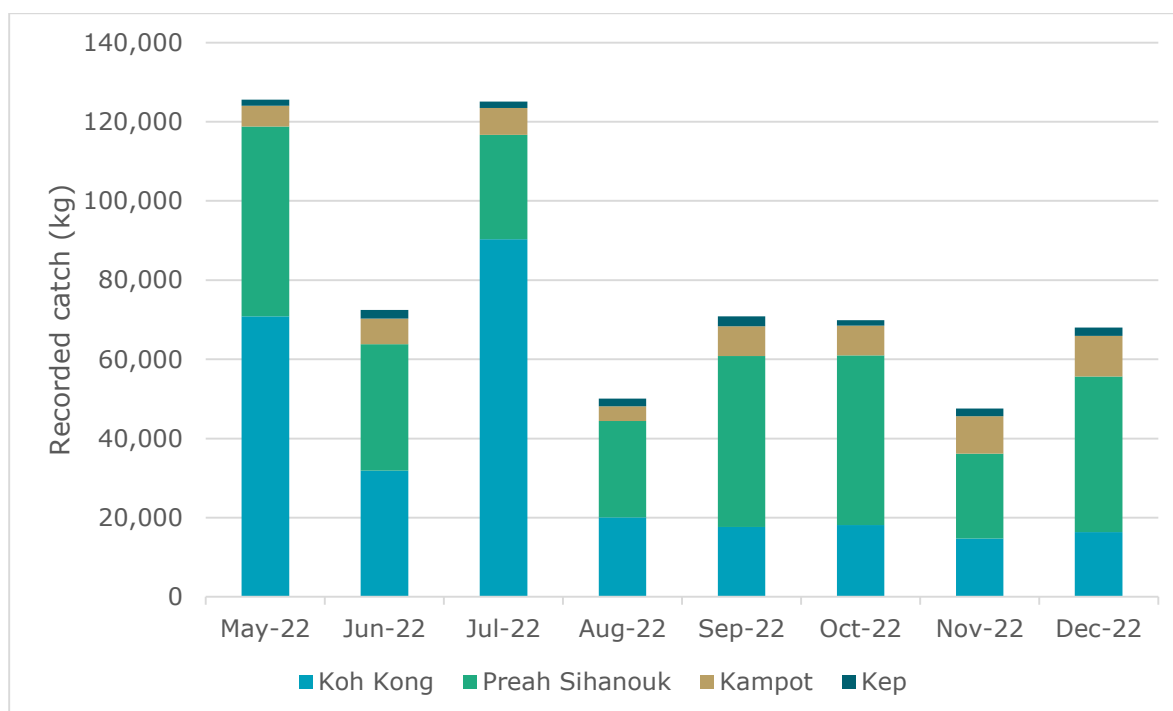
Figure 1. Total recorded landed weight (kg) by province and month.

No seasonality is observable for the other provinces and differences between months for the same provinces are largely caused by random sampling of certain gears or occasional inclusion of larger vessel sizes.

2.2 Reported Catch by Gear

The reported average catch per landing is indicated in Table 2, for 2022 with data from all 8 months combined. Fishing gears that are only observed for a single landing have been omitted. The results indicate differences in catches with the same fishing gear between vessel classes.

The statistical precision indicated is acceptable for most boat-gear combinations, with only a few gears, e.g. fish gillnets, Squid tow longline and encircling seines showing a high variability, most likely due to differences in the amount of gear deployed or due to insufficient records, as evident for Mantis shrimp gillnet, Ray bottom longline, Siganus (Fish) gillnet and Squid trap.

Table 2. Mean reported catch in sampled landings (kg) for all single gear landings in 2022.

Gear	Landings recorded	Small-scale		Middle-scale	
		Mean	ε%	Mean	ε%
Trawl	764			490.9	11.7%
Crab gillnet	236	44.9	19.7%	49.8	11.6%
Fish gillnet	179	49.8	11.9%	531.5	12.8%
Crab trap	102	14.6	9.8%	123.6	29.8%
Centipede trap	99	14.3	12.8%	24.7	7.3%
Mackerel Gillnet	93	50.3	26.3%	434.2	16.3%
Octopus trap longline	41	262.9	13.2%	259.0	11.1%
Push net	41	40.7	12.3%	34.2	20.5%
Shrimp gillnet	40	352.8	52.3%	917.0	58.3%
Fish trap	11	800.5	74.9%	1,042.8	8.4%
Halfbeak gillnet	11			1,666.7	6.3%

Gear	Landings recorded	Small-scale		Middle-scale	
		Mean	ε%	Mean	ε%
Squid tow longline	10	3.2	62.1%	249.0	41.9%
Blood cockle dragnet	7			4.9	19.4%
Indian Threadfin Gillnet	6	11.5	15.6%		
Bottom longline for Squid	5	35.0	71.4%	256.7	16.9%
Snail trap	5			77.2	28.7%
Encircling seine	4			13,685.0	45.5%
Mullet gillnet	4	22.5	13.9%		
Undulate Venus dragnet	3	585.0	3.0%		
Fish longline	3	10.5	14.3%		
Mantis shrimp gillnet	3			7.9	34.2%
Ray bottom longline	3	12.2	52.8%		
Siganus (Fish) gillnet	3	71.7	41.9%		
Squid trap	3	97.0	36.0%		
Fish hook	2	17.5	14.3%		
Hand push net	2	11.5	13.0%		
Trammel net for shrimp	2	6.7	20.3%		

The relative standard error is indicated by ε%, if this is higher than 30%, values are not statistically accurate and cannot be used; average catch based on a single observation, are not representative for that gear and are not included in the table.

Daily catches are calculated for the top 15 gears in Table 3, based on the reported weight and fishing trip duration. Despite the number of fishing days contributing to the catch not consistently recorded for all landings, this provides a better estimate for the relative fishing yield of different gears, then the catch by landing.

Table 3. Mean calculated daily catch (kg/day), with statistical significance for difference between small- and middle scale fishery operations.

Gear	Small-scale			Middle-scale			p
	Mean	ε%	SD	Mean	ε%	SD	
Trawl				211.3	6.2%	1,592.0	-
Crab gillnet	16.2	12.1%	73.9	21.0	7.4%	74.7	0.0492
Fish gillnet	35.9	6.5%	64.0	89.3	9.0%	534.4	<0.0001
Crab trap	13.8	10.1%	7.9	26.1	6.9%	312.1	<0.0001
Centipede trap	14.3	12.8%	11.1	21.3	7.9%	14.1	0.0056
Mackerel Gillnet	48.4	27.6%	59.2	101.2	12.1%	605.0	0.0035
Octopus trap longline	40.3	10.4%	92.1	50.4	6.8%	168.2	0.0813
Push net	40.7	12.3%	27.1	34.2	20.5%	24.3	0.4595
Shrimp gillnet	100.2	57.4%	451.9	90.1	38.5%	3,116.6	0.8832
Fish trap	158.8	26.5%	847.8	86.9	11.1%	263.6	0.3264
Halfbeak gillnet				151.6	17.2%	332.6	-
Squid tow longline	3.2	62.1%	3.4	27.1	17.5%	276.2	0.0019
Blood cockle dragnet			-	4.9	19.4%	2.5	-
Indian Threadfin Gillnet	11.5	15.6%	4.4			-	-
Bottom longline for Squid	6.0	44.0%	35.4	28.0	14.9%	75.1	**0.0212**

Daily catch is calculated based on reported total landed weight and number of fishing days. A value of p < 0.05 indicates a statistically significant difference between mean catch for small- and middle-scale. A value for ε%>30% means that the mean value is not statistical valid and should not be used.

Trawlers have the highest daily catch, at 211 kg/day, but with a large variation, followed by fish traps and halfbeak gillnets. For many gears there is a significant difference between the daily catch for small- and middle-scale vessels, with catches for gears like gillnet and traps influenced by the size of the vessel (and engine power) in terms of how much gear can be deployed and how far the vessel can travel.

The daily catch by gear, by province is included in annex 3.

Table 4. Proportion of landings recorded for all gears by province, with contribution to recorded catch (kg).

Gear	Koh Kong	Preah Sihanouk	Kampot	Kep	Grand Total	%Total
Trawl	33.9%	61.1%	2.6%	2.4%	375,074.3	59.49%
Encircling seine	100.0%	-	-	-	54,740.0	8.68%
Fish gillnet	9.5%	51.4%	37.6%	1.6%	38,780.5	6.15%
Shrimp gillnet	97.5%	2.4%	-	0.0%	33,294.1	5.28%
Mackerel Gillnet	18.5%	46.0%	35.4%	0.1%	32,703.0	5.19%
Others	95.1%	-	3.5%	1.4%	25,133.7	3.99%
Halfbeak gillnet	0.3%	-	99.7%	-	16,724.0	2.65%
Crab gillnet	4.0%	74.8%	0.3%	20.9%	11,415.3	1.81%
Fish trap	98.2%	-	1.8%	-	10,986.0	1.74%
Octopus trap longline	91.9%	4.9%	-	3.2%	10,645.0	1.69%
Crab trap	77.2%	0.4%	14.2%	8.2%	9,338.1	1.48%
Centipede trap	15.4%	-	0.5%	84.2%	2,060.0	0.33%
Undulate Venus dragnet	100.0%	-	-	-	1,755.0	0.28%
Squid tow longline	97.6%	-	-	2.4%	1,752.5	0.28%
Push net	100.0%	-	-	-	1,590.7	0.25%
Spanish mackerel gillnet	40.0%	60.0%	-	-	1,500.0	0.24%
Bottom longline for Squid	98.8%	-	-	1.2%	840.0	0.13%
Anchovy seine net	100.0%	-	-	-	700.0	0.11%
Snail trap	63.7%	36.3%	-	-	386.0	0.06%
Squid trap	89.3%	-	10.7%	-	291.0	0.05%
Siganus (Fish) gillnet	-	-	100.0%	-	215.0	0.03%
Oyster collection	-	-	100.0%	-	92.0	0.01%
Mullet gillnet	82.2%	-	17.8%	-	90.0	0.01%
Indian Threadfin Gillnet	29.1%	-	70.9%	-	68.8	0.01%
Ray bottom longline	-	-	-	100.0%	36.5	0.01%
Fish hook	57.1%	-	-	42.9%	35.0	0.01%
Blood cockle dragnet	100.0%	-	-	-	34.5	0.01%
Fish longline	71.4%	-	28.6%	-	31.5	<0.01%
Capture by hand	-	-	-	100.0%	30.0	<0.01%
Mantis shrimp gillnet	100.0%	-	-	-	23.8	<0.01%
Hand push net	-	-	100.0%	-	23.0	<0.01%
Trammel net for shrimp	-	-	100.0%	-	13.3	<0.01%
Fish bottom longline	-	-	-	100.0%	12.0	<0.01%
Trap	-	-	100.0%	-	12.0	<0.01%

Gear	Koh Kong	Preah Sihanouk	Kampot	Kep	Grand Total	%Total
Spear	100.0%	-	-	-	5.5	<0.01%
Grand Total	45.1%	43.6%	8.8%	2.4%	630,432.1	

The data in Table 4, excludes landings when more than one gear is used, which contributes 6,004 kg, or less than 1% of the total reported catch, for 44 landings, mainly for Preah Sihanouk. Most of these multiple gear landings utilise a combination of gillnets, for fish, crab and shrimp. This constitutes 84% of the landings and 76% of the reported catch for these multiple gear landings.

As shown in Table 4 and
Figure **2**, close to 60% of the recorded catch is from trawlers, mainly from Preah Sihanouk and Koh Kong, Encircling seine contributes 8.7% and Fish gillnet, shrimp gillnet and Mackerel Gillnet and contributing 5-6% each. About 4% of the catch is attributed to unspecified gears, mainly in Koh Kong.

Table 4 also highlights that landings for some gears are only, or mainly, observed in one province. This is not in line with the information contained in the Vessel Census Database (2018) and indicates complications for estimating total catch by province, based on vessel-gear based estimates for the average catch and effort by province. With trawlers mainly recorded in Preah Sihanouk, this may not be representative for catches in other provinces, which may skew the estimation.
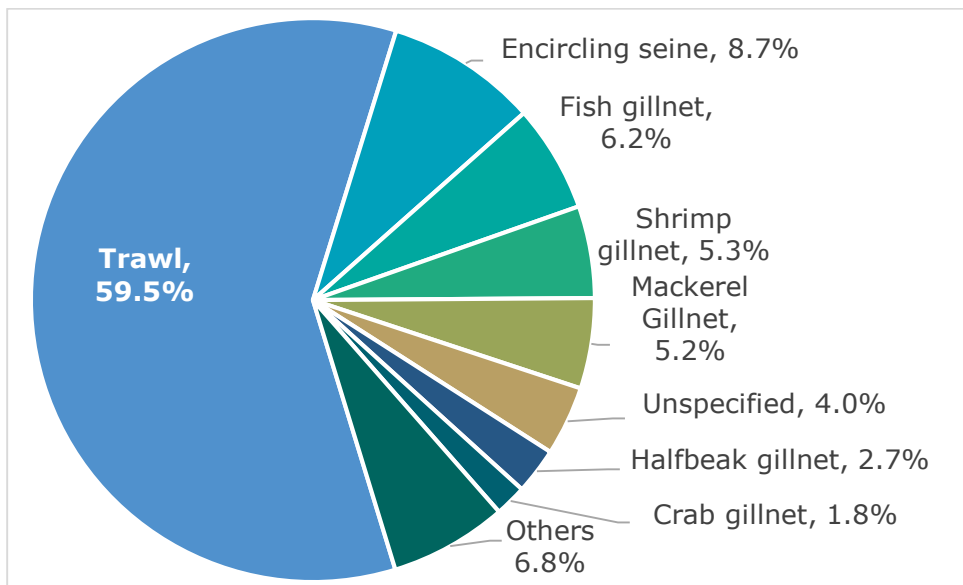
Figure 2. Contribution of main gear types to total reported catch in recorded landings (total reported catch: 636,436 kg).
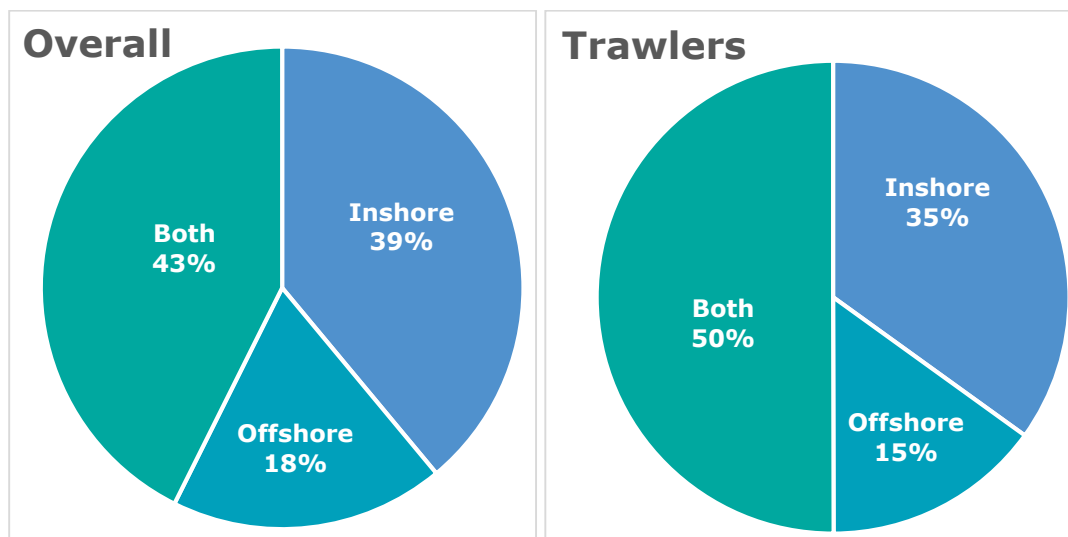
Figure 3. Reported fishing location for all gears combined and separated for trawlers.

The general location where vessels operate, specifically whether the catch was obtained in- or offshore is reported and is included in
Figure **3**. This suggests that a considerable proportion of the catch is reported from inshore areas (within the 20-meter depth line), even for trawlers. It is expected that most of the catch reported for both fishing areas is mainly caught off-shore and that many fishers don't know their exact location or where the boundary for inshore and offshore lies.

2.3 Gear effort

The 2022 FCMAS collects data on the number of fishing days, which can be used to calculate the fishing effort, by vessel-gear class. This is used to estimate the monthly fishing days by vessel-gear class by province in Table 5. This shows that there are only small differences between vessel-gear classes and provinces, with the average effort typically between 16-22 days/month (all estimates are statistically significant). The only outliers are for Kep where all non-trawl operations have a lower effort and for middle-scale vessels > 18 meters in Kampot that have a much higher fishing effort then in other provinces.

Table 5. Estimated average monthly fishing days by vessel gear class and province.

Vessel-gear class	Koh Kong		Preah Sihanouk		Kampot		Kep		Overall	
	Days	ε%	Days	ε%	Days	ε%	Days	ε%	Days	ε%
Small-scale	17.9	3.2%	19.2	6.4%	20.7	2.5%	15.0	5.1%	18.2	1.9%
Middle-scale 12-18m	16.4	3.3%	21.7	2.1%	19.5	3.2%	12.3	5.0%	16.6	2.0%
Middle-scale >18m	20.5	7.1%	20.9	3.7%	25.9	3.7%	13.7	15.2%	20.3	3.7%
Trawl <12m	18.4	5.4%	21.9	3.3%	17.9	2.0%	21.5	1.8%	19.6	1.3%
Trawl 12-18m	17.7	6.0%	22.1	1.2%	19.6	4.1%	22.3	5.0%	21.2	1.3%
Trawl >18m	16.0	24.7%	21.5	4.4%					20.6	5.1%

Note: Middle-scale represents all middle-scale vessels, except for vessels operating trawls

For the fishing effort by gear type (Table 6), the fishing effort is very similar for different gears and vessel classes, with only a few outliers. This indicates that fishing effort is largely independent of the vessel-gear category, with most operators targeting full-time fishing.

Table 6. Estimated average monthly fishing days by gear

Gear	Small-scale		Middle-scale	
	Days	**ε%**	**Days**	**ε%**
Trawl			20.3	0.9%
Crab gillnet	16.6	5.2%	13.0	5.0%
Fish gillnet	19.8	3.0%	21.0	3.6%
Crab trap	17.6	6.8%	17.7	4.0%
Centipede trap	18.1	6.9%	15.8	5.7%
Mackerel Gillnet	20.7	8.5%	22.6	3.1%
Octopus trap longline	17.3	18.1%	14.0	7.8%
Push net	19.1	5.3%	17.3	8.7%
Shrimp gillnet	17.8	7.0%	19.0	5.6%
Fish trap	16.0	25.0%	16.0	10.3%
Halfbeak gillnet			25.3	5.0%
Squid tow longline	11.7	46.0%	16.9	12.1%
Blood cockle dragnet			16.1	19.6%
Indian Threadfin Gillnet	22.0	5.9%		
Bottom longline for Squid	21.5	30.2%	10.0	28.9%
Snail trap			15.4	19.4%
Encircling seine			25.0	10.6%
Undulate venus dragnet	16.0	13.0%		
Fish longline	16.0	6.3%		
Mantis shrimp gillnet			17.3	39.0%
Ray bottom longline	6.7	21.8%		
Siganus (Fish) gillnet	24.0	12.5%		
Squid trap	19.0	5.3%		
Fish hook	13.0	69.2%		
Hand push net	21.5	30.2%		
Mullet gillnet	18.5	35.1%		
Trammel net for shrimp	26.5	5.7%		

2.4 Catch and value by species

Fish constitutes the majority of the reported catch by weight, as is shown in
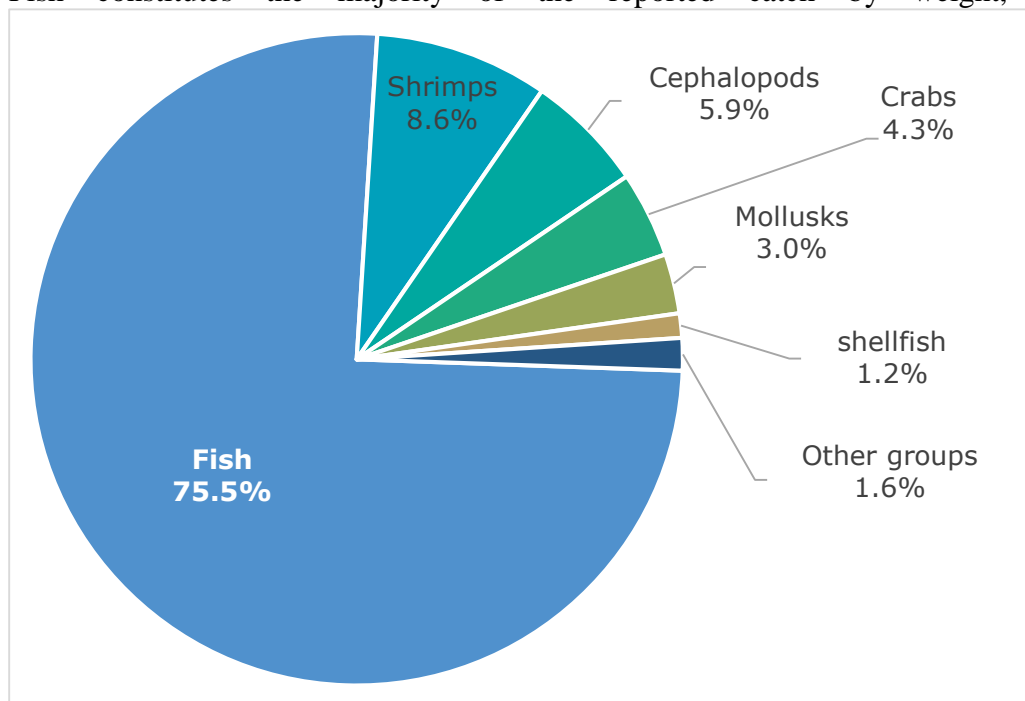
Figure **4**, followed by shrimps, cephalopods and crabs.
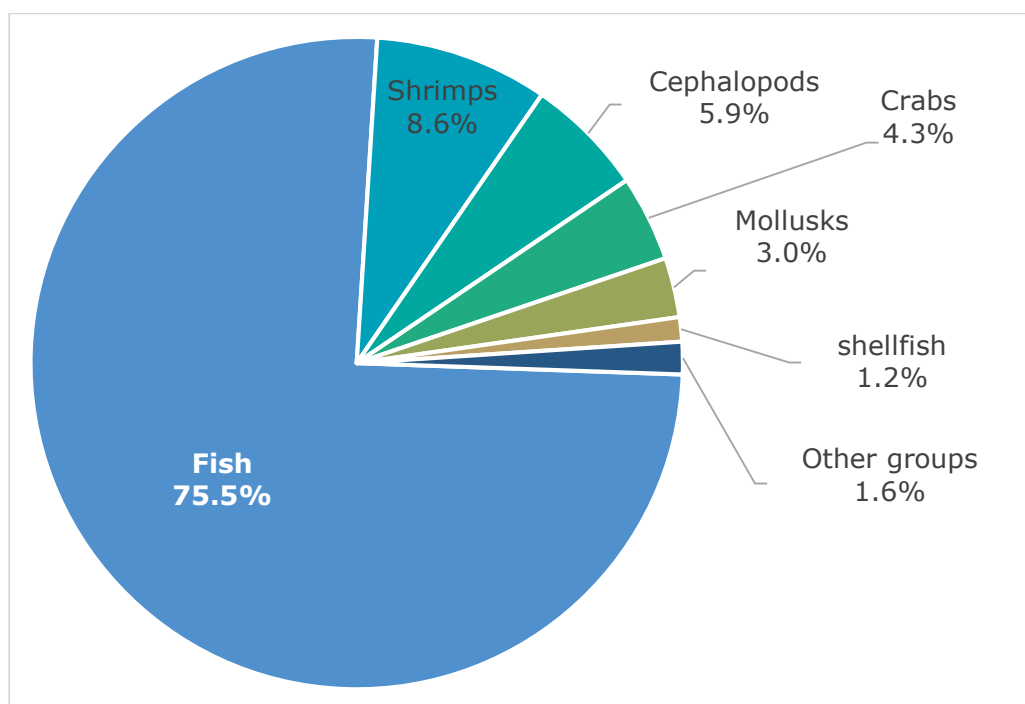
Figure 4. Contribution of main aquatic animal groups to reported catch (total reported catch: 636,436 kg).

Anchovy, unspecified fish species and trash fish (low value fish used mainly for fishmeal production) make up 50% of the reported fisheries yield (Table 7). Other species and species groups contribute far less. The top 20 species by weight, contribute more than 86% of the reported catch.

Due to the large proportion of other fish and trash fish in the reported catch, 37% of the catch is not reported by individual species, excluding the trash fish component, more than 29% of the catch is reported by species group.

Table 7. Top 20 reported species and species groups **by weight** (kg).

	Scientific name	English common	Catch (kg)	Catch % %Total	Catch % %Cum
1	*Encrasicholina heteroloba*	Shorthead anchovy	194,880.0	30.6%	30.6%
2		Other fish nei	75,447.5	11.9%	42.5%
3		trash fish	50,643.8	8.0%	50.4%
4	*Penaeus sp.*	Prawns nei	26,041.2	4.1%	54.5%
5	*Portunus pelagicus*	Swimming crab	23,722.7	3.7%	58.3%
6		Needlefish nei	22,740.0	3.6%	61.8%
7	*Metapenaeus spp.*		21,269.0	3.3%	65.2%
8		Mollusks nei	18,710.3	2.9%	68.1%
9		Squids nei	16,588.8	2.6%	70.7%
10	*Decapterus macrosoma*	Shortfin scad	15,418.0	2.4%	73.1%
11	*Atule mate*	Yellowtail scad	15,001.0	2.4%	75.5%
12		Octopus	10,646.1	1.7%	77.2%
13	*Rastrelliger brachysoma*	Short mackerel	10,076.0	1.6%	78.7%
14	*Stolephorus indicus*	Indian anchovy	10,041.0	1.6%	80.3%
15		Pony fishes	7,607.5	1.2%	81.5%
16	*Scomberoides commersonianus*	Talang queenfish	7,201.0	1.1%	82.7%
17		Other catch nei	7,186.6	1.1%	83.8%
18		Shellfish nei	6,791.0	1.1%	84.8%
19	*Chirocentrus dorab*	Dorab wolf-herring	5,520.0	0.9%	85.7%
20	*Anodontostoma chacunda*	Chacunda gizzard shad	5,440.0	0.9%	86.6%
	Other species		85,464.9	13.4%	100.0%
	Total reported catch		**636,436.4**		

The total reported species weight by province is included in Annex 1.

The contribution of non-fish species to the total value of the catch (Table 8), is much higher than their contribution in quantity, due to the much higher prices and 51% of the fish catch made up by low value Anchovy and trash fish, which on average sell for 500-1,000 Riel/kg at first point of sale. Fish represents less than 38% of the total catch value, with the remainder for non-fish species.
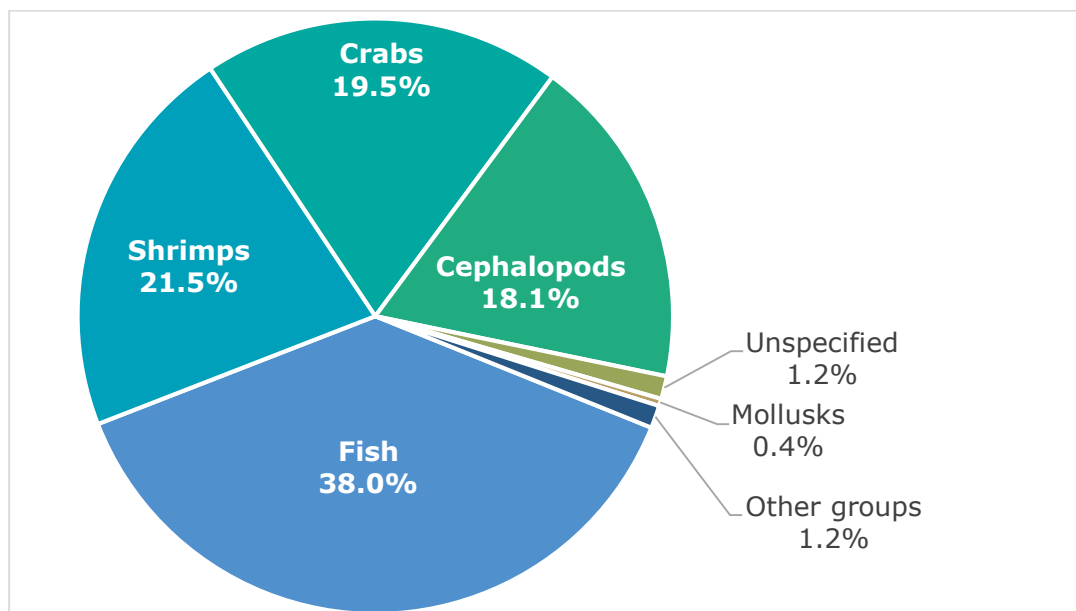
Figure **5**). Not all value is reported by species or species group, some commercial (trade) groups are included as separate categories.
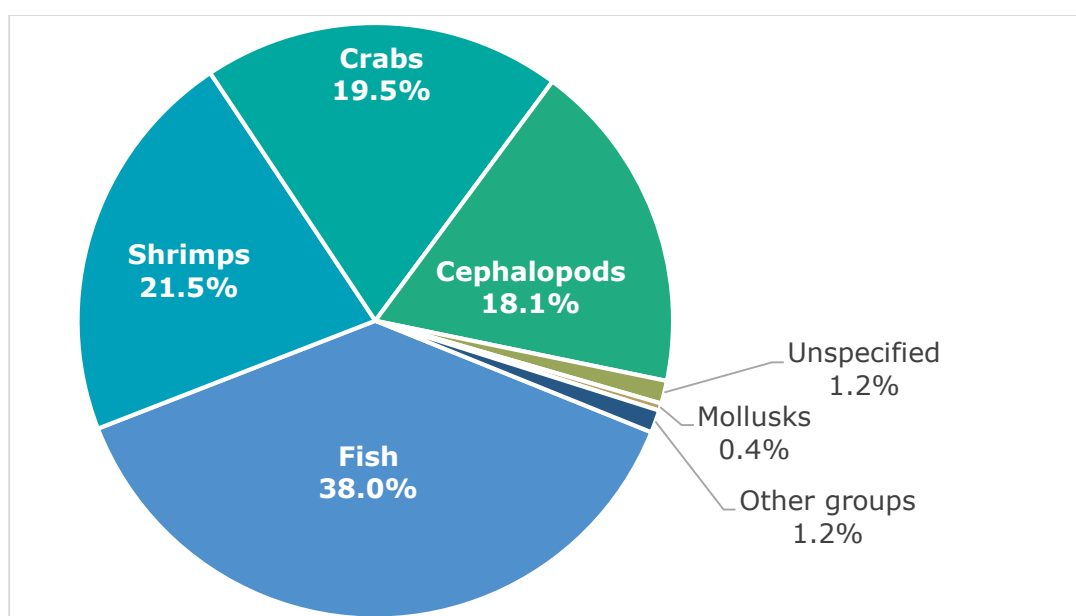
Figure 5. Proportion of total reported value, by main aquatic animal group (total value: 3,397,948,500 Riel).

Table 8. Top 20 reported species by value (1000 Riel) and average price/kg.

	Scientific name	English Common	Value (1000 Riels)	%Value	%Cum	Price (Riel)
1	*Portunus pelagicus*	Swimming crab	666,666.8	19.6%	19.6%	25,500
2		Squids nei	353,214.7	10.4%	30.0%	19,000
3	*Penaeus sp.*	Prawns nei	319,839.6	9.4%	39.4%	18,500
4	*Metapenaeus spp.*		285,057.0	8.4%	47.8%	18,500
5	*Encrasicholina heteroloba*	Shorthead anchovy	208,775.6	6.1%	54.0%	1,000
6		Other fish nei	204,626.2	6.0%	60.0%	4,000
7	*Atule mate*	Yellowtail scad	120,007.0	3.5%	63.5%	7,500
8		Octopus	119,170.0	3.5%	67.0%	12,500
9		Needlefish nei	107,600.0	3.2%	70.2%	7,000
10	*Decapterus macrosoma*	Shortfin scad	99,799.5	2.9%	73.1%	6,500

	Scientific name	English Common	Value (1000 Riels)	%Value	%Cum	Price (Riel)
11	*Suborder Sepiina*	Cuttlefish	64,226.5	1.9%	75.0%	14,000
12		Cephalopods (squids/cuttlefish)	62,673.1	1.8%	76.9%	14,000
13	*Rastrelliger brachysoma*	Short mackerel	62,069.5	1.8%	78.7%	6,000
14	*Scomberoides commersonianus*	Talang queenfish	60,229.5	1.8%	80.5%	9,000
15	*Penaeus monodon*	Giant tiger prawn	58,035.6	1.7%	82.2%	24,500
16	*Euthynnus affinis*	Mackerel tuna	46,250.0	1.4%	83.5%	9,000
17	*Scomberomorus commerson*	Narrow-barred Spanish mackerel	43,700.0	1.3%	84.8%	10,000
18		Other catch nei	41,692.0	1.2%	86.0%	
19		trash fish	34,672.5	1.0%	87.1%	500
20		Mantis shrimp	31,064.8	0.9%	88.0%	57,000
	Other species		408,578.5	12.0%	100.0%	
	Total reported value by species		**3,397,948.5**			

High value species include shrimps, prawns, lobster, squid and crabs (especially mud crab). However, most high value species have very low catch amounts, three most expensive species: Conger eels (150,000 Riels), Lobster (60,000) and Mantis shrimp (57,000) have fairly low catches, with mantis shrimp only contributing 807 kg (0.13%) of the total reported catch. The total reported species value by province is included in Annex 2.

2.5 Total estimated catch

Although data collected during 2022 include the fishing effort, as fishing days, it doesn't include an estimate for the Fishing Activity Coefficient (FAC), which normally is used for estimating the total catch. In addition, the number of fishing days for each landing has some inconsistencies, making it difficult to calculate a reliable estimate for the daily catch and total effort. This is expected to further improve for 2023.

Therefore, the same approach as used for 2021 is followed, as the available data does allow for estimating the total monthly catch, based on the average reported landed weight and the reported number of fishing trips (Table 9). To better represent the important trawler component of the fisheries, this is separated by size class of the vessel operating the trawl as this affects both the landed weight and the number of fishing trips.

Table 9. Estimated mean monthly catch by vessel-gear class (Kg), with indicators for statistical accuracy.

Vessel-gear class	Average Landed weight (Kg)	SD	Recorded Landings	ε%	Weekly Fishing Trips	Monthly Fishing Trips	Monthly vessel yield (kg)
Middle-scale 12-18m	213.0	687.4	542	13.9%	3.3	14.49	3,086.4
Middle-scale 18-24m	1743.3	4144.9	78	26.9%		5.21	9,082.3
Small-scale < 6m	19.2	4.6	5	10.7%	5	21.65	415.7
Small-scale 6-12m	78.4	221.4	395	14.2%	3.9	16.9	1,324.9
Trawl 6-12m	105.5	230.7	411	10.8%	3.9	16.95	1,787.4
Trawler 12-18m	1020.3	2547.0	317	14.0%	4.9	21.18	21,609.4
Trawler 18-24m	1732.9	3294.3	36	31.7%		11.71	20,292.6

Note that the estimated monthly yield for vessels smaller than 6 meters is based on only 5 observations at landing sites. Since no large-scale vessels are covered by the current FCMAS survey their contribution is omitted. The monthly and annual catch is based on the estimated fishing activity (the proportion of vessels actively fishing each month), which is tentatively set at 85%. The total estimated catch uses the number of vessels as included in the 2018 Vessel Database to extrapolate the average monthly vessel catch calculated in Table 10.

Table 10. Estimated total monthly and annual catch (MT) by vessel-gear class.

Vessel-gear class	Vessel numbers	Active vessels (85%)	Monthly yield (MT)	Annual yield (MT)	%Total
Middle-scale 12-18m	1819	1546	4,771.6	57,259	24.6%
Middle-scale 18-24m	115	98	890.1	10,681	4.6%
Small-scale < 6m	924	785	326.3	3,916	1.7%
Small-scale 6-12m	3115	2648	3,508.4	42,101	18.1%
Trawl 6-12m	1120	952	1,701.6	20,420	8.8%
Trawler 12-18m	399	339	7,325.6	87,907	37.8%
Trawler 18-24m	50	43	872.6	10,471	4.5%
Grand total 2022				**232,755**	

The vessel classes for which total catch estimates are calculated, have been selected to optimise the statistical precision, as indicated by the relative standard error (ε%). This is done for the purpose of calculating the total estimated catch, not to re-classify the marine fisheries. All estimates have a ε% of less than 30%, except for middle-scale vessels 18-24 meters, that have a ε%, of less than 31.7%. This is high, but in view of the high variation in the reported landed weight, acceptable.

As shown in Table 10, trawlers contribute 51.1% of the total catch which is by far the highest contribution for a single gear type, emphasising the importance of this fishery. The 2022 total catch estimate is similar to the estimate for 2021 (220,685 MT), if using the same proportion of number of vessels active (85%). However, because of the better coverage in time and space, the 2022 estimate is considered to be more reliable.

A separate total catch estimate by province, combining all 2022 data is included in annex 4. Because of vessels landing outside of the province where they are recorded in the vessel database, there are some issues with this approach. There are cases where there are no vessels recorded for a vessel class and province, but landings have been reported, or vice versa: no landing data is available, but vessels are recorded (and supposedly active) in the 2018 vessel census. This leads to a level of under-estimation of the total catch. Nevertheless, because of higher variation of the reported catches if calculated by province and with some values, statistically inaccurate, the combined total catch, if calculated by province is close to 260,000 MT, which is higher than the national level estimate.

The total estimated catch based on the FCMAS 2022 data, is 85.9% higher than the current FiA estimate of 125,200 MT. Although the estimate based on the results from the FCMAS, is statistically valid, a number of factors affect to the difference with the official FiA marine yield:
- **Coverage in time**: the 2022 is based on 8 months of data, although there is no seasonality in the monthly catch data and the estimate presented here is expected to be representative for the 2022. However, the total estimated catch could possibly be different if data was collected for all 12 months in the year. Collecting for the entire year is necessary to assess the fisheries.
- **Vessel numbers**: the extrapolation of the monthly reported catch by vessel class is done using the total number of vessels from the Vessel Census Database (2018) for each of the vessel classes. The Vessel Census Database information is almost 4 years old, the number of trawlers (and other

vessels) may no longer be correct. Vessel registration, licensing and inspections will be able to contribute to updating the Vessel Census Database;

- **Transhipment**: some vessels may land the combined catch from multiple vessels (transhipment), even though all vessels sampled indicate that the landing is for a single vessel, this needs to be verified through inspections at sea and the upcoming Vessel Monitoring System (VMS);
- **Vessel Activity**: The proportion of vessels that will be actively fishing each month is different for different vessel classes (and gears), but is currently not collected and estimated based on anecdotal information from FiAC at an average of 85%. When data becomes available this will allow to calculate this for the main vessel-gear categories;
- **Coverage**: the available data is not yet representative for the entire fisheries
  o Large-scale fisheries is not covered, although this only involves 5, inclusion is expected to marginally increase the total catch; and,
  o Small-scale long-tail boats have not yet been included in the data collection and these need to be targeted separately to improve the estimate for small-scale vessels < 6 meters.
- **Data collection**: the FCMAS depends on interviews with fishers and vessel owners, this results in a mix of recall data for smaller vessels and trader/owner-based records for some (not all) middle-scale vessels. The reliability of the data obtained is unknown
  o The source of the data (recall or trader/owner records) is not recorded, this will be introduced for the 2023 data collection
  o No verification survey is conducted to allow calculation of the accuracy, this is planned for 2023 either as a stand-alone survey or a research project

The above indicated improvements will be discussed and once implemented, will allow a more accurate estimate for the total catch.

2.6 Straddling, highly migratory and transboundary stocks

Cambodia ratified the United Nations Fish Stock Agreement (UNFSA) on 18 January 2020, and MAFF is processing the depository of the document to the UN. United Nations Convention on The Law of The Sea (UNCLOS) defines straddling stocks as "the same stock or stocks of associated species[which] occur both within the exclusive economic zone and in an area beyond and adjacent to the zone", while highly migratory are listed in Annex 1 of UNCLOS. for which signatories are required to take measures to ensure conservation and management. In addition, Cambodia is involved in two Regional Plan of Actions (RPOA) for the management of transboundary fish stocks: 1) RPOA- for the management Indo-Pacific mackerel (*Rastrelliger brachysoma*) and 2) the RPOA on neritic tunas. Both agreements were prepared by the South East Asian Development Centre on behalf of member countries, including Cambodia (SEAFDEC 2015) and carry an obligation to report the amount of catch for straddling and highly migratory stocks.

Table 11. Reported catch and estimated total catch (kg) for species included in the UNFSA and RPOA.

Scientific name	English Common	Khmer Name	Kampot	Koh Kong	Preah Sihanouk	Total	%Total	Total (MT)
Rastrelliger brachysoma	Short mackerel	ត្រីផ្ការ្ញ ឬ ត្រីកាម៉ុងខ្លួនខ្លី	3,909	3,675	2,492	10,076	1.58%	**3,678**
Euthynnus affinis	Mackerel tuna	ត្រីឈ្លាម		3,500		3,500	0.55%	**1,280**
Scomberomorus commerson	Narrow-barred Spanish mackerel	ត្រីបេការខ្ទៅ ឬ ត្រីបេកាឆ្នូត		3,320	10	3,330	0.52%	**1,210**
Thunnus tonggol	Longtail Tuna	ត្រីប្រម៉ា		1,535		1,535	0.24%	**559**
Sarda orientalis	Striped bonito	ត្រីឈ្លាមស	50		900	950	0.15%	**349**

Auxis thazard	Bullet tuna	ត្រីកាឡ្យាំង			130	130	0.02%	**47**
Total reported catch			**3,959**	**12,030**	**3,532**	**19,521**	**3.07%**	**7,123**

According to the available data from the FCMAS, 3% of the catch consists of species mentioned under the UNFSA and RPOA, Table 11. The proportion of these species found in the FCMAS, can be extrapolated using the total estimated marine catch (either the FCMAS or official FiA estimate). The estimated Total catch included in Table 11, is based on the FCMAS estimate.

2.7 Socio-economic data

The FCMAS has collected data on the cost of fisheries operations as part of the survey. This is summarised in Table 12. A more in-depth analysis is planned during 2023, to develop recommendations for collection of socio-economic fisheries data.

Table 12. Selected socio-economic indicators, with contribution to fishing cost, by province and vessel-gear category.

Koh Kong Vessel-gear	Crew No	Mean catch value (Riel)	GCF (Riel)	GP%	Contribution to operational cost (%)				
					Salary	Lube	Fuel	Ice	Other
Small-scale	1.9	607,500	-27,993	-4.6%	41.5%	0.8%	39.1%	7.9%	10.8%
Middle-scale 12-18	2.9	3,478,500	892,169	25.6%	30.0%	0.6%	54.3%	6.9%	8.1%
Middle-scale >18	12.6	35,826,000	14,896,000	41.6%	37.7%	0.4%	52.2%	5.1%	4.5%
Trawl <12	2.6	3,342,000	-713,731	-21.4%	19.2%	0.6%	67.6%	6.1%	6.5%
Trawl >18	4.7	8,486,500	-6,873,750	-81.0%	12.0%	0.7%	76.4%	5.3%	5.6%
Trawl 12-18	3.8	7,114,000	-4,056,646	-57.0%	16.2%	0.6%	73.3%	5.6%	4.3%

Preah Sihanouk Vessel-gear	Crew No	Mean catch value (Riel)	GCF (Riel)	GP%	Contribution to operational cost (%)				
					Salary	Lube	Fuel	Ice	Other
Small-scale	5.0	4,558,000	1,950,114	42.8%	67.4%	0.4%	19.4%	3.4%	9.4%
Middle-scale 12-18	4.2	3,036,000	1,501,135	49.4%	65.1%	1.5%	21.3%	2.7%	9.4%
Middle-scale >18	4.7	5,883,500	2,549,234	43.3%	66.2%	0.6%	23.6%	2.8%	6.8%
Trawl <12	2.6	702,000	-97,805	-13.9%	35.3%	3.4%	53.7%	1.9%	5.8%
Trawl >18	3.9	1,626,000	-817,495	-50.3%	12.3%	3.1%	79.1%	2.4%	3.2%
Trawl 12-18	3.9	1,673,000	-45,239	-2.7%	16.6%	3.2%	75.3%	1.5%	3.4%

Kampot Vessel-gear	Crew No	Mean catch value (Riel)	GCF (Riel)	GP%	Contribution to operational cost (%)				
					Salary	Lube	Fuel	Ice	Other
Small-scale	1.9	223,000	107,551	48.2%	67.6%	0.5%	20.9%	1.8%	9.1%
Middle-scale 12-18	2.7	1,508,500	318,665	21.1%	63.1%	0.7%	33.4%	0.3%	2.4%
Middle-scale >18	5.3	5,636,000	-282,929	-5.0%	56.5%	0.4%	25.9%	7.0%	10.2%
Trawl <12	2.0	409,000	45,002	11.0%	21.4%	2.0%	68.1%	3.0%	5.6%
Trawl >18	-	-	-	-	-	-	-	-	-
Trawl 12-18	2.0	699,000	184,081	26.3%	24.1%	2.0%	65.6%	2.9%	5.4%

Kep Vessel-gear	Crew No	Mean catch value (Riel)	GCF (Riel)	GP%	Contribution to operational cost (%)				
					Salary	Lube	Fuel	Ice	Other
Small-scale	1.9	214,000	68,759	32.1%	59.7%	5.8%	26.0%	1.8%	6.7%
Middle-scale 12-18	2.8	484,000	116,466	24.1%	56.4%	2.2%	33.7%	1.4%	6.3%
Middle-scale >18	3.8	934,500	97,089	10.4%	40.5%	2.3%	51.4%	1.4%	4.4%
Trawl <12	2.6	409,000	120,305	29.4%	55.5%	6.4%	28.7%	2.0%	7.4%

Trawl >18	-	-	-	-	-	-	-	-	-
Trawl 12-18	2.9	787,500	427,132	54.2%	38.2%	1.1%	51.2%	2.3%	7.3%

The Gross Cash Flow (GFC) and gross profit margin (GP%) are calculated considering all operational costs, but excludes maintenance costs and capital investment in procurement of gears and other equipment. A negative GFC (indicated with red font), means that, based on the data provided, on average operations don't make a profit, as reported costs are higher than the value of the landed catch.

Almost all fishing operations in Kampot and Kep are profitable, while all trawler operations in Koh Kong and Preah Sihanouk are not. Salary and fuel costs are the largest components of the operational cost of fishing for all vessel-gear classes.

3. Conclusions and Recommendations

The FCMAS implemented by MaFReDI in close collaboration with FiAC staff in the coastal provinces provides valuable data and information on the marine fisheries. In order to better support policy development, evaluation and decision making on management interventions, a number of adjustments need to be made with technical support from FAO CAPFISH.

1. The collection of socio-economic data needs to be reviewed. It is recommended to reduce the frequency of collecting the socio-economic indicators to a quarterly or annual survey. Changes to the methodology and coverage need to be based on a more in-depth analysis and review of the requirements under the MFMP.
2. The accuracy of the data needs to be improved
   a. The source of the data needs to be indicated during the interview, showing if the data provided is obtained from 1. recall by a fisher or vessel owner, or 2. copied from trader/vessel owner records;
   b. A limited scope verification survey needs to be considered to determine both the species composition and species catch, using a sub-sample bought from the fisher or vessel owner for randomly selected vessel-gear landings;
   c. The field-based validation rules included KoBo for catch, effort and value need to be reviewed to ensure that typos and outliers are reduced to limit the effort for data cleaning.
3. The coverage for small-scale vessels < 6 meters needs to be improved, by adding a random sample for long-tail vessels, as recommended during the 2021 evaluation.
4. The gear classifications used in KoBo need to be reviewed
   a. Allow separation of trawlers into sub-categories, e.g. pelagic /fly trawlers and beam trawlers
   b. Review and align the Khmer and English classification and names, update the drop-down list for selecting gear categories/names used in KoBo
5. Linkages to post-harvest (disposal), should be strengthened, both through adjustments to the current FCMAS and additional research, specifically for trash fish, other fish/catch nei and discards
   a. In the FCMAS, if trash fish or other fish/catch nei, is reported, the type and use should be indicated by specifying what it is used for: fish meal, feed for aquaculture (cage culture), human consumption (fresh or processed), feed for livestock, fertiliser, other
   b. Data on species composition for 'trash fish' and species groups, especially other fish/catch nei, that contribute 13% of the total reported catch needs to be improved, through sub-sampling and analysis for selected landings as a research topic in collaboration with university and FiAC
   c. Discards are poorly represented in the data (less than 0.07% of the total reported catch), and oftentimes only represent a small proportion of the actual discards, this should be investigated through research, using a voluntary logbook or anonymous reporting and/or through an observer programme

6. Multiple local Khmer names are entered for the same scientific and English species name or species groups, this needs to be standardised and linked, to separate scientific species names where possible and update the KoBo drop-down list to facilitate data entry and avoid common spelling mistakes.
7. Reporting of catch by unspecified gears should be reduced and, if possible, avoided for data collection. Records without selecting a gear name need to be flagged during data collection/entry so a follow-up question can be asked (or the fisher can be contacted afterwards by phone)
8. The Vessel Census data needs to be reviewed to update the total numbers of operational vessels used for extrapolation of the total catch
9. A Fishing Activity Survey needs to be implemented to estimate the monthly active fishing vessels for the main vessel-gear categories
10. Adjust the sampling design to allow for statistically valid estimation of catch, effort and total catch for individual provinces

Annex 1. Total reported species weight (kg) by province.

Scientific Name	English Common	Khmer name	Koh Kong	Preah Sihanouk	Kampot	Kep	Grand Total	%Total	%Cum.[1]
Encrasicholina heteroloba	Shorthead anchovy	កាកឹម	2.0		29,345.0	165,533.0	194,880	30.62%	30.62%
	Other fish nei	ប្រភេទត្រីចំរុះ	3,723.0	1,935.0	55,697.0	14,092.5	75,448	11.85%	42.48%
	trash fish	ត្រីជី	416.0	1,505.0	17,207.0	31,515.8	50,644	7.96%	50.43%
Penaeus sp.	Prawns nei	បង្គា	1,378.0	552.7	15,814.6	8,295.9	26,041	4.09%	54.52%
Portunus pelagicus	Swimming crab	ក្តាមសេះ	2,108.9	3,054.5	9,863.5	8,695.8	23,723	3.73%	58.25%
	Needlefish nei	ត្រីផ្ទោង	22,661.5	45.5	33.0		22,740	3.57%	61.82%
Metapenaeus spp.		បង្គាខ្ទឹខាក់	39.7	10.0	21,074.0	145.3	21,269	3.34%	65.17%
	Mollusks nei	សប្បើសត្ត ពពួកខ្យង គ្រំ ងាវ	3.0	477.3	18,180.0	50.0	18,710	2.94%	68.11%
	Squids nei	មឹក	151.0	155.8	13,940.4	2,341.6	16,589	2.61%	70.71%
Decapterus macrosoma	Shortfin scad	ត្រីកាម៉ុងឬត្រីច្បាធ្យ	4,025.0		80.0	11,313.0	15,418	2.42%	73.14%
Atule mate	Yellowtail scad	ត្រីក្មនគំ			15,001.0		15,001	2.36%	75.49%
	Octopus	មឹកពើងពាង	938.0	679.1	8,552.0	477.0	10,646	1.67%	77.17%
Rastrelliger brachysoma	Short mackerel	ត្រីផ្ទាធ្យ ឬត្រីកាម៉ុងខ្លនខ្លី	3,909.0		3,675.0	2,492.0	10,076	1.58%	78.75%
Stolephorus indicus	Indian anchovy	ត្រីក្រចកក្របី		1.0	10,040.0		10,041	1.58%	80.33%
	Pony fishes	ត្រីកិ	259.0	13.5	6,235.0	1,100.0	7,608	1.20%	81.52%
Scomberoides commersonianus	Talang queenfish	ត្រីកាឡ្ញាំង		4.0		7,197.0	7,201	1.13%	82.65%
	Other catch nei	ផ្សេងៗ	6,587.1	65.0	390.5	144.0	7,187	1.13%	83.78%
	Shellfish nei	ខ្យង មឹក ក្តាមផ្សេងៗ		221.0	502.0	6,068.0	6,791	1.07%	84.85%
Chirocentrus dorab	Dorab wolf-herring	ត្រីស្រាមជារ			5,520.0		5,520	0.87%	85.72%
Anodontostoma chacunda	Chacunda gizzard shad	ត្រីកាម៉យ	3,859.0	179.0	10.0	1,392.0	5,440	0.85%	86.57%

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[1] This represents the cumulative proportion of the species weight, sorted by contribution, for all preceding values in the table

Scientific Name	English Common	Khmer name	Koh Kong	Preah Sihanouk	Kampot	Kep	Grand Total	%Total	%Cum.[1]
Sargocentron rubrum	Redcoat	ត្រីកាជី	10.0	15.0	5,100.0	20.0	5,145	0.81%	87.38%
Suborder Sepiina	Cuttlefish	មឹកស្ទុក	218.7	358.8	3,885.0	333.5	4,796	0.75%	88.13%
	Cephalopods (squids/cuttlefish)	ពួកមឹកស្ទុកនិងមឹកបំពង់	84.0	344.5	2,703.0	1,658.6	4,790	0.75%	88.89%
Amblygaster sirm	Spotted sardine	ត្រីគួនបារាំង			4,100.0		4,100	0.64%	89.53%
Selaroides leptolepis	Yellow stripe trevally	ត្រីឆ្នូតលឿង			3,700.0		3,700	0.58%	90.11%
Euthynnus affinis	Mackerel tuna	ត្រីឈាម			3,500.0		3,500	0.55%	90.66%
Scomberomorus commerson	Narrowbarred Spanish mackerel	ត្រីបេកាខ្មៅ ឬត្រីបេកាឆ្នួត			3,320.0	10.0	3,330	0.52%	91.18%
Rastrelliger kanagurta	Indian mackerel	ត្រីកាម៉ុងខ្លួនវែង	10.0	45.0	610.0	2,634.0	3,299	0.52%	91.70%
Penaeus monodon	Giant tiger prawn	បង្កាខ្លែង	63.0	1,383.2	1,396.0	273.0	3,115	0.49%	92.19%
Amblygaster leiogaster	Smoothbelly sardine	ត្រីគួន			3,000.0	20.0	3,020	0.47%	92.67%
	Mixed fish for (human) consumption	ប្រភេទសម្រាប់ហ៊ុប			3,000.0		3,000	0.47%	93.14%
Leiognathus equulus	Common ponyfish	ត្រីសំបោរហៀរ "មានវអិល"			2,881.0		2,881	0.45%	93.59%
	Crabs (swimming crab, mud crab)	ពួកក្តាម (រួមទាំងក្តាមសេះ ក្តាមថ្ម ក្តាមជ័រ ជាដើម)	35.0	670.3	2,073.5	3.0	2,782	0.44%	94.03%
Megalaspis cordyla	Torpedo scad	ត្រីកន្ធាយរវង		65.0		2,616.0	2,681	0.42%	94.45%
Siganus canaliculatus	Whitespotted Spinefoot	ត្រីកន្ទ្លាំងក្រអូម	382.0		2,060.0		2,442	0.38%	94.83%
Decapterus maruadsi	Round scad	ត្រីកូនកុំ			120.0	1,896.0	2,016	0.32%	95.15%
Sardinella gibbosa	goldstripe sardine	ត្រីគួន		2.0	500.0	1,120.0	1,622	0.25%	95.40%
Thunnus tonggol	Longtail Tuna	ត្រីប្រម៉ា			1,535.0		1,535	0.24%	95.65%
	squirrelfish	ត្រីក្រហម	180.0	13.0		1,307.0	1,500	0.24%	95.88%

22

Scientific Name	English Common	Khmer name	Koh Kong	Preah Sihanouk	Kampot	Kep	Grand Total	%Total	%Cum.[1]
Penaeus merguiensis	Banana shrimp	បង្កាប៉ាវ៉ា	0.5	61.5	661.5	703.5	1,427	0.22%	96.11%
Rastrelliger faughni	Island mackerel	ត្រីប៉ាឡ្វាំង	1,361.0				1,361	0.21%	96.32%
Parastromateus niger	Black Pomfret	ត្រីចាបខ្មៅ			1,205.0	2.0	1,207	0.19%	96.51%
	Small mixed shrimp nei	គី		1,042.2	150.0		1,192	0.19%	96.70%
	Lizardfish	ត្រីក្តូចិន	150.0		780.0	112.0	1,042	0.16%	96.86%
Epinephelus coioides	Orange-spotted grouper	ត្រីតុកកែកៅ		5.0	1,018.0		1,023	0.16%	97.02%
Hemiramphus far	Blackbarred halfbeak	ត្រីផ្ដោងផ្កា	1,000.0				1,000	0.16%	97.18%
	Mixed species catch in boat	ផលនេសាទមិនទាន់ញែក(លាយគ្នា) នៅក្នុងឃ្លូបទូក			1,000.0		1,000	0.16%	97.34%
Sarda orientalis	Striped bonito	ត្រីឈាមស	50.0			900.0	950	0.15%	97.48%
Brevitrygon imbricata	Scaly whipray	បបែលមាន់	3.0	26.2	818.0	102.0	949	0.15%	97.63%
	Rabbitfish	ត្រីកន្ថាំង	708.5	144.0			853	0.13%	97.77%
Setipinna taty	Scaly hairfin anchovy	ត្រីស្លឹកឬស្សី			850.0		850	0.13%	97.90%
Lutjanus argentimaculatus	Mangrove red snapper	ត្រីអាំងកីយក្រហម			850.0		850	0.13%	98.03%
Anadara granosa	Blood cockle	គ្រែងឈាម			45.0	780.0	825	0.13%	98.16%
	Mantis shrimp	បង្គងកណ្ដប	518.7	6.5	93.1	188.3	807	0.13%	98.29%
Acanthurus sp.	Surgeonfish	ត្រីកាតាំង	251.7	37.5	505.0		794	0.12%	98.42%
	Shrimps (all kinds of shrimps)	ពពួកបង្កាគ្រប់ប្រភេទទាំងអស់	75.0	111.0	482.0	7.0	675	0.11%	98.52%
Crenimugil seheli	Bluespot mullet	ត្រីក្បាក	528.5	16.5	94.0		639	0.10%	98.62%
	Cephalopods (octopus)	ពពួកមឹកពីងពាង	60.0	25.0	450.0	102.0	637	0.10%	98.72%
Nemipterus hexodon	Ornate treadfin bream	ត្រីអាងគីមលី			542.0		542	0.09%	98.81%
	Crabs nei	ក្ដាមផ្សេងៗ		528.0			528	0.08%	98.89%

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	Tuna	ត្រីឈាម			506.0		506	0.08%	98.97%
Scomberomorus sp.	Spanish mackerel species nei	ត្រីបេកា	106.0		250.3	104.0	460	0.07%	99.04%
	Parrot fish	ត្រីសេក	227.5	174.0			402	0.06%	99.11%
Otolithes ruber	Tigertooth Croaker	ត្រីចង្កូមបី			372.0	2.0	374	0.06%	99.16%
	Sharks	ឆ្លាម				349.5	350	0.05%	99.22%
	Rays nei	បបែល	8.0	72.5	6.0	250.0	337	0.05%	99.27%
Decapterus russelli	Slender scad	ត្រីកន្ធាយរវែង			18.0	267.0	285	0.04%	99.32%
Eleutheronema tetradactylum	Four-finger threadfin	ត្រីកវ៉ាវ	143.8	9.0	52.5	54.0	259	0.04%	99.36%
Portunus spp.	Swimming crabs	ក្ដាមសេះ	6.0	203.0	2.0	34.0	245	0.04%	99.40%
Episesarma sp.	Vinegar crab	ក្ដាមជ័រ		226.0			226	0.04%	99.43%
Lutjanus russelli	Russell's snapper	ត្រីបោះត្រា			168.0		168	0.03%	99.46%
Pseudorhombus arsius	Large-tooth flounder	ត្រីអណ្ដាតឆ្កែ	5.0	14.0	94.5	48.0	162	0.03%	99.48%
Thryssa hamiltonii	Hamilton's thryssa	ត្រីស្លឹកឬស្សី			120.0	40.0	160	0.03%	99.51%
Trichiurus lepturus	Largehead hairtail	ត្រីកុកក្បាលធំ			150.0		150	0.02%	99.53%
Episesarma versicolor	Violet vinegar crab	ក្ដាមជ័រ		106.0	36.5		143	0.02%	99.55%
Scylla serrata	Mud crab	ក្ដាមថ្ម	1.7	18.0	115.9	2.0	138	0.02%	99.58%
Auxis thazard	Bullet tuna	ត្រីកាឡៗាំង				130.0	130	0.02%	99.60%
Anodontostoma chacuda	Chacunda gizzard shad	ត្រីកាម៉ីយ	5.0	20.0		100.0	125	0.02%	99.62%
Sillago sihama	Silver sillago	ត្រីព្រលួស	23.5	70.0		19.0	113	0.02%	99.63%
Lethrinus harak	Thumbprint emperor	ត្រីបោះត្រា		20.0	88.0		108	0.02%	99.65%
scomberoides tala	Barred queenfish	ត្រីកាឡៗាំង				107.0	107	0.02%	99.67%
(blank)	Lobster	បង្កងប៉ាត	27.5	17.4	6.3	55.0	106	0.02%	99.68%
	Other catch	ផ្សេងៗទៀត Others	100.0	4.0			104	0.02%	99.70%
Saurida undosquamis	Bushtooth lizarfish	ត្រីក្តូចិនអុជខ្មៅ		52.0		52.0	104	0.02%	99.72%

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Nemipterus japonicus	Japanese threadfin bream	ត្រីជប៉ុនក្រហម	100.0				100	0.02%	99.73%
Panna microdon	Panna croaker	ត្រីប្រម៉ា	90.5	5.0	1.0		97	0.02%	99.75%
	Sea basses and groupers	ត្រីតុកកែ			90.0		90	0.01%	99.76%
Chiloscyllium punctatum	Brownbanded bambooshark	ឆ្លាមឆ្នូត		4.0	80.0		84	0.01%	99.78%
Priacanthus tayenus	Purple-spotted bigeye	ត្រីក្រហមភ្នែកលឿន			80.0		80	0.01%	99.79%
	Emperors, scavengers nei	ត្រីគ្រាប់ខ្នុរ	72.0	5.5	2.0		80	0.01%	99.80%
Nemipterus furcosus	Forktailed Threadfin Bream	ត្រីក្រហមស្រកាទន់			75.0		75	0.01%	99.81%
Sphyraena obtusata	Obtuse barracuda	ត្រីអប្រែ	36.0	6.5	25.0	7.0	75	0.01%	99.82%
	Terapons	ត្រីត្រសក់	57.0	13.5			71	0.01%	99.83%
	Breams	ត្រីក្រហម ឬត្រីឆ្នូតពីរ		39.0	20.0	11.0	70	0.01%	99.85%
Sillago ingenuua	Bay sillago	ត្រីព្រលួសធម្មតា		61.5			62	0.01%	99.86%
Lutjanus gibbus	humpback red snapper	ត្រីឆ្លុងក្រហម			60.0		60	0.01%	99.87%
Diagramma pictum	Painted sweetlips	ត្រីកាជី		6.0	50.0		56	0.01%	99.87%
Carangoides plagiotaenia	Barcheek trevally	ត្រីកំគួច				55.0	55	0.01%	99.88%
	Barracuda	ត្រីអប្រែ			40.0	14.0	54	0.01%	99.89%
Arius maculatus	Spotted catfish	ត្រីកុក	11.6	2.0	39.0		53	0.01%	99.90%
Gerres abbreviatus	Deepbody silverbiddy	ត្រីដុំអង្គរ		51.0			51	0.01%	99.91%
Chiloscyllium griseum	Grey bambooshark	ឆ្លាមគីង្គក់ឬឆ្លាមឆ្នូត		38.0		10.0	48	0.01%	99.91%
	Shellfish nei	ងាវចំរុះ		45.5			46	0.01%	99.92%
Selar crumenophthalmus	Bigeye scad	ត្រីកន្ទុយវែងភ្នែកធំ				45.0	45	0.01%	99.93%
Karalla daura	Goldstripe ponyfish	ត្រីសំបោរហៀរអំបិល			40.0		40	0.01%	99.94%
Lates calcarifer	Barramundi	ត្រីឆ្នង់ស		35.0		2.0	37	0.01%	99.94%

Scientific Name	English Common	Khmer name	Koh Kong	Preah Sihanouk	Kampot	Kep	Grand Total	%Total	%Cum.[1]
	Snappers, jobfishes	ត្រីអាំងកីយ	3.5	32.0			36	0.01%	99.95%
	mixed coral reef fish nei	ត្រីផ្កាថ្មចំរុះ		30.0			30	<0.01%	99.95%
Lactarius lactarius	False trevally	ត្រីស្លឹកខ្ចរ		5.0	22.0		27	<0.01%	99.96%
	Mullets	ត្រីក្បក	3.0		23.0		26	<0.01%	99.96%
	Drums and croakers nei	ត្រីចង្គមបី	1.0	3.0	21.0		25	<0.01%	99.96%
Thalamita crenata	Crenate swimming crab	ក្តាមថ្មខៀវ		22.0			22	<0.01%	99.97%
Ellochelon vaigiensis	Squaretail Mullet	ត្រីក្បកឧុក			21.0		21	<0.01%	99.97%
Saurenchelys cancrivora	Slender Sorcerer	ត្រីខ្ទីងសមុទ្រ		20.8			21	<0.01%	99.97%
	Flounders and soles nei	ត្រីអណ្តាតផ្ទែ	13.5	6.0	0.5		20	<0.01%	99.98%
(blank)	Cephalopods	មឹកហ្លួយសាយ		0.5		19.0	20	<0.01%	99.98%
Rachycentron canadum	Cobia	ត្រីផ្ធក់សមុទ្រ		14.0			14	<0.01%	99.98%
Gerres oyena	Common silverbiddy	ត្រីដុរអង្គរ	13.0				13	<0.01%	99.98%
Acanthurus lineatus	Lined surgeonfish	ត្រីកាតាំងឆ្នូត	0.5	9.0	3.0		13	<0.01%	99.99%
Scarus ghobban	Blue-barred parrotfish	ត្រីសេកស្រការលឿង	0.5	10.0	1.0		12	<0.01%	99.99%
Paralichthys olivaceus	Olive flounder	ត្រីអណ្តាតផ្ទែ		7.0	1.0		8	<0.01%	99.99%
Lutjanus malabaricus	Malabar blood snapper	ត្រីក្រហម		8.0			8	<0.01%	99.99%
Scomberomorus lineolatus	Streaked seerfish	ត្រីបេកា			7.0		7	<0.01%	99.99%
	Trevallies	ត្រីកំក្លួច		5.0			5	<0.01%	99.99%
Priacanthus hamrur	Moontail	ត្រីផែ្នកឡ្យាន		5.0			5	<0.01%	99.99%
	Cutlassfish	ត្រីកុក	4.0				4	<0.01%	99.99%
Choerodon anchorago	Orangedotted tuskfish	ត្រីសេកទឹកក្រូច		4.0			4	<0.01%	99.99%
	Sharks and Rays	ប្រភេទត្រីជី(ពពួគមានតម្លៃថោក)	1.0	3.0			4	<0.01%	100.00%
Carcharhinus sorrah	Spottail Shark	ឆ្លាម	3.8				4	<0.01%	100.00%

Scientific Name	English Common	Khmer name	Koh Kong	Preah Sihanouk	Kampot	Kep	Grand Total	%Total	%Cum.[1]
Hemigymnus fasciatus	Barred thicklip	ត្រីសេកមាត់ក្រាស់	3.0				3	<0.01%	100.00%
	Threadfins nei	ត្រីកាវ៉ាវ		2.5			3	<0.01%	100.00%
Polydactylus sexfilis	Sixfinger threadfin	ត្រីកាវ៉ាវព្រុយប្រាំមួយ				2.0	2	<0.01%	100.00%
	Herrings	ត្រីក្បក			2.0		2	<0.01%	100.00%
Coris sp.	Rainbow Wrasse	ត្រីក្រឹម	2.0				2	<0.01%	100.00%
Leiognathus smithhursti	Smithhurst's ponyfish	ត្រីកិខ្លួនខ្លី		2.0			2	<0.01%	100.00%
Pampus argenteus	Silver pomfret	ត្រីចាបស		2.0			2	<0.01%	100.00%
Albula neoguinaica	Sharpjaw bonefish	ត្រីបេកា	2.0				2	<0.01%	100.00%
Nemipterus thosaporni	Palefin threadfin bream	ត្រីក្រហម		2.0			2	<0.01%	100.00%
Gazza minuta	Toothpony	ត្រីសំបោរហៀរ "គ្មាន វ៉ាអិល"			2.0		2	<0.01%	100.00%
Cheilinus trilobatus	Tripletail wrasse	ត្រីសេកព្រុយបីកង់		1.5			2	<0.01%	100.00%
Acentrogobius caninus	Tropical sand goby	ត្រីត្រដោល/ ត្រីដំឡ្យុង	1.0				1	<0.01%	100.00%
Terapon jarbua	Jarbua terapon	ត្រីត្រសក់កន្ទុយផែក			1.0		1	<0.01%	100.00%
Cheilinus fasciatus	Redbreasted wrasse	ត្រីសេកបង្គង់		1.0			1	<0.01%	100.00%
	Congers nei	អន្ទង់សមុទ្រ	1.0				1	<0.01%	100.00%
Siganus virgatus	Doublebarred spinefoot	ត្រីកន្ធាំងថ្ម		0.5			1	<0.01%	100.00%
Maculabatis gerrardi	Whitespottted whipray	បបែលអុជ	0.5				1	<0.01%	100.00%
Sillago sp.	Silver sillago	ត្រីព្រលួស		0.5			1	<0.01%	100.00%
	Grand total		**56,824.2**	**15,313.3**	**286,879.6**	**277,419.3**	**636,436.4**		

Annex 2. Total reported species value (1000 Riel) by province.

Scientific Name	English common	Khmer name	Koh Kong	Preah Sihanouk	Kampot	Kep	Grand Total	%Total	%Cum.
Portunus pelagicus	Swimming crab	ក្តាមសេះ	222,441	316,009	45,093	83,123	666,667	18.29%	18.3%
	Other fish nei	ប្រភេទត្រីចំរុះ	265,131	103,497	21,076	19,548	409,252	11.23%	29.5%
	Squids nei	មឹក	305,249	41,940	3,257	2,769	353,215	9.69%	39.2%
Penaeus sp.	Prawns nei	បង្គា	197,071	99,863	13,499	9,407	319,840	8.77%	48.0%
Metapenaeus spp.		បង្គាឌីខាក់	280,338	3,575	944	200	285,057	7.82%	55.8%
Encrasicholina heteroloba	Shorthead anchovy	កាកឹម	21,665	187,091	20	-	208,776	5.73%	61.5%
Atule mate	Yellowtail scad	ត្រីកូនគុំ	120,007	-	-	-	120,007	3.29%	64.8%
	Octopus	មឹកពីងពាង	93,164	6,208	11,196	8,603	119,170	3.27%	68.1%
	Needlefish nei	ត្រីផ្ទោង	583	-	106,669	348	107,600	2.95%	71.0%
Decapterus macrosoma	Shortfin scad	ត្រីកាម៉ុងឬត្រីញាធុ	86	76,539	23,175	-	99,800	2.74%	73.8%
	Other catch nei	ផ្សេងៗ	4,122	3,980	74,737	545	83,384	2.29%	76.1%
Suborder Sepiina	Cuttlefish	មឹកស្មុក	51,099	4,913	3,017	5,199	64,227	1.76%	77.8%
	Cephalopods (squids/cuttlefish)	ពួកមឹកស្មុកនិងមឹកបំពង់	34,164	18,035	835	9,640	62,673	1.72%	79.5%
Rastrelliger brachysoma	Short mackerel	ត្រីផ្ទាធុ ឬត្រីកាម៉ុងខ្លួនខ្លី	21,847	16,414	23,809	-	62,070	1.70%	81.3%
Scomberoides commersonianus	Talang queenfish	ត្រីកាឡ្បាំង	-	60,150	-	80	60,230	1.65%	82.9%
Penaeus monodon	Giant tiger prawn	បង្គាខ្លីង	23,636	6,348	1,699	26,352	58,036	1.59%	84.5%
Euthynnus affinis	Mackerel tuna	ត្រីឈាម	46,250	-	-	-	46,250	1.27%	85.8%
Scomberomorus commerson	Narrowbarred Spanish mackerel	ត្រីបេការខ្មៅ ឬត្រីបេកាឆ្នូត	43,550	150	-	-	43,700	1.20%	87.0%
	trash fish	ត្រីជី	11,510	21,951	244	968	34,673	0.95%	87.9%

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	Mantis shrimp	បង្កងកណ្ដប	1,839	18,079	10,923	225	31,065	0.85%	88.8%
Rastrelliger kanagurta	Indian mackerel	ត្រីកាម៉ុងខ្លួនវែង	2,950	21,009	20	540	24,519	0.67%	89.4%
Epinephelus coioides	Orange-spotted grouper	ត្រីតុកកែពៅ	21,463	-	-	200	21,663	0.59%	90.0%
Sargocentron rubrum	Redcoat	ត្រីកាជី	18,400	10	4	15	18,429	0.51%	90.5%
Decapterus maruadsi	Round scad	ត្រីកូនតុំ	620	15,854	-	-	16,474	0.45%	91.0%
Thunnus tonggol	Longtail Tuna	ត្រីប្រម៉ា	15,170	-	-	-	15,170	0.42%	91.4%
Anodontostoma chacunda	Chacunda gizzard shad	ត្រីកាម៉យ	80	4,611	8,645	837	14,173	0.39%	91.8%
Megalaspis cordyla	Torpedo scad	ត្រីកន្ធុយរឹង	-	13,277	-	805	14,082	0.39%	92.2%
Penaeus merguiensis	Banana shrimp	បង្កាប៉ាវ៉	7,723	4,947	15	959	13,644	0.37%	92.6%
Siganus canaliculatus	Whitespotted Spinefoot	ត្រីកន្ឆាំងក្រអូម	11,865	-	1,489	-	13,354	0.37%	92.9%
	Mollusks nei	សប្បីសត្វ ពពួក ខ្យង គ្រំ ងាវ	6,609	1,000	6	5,644	13,259	0.36%	93.3%
Parastromateus niger	Black Pomfret	ត្រីចាបខ្មៅ	12,050	40	-	-	12,090	0.33%	93.6%
	Lizardfish	ត្រីក្ដូចិន	9,700	176	425	-	10,301	0.28%	93.9%
Rastrelliger faughni	Island mackerel	ត្រីប៉ាឡ្យាំង	-	-	9,885	-	9,885	0.27%	94.2%
	squirrelfish	ត្រីក្រហម	-	7,488	800	74	8,361	0.23%	94.4%
Lutjanus argentimaculatus	Mangrove red snapper	ត្រីអាំងកីយក្រហម	8,150	-	-	-	8,150	0.22%	94.6%
	Shrimps	ពពួកបង្កាគ្រប់ ប្រភេទទាំងអស់	6,150	88	935	957	8,130	0.22%	94.8%
Selaroides leptolepis	Yellow stripe trevally	ត្រីឆ្នូតលឿង	8,047	-	-	-	8,047	0.22%	95.1%
	Shellfish nei	ខ្យង ម៉ឹក ក្ដាមផ្សេ ងៗ	1,003	6,693	-	329	8,025	0.22%	95.3%

29

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	Cephalopods (octopus)	ពពួកមឹកពីងពោង	5,215	1,383	842	335	7,775	0.21%	95.5%
	Small mixed shrimp nei	គឺ	750	-	-	6,978	7,728	0.21%	95.7%
	Pony fishes	ត្រីកិ	5,184	1,750	476	53	7,463	0.20%	95.9%
Brevitrygon imbricata	Scaly whipray	បបែលមាន់	5,764	1,102	8	291	7,164	0.20%	96.1%
Sardinella gibbosa	goldstripe sardine	ត្រីគួន	300	6,500	-	8	6,808	0.19%	96.3%
	Mixed species catch in boat	ផលនេសាទមិនទាន់ញែកលាយ) នៅក្នុងឈ្នួប (គ្នាទូក	6,800	-	-	-	6,800	0.19%	96.5%
	Lobster	បង្កងប៉ាក	488	5,420	426	387	6,721	0.18%	96.7%
Portunus spp.	Swimming crabs	ក្ដាមសេះ	20	712	120	5,845	6,697	0.18%	96.9%
Acanthurus sp.	Surgeonfish	ត្រីកាតាំង	3,540	-	2,301	485	6,326	0.17%	97.0%
Scomberomorus sp.	Spanish mackerel species nei	ត្រីបេកា	3,768	1,567	801	-	6,136	0.17%	97.2%
Stolephorus indicus	Indian anchovy	ត្រីក្រចកក្របី	6,080	-	-	15	6,095	0.17%	97.4%
Hemiramphus far	Blackbarred halfbeak	ត្រីផ្ដោងផ្ដា	-	-	6,000	-	6,000	0.16%	97.5%
	Mixed fish for consumption	ប្រភេទសម្រាប់ហូប	6,000	-	-	-	6,000	0.16%	97.7%
Chirocentrus dorab	Dorab wolf-herring	ត្រីស្រាមដាវ	5,430	-	-	-	5,430	0.15%	97.8%
Leiognathus equulus	Common ponyfish	ត្រីសំបោររៀប "មានរំអិល"	5,135	-	-	-	5,135	0.14%	98.0%
	Sharks	ឆ្លាម	-	4,726	-	-	4,726	0.13%	98.1%
Scylla serrata	Mud crab	ក្ដាមថ្ម	3,255	62	75	910	4,302	0.12%	98.2%

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	6-Crabs (swimming crab, mud crab)	ពពួកក្តាម រួមទាំង) ក្តាមសេះ ក្តាម (ឫ ក្តាមជ័រ ជាដើម	2,339	30	82	1,844	4,295	0.12%	98.3%
Sarda orientalis	Striped bonito	ត្រីឈាមស	-	3,780	400	-	4,180	0.11%	98.5%
Amblygaster leiogaster	Smoothbelly sardine	ត្រីគួន	3,600	160	-	-	3,760	0.10%	98.6%
Amblygaster sirm	Spotted sardine	ត្រីគួនបាវ៉ាំង	3,660	-	-	-	3,660	0.10%	98.7%
Eleutheronema tetradactylum	Fourfinger threadfin	ត្រីកាវ៉ាវ	390	964	1,996	255	3,605	0.10%	98.8%
	Rabbitfish	ត្រីកន្ទាំង	-	-	2,670	797	3,466	0.10%	98.9%
	Rays nei	បបែល	54	2,050	60	1,014	3,178	0.09%	98.9%
Anadara granosa	Blood cockle	គ្រែងឈាម	962	1,950	-	-	2,912	0.08%	99.0%
Pseudorhombus arsius	Largetooth flounder	ត្រីអណ្ដាតផ្ទែ	611	1,356	7	171	2,144	0.06%	99.1%
Crenimugil seheli	Bluespot mullet	ត្រីក្បក	713	-	1,034	114	1,861	0.05%	99.1%
Trichiurus lepturus	Largehead hairtail	ត្រីកុកក្បាលធំ	1,800	-	-	-	1,800	0.05%	99.2%
Nemipterus hexodon	Ornate treadfin bream	ត្រីអាងគីមលី	1,713	-	-	-	1,713	0.05%	99.2%
Lutjanus russelli	Russell's snapper	ត្រីបោះត្រា	1,541	-	-	-	1,541	0.04%	99.3%
	Parrot fish	ត្រីសេក	-	-	732	730	1,461	0.04%	99.3%
Decapterus russelli	Slender scad	ត្រីកន្ធយរ៉ឹង	66	1,318	-	-	1,384	0.04%	99.4%
	Sea basses and groupers	ត្រីតុកកែ	1,310	-	-	-	1,310	0.04%	99.4%
Otolithes ruber	Tigertooth Croaker	ត្រីចង្កូមបី	1,204	30	-	-	1,234	0.03%	99.4%
	Crabs nei	ក្តាមផ្សេងៗ	-	-	-	1,177	1,177	0.03%	99.5%
Setipinna taty	Scaly hairfin anchovy	ត្រីស្លឹកឫស្សី	1,135	-	-	-	1,135	0.03%	99.5%
Carangoides plagiotaenia	Barcheek trevally	ត្រីកំគួច	-	1,100	-	-	1,100	0.03%	99.5%
Auxis thazard	Bullet tuna	ត្រីកាឡ្យាំង	-	1,040	-	-	1,040	0.03%	99.5%

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scomberoides tala	Barred queenfish	ត្រីកាឡ្បាំង	-	856	-	-	856	0.02%	99.6%
Sillago sihama	Silver sillago	ត្រីព្រល្បស	-	48	92	701	840	0.02%	99.6%
	Tuna	ត្រីឈាម	818	-	-	-	818	0.02%	99.6%
Saurida undosquamis	Bushtooth lizarfish	ត្រីក្តួចិនអុជខ្មៅ	-	623	-	154	777	0.02%	99.6%
Chiloscyllium punctatum	Brownbanded bambooshark	ឆ្លាមផ្លួត	530	-	-	120	650	0.02%	99.7%
	Cephalopods	មឹកហ្នួយសាយ	-	608	-	18	626	0.02%	99.7%
Lutjanus gibbus	humpback red snapper	ត្រីឆ្លុងក្រហម	600	-	-	-	600	0.02%	99.7%
Sillago ingenuua	Bay sillago	ត្រីព្រល្បសធម្មតា	-	-	-	583	583	0.02%	99.7%
Episesarma versicolor	Violet vinegar crab	ក្ដាមជ័រ	61	-	-	512	573	0.02%	99.7%
Lethrinus harak	Thumbprint emperor	ត្រីបោះត្រា	247	-	-	300	547	0.02%	99.7%
Anodontostoma chacuda	chacunda gizzard shad	ត្រីកាម៉យ	-	450	15	80	545	0.01%	99.8%
Arius maculatus	Spotted catfish	ត្រីក្តុក	264	-	255	4	523	0.01%	99.8%
Panna microdon	Panna croaker	ត្រីប្រម៉ា	15	-	406	100	521	0.01%	99.8%
Sphyraena obtusata	Obtuse barracuda	ត្រីអង្ក្រែ	125	91	217	78	511	0.01%	99.8%
	Breams	ត្រីក្រហម ឬត្រីឆ្លួតពីរ	160	132	-	192	484	0.01%	99.8%
	Emperors, scavengers nei	ត្រីគ្រាប់ខ្នុរ	6	-	441	23	470	0.01%	99.8%
Chiloscyllium griseum	Grey bambooshark	ឆ្លាមគីង្គក់ឬឆ្លាមផ្លួត	-	200	-	257	457	0.01%	99.8%
Selar crumenophthalmus	Bigeye scad	ត្រីកន្ធយរឹងភ្នែកធំ	-	450	-	-	450	0.01%	99.8%
Gerres abbreviatus	Deep body silver biddy	ត្រីដូងអង្ករ	-	-	-	403	403	0.01%	99.9%
	Barracuda	ត្រីអង្ក្រែ	200	186	-	-	386	0.01%	99.9%

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Episesarma sp.	Vinegar crab	ក្តាមជ័រ	-	-	-	318	318	0.01%	99.9%
	mixed coral reef fish nei	ត្រីផ្កាថ្មចំរុះ	-	-	-	300	300	0.01%	99.9%
Lates calcarifer	Barramundi	ត្រីឆ្នូងស	-	50	-	245	295	0.01%	99.9%
	Snappers, jobfishes	ត្រីអាំងកីយ	-	-	77	200	277	0.01%	99.9%
	Shellfish nei	ងាវចំរុះ	-	-	-	273	273	0.01%	99.9%
Diagramma pictum	Painted sweetlips	ត្រីកាជី	260	-	-	2	262	0.01%	99.9%
Thryssa hamiltonii	Hamilton's thryssa	ត្រីស្លឹកឬស្សី	72	185	-	-	257	0.01%	99.9%
	Other catch	ផ្សេងៗទៀត	-	-	200	47	247	0.01%	99.9%
	Mullets	ត្រីក្បក	175	-	45	-	220	0.01%	99.9%
Rachycentron canadum	Cobia	ត្រីផ្ទក់សមុទ្រ	-	-	-	207	207	0.01%	99.9%
Saurenchelys cancrivora	Slender Sorcerer	ត្រីខ្ទឹងសមុទ្រ	-	-	-	189	189	0.01%	99.9%
	Drums and croakers nei	ត្រីចង្កូមបី	141	-	6	27	174	<0.01%	100.0%
Ellochelon vaigiensis	Squaretail Mullet	ត្រីក្បកខ្ពក	168	-	-	-	168	<0.01%	
Gerres oyena	Common silverbiddy	ត្រីដួរអង្គរ	-	-	156	-	156	<0.01%	
	Congers nei	អន្ទង់សមុទ្រ	-	-	150	-	150	<0.01%	
	Terapons	ត្រីត្រសក់	-	-	91	27	118	<0.01%	
Nemipterus furcosus	Forktailed Threadfin Bream	ត្រីក្រហមស្រកាទុន	116	-	-	-	116	<0.01%	
Carcharhinus sorrah	Spottail Shark	ឆ្លាម	-	-	114	-	114	<0.01%	
Scomberomorus lineolatus	Streaked seerfish	ត្រីបេកា	105	-	-	-	105	<0.01%	
Priacanthus tayenus	Purple-spotted bigeye	ត្រីក្រហមភ្នែកល្បៀន	103	-	-	-	103	<0.01%	
Thalamita crenata	Crenate swimming crab	ក្តាមថ្មខៀវ	-	-	-	90	90	<0.01%	

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	Flounders and soles nei	ត្រីអណ្ដាតផ្សែ	3	-	28	52	83	<0.01%	
	Threadfins nei	ត្រីកាវ៉ាវ	-	-	-	75	75	<0.01%	
Nemipterus japonicus	Japanese threadfin bream	ត្រីជប៉ុនក្រហម	-	-	70	-	70	<0.01%	
Acanthurus lineatus	Lined surgeonfish	ត្រីកាតាំងឆ្នូត	15	-	3	41	59	<0.01%	
Paralichthys olivaceus	Olive flounder	ត្រីអណ្ដាតផ្សែ	5	-	-	50	55	<0.01%	
Polydactylus sexfilis	Six-finger threadfin	ត្រីកាវ៉ាវព្រុយ ប្រាំមួយ	-	50	-	-	50	<0.01%	
	Sharks and Rays	ប្រភេទត្រីជីពពុត) (មានតម្លៃថោក	-	-	20	28	48	<0.01%	
Scarus ghobban	Blue-barred parrotfish	ត្រីសេកស្រកា លៀង	-	-	2	45	47	<0.01%	
Lutjanus malabaricus	Malabar blood snapper	ត្រីក្រហម	-	-	-	36	36	<0.01%	
Karalla daura	Goldstripe ponyfish	ត្រីសំបោរហៀរ វ៉ឥល	30	-	-	-	30	<0.01%	
	Trevallies	ត្រីកំក្លូច	-	-	-	28	28	<0.01%	
Lactarius lactarius	False trevally	ត្រីស្ទឹកខ្វរ	20	-	-	8	28	<0.01%	
Priacanthus hamrur	Moontail	ត្រីផ្ដែកឡ្យាន	-	-	-	25	25	<0.01%	
	Herrings	ត្រីក្បក	20	-	-	-	20	<0.01%	
Albula neoguinaica	Sharpjaw bonefish	ត្រីបេកា	-	-	14	-	14	<0.01%	
Choerodon anchorago	Orangedotted tuskfish	ត្រីសេកទឹកក្រូច	-	-	-	12	12	<0.01%	
Pampus argenteus	Silver pomfret	ត្រីចាបស	-	-	-	10	10	<0.01%	

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Gazza minuta	Toothpony	ត្រីសំបោររៀវ "គ្មានវ័អិល"	10	-	-	-	10	<0.01%	
Nemipterus thosaporni	Palefin threadfin bream	ត្រីក្រហម	-	-	-	9	9	<0.01%	
Coris sp.	Rainbow Wrasse	ត្រីក្រឹម	-	-	8	-	8	<0.01%	
Hemigymnus fasciatus	Barred thicklip	ត្រីសេកមាត់ក្រាស់	-	-	8	-	8	<0.01%	
Siganus virgatus	Doublebarred spinefoot	ត្រីកន្ធាំងថ្ម	-	-	-	6	6	<0.01%	
Cheilinus fasciatus	Redbreasted wrasse	ត្រីសេកបង្កង់	-	-	-	5	5	<0.01%	
Cheilinus trilobatus	Tripletail wrasse	ត្រីសេកព្រុយបីកង់	-	-	-	5	5	<0.01%	
	Cutlassfish	ត្រីកុក	-	-	4	-	4	<0.01%	
Leiognathus smithhursti	Smithhurst's ponyfish	ត្រីកិខ្លួនខ្លី	-	-	-	4	4	<0.01%	
Acentrogobius caninus	Tropical sand goby	ត្រីត្រង៉ោលត្រី / ដំឡុង	-	-	2	-	2	<0.01%	
Sillago sp.	Silver sillago	ត្រីព្រល្អស	-	-	-	1	1	<0.01%	
Maculabatis gerrardi	Whitespottted whipray	បបែលអុជ	-	-	1	-	1	<0.01%	
Grand Total			1,956,825	1,100,859	382,866	204,660	3,645,209		

Annex 3. Mean daily catch weight (kg/day) by gear and province.

Koh Kong	Small-scale		Middle-scale	
Gear type	Mean	ε%	Mean	ε%
Trawl			126.5	15.3%
Crab gillnet	6.8	11.5%	6.7	12.1%
Fish gillnet	5.5	**43.6%**	61.5	26.9%
Crab trap	8.0	25.0%	56.6	9.5%
Mackerel Gillnet	34.0	10.8%	46.1	14.5%
Octopus trap longline	40.3	10.4%	51.4	7.2%
Push net	40.7	12.3%	34.2	20.5%
Shrimp gillnet	117.0	**57.6%**	254.1	**46.6%**
Fish trap			86.9	11.1%
Squid tow longline			31.3	17.9%
Blood cockle dragnet			4.9	19.4%
Bottom longline for Squid			28.0	14.9%
Snail trap			41.5	3.6%
Encircling seine			2,043.0	**54.2%**
Undulate venus dragnet	585.0	3.0%		
Mantis shrimp gillnet			7.9	**34.2%**
Squid trap	13.0	15.4%		

Sihanouk	Small-scale		Middle-scale	
Gear type	Mean	ε%	Mean	ε%
Trawl			470.4	6.1%
Crab gillnet	41.6	8.8%	43.5	13.2%
Fish gillnet	59.7	5.8%	126.3	8.3%
Mackerel Gillnet			232.5	8.7%
Octopus trap longline			76.5	21.6%
Shrimp gillnet			31.0	13.1%
Snail trap			46.7	7.1%

Kampot	Small-scale		Middle-scale	
Gear type	Mean	ε%	Mean	ε%
Trawl			39.7	3.0%
Crab gillnet	8.1		12.5	**60.0%**
Fish gillnet	43.3	0.1%	69.4	17.6%
Crab trap	16.1	0.7%	21.2	3.9%
Mackerel Gillnet	39.5	2.3%	105.2	23.6%
Halfbeak gillnet			301.8	**45.0%**
Indian Threadfin Gillnet	9.8	2.5%		
Siganus (Fish) gillnet	25.6	5.1%		
Hand push net	11.5	6.3%		
Trammel net for shrimp	6.7	10.4%		

Kep	Small-scale		Middle-scale	
Gear type	Mean	ε%	Mean	ε%
Trawl			50.5	2.4%
Crab gillnet			17.8	4.5%
Fish gillnet	18.2	0.00%	26.3	23.8%
Crab trap	11.8	0.02%	22.4	18.3%
Mackerel Gillnet			11.3	11.1%
Octopus trap longline			35.0	14.3%
Squid tow longline			16.5	9.1%

Annex 4. Total annual estimated catch by province.

Mean landed weight

Vessel-gear class	Kampot	Kep	Koh Kong	Preah Sihanouk	National
Middle-scale 12-18m	283.2	27.3	348.5	229.3	213.0
Middle-scale 18-24m	1,763.1	42.2	5,382.5	765.4	1,743.3
Small-scale < 6m			19.2		19.2
Small-scale 6-12m	43.4	18.9	132.5	199.2	78.4
Trawl 6-12m	50.2	58.3	412.7	169.3	105.5
Trawler 12-18m	100.6	80.8	2,504.3	945.0	1,020.3
Trawler 18-24m			5,342.8	1,011.0	1,732.9

Values in red, are not statistically accurate and should not be used

Standard Deviation for landed weight

Vessel-gear class	Kampot	Kep	Koh Kong	Preah Sihanouk	National
Middle-scale 12-18m	583.3	18.3	1,069.8	359.6	687.4
Middle-scale 18-24m	498.1	33.9	8,258.5	501.4	4,144.9
Small-scale < 6m			4.6		4.6
Small-scale 6-12m	38.8	15.5	352.0	109.2	221.4
Trawl 6-12m	20.3	17.8	571.1	218.7	230.7
Trawler 12-18m	242.1	118.2	5,605.9	1,456.2	2,547.0
Trawler 18-24m			,6110.3	1,850.8	3,294.3

Number of recorded landings

Vessel-gear class	Kampot	Kep	Koh Kong	Preah Sihanouk	National
Middle-scale 12-18m	85	172	179	106	542
Middle-scale 18-24m	14	16	16	32	78
Small-scale < 6m			5		5
Small-scale 6-12m	134	96	143	22	395
Trawl 6-12m	180	142	45	44	411
Trawler 12-18m	35	23	47	212	317
Trawler 18-24m			6	30	36

Relative standard error (ε%) of mean landed weight

Vessel-gear class	Kampot	Kep	Koh Kong	Preah Sihanouk	National
Middle-scale 12-18m	22.3%	5.1%	22.9%	15.2%	13.9%
Middle-scale 18-24m	7.6%	20.1%	38.4%	11.6%	26.9%
Small-scale < 6m			10.7%		10.7%
Small-scale 6-12m	7.7%	8.4%	22.2%	11.7%	14.2%
Trawl 6-12m	3.0%	2.6%	20.6%	19.5%	10.8%
Trawler 12-18m	40.7%	30.5%	32.7%	10.6%	14.0%
Trawler 18-24m			46.7%	33.4%	31.7%

Values of ε%, higher than 30% reflect means that are statistically inaccurate and should not be used for calculations, this has also been indicated for the mean landed weight and the resulting monthly and annual catch estimates

Mean number of monthly fishing trips

Vessel-gear class	Kampot	Kep	Koh Kong	Preah Sihanouk	National
Middle-scale 12-18m	19.3	11.7	14.0	18.2	14.5
Middle-scale 18-24m	2.5	8.1	2.1	7.2	5.2
Small-scale < 6m			22.2		**21.7**
Small-scale 6-12m	20.7	15.6	16.3	6.4	16.9
Trawl 6-12m	18.3	17.6	9.5	21.4	17.0
Trawler 12-18m	23.5	19.1	7.9	23.7	21.2
Trawler 18-24m			1.4	18.5	11.7

Mean monthly catch

Vessel-gear class	Kampot	Kep	Koh Kong	Preah Sihanouk	National
Middle-scale 12-18m	5,464.7	317.9	4,882.2	4,173.3	3,086.4
Middle-scale 18-24m	4,407.9	340.6	11,533.9	5,511.2	9,082.3
Small-scale < 6m	-	-	425.3	-	415.7
Small-scale 6-12m	898.6	294.7	2,154.2	1,283.5	1,324.9
Trawl 6-12m	921.2	1,025.9	3,930.7	3,627.6	1,787.4
Trawler 12-18m	2,362.2	1,540.0	19,761.0	22,363.3	21,609.4
Trawler 18-24m	-	-	7,480.0	18,702.6	20,292.6

Total reported vessels

Vessel-gear class	Kampot	Kep	Koh Kong	Preah Sihanouk	National
Middle-scale 12-18m	300	304	566	649	1819
Middle-scale 18-24m	6	**0**	67	42	115
Small-scale < 6m	**4**	0	886	**34**	924
Small-scale 6-12m	406	227	1538	944	3115
Trawl 6-12m	311	63	167	579	1120
Trawler 12-18m	12	**0**	112	275	399
Trawler 18-24m	0	0	50	**0**	50

Red bold numbers indicate where there are no vessels recorded for a vessel class and province, but landings have been reported, or vice versa, where no landing data is available, but non-zero vessels recorded, i.e. where total catch is under-estimated

Total active vessels (85%)

Vessel-gear class	Kampot	Kep	Koh Kong	Preah Sihanouk	National
Middle-scale 12-18m	300	304	566	649	1819
Middle-scale 18-24m	6	**0**	67	42	115
Small-scale < 6m	**4**	0	886	**34**	924
Small-scale 6-12m	406	227	1538	944	3115
Trawl 6-12m	311	63	167	579	1120
Trawler 12-18m	12	**0**	112	275	399
Trawler 18-24m	0	0	50	**0**	50

The proportion of active vessels is based on estimates by FiAC staff

Total monthly estimated yield (MT)

Vessel-gear class	Kampot	Kep	Koh Kong	Preah Sihanouk	Provincial total	National
Middle-scale 12-18m	1,393.5	82.0	2,348.3	2,303.6	**6,127.4**	4,771.6
Middle-scale 18-24m	22.0	-	657.4	198.4	**855.8**	890.1
Small-scale < 6m	-	-	320.2	-	**320.2**	326.3
Small-scale 6-12m	310.0	56.9	2,815.6	1,029.3	**4,211.8**	3,508.4
Trawl 6-12m	243.2	55.4	558.2	1,784.8	**2,641.6**	1,701.6
Trawler 12-18m	23.6	-	1,877.3	5,233.0	**7,110.3**	7,325.6
Trawler 18-24m	-	-	321.6	-	**321.6**	872.6
Total	**1,992.4**	**194.3**	**8,898.7**	**10,549.2**	**21,634.6**	**19,396.2**

Total annual estimated yield (MT)

Vessel-gear class	Kampot	Kep	Koh Kong	Preah Sihanouk	Provincial total	National
Middle-scale 12-18m	16,722	984	28,180	27,644	**73,530**	57,259
Middle-scale 18-24m	264	-	7,889	2,381	**10,534**	10,681
Small-scale < 6m	-	-	3,843	-	**3,843**	3,916
Small-scale 6-12m	3,720	683	33,787	12,352	**50,542**	42,101
Trawl 6-12m	2,919	665	6,698	21,417	**31,699**	20,420
Trawler 12-18m	283	-	22,528	62,796	**85,607**	87,907
Trawler 18-24m	-	-	3,860	-	**3,860**	10,471
Total	**23,909**	**2,332**	**106,784**	**126,590**	**259,615**	**232,755**