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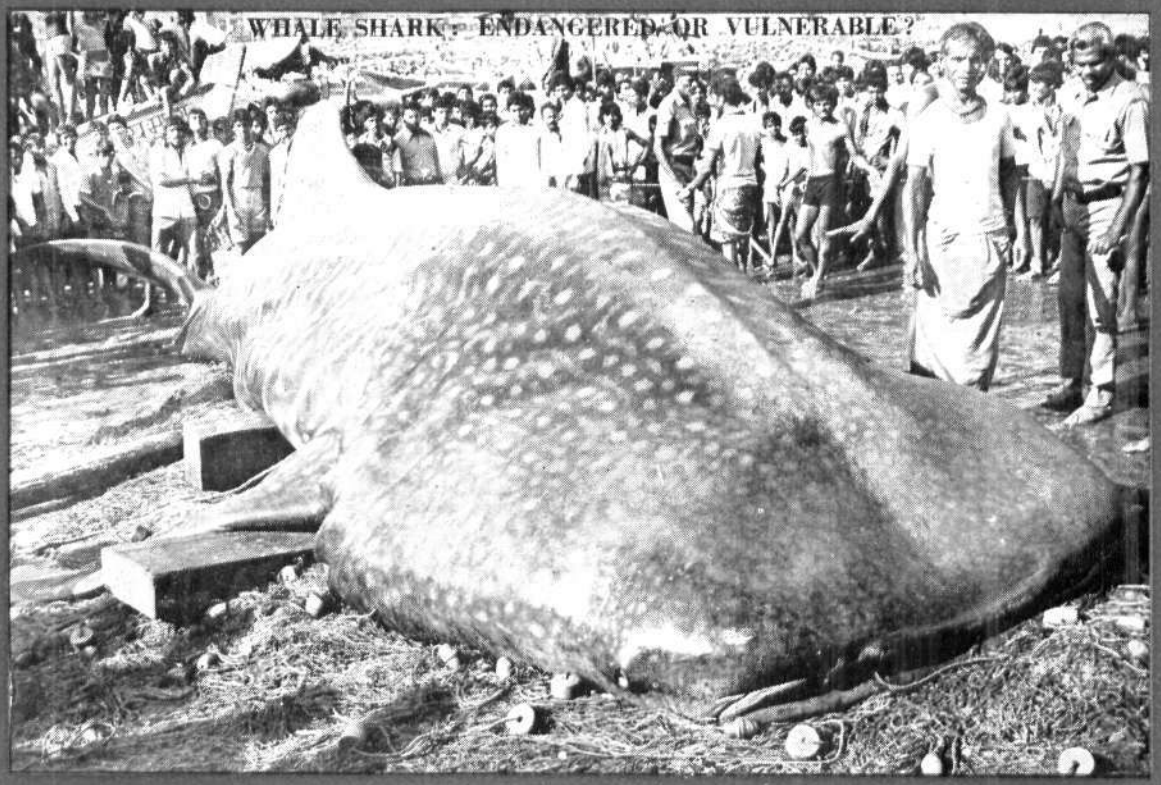

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THE MARINE FISHERIES INFORMATION SERVICE: Technical and Extension Series envisages the rapid dissemination of information on marine and brackish water fishery resources and allied data available with the National Marine Living Resources Data Centre (NMLRDC) and the Research Divisions of the Institute, results of proven researches for transfer of technology to the fish farmers and industry and of other relevant information needed for Research and Development efforts in the marine fisheries sector.

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Front cover photo: Frontal view of the whale shark showing obtuse and depressed snout and cavernous mouth.
Back cover photo: Whale shark (approx: 6 m) landed at Hejmadi, Karnataka in December, 1980.

THE WHALE SHARK (*RHINIODON TYPUS* SMITH) IN INDIAN COASTAL WATERS: IS THE SPECIES ENDANGERED OR VULNERABLE ?

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Introduction

Notable contributions summarising our knowledge of the known habits of the whale shark in general, and its occurrence in Indian coastal waters have been made by Gudger (1935), Chevey (1936) and Prater (1941). The monumental work "The Fishes of the Western North Atlantic" by Bigelow and Schroeder (1948) lists several references to *Rhiniodon typus* Smith from various parts of the world, but there are some omissions from Indian coastal waters. Subsequent records and observations on whale sharks from Indian coastal waters and other parts of the world have added to our knowledge of this leviathan of the open seas. In the light of these, a re-appraisal seems necessary. Herein, are also added a number of records of the whale shark from Indian coastal waters, while attention is drawn to the gaps in our knowledge of the natural history of this shark so that those interested could make constructive observations as and when opportunities arise.

Silas and Rajagopalan (1963) reviewed the position regarding captures of whale shark in Indian waters until about that time, and the following authors have recorded additional captures: Gopalan (1962), Thomas and Kartha (1964), Pai and Pillai (1970), Seshappa *et al.* (1972), Pillai (1972), Freda and Bose (1973), Kuthalingam *et al.* (1973), Kunjipalu and Mathai (1976), Anon. (1981), Nammalwar and Krishna Pillai (1983), Pai *et al.* (1983) and Dhulkhed (1983).

More records of whale sharks from Indian coastal waters

1. During the first week of July, 1960, a whale shark of sizeable proportions was caught in fishing net, a few miles to the east of Tondi in the Palk Bay. The fish was towed to Thangachimadam on Rameswaram Island where it was cut up and readily sold to be cured and later exported to Sri Lanka, as its flesh is not favoured much locally. Information about the capture was received too late and hence no photographs or measurements are available except the following data. The fish weighed, excluding a part of the cartilaginous skeletal parts and the viscera, about 84 maunds (3,123.7 kg), the weight of the liver alone being 2¼ maunds (93.0 kg). The flesh was sold at Rs. 12/- per maund. Besides this information it was possible to collect a few vertebrae of this fish; 14 of which in the dried condition measured 82.5 cm, the average length of each vertebra being 65 mm and the average diameter 84 mm. The vertebral centra are asterospondylous, the outer cartilaginous layer being traversed by four characteristic, outwardly radiating hardened (calcified) areas, the lateral areas being slightly wider than the dorsal and ventral ones as noted by White (1930). Between these four, but extending only very slightly from the cone are four irregular calcified ridges (intercalated calcifications) which are poorly developed in these vertebrae, probably on account of the smaller size of the animal. The centra also show a number of concentric rings of white fibrous tissue, progressively narrower towards the periphery of the centra and whether these rings could help in age determination is not known. There was hardly any way of knowing the exact length of the shark except hearsay which placed it round about six metres.

Although a rarity, the fishermen are familiar with the whale shark which in Tamil is locally known as 'Panai meen'. They recognise it as one of the sharks and their characterisation of it as of large size combined with the broad head, large transverse slit-like terminal mouth, and the slaty grey colour of the dorsal side with numerous large circular white markings and the structure of the vertebrae recovered are but definite clues to its correct identity.

2. Mr. K. Virabhadra Rao, formerly of the CMFRI, kindly informed me of the capture of a 25'4" (7.72 metres) whale shark on 16th May, 1958 at Irumeni on the Palk Bay coast, a few miles from the Central Marine Fisheries Regional Research Centre, Mandapam Camp. Reports of this capture appeared in the newspapers at that time.

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Additional details for the shark are as follows: girth of fish : 13′ 6″ (4.11 m); sex : female; weight : about 5.5 tonnes.

3. I am also informed by my colleague, Mr. S. Mahadevan about another landing of a whale shark, 28′ (8.5 metres) long, at Periathalai, near Idinthakarai in the Gulf of Mannar on 26th March, 1958. It was four days before the authorities could visit the spot and by that time the animal had become badly decomposed, but parts of the skeleton appeared to have been saved.

The fishermen call the whale shark 'Uravi' (Tamil) at Tuticorin and Idinthakarai, while further south at Cape Comorin it is known as 'Pullian surrow' (Tamil), while the name 'Panai meen' by which it is known at Palk Bay is applied by the Cape fishermen to the baleen whale.

4. On 10th December, 1960 while visiting Pozhikara, a fishing village between Cape Comorin and Colachel on the west coast, I was informed by Mr. A. C. Roche, a local inhabitant, of the capture of a whale shark in a drift net off Pozhikara during the first week of January, 1960. The fishermen who made the catch were there at the time and they had no difficulty in identifying their fish with that of a drawing of *Rhiniodon*, from amongst several drawings of cetaceans, sharks and other fishes. The whale shark was said to measure 18 feet (5.48 metres) and the liver of the animal was sold for Rs. 20/-. Since the meat was whitish and very soft, it was considered unpalatable and the carcass was towed back and dumped far into the sea.

5. To these may be added a fifth record of a whale shark caught at Vizhinjam, nine miles south of Trivandrum in February, 1960, measuring 32 feet (9.75 metres). This last record I have been able to gather from the monthly progress report of the Fishery Resources Assessment Division of the Central Marine Fisheries Research Institute.

6. A 6.1 m whale shark caught in gill net at Visakhapatnam on 25th May, 1965 and reports with a photograph of the shark appeared in the *Indian Express* dated 26th May, 1965 from Visakhapatnam.

7. A 7.67 m whale shark weighing about eight tonnes caught in 'Pattuvalai' (drift net) about 25 km off Sakthikulangara, north of Quilon on 22nd April, 1975. The depth where the net was operated was 19 fathoms as informed by Shri S. B. Chandrangathan of Central Marine Fisheries Research Institute to the author.

8. A female whale shark measuring 6.88 m and weighing about 1.5 tonnes landed at Cuffe Parade, Bombay on 18th January, 1978 and reported by Pai *et al.* (1983).

9. A female whale shark measuring 7.58 m landed at Cuffe Parade, Bombay on 8–1–1980 and reported by Karbhari (1986) in this publication (p. 20).

10. A 6.4 m whale shark landed in purse seine catch at Hejmadi on 8th November, 1980 and reported by Satyanarayana Rao (1986) in this publication (p. 22). Details are not available.

11. Another whale shark landed at Hejmadi in December, 1980 and reported here. No details are available.

12. A 7.92 m female whale shark weighing about four tonnes, caught in purse seine and landed at Malpe, Karnataka on 27th December, 1980 and reported by Satyanarayana Rao (1986) in this publication (p. 22).

13. A 5.18 m male whale shark weighing about 1.7 tonnes caught in purse seine off Malpe on 31st December, 1980 and reported by Satyanarayana Rao (1986) in this publication (p. 22).

14–16. Three male whale sharks caught in purse seine on 8–11–1980 along South Kanara coast off Yermal, Mooloor and Kaup measuring 6.71m, 4.88m and 5.65m respectively. This was directed fishing on sighting. Details are reported by Satyanarayana Rao (1986) in this publication (p. 22).

17. A juvenile female whale shark measuring 5.7 m and weighing about 2.2 tonnes caught in gill net off Anjuna, Goa on 29th January, 1981 and reported by Doiphode (1986) in this publication (p. 29).

18 – 40. 22 whale sharks taken in directed fishing from mechanised boats off Veraval. The sharks were caught by harpooning and brought alive to the harbour, and after removal of the liver the carcasses were towed back and discarded in the sea. Reported by Sudhakara Rao (1986) in this publication (p. 30).

The captures were as follows:

Dates	No. of sharks caught
12–4–1982	9
13–4–1982	7
14–4–1982	4
15–4–1982	2

Table 1. *Occurrence of whale sharks in the coastal waters of India, Pakistan and Sri Lanka*

Locality	Date	No.	Sex	Length in metres	Recorded by
(1)	(2)	(3)	(4)	(5)	(6)
A. Coast of Pakistan					
1. Karachi	?	1	?	?	Buist (1850)
2. Karachi	April, 1932	1	?	?	Prater, S. H. (1941)
3. Karachi	27th March, 1937	1	?	5.48	,, (1941)
4. Karachi	April, 1937	1	?	?	,, (1941)
5. Baba Is. (s), off Karachi coast	November, 1949	1	?	11.58	Hussain, I. (1949)
B. West Coast of India and Gulf of Mannar					
1–2. Gulf of Mannar, Tamil Nadu	?	2	?	?	Steuart, J. (1862)
3. Trivandrum, Kerala	1900	1	?	8.83	Pillay, S. N. (1929)
4. Trivandrum, Kerala	February, 1909	1	?	4.14	Pillay, S. N. (1929)
5. Bombay, Maharashtra	13th February, 1938	1	M	6.55	Prater, S. H. (1941)
6. Bombay, Maharashtra	16th January, 1940	1	M	5.66	Prater, S. H. (1941)
7. Jaigarh, north of Ratnagiri, Maharashtra	3rd October, 1936	1	?	6.09±	Prater, S. H. (1941)
8. Trivandrum, Kerala	March, 1934	1	?	3.96	Prater, S. H. (1941)
9. Navapur, 104 km north of Bombay, Maharashtra	21st February, 1948	1	F	6.98	Kulkarni, C. V. (1948)
10. Madapally, 40 km north of Calicut, Kerala	12th February, 1954	1	M	6.47	Chacko, P. I. & M. J. Mathew (1954)
11. Thollayiram Parr, off Tuticorin, Tamil Nadu	11th December, 1953	1	?	6.62±	Chacko, P. I. & M. J. Mathew (1954)
12. Suratkal, 16 km north of Mangalore, Karnataka	5th March, 1959	1	F	12.09	Kaikini, A. S., *et al.* (1959)
13. Periathalai, near Idinthakarai, Tamil Nadu	25th March, 1958	1	?	8.53	Silas, E. G. (1986) (in this paper)
14. Pozhikara, north of Cape Comorin, Tamil Nadu	January, 1960	1	?	5.48	Silas, E. G. (1986) (in this paper)
15. Vizhinjam, Kerala	February, 1960	1	?	9.75	Silas, E. G. (1986) (in this paper)
16. 7 km off Veraval, Gujarat	15th March, 1961	1	F	5.25	Gopalan, U. K. (1962)
17. Okha, Gujarat	?	1	?	?	Gopalan, U. K. (1962)
18. Off Cannanore, landed at Thayyil, Kerala	27th February, 1963	1	?	4.65	Thomas, M. M. & K. Kartha (1964)
19. Calicut, Kerala	5th January, 1970	1	M	5.6	Seshappa, G. *et al.* (1972)
20. Tuticorin, Tamil Nadu	28th July, 1961	1	F	5.62	Silas, E. G. & M. S. Rajagopalan (1963)
21. Tuticorin, Tamil Nadu	26th July, 1968	1	M	5.96	Pai, M. V. & M. Pillai (1970)
22. Hare Is., Tuticorin, Tamil Nadu	16th June, 1970	1	M	7.45	Pillai, M. (1972)
23. Manapad, Tamil Nadu	2nd February, 1973	1	M	5.4	Freda & Bose (1973)
24. Pamban, Tamil Nadu	15th April, 1967	1	M	5.52	Kuthalingam, M. D. K. *et al.* (1973)

1	2	3	4	5	6
25. Kesavanputhanthurai, Colachal, Tamil Nadu	20th December, 1971	1	M	5.17	Kuthalingam, M. D. K. *et al.* (1973)
26. Vizhinjam, Kerala	23rd December, 1971	1	F	3.93	Kuthalingam, M. D. K. *et al.* (1973)
27. Vizhinjam, Kerala	16th March, 1972	1	F	5.65	Kuthalingam, M. D. K. *et al.* (1973)
28. Veraval, Gujarat	17th January, 1976	1	F	6.65	Kunjipalu & Mathai (1976)
29. Anjadiv Is., Karwar, Karnataka	21st January, 1981	1	F	8.81	Pai M. V. *et al.* (1983)
30. Karwar, Karnataka	18th March, 1983	1	?	5.35	Dhulkhed, M. H. (1983)
31. Appa Is., Kilakarai, Tamil Nadu	7th February, 1983	1	?	4.00	Nammalwar, P. & S. Krishna Pillai (1983)
32. Kilakarai, Tamil Nadu	23rd February, 1983	1	M	4.75	Nammalwar, P. & S. Krishna Pillai (1983)
33. Sakthikulangara, Quilon, Kerala	22nd April, 1975	1	?	7.67	Silas, E. G. (1986) (in this paper)
34. Cuffe Parade, Bombay, Maharashtra	18th January, 1978	1	F	6.88	Pai, M. V. *et al.* (1983)
35. Cuffe Parade, Bombay, Maharashtra	8th January, 1980	1	F	7.58	Karbhari, J. P. (1986)*
36. Hejmadi, South Karnataka	8th November, 1980	1	?	6.40	Satyanarayana Rao, K. (1986)*
37. Hejmadi, South Karnataka	December, 1980	1	?	?	Silas E. G., (1986) (in this paper)
38. Malpe, South Karnataka	27th December, 1980	1	F	7.92	Satyanarayana Rao, K. (1986)*
39. Malpe, South Karnataka	31st December, 1980	1	M	5.18	Satyanarayana Rao, K. (1986)*
40. Yermal, South Karnataka	8th November, 1980	1	M	6.71	Satyanarayana Rao, K. (1986)*
41. Mooloor, South Karnataka	8th November, 1980	1	M	4.88	Satyanarayana Rao, K. (1986)*
42. Kaup, South Karnataka	8th November, 1980	1	M	5.65	Satyanarayana Rao, K. (1986)*
43. Anjuna, Goa	29th January, 1981	1	F	5.70	Doiphode, P. V. (1986)*
44–52. Veraval, Gujarat	12th April, 1982	9	?	?	Sudhakara Rao, G. (1986)*
53–59. Veraval, Gujarat	13th April, 1982	7	?	?	Sudhakara Rao, G. (1986)*
60–63. Veraval, Gujarat	14th April, 1982	4	?	?	Sudhakara Rao, G. (1986)*
64–65. Veraval, Gujarat	15th April, 1982	2	?	?	Sudhakara Rao, G. (1986)*
66. Cuffe Parade, Bombay, Maharashtra	21st November, 1985	1	M	12.18	Karbhari, J. P. & C. J. Josekutty (1986)*
67. Cochin, Kerala	17th December, 1984	1	F	?	Somasekharan Nair *et al.* (1986)*
68. Cuffe Parade, Bombay Maharashtra	10th November, 1985	1	?	5.00	Shriram, M. (1986)*

1	2	3	4	5	6
C. East Coast of India					
1. Mouth of Hooghly, R., West Bengal	23rd March, 1908	1	?	4.26	Lloyd, R. E. (1908)
2. Madras, Tamil Nadu	February, 1889	1	?	6.70	Thruston, E. (1890)
3. Madras, Tamil Nadu	?	1	?	?	Foley, W. (1835)
4. Irumeni, Palk Bay, Tamil Nadu	16th May, 1958	1	F	7.72	Silas, E. G. (1986) (in this paper)
5. Thangachimadam, Rameswaram Is., Palk Bay, Tamil Nadu	July, 1960	1	?	6.00±	Silas, E. G. (1986) (in this paper)
6. Visakhapatnam, Andhra Pradesh	26th May, 1965	1	?	6.10	Silas, E. G. (1986) (in this paper)
7. Mullikuppam, Madras, Tamil Nadu	23rd March, 1980	1	M	7.40	James, D. B. *et al.* (1986)*
8. Royapuram, Madras, Tamil Nadu	2nd July, 1984	1	F	5.63	James, D. B. *et al.* (1986)*
9. Keelakarai, G. of Mannar, Tamil Nadu	7th February, 1983	1	?	3.15	Nammalwar, P. (1986)*
10. Solathandavankuppam, Pondicherry	30th January, 1984	1	M	4.97	Chidambaram, L. (1986)*
11. Adirampatnam, Tamil Nadu	19th October, 1985	1	?	–	Ganapathy, A. (1986)*
D. West Coast of Sri Lanka					
1. Dutch Bay	18th March, 1910	1	F	?	Southwell, T. (1912–'13)
2. Morutuva	11th January, 1883	1	?	7.24	Haly, A. (1883)
3. Negombo	January, 1884	1	?	5.48	Haly, A. (1890)
4. Colombo	February, 1889	1	?	4.39	Thruston, E. (1890)
5. Off Sri Lanka	?	1	?	?	Tennant, E. (1861)
6. Kalutara	15th January, 1942	1	M	7.62	Deraniyagala, P.E.P. (1944)
7. Beruvala	December, 1930	1	?	4.50±	Deraniyagala, P.E.P. (1944)
8. Colombo	23rd September, 1953	1	?	9.75	Deraniyagala, P.E.P. (1955)
9. Off Ralagala, Gintota	20th February, 1959	1	?	12.2±	Jonklass, R. (1959)
E. East Coast of Sri Lanka					
1. Kuchchavalli, E. Province	8th October, 1952	1	?	5.48	Deraniyagala, P.E.P. (1953)
2. Trincomalee	22nd October, 1954	1	?	4.11	Deraniyagala, P.E.P. (1955)
3–5. Nilaveli, E. Province	September, 1957	3	?	?	Deraniyagala, P.E.P. (1958)
6. Nilaveli, E. Province	10th October, 1957	1	?	6.09	Deraniyagala, P.E.P. (1958)

*In this publication

Sudhakara Rao (1986) reports that enquiries with fishermen elicited the information that about 40 whale sharks were caught during that season off Veraval.

41. A juvenile whale shark measuring 3.15 m and weighing about 1.5 tonnes. Reported by Nammalwar (1986) in this publication (P. 30).

42. An adult male whale shark measuring 12.18 m landed at Cuffe Parade, Bombay on 21-11-1983 and reported by Karbhari and Josekutty (1986) in this publication (P. 31). This is the largest authentic recorded measurement from Indian seas.

43. A male whale shark measuring 4.97 m landed at Solathandavankuppam, Pondicherry on 30th January, 1984 and reported by Chidambaram (1986) in this publication (P. 36).

44-45. Two whale sharks, a male measuring 7.40 m landed at Mullikuppam, Madras on 23-3-1980 and a female measuring 5.63 m landed at Royapuram on 2nd July, 1984 and reported by James *et al.* (1986) in this publication (P. 21).

46. A female whale shark of 3.6 m length caught off Cochin on 17th December, 1984 weighing about 1.5 tonnes and reported by Somasekharan Nair *et al.* (1986) in this publication (P. 36).

47. A 9 m whale shark landed at Adirampatnam, Tamil Nadu on 19th October, 1985 reported by Ganapathy (1986) in this publication (P. 37).

48. A whale shark measuring 5 m landed at Cuffe Parade, Bombay on 10th November, 1985 and reported by Shriram (1986) in this publication (P. 37).

Known occurrence of the whale shark in Indian coastal waters

In Table 1, the known information on capture and sighting of whale sharks in the Indian coastal waters is given along with similar data for Pakistan and Sri Lankan waters. In the latter cases, there may be some incompleteness in data, but the existing information may be indicative of the time of occurrence of the species in the coastal waters adjacent to ours. There are two additional records of whale sharks rammed by steamers over deep waters off Sri Lanka but not included in the Table. The last two records are: (1) One specimen rammed by the Dutch ship *Johan van Oldenbarnvelt* on 23rd November, 1932 about 150 miles west of Colombo and reported by Gudger (1940), the estimated length of the shark being 7.62 metres, and (2) One specimen rammed by the Japanese ship *S.S. Katori Maru* on 10th July, 1933 about 300 miles off Colombo and reported by Deraniyagala (1936), the estimated length of the shark being about 12.19 metres.

Season of occurrence

The months of occurrence of 91 captures out of a total of 98 reported herein is known (Table 2). Of these, four are from Pakistan, 63 from the west coast of India and the Gulf of Mannar, 10 from the east coast of India and eight and six respectively from the west and east coasts of Sri Lanka.

Table 2. *The month-wise occurrence of whale sharks reported so far*

Month	Pakistan	West coast India & Gulf of Mannar	East coast India	West coast Sri Lanka	East coast Sri Lanka	Total
Jan.	—	8	1	3	—	12
Feb.	—	9	2	2	—	13
March	1	6	2	1	—	10
April	2	24	—	—	—	26
May	—	—	2	—	—	2
June	—	1	—	—	—	1
July	—	2	2	—	—	4
Aug.	—	—	—	—	—	—
Sep.	—	—	—	1	3	4
Oct.	—	1	1	—	3	5
Nov.	1	2	—	—	—	3
Dec.	—	10	—	1	—	11
	4	63	10	8	6	91

It will be seen that more than 78% of the captures were during the period December-April. The largest aggregation seen was off Gujarat coast where during April, 1982 the fishermen are reported to have harpooned about 40 sharks, of which 22 were taken to the Veraval fisheries harbour for removing the liver in four days from 12 to 15 April, 1982.

On the whole the occurrences reported as captures are much more along the west coast of India, the Gulf of Mannar and the west coast of Sri Lanka (71) than along the east coasts of Sri Lanka and India (16).

Along the west coast of India and the Gulf of Mannar there are no records during May,

August and September, while along the east coast of India, the same is true for six months (April, June, August, September, November and December). These gaps may be partly due to insufficient documentation and captures going unreported. A more effective data acquisition system will be necessary. The National Marine Living Resources Data Centre (NMLRDC) at the Central Marine Fisheries Research Institute should help in such monitoring.

At this stage it is not very clear whether there is a seasonal migration of the whale shark along the coastal waters of the west coast from the south northwards. Nor is it very clear as to whether their incursions from the offshore to coastal water take place at different latitudes at different times. An annual synoptic picture of their occurrence on more sighting or captures is needed to answer some of these questions.

December to April also coincides with the season for pelagic fisheries such as sardines and anchovies along the west coast. The relationship between occurrence and forage abundance is yet another aspect which needs further study.

So also there is need to understand whether environmental parameters such as temperature and salinity play a role in their aggregation. The three records along the west coast – G. of Mannar region of India during June and July are from the Gulf of Mannar. It is not known whether the whale shark generally avoids lower salinities. Whether the absence of records from the coastal waters during May, June, July, August and September along the west coast of India which coincides with the southwest monsoon is not clear.

The records are suggestive that the whale shark is not resident in the coastal waters, but influxes come in from the offshore and high seas influenced by some extraneous factors.

Sex ratio

One of the most frustrating experiences while looking at past records is that often when workers have taken great pains to measure captured whale sharks, the sex is not reported. The known information on this from the west and east coasts of India are given in Table 3.

It will be seen that there is great insufficiency of information, the available data being only for 31 specimens from west and east coasts of India, of which 27 are from the west coast.

Table 3. *Sex composition of whale sharks reported so far*

Month	West coast of India and Gulf of Mannar		East coast of India		Total	
	Male	Female	Male	Female	Male	Female
Jan.	2	5	1	—	3	5
Feb.	4	1	—	—	4	1
March	—	3	1	—	1	3
April	1	—	—	—	1	—
May	—	—	—	1	—	1
June	1	—	—	—	1	—
July	1	1	1	—	2	1
Aug.	—	—	—	—	—	—
Sep.	—	—	—	—	—	—
Oct.	—	—	—	—	—	—
Nov.	1	—	—	—	1	—
Dec.	4	3	—	—	4	3
	14	13	3	1	17	14

With the present state of knowledge of the species, it is difficult to say whether sexual segregation occurs in the whale shark either of a "behavioural" type as noted in the case of the spiny dog fish *(Squalus acanthias)* by Ford (1921) or of a "geographical" nature as reported in the case of the soupfin shark *Galeorhinus zyopterus* (Ripley, 1946), and the white-tip shark *Pterolamiops longimaness* (Backus *et al.*, 1956). Information such as size at first maturity, maximum size attained by both sexes and reproductive potential are not available.

Mode of development

Until recently speculation was rife as to the mode of development of the whale shark, the general belief being that it was viviparous. In fact, late Dr. Gudger, the greatest authority on whale sharks, once remarked (Gudger, 1935) that "It is my judgement that the whale shark will be found to be viviparous – *i.e.* a live-bearer. The young when born must be of good size, too large to be hatched from a shelled egg extruded into the water. The just born young must be atleast three to five feet long–perhaps as much as eight to ten. *Quien sabe!*" However, the earliest indication that this giant fish could be oviparous was suggestive from Southwell's observation (1912-'13) based on a specimen taken at Dutch Bay, west coast of Sri Lanka in which he found "...very ripe ovary, oviduct full of eggs, 16 cases counted, same form as in dogfish." This observation, although very significant was discounted by Gudger (1933) who

opined that Southwell's shark could have been a *Galeocerdo tigrinum*, although Southwell (in litt. see Gudger, 1933) appears to have been quite positive about his identity of the shark. However, based on Southwell's observations, Bigelow and Schroeder (1948) suggested the possibility of the mode of development of *Rhiniodon* being ovoviviparous, and changing his views on the same grounds Gudger (1952) conceded oviparity to be a possibility.

Of exceptional interest is the discovery of an egg case containing a fully developed embryo of the whale shark from the coastal waters of the Gulf of Mexico off Texas (Baughman, 1955). The embryo when released from the egg measured 14¼ inches (37 cm) in total length and was bluish grey, dorsally with the characteristic white spots, the ventral side of the body being whitish. The egg case was 12 inches long, 5¼ inches wide and 3¼ inches thick (35 x 14 x 9 cm) and "presented every appearance of having been in the water for some time, one side of it being worn, as if by sand." Baughman further remarks that the discoverer of the egg, Captain Freeze found a large whale shark, longer than his 65-foot shrimp trawler *Doris*, on or about 2nd July, 1953, (the day that the egg was taken), swimming on the surface in the same area a number of times. For a redescription and an additional drawing of this embryo, reference is invited to Reid (1957) and Garrick (1964). One point of interest is that the egg was trawled from 51 m in the coastal waters and in this context Southwell's find of a gravid female whale shark in the month of March in coastal waters is significant as it suggests that this shark besides undertaking migratory movements to feeding grounds could also seek sheltered coastal waters for breeding.

However, the controversy as to whether the whale shark is viviparous or oviparous or ovoviviparous still continues. The Gulf of Mexico embryo had an external yolk sac of about 6.3 m^3 and a stalk 24 cm long and Reid (1957) commented on the extent of absorption of yolk and opined that the embryo was close to hatching. Wolfson (1983) examining early juveniles of whale sharks, found in three of the specimens measuring 55.0, 62.0 and 63.0 cm "a faint indentation is all that remains to mark the stalk" a condition seen in some other elasmobranchs where the "umbilical scar" disappears a few months after hatching. Garrick (1964) postulated that the Gulf of Mexico embryo had yolk in its abdomen which was confirmed by Wolfson (1983). The presence of an umbilical scar in a 55.0 cm (TL) juvenile led Nolan and Taylor (1978) to suggest a viviparous mode of reproduction for the whale shark. In pointing out that the whale shark's mode of reproduction is still uncertain, Wolfson (1983) remarks that "The egg case of *Rhiniodon* is light amber in colour and extremely thin.....the corners may have possessed 'rudimentary' tendrils, but that would have been insufficient to allow for anchoring... and that the case does not appear to be well adapted to withstand conditions on the sea floor." Wolfson (1983) further points out that the embryo could have been aborted by the shark. In the light of these it is quite evident that the mode of reproduction of the whale shark is still an open question. The evidence, therefore suggests ovoviviparity.

Size

The size of whale sharks caught or stranded have always been a matter of interest and the smallest known specimen, besides the 37 cm (given by Wolfson, 1983 as 35.5 cm) embryo mentioned earlier, are six specimens 55.0, 56.0 (2), 62.0, 63.0 and 93.0 cm in TL collected in purse seine from the high seas of Eastern Pacific and Tropical Atlantic where the depth was well over 2,600 m. The next may be the 6 feet (1.81 m) specimen from Cuban waters (Bigelow and Schroeder, 1948). The largest on record is one, a few inches over 59 feet (ab. 18 m) from the Gulf of Siam (Smith, 1925, not actually measured). I am unable to comment about the plus 65-foot specimen mentioned in Baughman's account (1955) from the Gulf of Mexico. However, the longest actually measured specimen appears to be the one recorded from the Seychelles Islands by Wright (1870) as measuring 45 feet (13.72 m). In Indian coastal waters the smallest on record is 3.15 m and the largest 12.18 m, a male.

Shri Ali Manikfan, formerly of the Central Marine Fisheries Research Institute, who hails from the Minicoy Island in the Lakshadweep Archipelago informs me that he has seen on atleast three occasions whale sharks caught at Minicoy, but none of the specimens was longer than eight feet. Their occurrence is rare, but the local fishermen are well aware of its passive and harmless disposition, and call it 'Vori mas meer'. The name'Vori mass' is applied by them to species of *Siganus stellatus* (Forskal) which has got a blotched colour pattern, from which probably the name of the shark is also derived.

Out of the 68 records from the Indian seas, the length measurements are available for only 49 specimens and these are given in Table-4.

From the above statement it is apparent that individuals between four and nine metres are more liable to be encountered in Indian coastal waters.

Table 4. *Length measurements of whale sharks caught from Indian seas*

Sl. No.	TL (m)	No. of specimens	Sl. No.	TL (m)	No. of specimens
1.	3.0–3.9	3	6.	8.0–08.9	3
2.	4.0–4.9	7	7.	9.0–09.9	1
3.	5.0–5.9	15	8.	10.0–10.9	—
4.	6.0–6.9	11	9.	11.0–11.9	—
5.	7.0–7.9	7	10.	12.0–12.9	2

What is intriguing is that we have no information on specimens less than 3 m. The work of Wolfson (1983) points to the occurrence of small whale shark occurring in the high seas and have been taken by the purse seine operated for tuna fishing. The information I have received from Ali Manikfan from the Lakshadweep also suggests that early juvenile whale sharks may be found in oceanic waters. This information gap on early juveniles need bridging. Similarly our information on specimens 10 m and above is extremely meagre.

Food

But for stray observations which have led to two schools of thought, nothing much is known about the food of the whale shark. Gudger (1939, 1953), Prater (1941) and Deraniyagala (1944) have tried to correlate the occurrence of whale sharks in Indian coastal waters with the abundance of zooplankton in these areas. Von Kampen (1908) found shells of small *Sepia* and some small fishes (Gobiids and Saurids) in the stomach of one specimen harpooned in Batavia Bay, Indonesia and on more than one occasion the whale shark has been noticed to feed on tuna bait fish, namely anchovies and sardines (Gudger, 1915, 1918, 1935, 1941a, 1953). On the contrary, Wright (1868, 1870) found large masses of algae as stomach contents of the whale shark he examined in Seychelles and concluded that the whale shark was herbivorous. Later, Pflueger's examination of a 5.5 m whale shark harpooned off the Florida coast showed the stomach to contain nothing but seaweeds and a large quantity of partly digested and consequently unrecognisable food material (Gudger, 1932a). In Indian coastal waters, Mc Cann's (1954) examination of the stomachs of two specimens and the observations of Kaikini *et al.* (1959) show that marine algae could as well form an item of the food of the whale shark during its visits to the coastal waters. It is also possible that the dietary habits of this fish may change with age. Southwell's (1912–'13) remark that the stomach of the gravid female specimen taken at Dutch Bay, west coast of Sri Lanka, was empty, is also of interest. Although, from this it would appear that the whale shark is an omnivorous feeder and not a purely zooplankton feeder or a herbivore, the final word has not yet been said and it is desirable to have more information about the food of this, larger of all fishes.

Natural enemies and longevity

Gudger (1953) mentions intestinal parasites as the only mortal enemies of the whale shark, while ramming by ocean going vessels also accounts for a few others being killed. According to him, if *R. typus* escapes these, only "one end awaits him–Death from Old Age-from the degenerative metabolic changes and processes consequent on aging." To this should be added fishing with gill nets, purse seines and harpoons. Another limiting factor which he overlooked and which Mc Cann (1954) has rightly drawn attention to, is the possibility of younger individuals being more susceptible to dangers of mortality. In fact, now that we know that the newly hatched whale shark is less than half a metre long, it is undoubtedly subject to dangers of predation and only a very fast growth rate could help it minimise mortality rate. In addition, many of the captures of smaller individuals may take place in coastal waters and go unreported or it may not excite curiosity even if reported on account of the smallness of their size. Capture and stranding of larger individuals by themselves may be contributory factors in limiting their ultimate numbers.

Gudger's surmise of intestinal parasites of the whale shark is also based on Southwell's report on the Dutch Bay specimen in which he found "..... six huge cestodes in gut.....a number of soft, round, pink cysts also found on walls of stomach. Spiral valve full of holes. Cestodes numerous, all Tetrahunchids." It is interesting that neither Mc Cann (1954) nor Kaikini *et al.* (1959) found any parasites in the stomach in spite of detailed examination of the stomach of three specimens.

Wilson (1907) has reported on some gill parasites of whale sharks. Wright's record (1877) of a new genus and species of *Pandarina* as parasitic on the whale shark should also be mentioned here. Thus it will be seen that only very scanty information is available regarding external as well as internal parasites of the whale shark.

Apparently only three instances are on record of whale shark carcass being drifted ashore, one near Madras in 1889, the second on the Florida coast in 1902 (Gudger,1952) and the third recently recorded by Deraniyagala (1955) as having been washed ashore at Colombo

on 23rd September, 1953. A few records of dead whale sharks washed ashore, but inspected after a few days or even several days after the occurrence could represent specimens caught and draged ashore by fishermen and subsequently dead. In view of the tendency of the whale shark to sink rapidly when killed in open waters (Tubb, 1948), or when rammed and killed by ocean going vessels the three instances cited above are of interest, although in neither case information is available about the cause of death, as whether due to natural causes, injury or infection.

Schooling behaviour

In the open seas as well as in some of the coastal waters of the world, the whale shark has been observed to swim about in small schools, but the reasons for such congregations are least understood, some suggesting a mode of group feeding. Thomas (1887) apparently was the first to observe a school of whale shark with individuals from 25 to 40 feet long in association with other sharks in New Guinea waters. Subsequently, Weber (1902) noted among a school of sharks and rays in the Strait of Buton, between the islands of Buton and Muna, southeast of Celebes, several whale sharks, which appeared least concerned about the expedition ship *Siboga*, but went about playing around the vessel and struck its bow. Other records of whale shark schools are given by Gudger (1935, 1939) and a recent report appears to be the one recorded by Tubb (1948), who observed two small schools of whale sharks, the smallest school consisting of nine sharks ranging in size between 20 and 35 feet (6.09 and 10.66 metres) in Darvel Bay, British North Borneo. The capture of two specimens at the same time at Madapally on the west coast of India (Chacko and Mathew, 1954) is the first indication of such schooling behaviour in our waters. However, more recently we have seen aggregations in Gujarat waters off Veraval which definitely points to their schooling in some parts of our coastal waters.

Association with tuna

Very significant is the tendency of *Rhiniodon* to associate with larger schooling fish. Gudger (1941) has given a number of instances of associations between *Rhiniodon* and the Bonito in Japan, Cuban waters, off Havana, Manzanillo, Gibara and Vita. In the Bahamas, the whale shark has been seen along with tuna schools and the same association has been noted also off Lower California. The behaviour of the whale shark when in association with bonitos and tunas suggests that they might have been together in seeking their food.

In oceanic waters, whale shark is considered as an indicator of tuna schools and regularly so along North West Africa (Wolfson, 1983). Association of whale sharks and tunas have been also reported by Tubb (1948) from North Borneo; Baughman (1955) from British Honduras; Baughman and Springer (1950) and Springer (1957) from U.S. and Mexican waters; Fourmanoir (1955, 1961) from Malagasy; Iwasaki (1970) from Japan and Cropp (1978) from Australia. The capture of early juveniles in purse seine operations over deep water reported by Wolfson (1983) is also interesting.

On the west coast of India, the period from November-December to April is the time when sardines and mackerel occur in abundance, and as already noted, this period coincides with the occurrence of whale sharks in the coastal waters of that area. This is also the period when schools of bonitos, frigate mackerels, skipjack and yellow-fin tunas visit the coastal waters along the west coast of India and it will be worth finding whether any such associations between these larger fish and the whale shark exist in our waters. In fact, off San Diego on the California coast, whenever the whale shark is sighted, fishermen know that it will be invariably surrounded by yellowfin tuna and head for it (Gudger, 1941 *a*).

Other animal associates

Composite schools of whale sharks and other sharks and rays have been reported by Thomas (1887), Weber (1902), Gudger (1941 *a*, *c*), Tubb (1948) and others. Off Sri Lanka waters, Captain James Steuart (1862) observed that "...sharks of the ordinary description are frequently seen: and on two occasions my attention has been called to spotted ones of such monstrous size as to make the common ones at their sides appear like pilot-fish."

The sucker fish or remoras are known to be associated with the whale shark (Gudger, 1935) and in the open seas have been observed to freely enter and leave the oral cavity of the shark (Gudger, 1922; Prater, 1940). Jonklass (1959) gives a fascinating account of his encounter with a 40-foot whale shark off Sri Lanka coast while aqualung diving, and recollects seeing 'pilotfish' hovering around the mouth of the shark. In fact, one such fish has even been taken from the stomach of a whale shark (Kishinouye, 1901), probably swallowed inadvertently at the time of capture. In one of the whale sharks landed at Sassoon Docks, Bombay, Prater (1940) found a sucker fish cleaving to its palate, well inside the mouth.

Tubb (1948) also mentions of an interesting association between the whale sharks and small shoals of

stromateid fish (young *Stromateus cinereus)*, the latter swimming "almost invariably on their sides, suggesting pleuronectids and although somewhat scattered, each shoal closely followed the movements of its gigantic companion. The stromateids appeared to generally travel about one fathom below the whale shark." When one of the sharks was killed, the accompanying stromateid shoal transferred its allegiance to the launch and stayed beneath it until the speed was increased, suggesting the natural tendency of these smaller fishes to take shelter under or follow in the wake of giant fishes. In Indian coastal waters, only Chacko and Mathew (1954) mention of fishermen having seen such an association between *Stromateus cinereus* and the two whale sharks they reported on at Madapally.

Yet, another interesting association is that between the whale shark and enormous shoals of the carangid fish *Caranx gymnostothoides* noted regularly off Seychelles Islands (Gudger, 1932 b).

Whale sharks and underwater sound

Are whale sharks capable of producing underwater sound? Hitherto there has been nothing to indicate that they are concerned with purposeful sound production of a biological nature or even mechanical sound production. However, Mr. S. Mahadevan who was connected with the pearl fishing operations in the Gulf of Mannar during the past few years informs me that pearl divers are familiar with the 'Uravi' or whale shark which is not at all uncommon in the Pearl Banks off Tuticorin during the pearl fishing season extending from November to about April. The curious thing is that fishermen while diving recognise the presence of the shark, even when it is quarter of a mile away, by a peculiar intermittent snapping or grating noise, well audible under water. The volume of this crackling noise resembling that made by a heavy disused door moved on its rusted hinges, it appears, if heard at close quarters under water is really deafening. (It sounds very cetacean to me). Once when the divers indicated the presence of an 'Uravi' in the vicinity, Mr. Mahadevan immersed his head under water and sure enough, heard the peculiar grating sound. A few moments later a large swirl in the water a few hundred metres away indicated the place where the animal had sounded. Although the divers are well aware that the shark is harmless in spite of its enormous size, the moment they hear its noise under water they come up and remain in the boats for 5 to 10 minutes by which time the direction of movement of the shark would be known, and when it has passed by they recommense diving.

The absence of air bladder in the whale shark will rule out the sound as being accomplished by the air bladder and associated organs as is the case with many of the sciaenids, perches, etc. For such a large animal with hardly any natural enemies, the purposefulness of any biological sound production as a warning sign may be ruled out. Mechanical sound production appears to be the only possibility and under this category too, as the shark passively swims about, there is no likelihood of its producing such sound as a result of body movements directly involved in swimming. Nor is it likely that the exhalation of water through the gill openings could account for such sound. As such, I feel that the mode of feeding possibly has something to do with the sound produced by this shark. As the oral armature may give a clue, the nature of the dentition as described by Gudger (1953) is given below: ".....the very small teeth are in contrast with the 4- or 5-ft wide jaws. They form in each jaw a band (of about 3,600 teeth in a 31.5 ft specimen) extending from angle to angle of the great jaws.....The band is composed of rows of teeth extending from front to back. Each row has from 10 to 12 or 14 teeth pointing backwards. Each tooth has a bulbous base and the tooth proper is sharply recurved flatly to the rear (the interior of the mouth). The cusp of the tooth, that is, the part covered with enamel, is only about three-sixteenths of an inch long. It does not stand upright, as do other sharks teeth, but is bent flatly backwards and inwards..."

The quick and successive snapping of the jaws and the consequent grinding of the numerous teeth may perhaps produce the grating sound. That this is a possibility is understandable from Dr. Fish's (1954) observation on the mechanical sound produced by the smooth dogfish *Galeorhinus laevis* Valmont. She remarks that the sounds of five of these fishes "were audible only when they were swimming with fins partly out of water or occasionally when feeding on crabs.....However, the noisy grinding of the numerous flat granular teeth of a 'pack of sea hounds' over favourite shoal feeding grounds may be expected to reach considerable volume." It is interesting that in the Pearl Banks off Tuticorin the fishermen should associate this characteristic underwater sound only with the whale shark and not with any other sharks, skates or rays nor with any of the reef fishes or cetaceans.

I have still reservations as to whether this could be the sound produced by the sperm whale or any other cetacean. No doubt, this reported mechanical sound production in the whale shark needs confirmation.

Synonyms: GENUS *RHINIODON* SMITH, 1928

Rhincodon Smith (1929)
Rineodon Muller and Henle (1838)
Rhiniodon Swainson (1839)
Rhinodon Muller and Henle (1841)
Micristodus Gill (1865)
Cetorhinus Poey (1876) *nec* Blainville (1816)
Selache Thomas (1887) *nec* Cuvier (1817)

The genus *Rhiniodon* Smith which is monotypic, is now placed under the family Rhincodontidae, although at one time Regan (1908) treated it as a member of the family Orectolobidae.

The generic name is spelt differently, but *Rhiniodon* being the first used, is followed here. The matter of usage of *Rhiniodon* or *Rhincodon* is under consideration of the International Commission on Zoological Nomenclature (Hubbs *et al.*, 1976; Wheeler, 1982). Until a ruling is made on this by the Commission, it will be desirable to use the original spelling *(Rhiniodon)*.

RHINIODON TYPUS SMITH

(1828, S. African Comm. Advertiser, 3 (145): 2. Type locality: Table Bay, South Africa)

In a check-list of elasmobranch fishes from Indian seas, Misra (1947) gives a very incomplete list of seven references to the whale shark from the Indian seas. To facilitate workers in this region, I have given below as far as possible a complete list of references and synonymy referable to *Rhiniodon typus* Smith from Indian coastal waters. *Micristodus punctatus* Gill (Gulf of California), *Cetorhinus maximus* Poey (Cuban waters), *Selache maxima* Thomas (New Guinea), *Rhinodon pentalineatus* Thomas (New Guinea) and *Rhinodon pentalineatus* Kishinouys (Japan), all described or named from extra Indian waters but not included in the ensuing list are synonyms of *Rhiniodon typus* Smith.

Synonymy and references

(Unusual Sea Monster) Foley, 1835. *J. Asiat. Soc. Bengal*, **4**: 62-63 (Sight record off Madras).

(Great Basking Shark or 'Mhor') Buist, 1850. *Proc. Zool. Soc. London*, **18**: 100 (Fishing off Karachi, West Pakistan).

(Basking Shark) Tennant, 1861. *Natural History of Ceylon.* (Off Ceylon, now Sri Lanka, in Gulf of Mannar).

(Spotted Monster Shark) Steuart, 1862. *Notes on Ceylon* etc. p. 156 (Sight records at Ceylon Pearl Banks).

Rhinodon typicus Haly, 1883. *Ann. Mag. Nat. Hist.*, **5** (12): 48 (Ceylon); Day, 1888. *Fish. India, Suppl.*, 811 (Ceylon); 1889. *Faun. Brit. India, Fish*, **1**: 29 (General); Thruston, 1890. *Bull. Madras Govt. Mus.*, 99-100 (Ceylon Pearl Banks); 1894. *Ibid.*, 36-38, pl. 3 (Ceylon and Madras); Lloyd, 1908. *Rec. Indian Mus.*, **2**: 306 (Mouth of Hooghly River, Bay of Bengal); Regan, 1908. *Proc. Zool. Soc. London*, **353** (Ceylon, etc); Southwell, 1912-'13. *Ceylon Adm. Rept. Mar. Biol.*, E 44, E 49 (Ceylon) (Eggs and intestinal parasites); Pillay, 1929. *J. Bombay. nat. Hist. Soc.*, **33**: 351 (Trivandrum, Kerala, India).

Rhineodon (no specific name), Gudger 1933. *Nature, London*, **131**: 165 (Ceylon).

Rhineodon typus Gill, 1905. *Science*, **21**: 790 (Indian fishery and habits); Gudger, 1931. *Bull. Amer. Mus. Nat. Hist.*, **61**: 613-637 (Mounted skins of whale sharks in world Museums including the ones at Colombo (Ceylon), Madras and Trivandrum (India); structure, habits, comparative measurements of specimens from Table Bay (S. Africa), Florida, Madras and Ceylon); Pearson, 1933. *Nature, London*, **131**: 729 (Ceylon); Gudger, 1935. *J. Amer. Mus. Nat. Hist.* (Natural History), **36** (2): 128-132 (Mounted skin of whale sharks in various museums of the world including those at Colombo and Madras); 1935. *Proc. Zool. Soc. London*, 863 (List of records upto 1934); Chevey, 1936. *Inst. Oceanogr. de L' Indochina*, **28**: 1-31 (Indochina and previous Indian records cited from literature); Gudger, 1937. *Nature, London*, **139**: 549 (whale shark rammed off Ceylon); 1938. *Copeia*, **172** (whale sharks rammed off Ceylon, Red Sea *etc*); 1940. *Sci. Monthly*, **50**: 225-233 (Habits, also mounted skins in world museums including ones at Colombo, Trivandrum, etc); 1940. *New England Naturalist*, **7**: 1-10 (Ramming of whale sharks by ocean going vessels near Colombo, Red Sea, etc); 1941. *Amer. Nat.*, **75**: 550-568 (whale sharks unagressive towards and unafraid of man, instances from all seas including Indian Ocean); Prater, 1941. *J. Bombay nat. Hist. Soc.*, **42** (2): 225-279 2 figs. and 7pl. (General, coastal waters of India and Ceylon, habits); Deraniyagala, 1944. *Ibid.*, **44** (3): 426-448, pl. 1 (Ceylon); Kulkarni, 1948. *Ibid.*, **47**: 762-763 (Navapur, N. of Bombay); Gudger, 1952. *Amer. Nat.*,

86 (827): 113-116 (Records of *Rhiniodon* carcass drifting ashore, one at Madras in 1889, etc); 1952. *Copeia,* **4**: 266–267 (whale shark possibly an egg-layer); 1953. *J. Bombay nat. Hist. Soc.,* **51**: 879-884 (Habits); McCann, 1954. *Ibid.,* **52**: 623-624 (Malabar coast and Gulf of Mannar).

Rhincodon typus Fowler, 1941. *Bull. U.S. nat. Mus.,* **100** (13): 116-117 (Description, synonyms and distribution. Indian records cited); Misra, 1947. *Rec. Indian Mus.,* **45**: 9 (Synonymy, very incomplete); Bigelow and Schroeder, 1948. *Mem. Sears Found. Mar. Res.,* **1**, *Fish. Western N. Atl.,* 187-195, fig. 30 a-f (Description, synonymy); Misra, 1952. *Rec. Indian Mus.,* **49** (1): 99, fig. 2*a*; Deraniyagala, 1952. *A coloured Atlas of some vertebrae from Ceylon,* 1, Fishes, 7 pl. 1 (General; Ceylon); 1953. *Spol. Zeylan.,* **27** (1): 43, pl. 1. (East coast of Ceylon); 1955. *Ibid.,* **27** (2): 241 (One record each from east and west coasts of Ceylon); Munro, 1955. *Marine and Freshw. Fish. Ceylon,* 3–4, pl. 2, fig. 5 (Reference); Jonklass, 1959. *Times of Ceylon,* Sunday Ed.; Deraniyagala, 1958. *Spol. Zeylan,* **28** (2) (Eastern Province of Ceylon); John, 1959. *Bull. Res. Inst. Univ. Kerala, Ser.* C, 7: 93 (Reference, Cape Comorin Bank); Kaikini, Rao and Dhulkhed, 1959. *J. mar. biol. Ass. India,* **1** (1): 92-93 (West coast of India); Gopalan, 1962. *J. mar. biol. Ass. India,* **4** (2): 231-232; Silas and Rajagopalan, 1963. *Ibid.,* **5**: 163–67; Thomas and Kartha, 1964. *Ibid.,* **6**: 174-175; Pai and Pillai, 1970. *Ibid.,* **12** (1 & 2): 224-225; Pillai, 1972. *Ibid.,* **14** (1): 408-409; Seshappa *et al.,* 1972. *Indian J. Fish.,* **19**: 200-201; Freda and Bose, 1973. *J. mar. biol. Ass. India,* **15** (1): 438-439; Kuthalingam *et al.,* 1973. *Indian J. Fish.,* **20** (2): 647-651; Kunjipalu and Mathai, 1976. *Fish. Technology,* **8** (2): 161-162; Pai *et al.,* 1983. *Indian J. Fish.,* **30** (1): 157-160; Nammalwar and Krishnapillai, 1983. *Mar. Fish. Infor. Serv. T&E Ser.,* **49**: 24-25; Dhulkhed, 1983. *Ibid.,* **49**: 25.

For recent records reference should be made to reports in this publication which are also listed in Table 1.

Local names

West Pakistan

'Mhor'

West coast of India

'Karanj', 'Bhariat', 'Bahiri' (Marathi)

'Makara sravu', 'Osman shira' (Malayalam)

'Pulli-udoombu', 'Pullian surrow'(Tamil)

Lakshadweep Islands

'Vori mas meer'

West coast of Sri Lanka

'Muni-muthu-mora' (Singhalese)

Gulf of Mannar

'Panai meen', 'Uravi' (Tamil)

Palk Bay, east coast of India

'Panai meen' (Tamil)

Whale shark in the Jataka Sculpture of 2nd B.C.

The present discussion also necessitates clarification of any doubtful references to the whale shark, especially from this area. In this connection, two notes by the late Dr. Hora (1955, 1956) referring to the *Timingila Jataka* Medallion of the Bharhut reliefs of the 2nd century B.C. as representing a whale shark and not a whale calls for a re-study. Hora (1956) remarks that "..... its food-fishes, such as mullets, sardines and small perches, are shown in the medallion.....When the fish inhales water for oxygenating its gills, the power of suction is so great that small boat with three occupants could be sucked into its cave-like mouth as is so clearly shown in the medallion. It is evident, therefore, that even sizeable fish and other animals, besides plankton and small shoaling fishes, could form the food of the whale shark." The *Timingila* is represented as a pisciform animal with the body covered with scales, with a very large head and an enormously large mouth fringed with conspicuous conical teeth, but with the lower jaw shorter. The eyes are large, and still more significant is a spout of water shown cascading from near the anterior end of the snout and seen curving backwards as well as forwards. While it is difficult to imagine that such a creature could in any way be connected with the whale shark, there is no reason why it could not be the product of an artists imagination of a whale! The enormity of the animal and the known disposition of some whales to even attack or upset a boat in the vicinity with their sudden movements could have given rise to the scene depicted in the medallion, the scales on the body shown again being a matter of imagination and

the small fishes only adding flavour to the marine environment and not forming food of the whale. Besides, a whale is known as *Timingilam* in Tamil, *Timingalam* in Malayalam and *Thimingilamu* in Telegu, while as will be seen from the local names given above, the whale shark is not known to be denoted by the name *Timingilam*.

A second doubtful identity of the whale shark from Indian waters may also be mentioned here. Burton (1940) remarks of a sight he saw two days after leaving Chetlat Is. in the Lakshadweep Archipelago for Mangalore as ".....an enormous dorsal fin moved along four or five feet out of the water at a distance of several hundred yards, but what creature it belonged to we could not make out; perhaps it was a whale shark *(Rhiniodon typicus)* which usually swims near the surface with part of its dorsal fin exposed." It may be mentioned here that *R. typus* besides having a moderately large dorsal fin has also a large upper caudal fin lobe which surely should be partly seen when the fish swims, at the surface, as figured by Norman and Fraser (1937, pl. 2, fig. A). It is not unlikely that the animal sighted could be a solitary killer whale *Orcinus orca* which has a conspicuous dorsal fin and which in a 30 feet specimen may be nearly six feet high.

Centre of origin and dispersal

Gudger (1935) opined that a fish so markedly distinct and circumtropical in distribution should have had only one centre of origin and assigned the Sulu Sea in the south west part of the Philippines as the focal point from where the whale shark originated and subsequently got dispersed. The basis for this postulation was that as on December 31, 1934 for a period of 107 years, out of 76 whale sharks recorded from all seas, 17 were definite records for the general region of the Sulu Sea "with as many more being checked up." At that time he listed only 10 definite records from Indian coastal waters, which Prater (1940) raised to 20, and I have in this contribution referred to 78 + occurrences. Now, this increase in the number of records from Indian coastal waters has also kept pace with additional records from all seas which to date may add to number a few hundred. To presume that the abundance of an organism at one place in the present day and its relative scarcity in other areas should indicate the former area to be the centre of origin of a species is a highly controversial subject. For a study of the origin and present day distribution of the whale shark, it will also be necessary to consider conditions existant in the past geological ages (the period of origin of *Rhinodon* is not known, but the closely allied family Orectolobidae is known from the Upper Jurassic to Recent) especially oceanic conditions prevalent then and during the successive ages. While Gudger's thesis is fascinating, and has hardly any facts today to substantiate it, yet it is equally feasible that the whale shark, pelagic and passive as it is having originated from one place (unknown), has at present found suitable niche in the different seas, areas where they are at present found in numbers. The latter may be feeding aggregations and we right now have little information on breeding, migration and behaviour. With our present limited knowledge, any pinpointing of the centre of origin of the whale shark will only be a matter of conjecture.

While describing a recent sensational discovery – the Megamouth – as a new species, genus and family *(Megachasma pelagios,* Family Megachasmidae) Tailor *et al.* (1983) make some pertinent remarks on the whale shark, its feeding habits and biology in relation to *Megachasma* and *Cetorhinus*. They have described the filter apparatus of *Rhiniodon* which differs from the latter two genera markedly to form dense screens, and act as more efficient filters for short suction intakes and not as a flow through system. The whale shark's behaviour of generally aligning itself vertically below the prey school which may include small crustaceans (including euphausiids), squids, anchovy and sardines and sucking in the same is reported by these authors. Hence we have some information today about the whale shark when it occurs in its feeding ground.

Deraniyagala advocates Gudger's view when he states that "the newly hatched young ones of this slow swimming, giant pelagic shark are transported from the breeding ground by current and attain a length of about 22 feet by the time they reach Ceylon." Although early juveniles have recently been caught in purse seine in the Atlantic and the Eastern Pacific from oceanic waters, more work is needed before we say anything about breeding ground and growth. Southwell's record of the gravid female from Sri Lanka waters is considered doubtful. Baughman's (1953) record of the egg case of a whale shark from the trawling ground is now considered as most probably an aborted egg. The seasonal migrations of whale shark need closer study.

Its present circumglobular distribution is interesting and its linkage between the Indo-Pacific and the Atlantic should be only *via* South African waters. Compagno (1984) reports that whale sharks apparently prefer "areas where surface temperature is 21 to 25°C with cold water of 17°C or less upwelling into it and salinity

of 34 to 34.5 ppt." This moderately lower temperature tolerance may also enable it to circumvent the Cape of Good Hope. However, it will be worthwhile to see whether any genetic heterogeneity exists in the species along its range of distribution.

Is the whale shark endangered or vulnerable?

Commercial harvesting of whale sharks is practically non-existent. In a very few areas, directed fishing is practised especially for its liver oil which is used as a preservative for the timber used in boat hulls. Gujarat waters along the northwest coast of India is a good example where a small harpoon fishery during certain years exists when the sharks occur in numbers. Off Pakistan also a similar activity is said to occur. In incidental captures, sometimes the meat is marketed fresh or is salt cured.

When there is such a low level of exploitation of this resource, one may question the appropriateness of addressing ourselves to the question whether the whale shark is endangered or vulnerable. My reasons are:

1. Our knowledge today is confined mainly to incidental captures, strandings or rammings by ships or boats.

2. Even so, data on such specimens are grossly insufficient.

3. Many sightings or captures of smaller whale sharks less than 2.5 m or 3 m may go unreported.

4. The data acquisition system is far from adequate in the tropics, except in countries such as India where we follow a multistage stratified random sampling technique for estimating the exploited resources and as such, the enumerators and field staff of the Central Marine Fisheries Research Institute may chance on specimens being caught and file a report. This system has undoubtedly increased the number of records from the Indian coastal waters many fold.

5. Decades of fishing for oceanic pelagics such as tunas and billfishes has resulted in only few sightings and captures of whale sharks.

6. Their occurrence in coastal waters in many places are very sporadic and may often be fortuitous. Rarely do we have captures in two successive years from the same area.

7. The "aggregations of upto hundreds of sharks" which Compagno (1984) mentions has not been observed in Indian coastal waters.

8. In the absence of tagging we have hardly any information about their migrations, growth, size at first maturity and longevity.

9. A major critical gap is our lack of knowledge about its reproductive potential and recruitment to juvenile and adult sizes.

10. Many gaps in our knowledge on its life history and biology have been already pointed out.

11. Other than man and his activities we are not aware of its natural enemies and predators. Diseases and internal parasites are practically unknown. Neither are we in a position to say about the effects of toxic pollutants it may assimilate through its food nor the effect of plastics, tar balls and other flotsam it may accidentally imbibe.

12. With so many unknown factors, and apparently limited numbers wherever they are known, any increase in directed effort at capture may result in great imbalance. Hence the dangers that I foresee are:

a. The more increased small-scale fisheries in island states and mainland coastal waters (neritic) using better fishing craft and gear such as purse seine and gill nets resulting in greater incidental catch or even directed fishing.

b. The large scale use of tuna purse seine in oceanic waters, especially in the Indian Ocean, where until 1981 this activity was practically nil. An explosive development is taking place now.

c. The wider use of its meat and oil if more whale sharks are landed.

13. Hitherto, its occurrence has been a rarity.

In the light of these, while I would not consider the whale shark as an endangered species at this point of time, but a highly vulnerable one. Both natural and regional co-operative research programmes may be necessary to study more about this, the largest of all fishes.

Mere recordings of occurrence unaccompanied by facts such as the exact location of capture or stranding, the time of occurrence, the length of the shark, sex etc. will be hardly helpful and so in order to facilitate

collection of proper data, I have given in the Appendix–I the information most desired (also Fig. 1). The format is the same as that given by Silas and Rajagopalan (1963). Perhaps proper documentation of such data over a period of time will help us understand more about the habits and natural history of this shark. With this in view, I appeal that readers who are able to make any fresh observations on the whale shark from Indian seas, both in coastal as well as offshore waters, communicate their findings, to the National Marine Living Resources Data Centre (NMLRDC) at the Central Marine Fisheries Research Institute, Cochin, so that the information could be collected and published from time to time. Perhaps the time has come when international collaboration in whale shark research will also have to be considered, while taking as a first task a tagging programme. A simultaneous extension programme to educate the coastal and island fishermen for data on whale sharks and the need of releasing the sharks when caught may have to be taken up. In India, this could be done through the CMFRI through its field and research staff and the Department of Fisheries of concerned maritime states and union territories.

The question may be posed as to what will all this prove, especially for a resource which is a rarity. I have no hesitation in saying that aside from our knowing more about the largest of all fishes, already whale sharks have been used as an indicator of aggregations of tuna shoals and no doubt if they are after sardines and anchovy in neritic waters we may find that they could be an equally good indicator of their forage resource or incursion of water masses into the neritic realm– cutting it short, the well being of the ecosystem.

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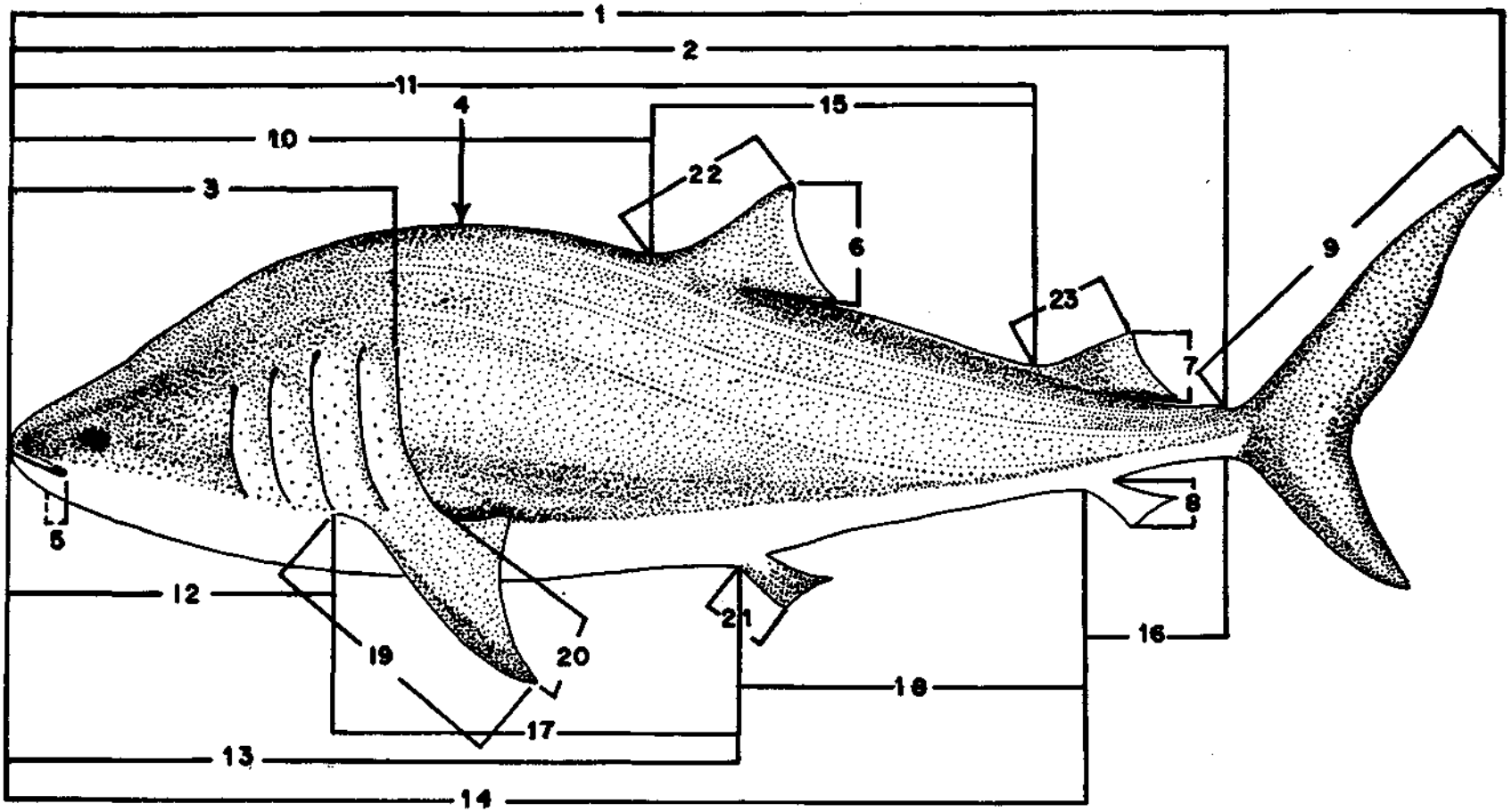


Fig. 1. Schematic diagram of lateral view of whale shark showing methodology for measurements (outline drawing after Bigelow and Schroeder, 1948) Nos. are in sequence as given in Appendix-I.

APPENDIX—I

Data

Date.....Locality.....
.....
If captured, time and method of capture .....
If stranded, time.....
If stranded, injured or infected .....
If washed ashore, dead, injured or infected .....
If sight record, location (Lat. & Long.) .....
Any other animals seen in association with the whale shark.....
Sex.....Weight.....
If female, any eggs (if so number).....
Length, width and thickness of egg cases.....
Length of embryos (eggs and embryos to be preserved) .....
Contents of stomach (atleast sample to be preserved) .....
..... (if so, to be preserved)
Any gill parasites ..... („ „ „ „)
Any external parasites ..... („ „ „ „)

MEASUREMENTS (in metric system):

(1) Total length..... (2) Standard length.....(3) Head length .....
(4) Girth of body at.....(5) Width of mouth from angle to angle .....

Vertical height of:

(6) First dorsal fin..... (7) Second dorsal fin .....
(8) Anal fin.....
(9) Length of caudal fin along upper margin .....

Snout to:

(10) First dorsal..... (11) Second dorsal..... (12) Pectoral .....
(13) Pelvic..... (14) Anal .....

Interspace between: (15) First and second dorsals.....
(16) Anal and caudal .....
(17) Pectoral and pelvic origins .....
(18) Pelvic and anal origins .....

Length of pectoral fin: (19) Along outer margin .....
(20) From angle of inner base to tip .....
(21) Length of pelvic fin .....
(22) Length of first dorsal .....
(23) Length of second dorsal.....

If male: Length of clasper from inner base of pelvic fin.....
Length of pelvic fin along its inner side .....

Any additional measurements and information available .....
.....

RETURN TO: National Marine Living Resources Data Centre,
Central Marine Fisheries Research Institute,
P. B. No. 2704, Cochin - 682 031,
Kerala.

ON A WHALE SHARK *RHINEODON TYPUS* SMITH LANDED AT CUFFE PARADE BEACH, BOMBAY*

On the 8th January, 1980 a female whale shark, which got entangled in a nylon gill net (locally called 'Tarti') and let of off Alibag (about 40 nautical miles south of Bombay) at a depth of 13 m was landed alive at Cuffe Parade. The fish reportedly was caught at about 0130 hrs on 8th instant and died at about 1530 hrs, the same day (Fig. 1).

Fig. 1. Dorso-lateral view of a 7.58 m whale shark landed at Cuffe Parade, Bombay, on 8th January, 1980.

Details of morphometric measurements (in cm) recorded on the lines suggested by Silas and Rajagopalan (1963) *(J. mar. biol. Ass. India,* 5 (1): 153-157) are given below:

1.	Total length	... 758
2.	Standard length	... 622
3.	Head length	... 185
4.	Width of mouth	... 88
	Vertical height of:	
5.	First dorsal fin	... 84
6.	Second dorsal fin	... 58
7.	Length of caudal fin from caudal pit along upper margin	... 183
	Snout to:	
8.	First dorsal fin	... 375
9.	Second dorsal fin	... 533
10.	Pectoral fin	... 155
11.	Inter-space between first and second dorsals	... 137
	Length of:	
12.	Pectoral fin along outer margin from anterior insertion	... 144
13.	Pectoral fin from angle of inner base to tip	... 123
14.	First dorsal fin along outer margin from anterior insertion	... 87
15.	Second dorsal fin along outer margin from anterior insertion	... 52
16.	Least height of caudal peduncle	... 41
17.	Diameter of orbit	... 6.5
18.	Inter-orbital distance	... 165
	Anterior margin (mid-point) of snout to:	
19.	Eye	... 83
20.	Spiracle	... 108
21.	First gill opening	... 163

The colour of the specimen was dark grey with numerous yellowish white spots over the body. There was a median ridge on the back and three lateral ridges on each side.

As the local fish merchants did not evince interest to buy the fish the fishermen towed it back to the sea on the next day and sank it by tying heavy sinkers to its body.

*Reported by J. P. Karbhari, Bombay Research Centre of CMFRI, Bombay.

ON TWO JUVENILE WHALE SHARKS *RHINCODON TYPUS* SMITH CAUGHT AT MADRAS*

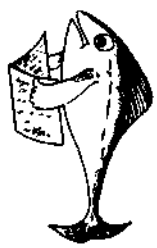
The present report provides details regarding two juvenile whale sharks *Rhincodon typus* Smith, one caught at Mullikuppam (Thiruvanmiyur) and the other at Royapuram, Madras.

Fig. 1. Whale shark *Rhincodon typus* Smith caught at Mullikuppam (Thiruvanmiyur).

*Reported by: D.B. James, P. Nammalwar and S. Srinivasarengan, Madras Research Centre of CMFRI, Madras.

The first one a male whale shark measuring 740 cm was caught by the fishermen on 23–3–1980 at 0900 hrs in the shore-seine net operated by thirty persons near the inshore area at Mullikuppam. Immediately after capture, the whale shark entered the cod end of the net which was severely damaged. The shark was alive until about 1500 hrs on 23–3–1980. The second shark measuring 563 cm was landed at Royapuram on 2nd July, 1984. The morphometric measurements (in cm) of the two specimens are given below:

		Specimens	
		1	2
1.	Total length	740	563
2.	Tip of snout to origin of first dorsal fin	350	—
3.	Tip of snout to origin of pectoral fin	127	129
4.	Breadth of pectoral fin	83	—
5.	Length of pectoral fin	—	104
6.	Tip of snout to anal opening	—	325
7.	Maximum height of body	111	68
8.	Girth of body at head region	185	—
9.	Breadth of first dorsal fin	91	53
10.	Height of first dorsal fin	60	50
11.	Breadth of second dorsal fin	45	27
12.	Height of second dorsal fin	25	20
13.	Length of upper caudal fluke	167	147
14.	Length of lower caudal fluke	88	81
15.	Tip of snout to first gill slit	—	96
16.	Breadth of snout/head	198	63
17.	Width of mouth	—	93
18.	Length of first gill slit	66	60
19.	Estimated weight	3.5 tonnes	2.75 tonnes



ON THE CAPTURE OF WHALE SHARKS OFF DAKSHINA KANNADA COAST*

Only stray individuals of the whale shark *Rhincodon typus* are caught occasionally along Dakshina Kannada coast. Previously they were caught in nylon gill nets. In recent years they are caught in purse seines which are extensively operated along this coast. The capture of six juvenile whale sharks in purse seines in a span of about two months between 8th November and 31st December, 1980 off Dakshina Kannada coast is reported here.

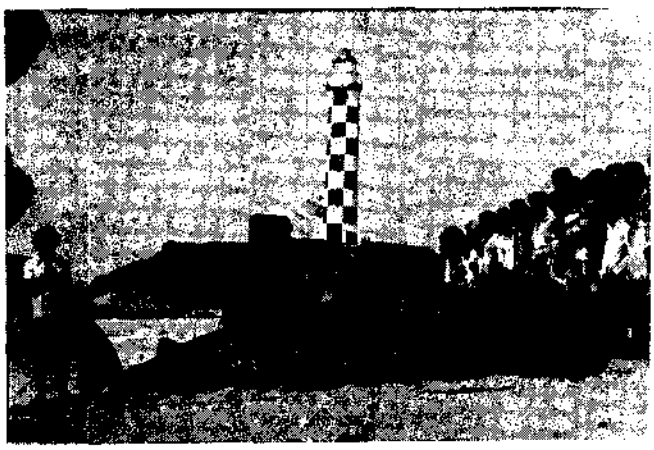


Fig. 1. A juvenile male *Rhincodon typus* 5.65 m in length caught in purse-seine 5 km off Kaup at a depth of 16 m on 20th December, 1980.

The size, sex, area and date of capture of the whale sharks are given below. (Also please see Table 1).

1. One juvenile of 6.4 m in total length, caught off Hejmadi, at a depth of 27 m on 8th November, 1980. (The sex was unknown as the fish was disposed off).

Fig. 2. The male *R. typus* caught off Kaup being hauled to the beach by fishermen using ropes.

2. A male of 6.71 m in total length, caught 9 km off Yermal, at a depth of 16 m, on 8th November 1980.

3. A male of 4.88 m in total length, caught 6.4 km off Mooloor, at a depth of 16 m, on 8th November, 1980.

Fig. 3. The anterior portion of the male *Rhincodon typus* 6.71 m in length caught 9 km off Yermal in purse-seine at a depth of 16 m on 8th November, 1980.

4. A male of 5.65 m in total length, caught 5 km off Kaup, at a depth of 16 m, on 8th November, 1980.

5. A female of 7.92 m in total length, caught 9 km off Malpe, at a depth of 16 m, on 27th December, 1980.

Fig. 4. Front view of head of the female *R. typus* caught off Malpe showing broad mouth on being hauled ashore.

*Prepared by K. Satyanarayana Rao, Tuticorin Research Centre of CMFRI, Tuticorin.

Table 1. *Data on six whale sharks* Rhincodon typus *caught along Dakshina Kannada coast*

Particulars | Sl. No. of whale sharks→	1	2	3	4	5	6
1. Date of capture	8th Nov. '80	8th Dec. '80	8th Dec .'80	8th Dec. '80	27th Dec. '80	31st Dec. '80*
2. Locality and depth	15 km off Hejmadi at depth of 27 m	9 km off Yermal at depth of 16 m	6.4 km off Mooloor at depth of 16 m	5 km off Kaup at depth of of 16 m	9 km off Malpe at depth of 16 m	12 km off Malpe at depth of 22 m
3. If captured, time and method of capture	Captured at 12 hrs in purse seine	Captured at 16 hrs in purse seine	Captured at 12 hrs in purse seine	Captured at 11 hrs in purse seine	Captured at 12 hrs in purse seine, landed at 16 hrs	Captured at 12 hrs in purse seine, landed at 17 hrs
4. If stranded, time	Not stranded	Not stranded	Not stranded	Not stranded	Not stranded	Not stranded
5. If stranded, injured or infected	—	—	—	—	—	—
6. If washed ashore, dead, injured or infected	—	—	—	—	—	—
7. If sight record, location	—	—	—	—	—	—
8. Fishing vessel which caught the whale shark and size of vessel	Purse seiner (43' vessel)	*Yermal Fisheries* (Purse seiner 43' vessel)	*Mooloor Fisheries* (Purse seiner 43' vessel)	*Maha-lakshmi* (Purse seiner 43' vessel)	*Prithi Enterprises* (Purse seiner 43' vessel)	*Rajeswari* (Purse seiner 43' vessel)
9. Owner of the fishing vessel	—	Shri K. Suvarna	30 ex-rampan fishermen	Shri Krishnappa, Kotian and 19 others	10 men of fishermen community (Not ex-rampan fishermen)	—

Particulars | Sl. No. of whale sharks→	1	2	3	4	5	6
10. Merchant who purchased the whale shark	—	Shri Ahmed Saheb	Shri Ahmed Saheb	Shri S. Kasper of M/s. Anthonyappa & Co., Muttom	Smt. Radha Devi Karkera	Smt. Jalajakshmi Karkera
11. Price paid by the merchant	Rs. 300/- claimed but none purchased	Rs. 300/-	Rs. 250/-	Rs. 250/-	Rs. 200/-	Rs. 50/-
12. Amount incurred by the merchant for hauling and cutting of whale shark	—	Rs. 200/-	Rs. 150/-	Rs. 100/-	Rs. 200/-	Rs. 200/-
13. Quantity of salt used for curing (kg)	—	1,000	800	1,000	2,000	1,000
14. Sex	—	Male	Male	Male	Female	Male
15. Weight (approximate) (kg)	—	1,800	1,250	1,500	4,000	1,700
16. If female, any eggs present, if so number	—	—	—	—	ovary immature	—
17. Length, width and thickness of egg cases	—	—	—	—	—	—
18. Contents of stomach (at least sample to be preserved)	—	—	—	Data given in Table 2	Data given in Table 2	Could not be collected
19. Any stomach, intestinal or other internal parasites	—	Not present	Not present	Not present	Not present	—
20. Any gill parasites	—	Not present	Not present	Not present	Not present	—

Particulars | Sl. No. of whale sharks→	1	2	3	4	5	6
21. Any external parasites	—	Not present	Not present	Not present	Not present	—
22. Weight of fresh meat (kg)	—	1,200	800	1,000	2,600	1,300
23. Weight after drying (kg)	—	350	250	300	800	420
24. Weight of liver (kg)	—	140	80	100	240	80
25. Quantity of oil extracted (l)	—	58	Liver discarded as oil was not of good quality	49.5	72	54
26. Any other animals seen in association with whale shark	—	—	—	—	Got 2.5 tonnes of oil sardine with whale shark	—
Morphometric data**						
1. Total length	6400	6705	4880	5650	7920	5180
2. Standard length	—	5030 (75.0)	—	4220 (74.7)	5930 (74.9)	—
3. Length of head	—	1800 (26.8)	—	1455 (25.8)	1890 (23.9)	—
4. Girth of body	—	389 (58.0)	—	3640 (64.4)	4400 (55.6)	—
5. Width of mouth from angle to angle	—	840 (12.5)	—	780 (13.8)	1180 (14.9)	—
6. Diameter of eye	—	40 (0.6)	—	—	44 (0.6)	—
7. Interorbital distance	—	1300 (19.4)	—	—	145 (018.3)	—
8. Snout to eye	—	700 (10.4)	—	—	790 (10.0)	—

Particulars | Sl. No. of whale shark→	1	2	3	4	5	6
9. Snout to spiracle	—	800 (11.9)	—	—	890 (11.2)	—
10. Snout to 1st gill opening	—	1420 (21.2)	—	—	1700 (21.5)	—
11. Length of pelvic fin	—	420 (6.3)	350 (7.2)	340 (6.0)	380 (4.8)	—
12. Length of first dorsal fin	—	710 (10.6)	660 (13.5)	770 (13.6)	820 (10.4)	—
13. Length of second dorsal fin	—	250 (3.7)	200 (4.1)	310 (5.5)	380 (4.8)	—
14. Range of thickness of body wall	—	40–90 (0.6–1.3)			65–130 (0.8–1.6)	—
Vertical height of:	—	640 (9.6)	520 (10.7)	690 (12.2)	739 (9.3)	—
15. First dorsal fin						
16. Second dorsal fin	—	250 (3.7)	230 (4.7)	310 (5.5)	319 (4.0)	—
17. Anal fin	—	250 (3.7)	—	220 (3.9)	284 (3.6)	—
18. Length of caudal fin from caudal pit along upper margin	—	1400 (20.9)	1330 (27.3)	1415 (25.0)	1830 (23.1)	—
Snout to:						
19. First dorsal fin	—	3090 (46.1)	—	2620 (46.4)	3286 (41.5)	—
20. Second dorsal fin	—	—	—	3750 (66.4)	5160 (65.2)	—
21. Pectoral fin	—	1750 (26.1)	—	1070 (18.9)	1910 (24.1)	—
22. Pelvic fin	—	—	—	2930 (51.9)	3720 (47.0)	—
23. Anal fin	—	—	—	3845 (68.0)	5305 (67.0)	—
Interspace between:						
24. First and second dorsal fins	—	—	—	980 (17.3)	1857 (23.4)	—
25. Anal and caudal fins	—	—	—	—	823 (10.4)	—

Particulars | Sl. No. of whale sharks→	1	2	3	4	5	6
26. Origins of pectoral and pelvic fins	—	—	—	—	2190 (27.7)	—
27. Origins of pelvic and anal fins	—	—	—	—	1537 (19.4)	—
Length of pectoral fin:						
28. Along outer margin from anterior insertion	—	1100 (16.4)	920 (18.9)	1090 (19.3)	1190 (15.0)	—
29. From angle of inner base to tip	—	850 (12.7)	880 (18.0)	836 (14.8)	1020 (12.9)	—
If male:						
30. Length of clasper from inner base of pelvic fin	—	250 (3.7)	—	220 (3.9)	—	—
31. Length of pelvic fin along its inner edge	—	280 (4.2)	—	190 (3.4)	—	—

* This particular whale shark was caught by 42½′ purse seiner *Hemalatha* (owned by Shri Somappa Kotian and party) 12 km off Gangolli at a depth of 22 m on 29th December, 1980 at 16 hrs and brought to Malpe on the same day at 18 hrs. But it was released in the sea 12 km off Malpe where the depth was 22 m on 30th December as workers demanded Rs. 200/- to haul the shark ashore. The same whale shark was captured by *Rajeswari* on 31-12-1980.

** Measurements in mm. Figures given in brackets are measurements expressed as percentage in total length.

6. A male of 5.18 m in total length, caught 12 km off Malpe, at a depth of 22m, on 31st December, 1980. There were no parasites on any of the sharks.

Capture of whale sharks: The fishermen reported that the whale shark swims slowly at or near the surface of water and follows shoals of fishes for feeding on them. On capture in the purse-seine, the fishermen put a noose around the caudal peduncle, tie a knot firmly around it and tow the shark to the shore using carrier boat. On reaching the coast, they haul the huge fish to the beach using ropes which are used for beaching mechanised boats. Only one purse seine in which a female was caught off Malpe on 27th December was partly damaged. The whale shark is usually docile. It makes lashing movements for about an hour on being hauled to the beach.

Causes of occurrence of whale sharks in coastal waters: In November–December, oil sardine, anchovies and mackerel are obtained in purse seines from the area. The whale sharks may enter the shallow coastal waters for feeding on shoals of these pelagic fishes. *Rhincodon typus* is normally a plankton feeder with the well developed gill apparatus for straining planktonic organisms like a sieve but they are also known to feed on fishes. The gut contents of whale sharks caught off Kaup on 20th December and off Malpe on 27th December consisted of *Stolephorus devisi, Kowala coval,* copepods and other zooplankters, phytoplankton and sand grains (Table 2).

The period October–March is one when zooplankton is abundant off Dakshina Kannada coast. It is

Fig. 5. The stomach and long, thick liver lobes of the female whale shark caught off Malpe as cut and exposed.

Fig. 6. The gills of *R. typus* caught off Malpe as cut and exposed.

Figs. 7 & 8. The flesh of *R. typus* caught off Kaup being cut for curing.

Table 2. *Data on stomach contents of whale sharks landed at Kaup and Malpe*

Particulars | Sl. No. of whale sharks→	4	5
Date of capture	20th December, 1980	27th December, 1980
Volume of fluid in stomach	24 litres	38 litres
Volume of stomach contents	355. 2 ml	1128.4 ml
Percentage of different items of stomach contents:		
Stolephorus devisi	78.3	57.1
Kowala coval	—	25.3
Zooplankton (copepods and other zooplankters in advanced stage of digestion)	16.1	12.8
Phytoplankton (in advanced stage of digestion)	4.4	2.2
Sand grains	1.2	2.6

possible that the migration of whale sharks to coastal waters is influenced by this factor also.

Utilization: Meat ranging in weight from 0.8 tonne to 2.6 tonnes, the latter from the whale shark weighing 4.0 tonnes, was got from the sharks landed. The fish merchants paid Rs. 50/- to 250/- per whale shark (Table 1) and incurred additional expenditure for cutting the fish and curing. The meat which was white and soft was salted, kept for seven to eight days and then dried. Water content of meat was very high being 68.8 to 70.8 per cent. Whale shark meat is not eaten locally. The cured meat was sent to Shimoga, Chickmagalur, Bangalore, Cannanore, Kottayam, Changanacherry, Alleppey and Ernakulam where there was demand. The cured meat fetched a price of Rs. 4/- per kg. The liver oil extracted by heating is used for giving a preservative coating to wooden boats. In addition, it is also used in the manufacture of shoe polish. The shoe polish manufacturing companies purchased the liver oil at a price of Rs. 20/- per tin of 16 litres.

ON THE LANDING OF A WHALE SHARK *RHINCODON TYPUS* SMITH AT ANJUNA, GOA*

On 29-1-1981 at about 0300 hrs. a female whale shark weighing 2.2 tonnes was entangled in a nylon gill net operated by fishermen off Anjuna, Goa at a depth of 27 m. The shark was towed ashore with the help of 16 fishermen from four canoes. This is the first record of *Rhincodon typus* from this area. Details of morphometric measurements of the species (in cm) are given below:

1.	Total length	... 570
2.	Standard length	... 455
3.	Girth of body (maximum)	... 255
4.	Width of mouth (angle to angle)	90
5.	Vertical height of first dorsal fin	... 95
6.	Vertical height of second dorsal fin	... 55
7.	Length of caudal fin from caudal pit along upper margin	... 145
8.	Length of caudal fin from caudal pit along lower margin	... 90
9.	Snout to first dorsal fin	... 265
10.	Snout to second dorsal fin	... 400
11.	Snout to pectoral fin	... 135
12.	Snout to first gill opening	... 120
13.	Inter-space between first and second dorsal fins	... 67

The liver of the shark weighed 50 kg and yielded 20 litres of quality oil and five litres of mixed poor quality oil.

*Reported by P. V. Doiphode, Directorate of Fisheries, Panaji, Goa

NOTE ON THE OCCURRENCE OF THE WHALE SHARK *RHINCODON TYPUS* SMITH OFF VERAVAL COAST*

In the course of observations at the trawler landing centre (Bhidiya) at Veraval, the author observed the landing of nine specimens of the whale shark, *Rhincodon typus* Smith on 12–4–1982. On enquiry it was found that the sharks were not caught by accident in the nets but were hunted. The sharks were caught by manually throwing heavy hooks (similar to harpooning). As soon as the hook penetrated into the body of the shark it was towed to the harbour in live condition. At the harbour the abdomen was cut open and the liver was removed. After removing the liver the carcass was towed back into the sea as the flesh had no demand in the local markets. The oil is generally used for painting boats and other wooden fishing appliances.

It was not possible to take any morphometric measurements of the specimens as there was no way of bringing the fish to the warf. Only one specimen of 950 cm in total length could be measured which yielded about 500 kg of liver. It is generally believed that the liver of these sharks formed about 10% of the total body weight. On this basis the weight of this shark was estimated at five tonnes. All the nine sharks landed on 12–4–'82 were of the same size or slightly smaller (ranging in total length from 900–950 cm). Landing of whale sharks was also observed on 13–4–'82 (7 Nos.), 14–4–'82 (4 Nos.) and 15–4–'82 (2 Nos.). Thus during a period of four days, landing of a total of 22 sharks could be observed. However, enquiries with the fishermen indicated landing of 40 Nos. of these sharks during this period. Fishermen further informed that a number of these sharks were sighted in the sea during the period from 10–4–'82 to 15–4–'82. It was also gathered that whale shark is a regular visitor of this coast during April and the fishermen who are in need of the oil, hunt them during this period. The present observation is significant in that about 40 numbers of these sharks were caught in just four days.

In the present instance no data on the biology could be collected as there was no way of bringing the specimen out of water.

*Reported by G. Sudhakara Rao, Veraval Research Centre of CMFRI, Veraval.

REPORT ON THE CATCH OF A JUVENILE WHALE SHARK *RHINCODON TYPUS* SMITH AT KEELAKARAI, GULF OF MANNAR*

A juvenile whale shark measuring 3.15 m in total length was caught at 0500 hrs on 7–2–'83 in the gill net *(Pachivalai)* operated by a 9 m mechanised boat off Keelakarai. It was estimated to weigh about 1.5 tonnes.

The whale shark was cut into pieces immediately after the landing and burried in the seashore on 7–2–'83. Therefore, morphometric measurements and photograph of the whale shark could not be taken. However, on 8–2–'83, it was exhumed, and from the remains of the head and the caudal flukes the specimen was identified as *Rhincodon typus* Smith.

*Reported by P. Nammalwar, Mandapam Regional Centre of CMFRI, Mandapam.

ON THE LARGEST WHALE SHARK *RHINCODON TYPUS* SMITH LANDED ALIVE AT CUFFE PARADE, BOMBAY*

The most publicised whale shark, *Rhincodon typus* Smith, which reportedly got entangled in the midwater gill net *(waghra)*, operated in 33 m. depth off Khanderi light house (lat. 18° 42′ N long. 72° 48′ E) about 26 nautical miles south of Bombay, on the west coast of India was landed alive at Cuffe Parade, on 21st November, 1983 (Fig. 3). (Please see photograph on back cover)

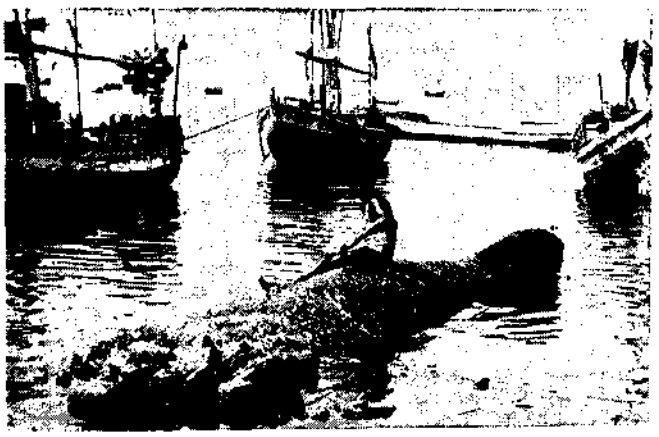


Fig. 1. The whale shark completely wrapped in gill net with floats. The shark was brought by three 20 footer mechanised boats seen in the back ground.

On 20-11-1983, at about 1400 hrs a 20 footer mechanised fishing boat named *Maya Prasad* fitted with an engine of 16 H.P. steamed out for gill net fishing from Cuffe Parade under the Captainship of Shri Jagannath Balakrishna Dhanu. The boat reached the fishing ground at about 1700 hrs on the same day. As usual, five fishermen of the boat paid out 36 units of gill net at about 1730 hrs. Earlier, the fishermen had noticed some surface-floating huge fish causing considerable damages to their surface set gill nets. To avoid further damage, the fishermen temporarily switched on to the operation of midwater gill net by attaching few more sinkers to their nets. The crews of *Maya Prasad* gill netter were terribly frightened as their boat started dragging away from its position at about 2330 hrs when the high tide was 4.60 m, 20th instant being a full-moon day. They were at a loss to understand as to what exactly had happened but roughly guessed that some huge fish had got entangled in their net. Realising a grave risk to their life and property in the sea, the boat crews shouted and light signalled for outside help. Two other nearby mechanised fishing boats namely *Rohini Prasad* (30 H.P.) and *Sainath Prasad* (18 H.P.) immediately rushed to the rescue of the boat in danger. On finding that the net was torn to shreds and it got wound around the body of a whale shark, fifteen crew of the three boats had to battle with the monster for about two and a half hours to overpower and securely tie the shark with strong nylon ropes. (Figs. 7 & 8). The shark after being fully wrapped in 17 gill-net units was completely brought under control and was successfully towed alive to Cuffe Parade beach at about 1000 hrs on 21-11-1983, during high tide, (Figs. 1 & 2). The struggle put up by the shark was so hard that it took about eight hours for three mechanised boats, in unision, to land it at Cuffe Parade. The shark after being alive for about fourteen hours died at about 1330 hrs on 21st instant, when the high tide water receded. The carcase was then completely disentangled from nets and ropes by twentyfive fishermen taking about two hours. (Figs. 9 & 10).

The news of the beaching of a leviathan at Cuffe Parade spread like wild fire throughout the length and

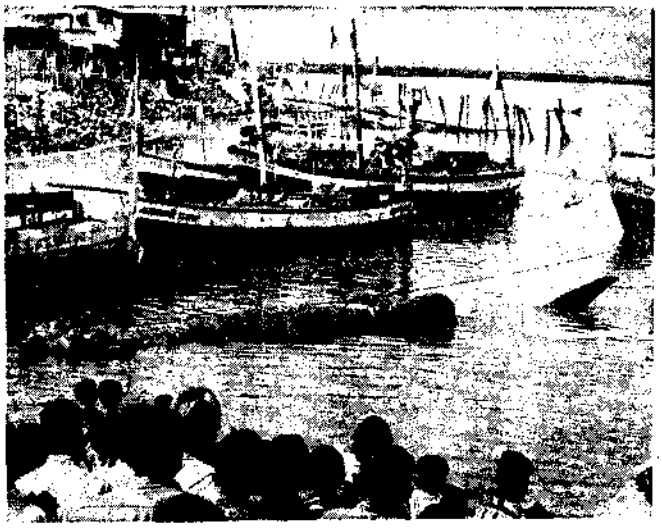


Fig. 2. The whale shark in water at Cuffe Parade after it was towed alive by 20 footer mechanised boats.

breadth of the cosmopolitan city of Bombay through local news papers, radio and television. People from all walks of life thronged at Cuffe Parade to have a glimpse of the giant sea creature and the crowed was so huge and unmanagable that special traffic squad was pressed into emergency service to clear and control the mas-

*Prepared by J. P. Karbhari and C. J. Josekutty, Bombay Research Centre of CMFRI, Bombay.

sive traffic jam. Some orthodox people paid homage to the unbelievably collosal sea creature by showering flowers, rice and vermilion and burning incense sticks. The shark was cordoned off by the local police.

Fig. 3. Dorso-lateral view of the whale shark caught alive in the fishing net near Khanderi Light House, on the Konkan coast of Maharashtra.

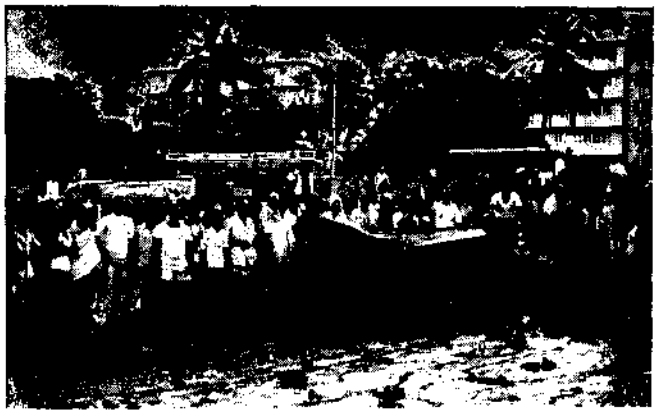


Fig. 4. Dorso-lateral view of the whale shark showing the close-up view of longitudinal lateral ridges or body keels.

The staff of Bombay Research Centre of CMFRI immediately arrived at Cuffe Parade and identified the shark as *Rhincodon typus* Smith – the whale shark. The authors strived for two days (21st and 22nd November 1983) to collect all possible data on the morphometry and the anatomy of the fish. The methodology adopted for the collection of morphometric data was as per the guidelines given by Silas and Rajagopalan (1963). The detailed morphometric measurements (in m) of the whale shark are given below:

1.	Total length	... 12.18
2.	Standard length	... 10.23
3.	Head length	... 2.14
4.	Girth of body at P1 base	... 5.05
5.	Width of mouth from angle to angle	... 1.36
	Vertical height of:	
6.	First dorsal fin	... 1.37
7.	Second dorsal fin	... 0.48
8.	Anal fin	... 0.34
9.	Length of caudal fin from caudal pit along upper margin	... 1.95
	Snout to:	
10.	First dorsal fin	... 4.08
11.	Second dorsal fin	... 6.95
12.	Pectoral fin	... 1.79
13.	Pelvic fin	... 4.48
14.	Anal fin	... 7.45
	Interspace between:	
15.	First and second dorsals	... 2.80
16.	Anal and caudal	... 0.98
17.	Pectoral and pelvic origins	... 2.68
18.	Pelvic and anal origins	... 3.08
	Length of:	
19.	Pectoral fin along outer margin from anterior insertion	... 2.16
20.	Pectoral fin from angle of inner margin to tip	... 1.78
21.	Pelvic fin along outer margin from anterior insertion	... 0.65
22.	First dorsal fin along outer margin from anterior insertion	... 1.55
23.	Second dorsal fin along outer margin from anterior insertion	... 0.65
24.	Length of clasper from inner base of pelvic fin	... 0.78
25.	Length of pelvic fin along its inner edge	... 0.55
26.	Interspace between eye and spiracle	... 0.19
27.	Interspace between eye and angle of jaw	... 0.25
28.	Diameter of eye ball	... 0.03
29.	Diameter of orbit	... 0.07
30	Inter-orbital distance	... 1.98
31.	Width of the mouth straight across inside from angle to angle of jaws	... 1.18

Description

The body had a hump-backed appearance and the caudal fin measured about two metres. There was a marked concavity at the inter-orbital space

(Fig. 5) which marked the flat wedge shaped form of the head. When seen or photographed in profile, it gave a deceptive fusiform appearance. Eventhough it has been reported that a furrow connecting the nostril to the mouth is absent in the adult, in the present adult whale shark, it was observed that the nasal flaps were well developed and extended in a crescentic fold from the nostril to under the rim of the lip (Fig. 5).

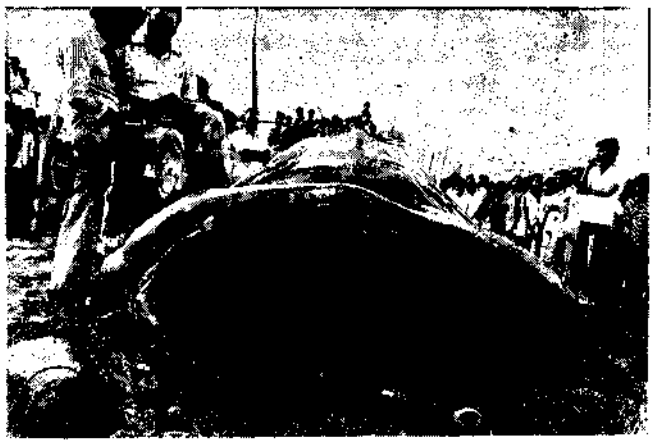


Fig. 5. Frontal view of the whale shark. Note the enormous gape. The width of the capacious mouth is 1.18 m. The Institute staff of Bombay Research Centre of CMFRI is seen in the background recording morphometric data. Also note the marked concavity of the inter-orbital space and the well developed nasal flaps extending into a crescentic fold from the nostril to under the rim of the lip.

Three distinct longitudinal lateral ridges or body keels were present on either side of the body. A dorso-lateral keel commencing above the branchiae extended to below the second dorsal and a median keel commencing anterior to the first dorsal extended to the

Fig. 6. Frontal view of the whale shark showing the close-up view of lateral rudges or body keels and their origin.

region of the tail. The third, the lowest keel was the strongest and most pronounced. It commenced behind the last gill-silt and reached up to the tail, coalescing there with the keel on its axis (Figs. 4 & 6). The snout was obtuse and depressed and the mouth was terminal and cavernous. The angle of the gape was tad-pole like and terminated in front of the eyes. The colour of the specimen was deep purplish-blue dorsally and the

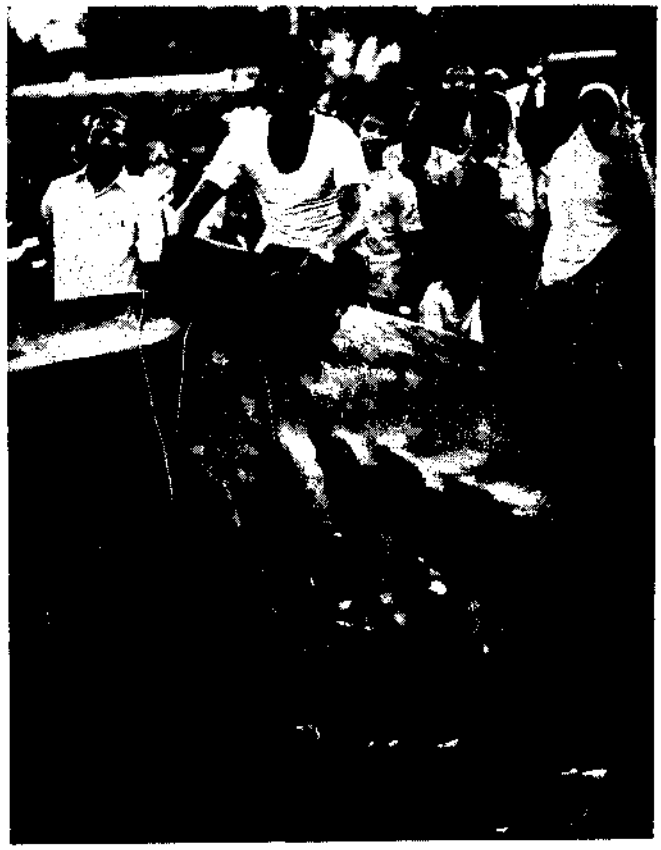


Fig. 7. Showing the ingenuity of the fishermen in securedly tying the whale shark with strong nylon rope near the gill slit region.

under surface was reddish-white. The same flush of red was visible under the head and on the margins of the fins.

The dorsal surface and the head were covered with a profusion of white spots which were arranged in a regular series of 23 vertical rows. In each alternate row the spots were fainter and tended to coalesce into linear markings, so that as a whole, the markings presented a pattern of rows of large, well spaced spots, alternating with linear bands. The anterior dorsal fin was spotted and faintly marked with transverse lines produced by coalescing of spots. Second dorsal was without spots, pectorals profusely and caudals sparsely spotted (Fig. 10). On the head, spots were more pronounced and formed a kind of mosaic (Fig. 9).

Fig. 8. The whale shark tied with nylon rope near the caudalpit.

Myraid of small rasp-like teeth were arranged in vertical rows on the toothband in each jaw. In appearance and feeling, the teeth in the bands were all pointing backward. One specimen of sucker fish *Remora remora* found firmly clinging to the upper palate, well inside the buccal cavity of the whale shark was collected and preserved by the authors. The tongue was large and flat. The specimen was an adult male and a pair of well developed copulatory organs called claspers extended backwards as far as the hind edge of the ventral as described by Prater (1941).

Disposal of the whale shark

The fishermen were confused after landing such a huge shark and were planning to dispose off the carcass by towing it back into the sea. On receipt of the proper and timely guidance from the authors, the entire animal was sold out for Rs. 4000/- to a local fish merchant (M/s Afzal Fisheries) who arranged to cut up for curing on 22–11–1983. Eight persons working for 10 hours (from 0800 to 1800 hrs.) could complete this stupendous task of fish disposal. The flesh was cut up into 475 big pieces each weighing about 20 kg. Thus the total weight of the glistening white soft flesh along with the cartilageous vertebrae and skin was approximately estimated at 9,500 kg. The flesh was cured by using 2,400 kg of salt, costing Rs. 750/-. The cured flesh was sold out for Rs. 6,250/- to M/s A. Sankara Appa of Secunderabad (Andhra Pradesh). During salt curing the brine formed was approximately equal in volume to that of the flesh cured, which was quite an unusual phenomenon.

The liver of the fish was shared equitably between the fishermen and the fish merchant. The fish merchant sold his share of liver (510 kg) to a shark liver oil extracting plant (Haffkine Biopharmaseutical Corporation Ltd., Sasoon Dock, Bombay) who had extracted 255 litres of liver oil. Data for oil analysis furnished by the above plant revealed that the oil was deficient in Vitamin A, potency being 6000 I/U per gm and Free Fatty Acid (FFA) being 1.6. The fishermen had received 508 kg of liver as their share and they had extracted oil in a crude form by heating. The fishermen use the oil against some skin diseases and as a preservative for their fishing crafts. The total weight of the liver was estimated at 1,018 kg.

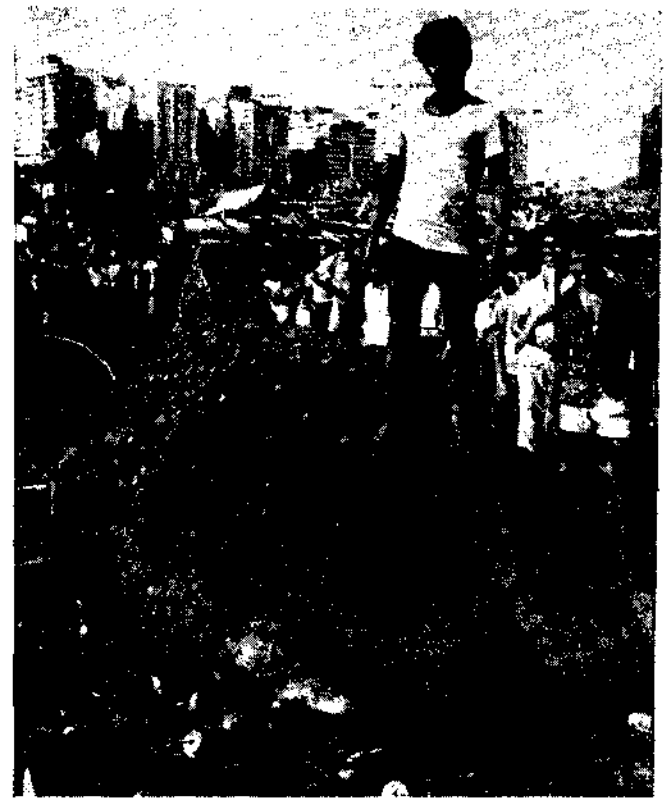


Fig. 9. Frontal view of the whale shark. Note the mosaic pattern of spots on the head. The gill net with floats are lying by the side of the shark. The captor Shri J. B. Dhanu is seen atop the whale shark.

The total weight of the viscera along with its gut contents, fins, gill arches with gill and gill-rackers was estimated at about 500 kg. The total weight of the whale shark was, thus, approximately estimated at 11,018 kg.

Fig. 10. The fishermen helping the CMFRI staff in taking various body measurements of the shark. Note the sparsely spotted caudal fin. A great crowed of people assembled round the shark is also seen.

Anatomical characteristics of the fish

The fish was cut up from dorsal side as it was originally lying in the same position with the ventral portion touching the sandy beach. Further, the weight of the fish was pausing a problem to turn it even slightly. One peculiarity noted was that any incision made in the body of this fish rapidly closed up and left no trace of the cut probably due to the resilience of the skin and the deep underlying layers of fat, as was observed by Gogote and reported by Prater (1941) in his description on a 20 feet long whale shark caught near Jayagad, Ratnagiri (Maharashtra) on October 3rd, 1936.

The thickness of the skin along dorsum and abdominal wall was 148 mm and 98 mm respectively. The flesh was soft and whitish in colour as was observed by Chacko and Mathew (1954).

The gill rackers were closely set in a row on the inner extrimity of the gill-arches and they projected towards the inner gill-cleft leading into the gullet. The closely set pectinate gill-rackers appeared to be covered by highly vascular tissues as large quantity of blood was seen oozing out when they were cut and removed as a waste. When the viscera of the shark was exposed and the stomach open, large quantity of water gushed out which probably the shark had apparently taken during its long struggle in the net. The analysis of the stomach contents in the field itself revealed that it included varied items such as large quantities of seaweeds and algae, partly digested remains of fish, crustaceans, molluscs etc. It was interesting to note that one suckerfish, *Remora remora*, measuring 208 mm in total length was found in the stomach of the whale shark, probably ingested accidentally.

The unique event of the capture and landing of 12.18 m long and live whale shark locally called *massa* by the traditional fishermen of Cuffe Parade, Bombay, has been widely publicised. The largest specimen obtained so far, on the Indian coasts measured 12.10 m (Kakikini *et al.*, 1959). Though the whale shark is known to attain a length of 18.3 m based on a specimen captured on the east coast of the Gulf of Siam (Smith, 1925) as given by Prater (1941), the Guinness Book of Animal – Facts and Feats (1976) has recorded a whale shark of 11.58 m killed by Captain Charles Thompson and some local fishermen just below Knight's Key, South Florida, U.S.A. in May, 1912 as the largest. From the above published records, it certainly appears that the present specimen of whale shark of 12.18 m at Bombay (India) is an unsually large one.

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NOTE ON A WHALE SHARK *RINCODON TYPUS* SMITH LANDED AT PONDICHERRY*

A juvenile male whale shark *Rhincodon typus* Smith was captured by the Solathandavankuppam fishermen of Pondicherry State on 30th January, 1984 at 0530 hrs in gill net (13 cm mesh size *kattu valai)* operated by a 9 m long mechanised boat near Marakkanam (off Eggikuppam) at about 40–45 m water depth. The net was partly damaged while bringing the whale shark by the mechanised boat to the shore at 1030 hrs. The morphometic measurements (in cm) of the whale shark are as follows:

1.	Total length (Snout to caudal tip)	...	497
2.	Standard length (Snout to caudal pit)	...	375
3.	Snout to origin of first dorsal	...	218
4.	Snout to first gill opening	...	75
5.	Width of head	...	100
6.	Eye diameter	...	3.5
7.	Width of mouth	...	68
8.	Length of anterior gill opening	...	60
9.	Length of posterior gill opening	...	30
10.	Length of first dorsal fin	...	60
11.	Length of pectoral fin	...	80
12.	Length of second dorsal fin	...	25
13.	Length of ventral fin	...	24
14.	Length of caudal fin (upper)	...	122
15.	Length of caudal fiin (lower)	...	122

Anal fin could not be measured due to scar.

*Reported by L. Chidambaram, Pondicherry Field Centre of CMFRI, Pondicherry.

ON A JUVENILE WHALE SHARK *RHINCODON TYPUS* SMITH LANDED AT COCHIN*

An immature female whale shark of 1.5 tonnes was caught about 20 km southwest of Cochin on 17-12-1984 between 2 and 3 hrs in a gill net at a depth of about 30 m. The stomach of the shark was empty and water gushed out when slit open. No internal, gill or external parasites were found. The following body measurements (*in cm*) have been recorded.

1.	Total length	... 360
2.	Standard length	... 265
3.	Head length	... 88
	Height of body at:	
4.	pectoral base	... 56
5.	second dorsal	... 24
6.	caudal peduncle	... 16
7.	Width of mouth from angle to angle	... 56
	Vertical height of:	
8.	first dorsal	... 34
9.	second dorsal	... 13
10.	anal	... 12
11.	Length of caudal fin from caudal pit along upper margin	... 88
	Snout to:	
12.	first dorsal	... 154
13.	second dorsal	... 219
14.	pectoral	... 82
15.	pelvic	... 191
16.	anal	... 241
17.	spiracle	... 34
18.	first gill opening	... 62
19.	second gill opening	... 73
20.	third gill opening	... 82
21.	fourth gill opening	... 85
22.	fifth gill opening	... 88
	Interspace between:	
23.	first and second dorsals	... 65
24.	anal and caudal	... 24
25.	pectoral and pelvic	... 109
26.	pelvic and anal	... 50

*Reported by K. V. Somasekharan Nair, A. A. Jayaprakash and V. A. Narayanankutty, CMFRI, Cochin.

Length of:

27. pectoral fin along outer margin from anterior insertion ... 66
28. pelvic fin from anterior insertion ... 18
29. first dorsal from anterior insertion ... 36
30. second dorsal from anterior insertion ... 18

Length of:

31. anal fin from anterior insertion ... 16
32. first gill opening ... 29
33. second gill opening ... 32
34. third gill opening ... 34
35. fourth gill opening ... 25
36. fifth gill opening ... 21
37. Diameter of orbit ... 3
38. Inter-orbital distance ... 71

As there was no buyer, on 18th evening the carcass was towed to the sea and discarded.

ON THE LANDING OF *RHINCODON TYPUS* SMITH ALONG ADIRAMPATINAM COAST, TANJORE DISTRICT, TAMIL NADU *

While operating bottom-set gill net *(Kalaivalai)* on 19-10-'85 at 8 m depth in Palk Strait off Adirampatinam, Shri Veerabadran, a boatman of Karayur, netted a whale shark and towed it the same day to the landing centre. The animal was alive until it reached the shore. It is reported that since last 30 years this is the first time such a huge whale shark has been caught in this area. The measurements taken (in cm) are as follows:

1.	Total length	...	900
2.	Height of body	...	210
3.	Girth of body	...	450
4.	Length of first fin (pectoral)	...	123
5.	Length of second fin (pectoral)	...	120
6.	Dorsal fin	...	115
7.	Second dorsal fin	...	85
8.	Length of caudal fin	...	198

*Reported by A. Ganapathy, Field Centre of CMFRI, Pattukottai.

ON A WHALE SHARK *RHINIODON TYPUS* SMITH LANDED AT CUFFE PARADE, BOMBAY*

A whale shark, *Rhiniodon typus* Smith measuring 5 m in total length was landed at Cuffe Parade landing centre at 15.30 hrs on 10th November, 1985. It was reported that the whale shark got entangled in a gill net operated by a mechanised boat about 15 km from the shore at about 30 m depth. The whale shark weighed approximately 5 tonnes and was sold for a price of Rs. 3,000/-.

*Reported by Shri M. Shriram, Bombay Research Centre of CMFRI, Bombay.

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