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Status of Elasmobranchs Fishery in Chennai, India

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Abstract

Catches of elasmobranchs in India showed an increasing trend from 27.4 thousand t in 1961 to 49 thousand t in 2006. During 2006, among the total elasmobranch catches throughout India, Tamil Nadu contributed substantially with 10.8 thousand tonnes. Observations on elasmobranchs fishery in Chennai for a period of 5 years from 2002–2006 was carried out. In Chennai fisheries harbor, annual elasmobranch catches varied from 489 t to 1735 t for the trawlnets and 194 t to 519 t for mechanized gillnets. In the same harbor, maximum catch of 2074 t of elasmobranchs was recorded in 2002. The contribution of elasmobranch i.e. 4.0 %, 16.0 % & 2.0 % to the trawl, gillnet, and hooks and line (H&L), respectively, with the CPUE of 24.4, 136.7, and 1.3 kg in the respective gears were observed. Trawlers landed heavy catch of more than 100 t of elasmobranchs during June and July with the catch per hour (cph) of 1.4–1.6 kg. Gillnet catches were better during June-September, where monthly catch was above 35 t with CPUE of 203-287 kg. H&L landed good catch during February and March, where the catch was above 1 t with the CPUE of 3.3-4.0 kg.

Catch using trawlnets was dominated by sting rays (74.1%), whereas Carcharhinid sharks (51.1%) were dominant in the catch by mechanized gillnet. The elasmobranchs fishery in Chennai constituted 13 species of sharks, 13 species of rays, and 4 species of guitar fishes. Hammer head shark, *Sphyrna lewini* (*S. lewini*), was dominant among the sharks, with 33.8%, 35.0%, and 37.5% contribution in the trawlnet, mechanized gillnets, and H&L catches respectively, followed by *C.sorrah* and the bull shark *Carcharhinus leucas (C.leucas)*. Among the rays, the contribution of stingray *D. jenkinsii* to the catch was 38.7% using the trawlnets, 31.5% using the gillnet, and 57.8% using the H&L, followed by the lesser devil ray *Mobula diabolus* (*M. diabolus*). Of the four species of guitarfishes, *Rhynchobatus djeddensis* was dominant.

The range of size recorded for *D. jenkinsii* in the trawl catch was 150-1199 mm, whereas the range was from 950 to 2599 mm for *S. lewini* in the gillnet catch. A change in the pattern of fishery was observed during the study period. From 2003 onwards, decrease in the catch of devil ray *M. diabolus* (27.1-148.0 t) was observed. Increase in the catch of bull shark *C. leucas* (5.1–105.4 t) and thresher shark *Alopias vulpinus* (0.9-28.9 t) and decrease in the catch of milkshark *Rhizoprionodon acutus* and spadenose shark *Scoliodon laticatus* were also recorded. The price structure and export markets of various by-products are given.

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Introduction

Elasmobranchs consisting of sharks, sawfishes, rays, and skates form one of the largest marine fish resources, which are exploited by different types of gears such as trawlnet, mechanized (drift) gillnets, and hooks and line (H&L). There was gradual increase in the catch of elasmobranchs from 29401 t in 1961 to 69844 t in 1985. Thereafter, the catches remained approximately 70,000 t until 2005. The Elasmobranchs contributed approximately 4% of the India and 3% of the Tamil Nadu catches (Raje et al. 2002). Among the total elasmobranchs catches, 1.6% (823.6 t) of the catches were from Kasimedu, Chennai, and Tamil Nadu. The present study provides a detailed account of the exploitation of elasmobranch resources by analyzing the data collected from Kasimedu fisheries harbor, Chennai for the 5-year period from 2002–2006.

Materials and methods

Observations regarding the catches were carried out every week at Kasimedu fisheries harbor, Chennai, and data on catch, effort, and species composition were collected for the period from 2002 to 2006. The monthly and annual estimates of catches were calculated following the Stratified Multistage Random Sampling Design adopted by the Fishery Resource Assessment Division of Central Marine Fisheries Research Institute. Length frequency of dominant species of sharks and rays were also collected on the sampling days, and samples of stingray *D. imbricatus* were obtained for biological studies.

Results and discussion

Gear-wise catch

In Tamil Nadu, fishing ban is imposed on the operation of mechanized units from 16 April to 30 May every year. During 2002-2006, at Kasimedu fisheries harbour, Chennai, elasmobranchs contributed 4% (1160 t) to the total fish catch fluctuating between 717 t in 2004 and 2074 t in 2002. The contribution of sharks, rays, and guitar fishes were 23, 67 and 10%, respectively. Elasmobranchs were predominantly landed by trawls (72.5%), followed by gillnets and H&L (Table 1). Third quarter was more productive followed by last quarter (Table 2).

Table 1. Group-wise catch composition (tonnes) of Elasmobranchs during 2002 - 2006 at Chennai

Group	Trawl net						%
	2002	2003	2004	2005	2006	Average	
Sharks	161.7	118.6	68.5	83.8	104.2	107.4	12.8
Rays	1294.8	694.8	369.6	367.6	392.1	623.8	74.1
Guitar fishes	278.7	143.1	50.7	42.4	38.3	110.6	13.1
Total	1735.2	956.5	488.8	493.8	534.6	841.8	100
							72.5
	Gilnet						
	2002	2003	2004	2005	2006	Average	
Sharks	87.8	64.6	137.1	346.2	157.6	158.66	51.1
Rays	237.2	127	89.4	171.4	128.5	150.7	48.5
Guitar fishes	0	2.6	0.1	1	2.5	1.24	0.4
Total	325	194.2	226.6	518.6	288.6	310.6	100
							26.8
	Hooks & Line						
	2002	2003	2004	2005	2006	Average	
Sharks	8	2.6	0.9	1.9	0.4	2.76	34.7
Rays	6.3	13.8	0.7	5.3	0	5.22	65.3
Guitar fishes	0	0	0	0	0	0	0
Total	14.3	16.4	1.6	7.2	0.4	8	100
							0.7
Over all catch	2074.4	1167	717	1019.8	823.6	1160.4	100

Group	Mean catch (t) during 2002-2006	%
Sharks	268.8	23
Rays	779.7	67
Guitar fishes	11.9	10

Table 2. Quarter-wise mean catch (t) of elasmobranchs during 2002-2006 at Chennai

Quarter	Trawlnet	Gillnet	Hooks & Line	Total	%
I	188.7	72.8	4.2	265.7	22.9
II	147.2	63.6	0.6	211.4	18.2
III	274.9	132.9	1	407.4	35.2
IV	214.1	59.7	0.7	274.5	23.7
Total	824.9	329	6.5	1160.4	100

Trawlnet

At Kasimedu fisheries harbor, Chennai, daily and multiday trawlers land their catches. Maximum catches are recorded from multiday trawlers. During the period from 2002 to 2006, the monthly average catch of elasmobranchs varied from 18.1 t to 129.1 t with the CPUE of 15.1 to 28.7 kg for trawlers with the expended effort (units) varying from 1201 in April to 4503 in June. Highest and lowest monthly landings of 129.1 t and 18.1 t were recorded during June and April, respectively (Table 3).

Table 3. Month-wise average catch of elasmobranchs during 2002-2006 at Chennai

Trawlnet							
Month	Effort			Elasmobranchs			
	Units	AFH	Total fish catch (t)	Catch (t)	C/E (kg)	C/h (kg)	%
January	2823	52861	1600.7	69.1	24.5	1.3	4.3
February	2516	51975	1517.8	62.5	24.8	1.2	4.1
March	2747	58289	1558.3	57.1	20.8	1	3.7
April	1201	17846	469.5	18.1	15.1	1	3.9
May	0	0	0.0	0.0	0	0	0
June	4503	82549	3149.4	129.1	28.7	1.6	4.1
July	3972	73064	2443.0	105.7	26.6	1.4	4.3
August	3690	76101	2476.4	90.7	24.6	1.2	3.7
September	3174	67669	1999.6	77.0	24.3	1.1	3.9
October	2728	58681	1709.0	59.9	22	1	3.5
November	3095	67625	1832.4	84.6	27.3	1.3	4.6
December	3317	66414	1853.2	69.6	21	1	3.8
Total	33766	673074	20609.2	823.6	24.4	1.2	4

			Gill net				
January	176	4338	157.7	17.4	99	4	11
February	190	4456	183.9	24.3	127.8	5.5	13.2
March	349	9431	329.5	31.2	89.4	3.3	9.5
April	134	2682	98.3	16.2	121.3	6.1	16.5
May	547	1867	43.3	7.9	14.3	4.2	18.1
June	194	12791	264.0	39.5	203.5	3.1	15
July	162	4859	191.9	36.0	221.8	7.4	18.8
August	230	6065	244.9	49.5	215.1	8.2	20.2
September	165	5152	251.6	47.5	287.1	9.2	18.9
October	94	3264	102.5	15.0	160.4	4.6	14.7
November	50	1000	43.6	11.7	233.6	11.7	26.8
December	117	3725	147.6	33.0	282.5	8.9	22.3
Total	2407	59630	2058.9	329.1	136.7	5.5	16
			Hooks & Line				
January	268	1287	13.6	0.8	2.8	0.6	5.6
February	437	2342	20.7	1.7	4	0.7	8.4
March	513	2313	22.6	1.7	3.3	0.7	7.6
April	389	2257	39.3	0.5	1.3	0.2	1.3
May	145	578	9.2	0.0	0	0	0
June	257	1539	8.5	0.1	0.4	0.1	1.2
July	208	1335	9.7	0.1	0.4	0.1	0.9
August	957	4178	77.3	0.8	0.8	0.2	1
September	465	2784	62.5	0.1	0.2	0	0.1
October	285	1162	16.5	0.1	0.4	0.1	0.7
November	690	2913	16.7	0.3	0.4	0.1	1.6
December	320	1237	20.4	0.3	0.9	0.2	1.4
Total	4933	23925	317.0	6.5	1.3	0.3	2

Mechanized Gillnet

At Kasimedu fisheries harbor, Chennai, mechanized gillnets were operated throughout the year except November mainly for catching tunas, seer fish, and sharks. The mean monthly catch fluctuated between 7.8 t and 49.5 t with the CPUE of 14.3–287.1 kg. (Table 3).

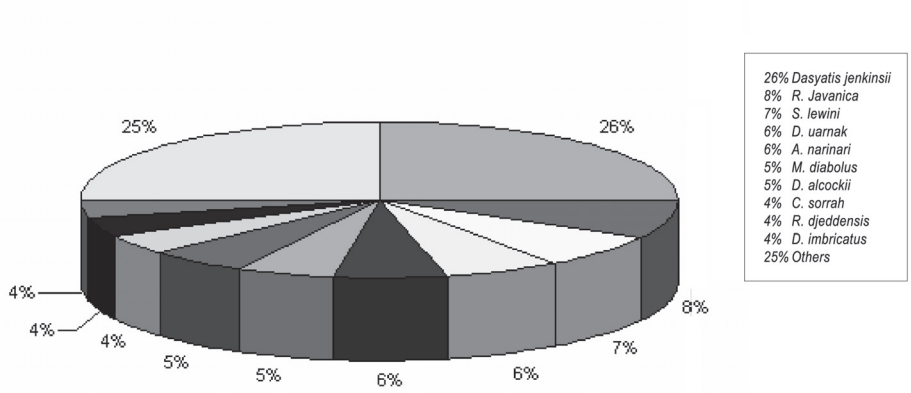

Figure 1. Dominant species of elasmobranchs during 2002-2006 at Chennai

Hooks and line

The elasmobranch catches landed by H&L were dominated by rays followed by sharks. The decreasing trend was discernible from 2002 to 2006. The mean monthly catch fluctuated between 0.08 t in September and 1.7 t in February (Table 3).

Species composition

Among the elasmobranchs, 13 species of sharks, 13 species of rays, and 4 species of guitarfishes were landed at Kasimedu fisheries harbor, Chennai. Of the 30 species that constituted the elasmobranch fishery at Chennai during 2002–2006, rays dominated the elasmobranch fishery with *D. jenkinsii* (25.1 %) as the major species followed by *R. javanica* (Fig 1).

Among 6 genera of rays *viz*., *Dasyatis, Aetobatus, Rhinoptera, Gymnura, Mobula,* and *Manta,* the sting rays *Dasyatis* spp. dominated the catch; 38.7%, 31.5%, and 58.2% of sharpnose stingray *D. jenkinsii* was caught by the trawl, the mechanized gillnet, and the H&L respectively. Among the sharks, the members of the family Carcharhinidae were predominant in the fishery. Eight genera of sharks namely, *Carcharinus, Rhizoprionodon, Sphyrna, Chiloscyllium, Iago, Alopias, Scoliodon, and Galeocerdo* were observed. The hammerhead shark *Sphyrna lewini* dominated the catch constituting 30.3%, 50.8%, and 35.1% in trawl, mechanized gillnet, and H&L catches, respectively, followed by *C. sorrah* and *Carcharhinus leucas* (*C. leucas*). Other dominant species were *Mobula diabolus.* Of the three genera *Rhina, Rhinobatos,* and *Rhynchobatos,* white-spotted shovelnose guitarfish *Rhynchobatos djiddensis* was dominant both in the trawl (42.1%) and gillnet (58.4%) catches (Table 4).

Table 4. Gear- wise species composition of elasmobranchs (t) during 2002-2006 at Chennai

Species	TRAWL NET							GILLNET							HOOKS & LINE							All gear %	% to elasmo
Shark	2002	2003	2004	2005	2006	Average	%	2002	2003	2004	2005	2006	Average	%	2002	2003	2004	2005	2006	Average	%		
C. melanopterus	49.2	22.5	6.2	3.6	3.7	17.0	15.9	34.5	12.2	5.3	11.3	4.5	13.6	8.5	2.9	0.9	0.1	0.7	0.0	0.9	32.8	11.7	2.7
C. sorrah	7.7	12.5	11.2	20.4	24.4	15.2	14.2	0.0	12.0	51.4	80.4	24.6	33.7	21.2	0.0	0.0	0.2	0.1	0.1	0.1	2.7	18.2	4.2
C. limbatus	0.0	14.7	0.0	0.0	0.0	3.0	2.7	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	1.1	0.3
C.leucas	0.0	0.0	1.8	10.1	25.1	7.4	6.9	0.0	5.1	8.3	95.3	57.7	33.3	21.0	0.0	0.0	0.1	0.0	0.2	0.1	2.5	15.2	3.5
C. amblyrhynchoides	0.0	0.0	0.5	0.0	0.0	0.1	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
C.brivipinna	0.0	0.0	0.0	0.4	2.7	0.6	0.6	0.0	0.0	0.0	2.7	2.4	1.0	0.7	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.6	0.1
R. acutus	34.4	11.0	10.0	22.2	21.4	19.8	18.5	21.4	10.4	8.8	4.9	6.5	10.4	6.5	1.8	0.5	0.0	0.2	0.1	0.5	18.5	11.4	2.6
S. lewini	53.5	49.0	21.9	13.8	13.3	30.3	28.2	31.6	23.2	42.1	110.4	46.5	50.8	32.0	2.3	1.2	0.4	0.9	0.0	1.0	35.1	30.5	7.1
C. griseum	8.2	4.3	1.7	3.2	1.2	3.7	3.5	0.0	0.0	0.0	2.4	0.4	0.6	0.4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	1.6	0.4
I. omanensis	0.0	4.5	5.8	0.4	0.1	2.2	2.0	0.0	0.8	0.0	0.0	0.0	0.2	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.9	0.2
A. vulpinus	8.7	0.0	3.7	2.5	4.4	3.8	3.6	0.0	0.9	20.2	26.4	12.2	11.9	7.5	0.9	0.0	0.1	0.0	0.0	0.2	6.9	5.9	1.4
S. laticaudus	0.0	0.0	5.8	5.5	7.5	3.8	3.5	0.4	0.0	1.0	11.5	2.4	3.1	1.9	0.0	0.0	0.0	0.0	0.0	0.0	0.2	2.5	0.6
G. cuvieri	0.0	0.0	0.0	1.7	0.4	0.4	0.4	0.0	0.0	0.0	0.8	0.2	0.2	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.2	0.1
Total	**161.7**	**118.6**	**68.5**	**83.8**	**104.2**	**107.3**	100.0	**87.8**	**64.6**	**137.1**	**346.2**	**157.6**	**158.7**	**100.0**	**8.0**	**2.6**	**0.9**	**1.9**	**0.4**	**2.8**	**100.0**	**100.0**	**23.2**
Ray																							0.0
Dasyatis jenkinsii	526.3	292.0	90.9	158.6	138.4	241.2	38.7	116.1	57.9	18.5	35.9	9.3	47.5	31.5	3.9	7.7	0.3	3.2	0.0	3.0	58.2	37.4	25.1
D.alcockii	119.4	55.3	60.0	13.1	22.4	54.1	8.7	0.0	9.7	16.5	2.0	2.2	6.1	4.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	7.7	5.2
D.kuhli	39.9	9.5	9.9	11.7	8.5	15.9	2.5	13.3	0.4	0.4	0.7	0.2	3.0	2.0	0.1	1.3	0.0	0.4	0.0	0.4	6.7	2.5	1.7
D.imbricatus	84.0	34.9	27.5	34.9	26.8	41.6	6.7	2.8	3.5	2.2	2.5	0.0	2.2	1.4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	5.6	3.8
D.uarnak	167.5	51.2	43.4	18.8	24.2	61.0	9.8	26.5	10.1	3.6	10.6	3.3	10.8	7.2	0.9	1.7	0.0	0.6	0.0	0.6	12.4	9.3	6.2
D.sephen	42.7	44.2	16.5	8.4	15.1	25.4	4.1	4.8	4.4	6.4	1.7	3.3	4.1	2.7	0.0	0.0	0.0	0.0	0.0	0.0	0.0	3.8	2.5
D. bleekeri	2.5	12.9	17.5	2.2	9.7	9.0	1.4	0.0	2.9	0.4	2.9	0.7	1.4	0.9	0.0	0.7	0.0	0.0	0.0	0.1	2.8	1.3	0.9
D.zugei	9.1	0.0	3.7	0.0	0.0	2.6	0.4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.3	0.2
R. javanica	120.8	89.0	33.2	60.0	47.2	70.0	11.2	44.5	15.0	8.2	27.8	14.8	22.1	14.6	0.0	0.0	0.1	0.0	0.0	0.0	0.4	11.8	7.9
A. narinari	137.3	70.7	40.9	15.8	31.0	59.2	9.5	26.4	14.3	3.4	6.9	4.3	11.0	7.3	1.4	2.4	0.1	1.1	0.0	1.0	19.1	9.1	6.1
G. poecilura	45.3	13.5	13.5	11.4	4.4	17.6	2.8	2.9	3.2	3.0	2.1	0.5	2.3	1.6	0.0	0.0	0.0	0.0	0.0	0.0	0.0	2.6	1.7
M. diabolus	0.0	21.6	5.7	32.8	58.0	23.6	3.8	0.0	5.5	21.5	77.7	90.0	38.9	25.8	0.0	0.0	0.1	0.0	0.0	0.0	0.5	8.0	5.4
M. birostris	0.0	0.0	6.9	0.0	6.0	2.6	0.4	0.0	0.0	5.4	0.0	0.0	1.1	0.7	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.5	0.3
Others	0.0	0.0	0.0	0.0	0.3	0.1	0.0	0.0	0.0	0.0	0.8	0.0	0.2	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total	**1294.8**	**694.8**	**369.6**	**367.6**	**392.1**	**623.8**	**100.0**	**237.2**	**127.0**	**89.4**	**171.4**	**128.5**	**150.7**	**100.0**	**6.3**	**13.8**	**0.7**	**5.3**	**0.0**	**5.2**	**100.0**	**100.0**	**67.2**
Guitarfish																							0.0
R. ancylostoma	88.7	42.6	26.5	7.4	12.6	35.6	32.2	0.0	0.1	0.0	0.3	1.4	0.3	25.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	32.1	3.1
R, granulatus	75.1	32.1	12.5	8.4	4.5	26.5	24.0	0.0	0.0	0.0	0.5	0.0	0.1	8.3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	23.8	2.3
R. djeddensis	114.9	68.4	11.6	22.9	14.9	46.5	42.1	0.0	2.5	0.1	0.2	0.7	0.7	58.4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	42.3	4.1
R. obtusus	0.0	0.0	0.0	3.7	6.3	2.0	1.8	0.0	0.0	0.0	0.0	0.4	0.1	8.3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	1.9	0.2
Total	**278.7**	**143.1**	**50.7**	**42.4**	**38.3**	**110.6**	100.0	**0.0**	**2.6**	**0.1**	**1.0**	**2.5**	**1.2**	100.0	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	100.0	**9.6**
Grand Total	**1735.2**	**956.5**	**488.8**	**493.8**	**534.6**	**841.8**		**325.0**	**194.2**	**226.5**	**518.7**	**288.5**	**310.6**		**14.3**	**16.4**	**1.6**	**7.2**	**0.4**	**8.0**			**100**

By products of elasmobranchs and their market at Chennai

The products of shark that have very high value such as fins, meat, liver oil, liver meal, cartilage, skin, and teeth and fins of guitarfishes and gill rakers of rays are exported from Chennai to Singapore, Thailand, Malaysia, and China. The price structure of the by-product is given in Table 5.

Table 5. Price structure of *Elasmobranchs* by products at Chennai

Product	Size (cm)	Price/kg (dried wt). (in rupees)
Fins of sharks and guitarfishes	Below 40 cm	Rs. 3500
	Above 40 cm	Rs. 4500
	Caudal fin 10–25cm	Rs. 7000
Hammerhead shark fin	Above 25cm	Rs. 4000
Shark teeth	.....	Rs. 1000
M.diabolus gill rakers	.....	Rs. 500

Conclusions

The study indicated that the catches of elasmobranchs decreased over the years from 2074 t in 2002 to 824 t in 2006. The peak landings were recorded during third quarter (July–September) as reported by Devadoss et al. (2000). In Tamil Nadu, 69% of the rays were caught by trawlers (Raje et al. 2002). In Chennai, rays contributed 67% in the elasmobranches catch. Contribution of sharks to the elasmobranchs catch was to the extent of 28% on the east coast (Raje et al. 2002) and at Chennai, it was 23%. Devadoss et al. (1989) reported that the landings of sharks by the gillnets have decreased from 71% during 1981–1985 to 59% during 2002–2006. Devadoss (1984) stated that the species of grey sharks *Carcharinus spp*. contributed 70 to 75% of the shark catch at Chennai, whereas during 2002–2006, *Carcharinus spp*. contribution decreased from 55% to 50%. Raje et al (2002) mentioned that the hammerhead shark *S. lewini* constituted only 12% of the sharks group in Tamil Nadu, whereas in the present study, it was recorded that the hammerhead shark (*S. lewini*) contribution has increased to 35% of the total sharks catch. The emerging small-scale fishery supported by the bull shark *C. leucas* (mostly of females) of Pulicat Lake, Chennai requires special investigation. Catches to the tune of 95 t and 58 t landed during 2005–2006 by trawlers and gillnetters. Eighty percent of the catches of *C.leucas* in Chennai was caught by mechanized gillnets. During the period of study, the landing of a female *C. leucas* with a total length of 3560 mm and weight of 320 kg during June 2005 at Kasimedu fisheries harbor, Chennai was reported. The present record of *C. leucas* is the largest recorded so for. (Rajapackiam et al. unpubl. data).

Pregnant sharks of *C. leucas* were often sighted off Pulicat Lake by the fishermen. This agrees well with the observations made by Devadoss et al. (1989). In November, because of unfavorable weather conditions, the gillnet operation by mechanized boats was stopped. During fishing ban by the mechanized boats, the fisherman operated gillnet in nonmechanized fiber boats. Therefore, the effort was more in operation resulting in low CPUE (14.3 kg).

A noteworthy observation was the quantity of *M.diabolus* catches landed by mechanized gillnets. The cow-nose ray *R. javanica* formed seasonal fishery during November–March. On several occasions, huge shoals formed by females were caught. A giant *Manta birostris* with 5.2 m disc width and weight of 1050 kg was landed by mechanized gillnet at Chennai fisheries harbor during April 2006. For the second time in Chennai fisheries harbor, two fan tail ray *Taeniura melanospila* landed in 2005 when the gillnet was used. The size of female was 150 mm with 70 kg, whereas for the male, it was 140 mm and 60 kg.

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