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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 Fishery Data Centre 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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Cover photo: Scuba diver taking the leap.

SCUBA DIVING INVESTIGATIONS AND TRAINING

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Introduction

Diving activity in sports and recreation acquired great popularity during the last three decades due to the new dimension given by Cousteau-e-Gagnan in 1942 by perfecting the 'Aqua-lung'. For the first time it was possible for man to experience a three dimensional space, diving with self-contained underwater breathing apparatus, popularly called SCUBA. This method of free diving opened up a new vista for scientists exploring the under-sea world by periodically organising excursions to study, photograph and collect materials. During the past 35 years underwater technology, engineering, bio-medicine, saturation diving and automation had developed tremendously to enable man to forge to very great depths in to the oceans and stay there for extensive periods. Sea city plans, off-shore living space, habitats, sea-labs etc. have been successfully experimented upon as a result of recent advances in the technology of diving. Inspite of all these aqua-lung diving continues to be very useful for scientists searching for specific underwater details, in photography, for collections and observations in the shallow limits of ocean beds. The very nature of the cheap cost of possessing and operating the aqua-lung makes it easy for developing countries to introduce this system of diving for scientific exploration programmes.

Diving with aqua-lung for scientific investigations, however, came into the field in India only in the late 1950's due to the joint efforts of the Central Marine Fisheries Research Institute and the Tamil Nadu Fisheries Department. Necessity arose to look for a satisfactory method of exploring the sea-beds in the Gulf of Mannar for locating and charting the pearl oyster beds and chank beds towards better management of these fisheries. The age-old method of commercial exploitation of these by a section of fishermen by skin diving upto 25 m depth left much to be improved in as much as it is laborious and tiresome. It needed modification by introducing diving with aqua-lung towards greater efficiency and ease. By creating a cadre of trained personnel in this field of activity and developing adequate infrastructure facilities a phased programme of change in the old system was felt necessary. A project jointly sponsored by the Government of India and Government of Tamil Nadu sought the technical assistance for expertise and equipment from FAO, Rome in 1958. The terms of reference for this project assistance by FAO envisaged (a) selection of equipment useful for studying the sea-bottom upto 30 m depth (b) training of Indian scientists in the modern methods of diving (c) carrying out accurate diving survey of areas containing pearl oyster and chank population to obtain precise information about the location and extent of each bed and knowledge of the ecological conditions and (d) to chalk out a long range programme of training, management and development of pearl and chank fisheries in these areas.

The F A O placed the services of Dr. F. Baschieri Salvadori, an expert diving scientist for this assignment who brought with him 6 pairs of aqua-lungs, 2 portable compressors 'Nereus' 1958 with ('continental' motors, diving accessories) and a 'Rollei Marin' Camera for underwater photography. The expert started project work at Tuticorin in November 1958 and completed his first assignment in May 1959. During this period he imparted aqua-lung training to six Indian scientists and gave training to two professional divers. He also undertook a rapid inspection of 33 pearl banks and a few chank beds. However, detailed survey of only four pearl banks (Paars) was completed by him. This enabled him to outline the contours of these areas, locate their position, calculate the extent of each paar, study the faunistic and floral features of the areas covered. A report embodying the details of work done and the results of his technical programme was brought out by the FAO in Report No. 1119-EPTA (1960) submitted to the Government of India. Since much remained to be completed after his first assignment, Dr. Salvadori was reassigned to visit India again twice for short spells during November-December 1960 and December 1961 to February 1962. During his second visit he initiated survey work of sea-bottom from 10 m depth to 26 m depth. His second report to Government of India, EPTA No. 1323, published by FAO in 1961 is very brief and outlines only the plan of work and the facilities needed. During his third and last visit he comple-

ted training of two more scientists in SCUBA diving and evaluated the progress of work till 1961. These are reflected in his third report, EPTA No. 1498, published by FAO, in 1962.

SCUBA diving in CMFRI

The training given to two scientists of CMFRI and two from the Tamil Nadu Fisheries Department and the experience gained in underwater exploration made it possible for them to carry out a phased programme of sea bottom survey during the next three years 1962-1964. The CMFRI imported six pairs of aqua-lungs ('Siebe-Gorman' make), important diving accessories, and a 'Rollei Marin' Camera to supplement the FAO equipment left with the Department of Fisheries, Tamil Nadu. Later, CMFRI acquired an electrically operated air compressor (Bristol' Co.), one portable air compressor (Sachs-Bauer-Utilus) and one more underwater camera - 'Calypso'. Thus the sustained interest evinced by the Institute to promote this discipline of scientific work enabled the scientists engaged in this project not only to acquire very valuable diving experience but also facilitated collection of useful data on the pearl oysters and chank, in the study of the ecological features of the sea bed off Tuticorin and estimation of the density of chank and oyster population in different localities investigated. The results of these studies were published (ref: list of publications).

Since marine fishing industry as well as industries based on marine products need as much of authentic information as possible in all matters connected with raw material availability, seasons and areas of abundance and expert consultancy on rational exploitation possibilities the expertise available is being provided by the CMFRI within the framework of its research objectives and time availability. One such assignment was the survey of Andamans and Nicobar Islands for assessing potentialities of these areas for mariculture purposes. For the first time a pioneering attempt was made during February-April 1978 to investigate the nearby coastal areas of nearly 27 of these islands by aqua-lung diving by the scientists of this Institute. The report and recomendations are being published. Another noteworthy contribution by the diving scientists team of CMFRI was the detailed survey of 20 islands in the Gulf of Mannar during 1978-80 and exploration of the fringing coral reefs and adjacent areas (Fig. 1-20) to determine the extent of damage done to the reefs and reef fauna by human interference and destructive fishing activities. This survey helped to outline conservation measures to protect endangered species based on which the creation of a 'Marine National Park' in the Gulf of Mannar was proposed by the Institute. This objective study was fully appreciated and accepted by the Government.

Training Programme

In order to promote 'SCUBA' diving for scientific and exploratory purposes and for exploitation of marine resources the Institute decided upon a programme of training scientists and technical personnel in aqua-lung diving. Towards facilitating this, additional diving equipment and accessories have been imported recently to substitute and supplement the existing ones. This training was initiated in 1979-80 at Tuticorin under the leadership of the two experienced scientists of the Institute. Scientists and technicians are eligible for this training. Two batches of scientists and other staff were trained during 1979-1981 (Fig. 21-24).

The training course imparts theoretical and practical lessons and runs for a period of 8 weeks. Two sessions are possible in each year. Selection of candidates is done after obtaining proof of their physical fitness as certified by competent medical authority and the selected candidates are required to get their lives insured by the sponsoring authorities or institutions for the duration of the training course.

The Institute does not undertake any financial commitment. Stay, food and medical expenses of the candidates so selected for training will have to be borne by the sponsors. The expertise offered by the CMFRI is free and on the successful completion of the course a testimonial of proficiency in SCUBA diving will be given to each candidate within the limits contemplated by the project objectives.

A broad outline of training schedule is given for the benefit of those interested in the training.

Training Schedule

Theory 20 Hours

Snorkeling: Basic rules and pre-requisites-pressure and skin diver equalising middle ear pressure-Deep dive techniques.

Fig. 1. Observations and gathering materials at the sea bottom.

Fig. 2. On the look-out for warding off possible danger from barracudas passing nearby.

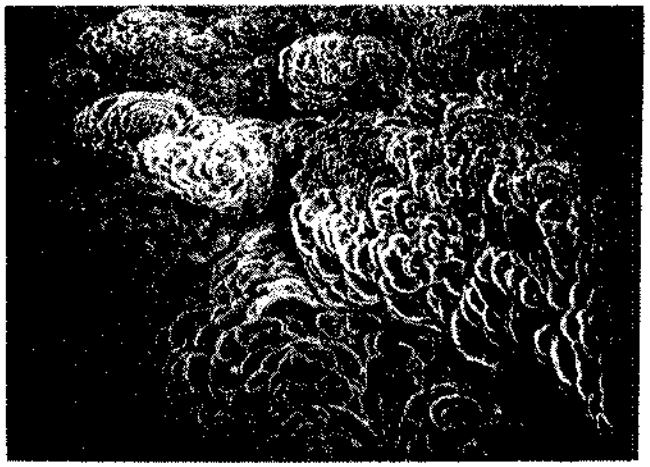

Fig. 3. An extensive Montiporan coral colony in the clear subtidal areas in the vicinity of Tuticorin shore line.

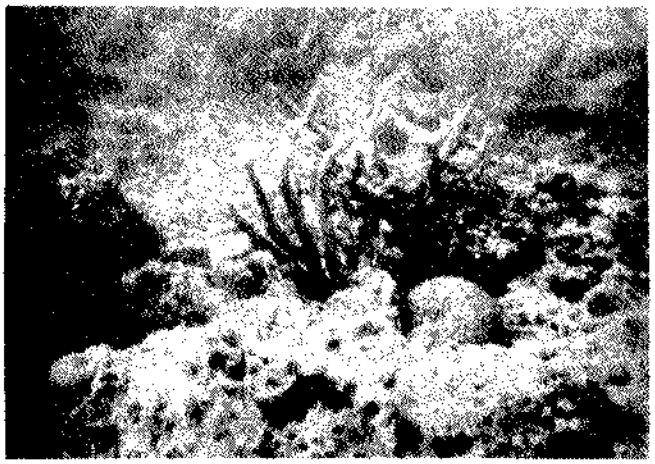

Fig. 4. Assemblage of live corals in the deeper zones.

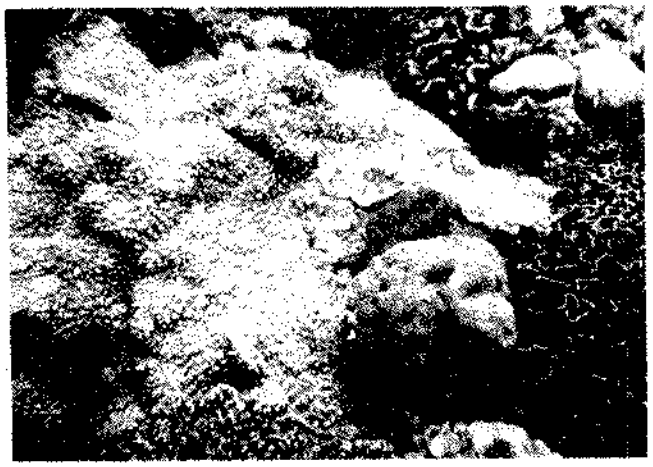

Fig. 5. Massive coral blocks and brittle coral colonies.

Fig. 6. Solitary coral, *Fungia* sp. over rocky substratum.

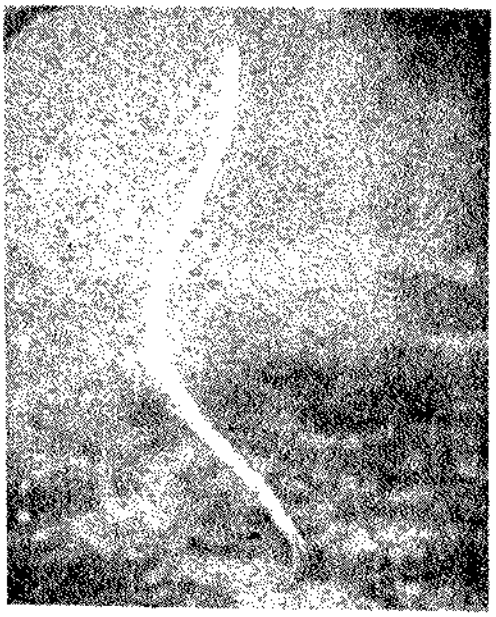

Fig. 7. Encountering sea-snakes at the bottom is a common feature.

Fig. 8. A giant rock lobster, *Panulirus* sp., caught from a ledge, being brought up.

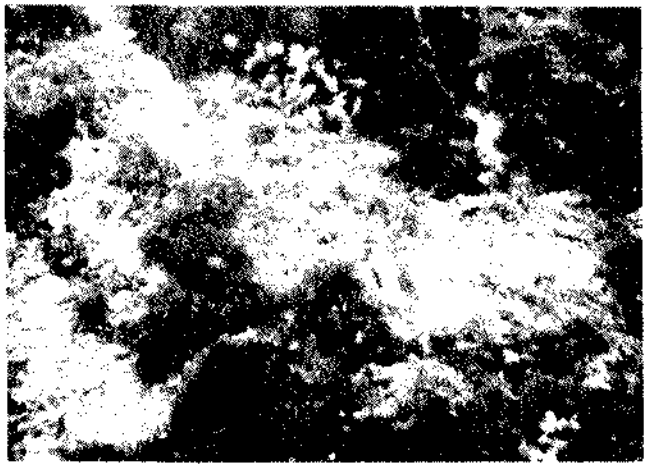

Fig. 9. A rugged sponge and seaweed covered rocky bed.

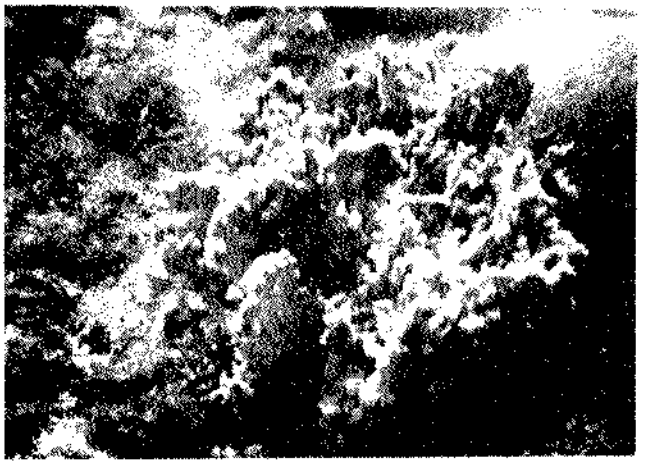

Fig. 10. Sponge colonising the rocky bottom.

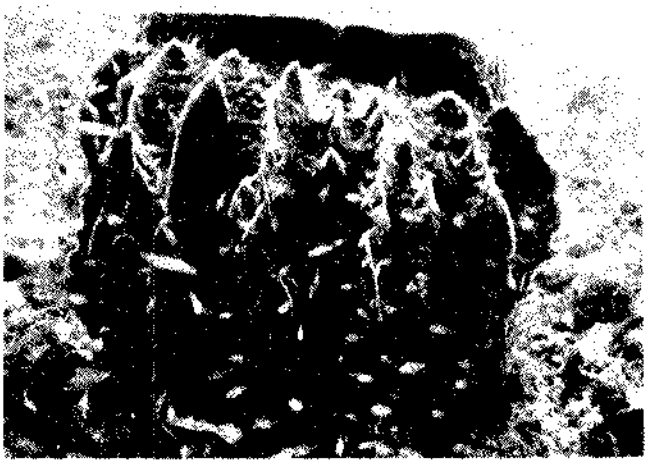

Fig. 11. Massive sponge. *Petrosia* sp. with coral fishes hovering round.

Fig. 12. Montiporan coral block providing hiding cover to *Gaterin* sp.

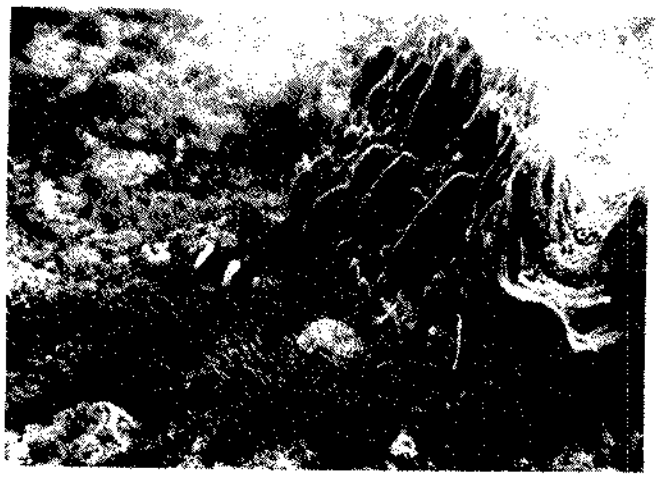

Fig. 13. A large sea anemone, *Amphiprion*, the damsel fish and *Serranus miniatus*, the red rock cod taking refuge alongside a sponge ridge.

Fig. 14. Coral reef fish community.

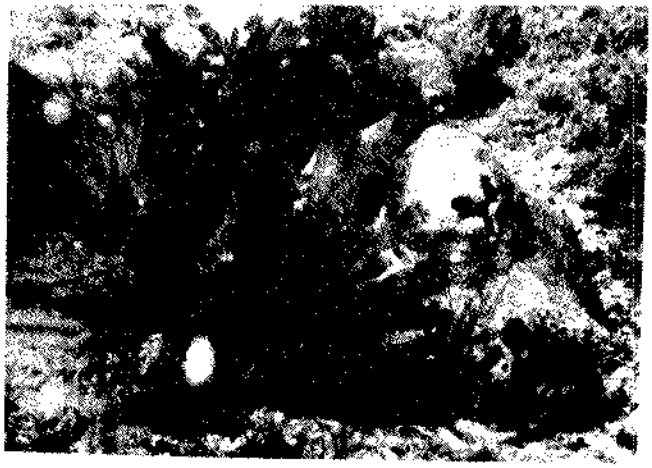

Fig. 15. Dense seaweed growths characteristic of the rocky sea floor off Tuticorin.

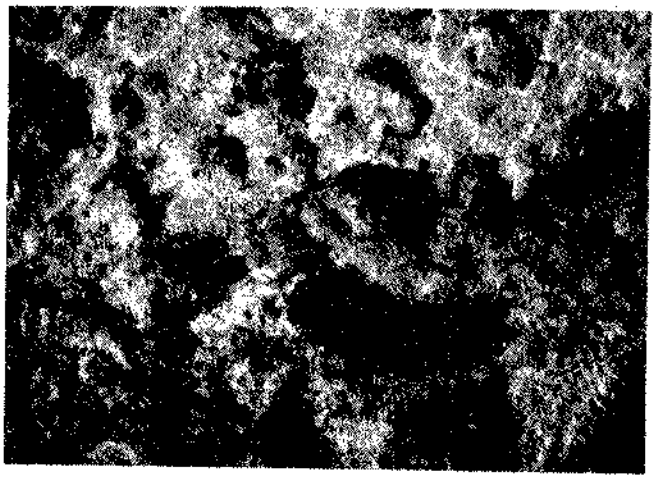

Fig. 16. Black holothurian on rocky bed.

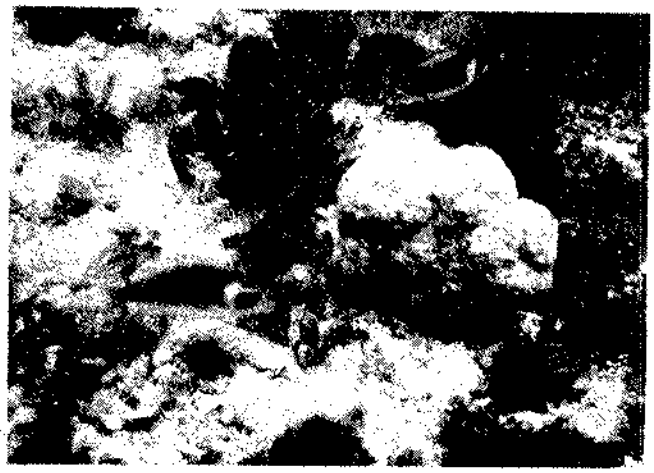

Fig. 17. *Scolopsis vasmeri*, a common fish at the pearl oyster beds.

Fig. 18. *Balistes* sp., the file fish is the most characteristic denizen of pearl oyster beds.

Fig. 19. These fishes are numerous in the pits and crevices of pearl beds.

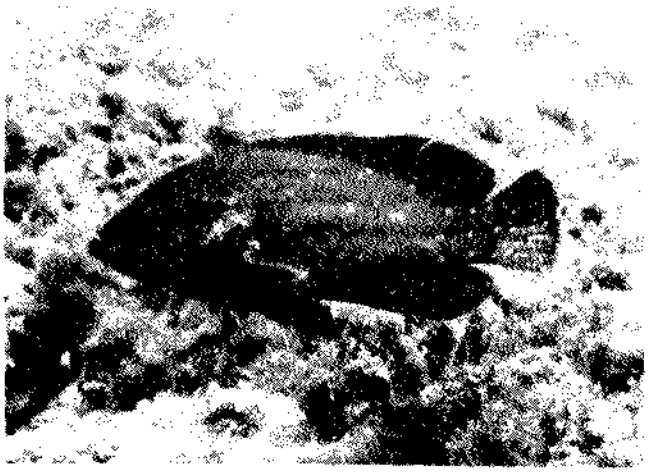

Fig. 20. The rock cod, *Serranus miniatus*, is ubiquitous from 10 m–25 m in the rocky areas.

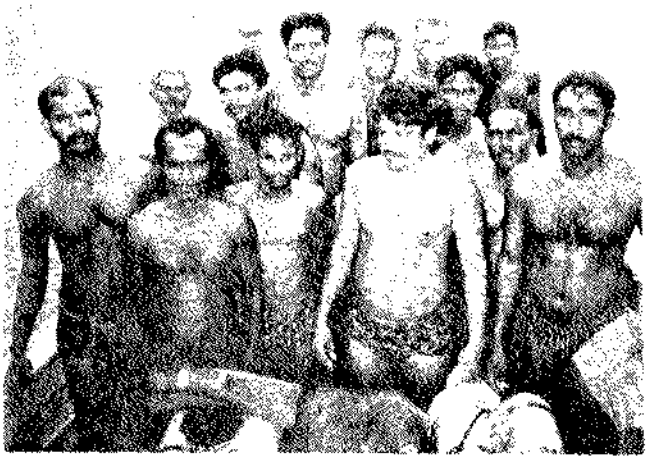

Fig. 21. 'SCUBA' diving training team with trainees from CMFRI.

Fig. 22. Training lessons in putting on Aqua-lung and positioning.

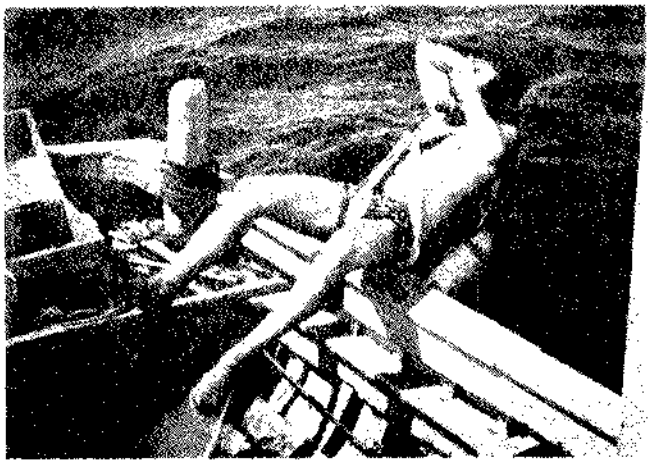

Fig. 23. The plunge into deep sea.

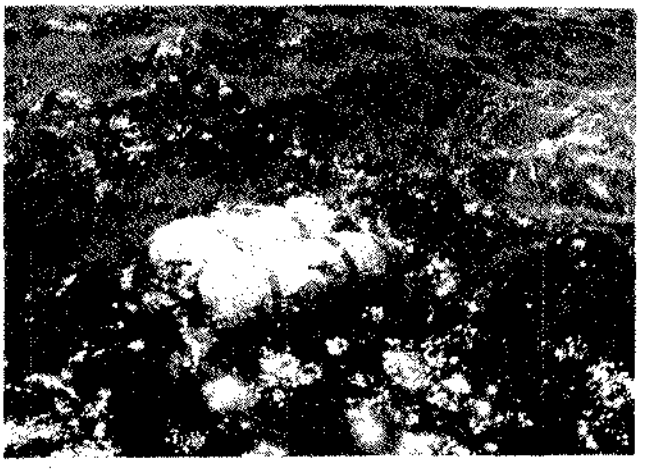

Fig. 24. 'SCUBA' diver in the process of descent.

Diving equipment: Make and selection of mask, fins, snorkel and knife-use and care of depth gauge, floats, watch, compass, suits, boats for divers-torch, camera, underwater guns, spear etc.

Diving: Where to dive-visibility-sea diving.

Aqua lung: What is aqua-lung-effect of pressure-hazards in diving-Symptoms of diving diseases-safety while diving-Decompression-Demand va lue regulator-functioning and uses-Types of regulatorr breather.

How to use aqua-lung-emergency procedures in diving-clearing of flooded mask, breathing tube, clearing mouth piece etc. Precautions with the equipment while diving.

Deep dive: Skin diving and safety-Buddy system-Diving signals-artificial respiration-do's and don'ts while diving with aqua-lung. Maintenance of aqua-lung and regulators.

Skin diver and marine life: Fish watching. Psychology of fish-senses of fish. Sharks and attacks-collection techniques at sea bottom-Dangerous marine life-Underwater photography.

Model gadgets in diving: Underwater vehicles and other recent advances in sea bottom studies by direct observation.

Practical 100 Hours.

Surface swimming with and without fins-swimming underwater with fins and mask-snorkeling in shallow areas and deeper areas-skin diving in shallow areas and slightly deeper areas-rescue operations while diving-artificial respiration.

Care of diving equipment and accessories-functioning of portable and electrical compressors-charging aqua-lungs-dismantling and assembling of lungs and regulator.

Exercises in removal of aqua-lung and replacing while diving at shallow water-clearing of flooded mask, breathing tubes-exchange of mouth piece with partner while diving-deep water diving with aqua-lung-collection of materials-use of different collection tools-confidence level diving.

Period of Training: December to April
Place : Tuticorin
No. of Trainees per Session : Eight

List of scientific publications in underwater diving observations by CMFRI

1. George, M. J., K. Nagappan Nayar and S. Mahadevan. 1967. Underwater observations. On a collection of shrimps from the Gulf of Mannar off Tuticorin. *Rec. Zool. Surv. India* **67**: 357-365.

2. Mahadevan, S. 1961. The pearl fish *Carapus margaratifera* (Rendahl), a new record for the Indian waters. *J. mar. biol. Ass. India.* **3** (1 & 2): 204-207.

3. Mahadevan, S. and K. Nagappan Nayar. 1965. Underwater ecological observations off Tuticorin in the Gulf of Mannar. Association between a fish (*Gnathonodon*) and a sea snake. *J. mar. biol. Ass. India* **7** (1): 1-3.

4. Mahadevan, S. and K. Nagappan Nayar. 1965. Underwater ecological observations off Tuticorin in the Gulf of Mannar. On the emperor bream, *Lutianus sebae* found with Pterois, the scorpion fishes. *J. mar. biol. Ass. India* **7** (2).

5. Mahadevan, S. and K. Nagappan Nayar. 1965. Note on the habitat and distribution of the file-fishes along the Tuticorin coast. *J. mar. biol. Ass. India* **7** (2). notes.

6. Mahadevan, S. and K. Nagappan Nayar. 1966. Underwater ecological observations in the Gulf of Mannar, off Tuticorin. VI. On the habitat, movements and breeding habits of the chank, *Xancus pyrum* (Linnaeus). *J. mar. biol. Ass. India* **8** (1): 213-218.

7. Mahadevan, S. and K. Nagappan Nayar. 1967. Underwater ecological observations in the Gulf of Mannar, off Tuticorin. VII. General topography and ecology of the rocky bottom. *J. mar. biol. Ass. India* **9** (1): 147-163.

8. Mahadevan, S. and K. Nagappan Nayar. 1971. Whither

pearl fishing. Souvenir Fish Exporters Chamber 181-184.

9. Mahadevan, S. 1971. Fishing for pearls in India. Sea-Food Export Jour. 3 (3): 23.

10. Mahadevan, S. and K. Nagappan Nayar. 1972. Free diving in Indian waters. Sea Food Export Jour. 4 (2): 25-27.

11. Mahadevan, S. and K. Nagappan Nayar. 1973. Pearl oyster resources of India. Proc. of the Symposium on the living resources of the seas around India: 659-671.

12. Mahadevan, S. and K. Nagappan Nayar. 1974. Ecology of the pearl oyster and chank beds. *Bull. of C.M.F.R.I.* No: 25: 106-112.

13. Mahadevan, S. and K. Nagappan Nayar. 1976. Underwater observation on the settlement of pearl oyster spat in the paars off Tuticorin. *Indian J. Fish.* 23: 105-110.

14. Mahadevan, S. 1979. Possibilities of mussel culture in Andaman Islands (ms).

15. Mahadevan, S. and D. C. V. Easterson. 1979. Topographical and ecological features of Andaman and Nicobar Islands with special reference to their suitability for mariculture activities (ms).

16. Nayar, K. Nagappan and S. Mahadevan. 1965. Underwater ecological observations off Tuticorin in the Gulf of Mannar. The occurrence of the synaptid *Chondrocloea* along with the massive sponge, *Petrosia*. *J. mar. biol. Ass. India*. 7 (1)

17. Nayar, K. Nagappan and S. Mahadevan. 1965. Underwater ecological observations off Tuticorin in the Gulf of Mannar. The occurrence of *Crinoids* (*Lamprometra* and *Comanthus*) on the gorgonid *Juncella*. *J. mar. biol. Ass. India* 7 (2).

18. Nayar, K. Nagappan and S. Mahadevan. 1965. Underwater ecological observations off Tuticorin in the Gulf of Mannar. On sea anemones and the fishes *Amphiprion* and *Dascyllus* found with them. *J. mar. biol. Ass. India* 7 (2).

19. Nayar, K. Nagappan and S. Mahadevan. 1967. The pearl and chank fisheries-A new outlook in survey and fishing. Souvenir: 20th Anniversary, Central Marine Fisheries Research Institute.

20. Nayar, K. Nagappan and S. Mahadevan. 1973. Chank resources of India. Proc. of the Symposium on the living resources of the seas around India: 672-686.

21. Nayar, K. Nagappan and S. Mahadevan. 1974. Chank fisheries and industrial uses of chanks. Bull of C.M.F.R.I. No. 25: 122-140.

22. Nayar, K. Nagappan and S. Mahadevan. 1976. On the settlement and collection of pearl oyster spat from Tuticorin area (ms). *Indian J. Fish.*

23. Silas, E. G., et al. 1977. Report on the survey of the islands in the Gulf of Mannar by C.M.F.R.I. for the setting up of a Marine National Park. C.M.F.R.I. Publication: (MS).

PRAWNS IN PURSE SEINE CATCHES*

Introduction

With the recent introduction of purse seine fishing along Karnataka and Kerala coasts there has been considerable improvement in the catches of pelagic shoaling fishes such as oil sardine and mackerel from these waters. In Karnataka state the purse seiners are operated mostly in South Kanara, centred around Mangalore, Malpe and Gangoli, the total number of purse seiners in operation in these centres rising to 261 during the last 4-5 years. At Cochin Fisheries Harbour, the only centre from where purse seines are operated in Kerala, there is a substantial landing of oil sardine, mackerel and other fishes like carangids by this gear, numbering about 60 in 1981.

The total estimated landings by purse seines at Cochin for the year April 1981-March 1982 was 17,050 tonnes, of which the Indian oil sardine *Sardinella longiceps* contributed 13,949 t forming 81.81% of the total catch, the Indian mackerel *Rastrelliger kanagurta* formed 1,836 t constituting 10.77% followed by carangids composed mainly of *Alepes kalla, A. djeddabba, Megalaspis cordyla* and *Scomberoides tol* contributing 399 t forming 2.3% of the total catch. At Mangalore the total landings by purse seines in 1981 were 42,269 t of which 27,215 t were contributed by oil sardine, 3,960 t mackerel, 3,990 t cat fishes, 2,322 t anchovies, 1,961 t tunnies, 1,635 t carangids and the rest other miscellaneous fishes. Prawns being demersal in habit, occur rarely in purse seine catches. But during 1981 and especially in 1982 on a few days unprecedented catch of prawns, contributed mostly by a single species, was noticed in the purse seine operations both in Kerala and Karnataka (Fig. 1-6). A study of these prawns occurring in purse seine catches has been attempted.

Prawn catches in purse seines at Cochin

On 28 th and 29 th April, 1982 unusually heavy landings of prawns were noticed in some purse seines operated by 42' vessels with 110 Hp engines, south west off Cochin at a depth range of 15-20 m. The prawn catch, composed exclusively of *Metapenaeus dobsoni* (Poovalan chemmeen), was estimated at 67,990 kg on 28.4.82 with the catch per unit fluctuating between 1,000 and 1,800 kg, the mean catch per unit per day being 1,133 kg. On 29.4.82 the intensity of the prawn catch dwindled, with the landings coming down to 33,070 kg with an average catch per unit of 601 kg. The oil sardine was also landed in good quantities on these days.

*Prepared by K. V. Somasekharan Nair, A. A. Jayaprakash, K. K. Sukumaran, K. Y. Telang and K. K. Balasubramanian with the guidance of M. J. George.

Table 1. *Prawn (Metapenaeus dobsoni) catches (in kg) by purse seiners at Fisheries Harbour, Cochin.*

Date	No. of units operated	Average catch of prawns per unit	Estimated total catch	Estimated value in Rupees
19.12.81	62	1.59	99	860
21.12.81	55	2.16	119	1,100
22.12.81	55	2.54	140	1,250
24.12.81	40	3.22	129	950
28.12.81	52	2.57	134	1,075
1..1..82	53	84.90	4,500	65,000
4..1..82	55	19.20	1,056	7,300
20.1..82	55	65.45	3,600	30,600
4..2..82	8	128.75	1,030	8,500
18..2.82	52	60.57	3,150	24,410
28.4..82	60	1,133.16	67,990	5,33,780
29.4..82	55	601.27	33,070	2,84,400

Fig. 1. A carrier boat full of *M. dobsoni* at Malpe (2-9-82)

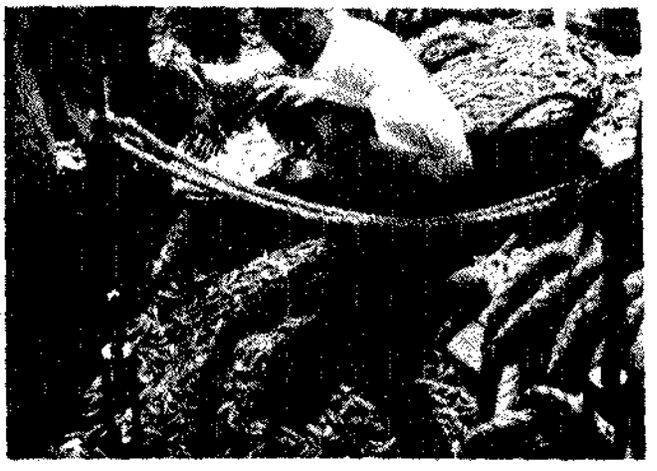

Fig. 2. Prawns being sorted on board a carrier boat.

Fig. 3. Unloading of *M. dobsoni* at Malpe from a purse seiner on 2-9-82.

Fig. 4. *M. dobsoni* at Malpe unloaded in baskets for transportation on 2-9-82.

Fig. 5. Catches being unloaded from a carrier boat at *Fisheries Harbour, Cochin.*

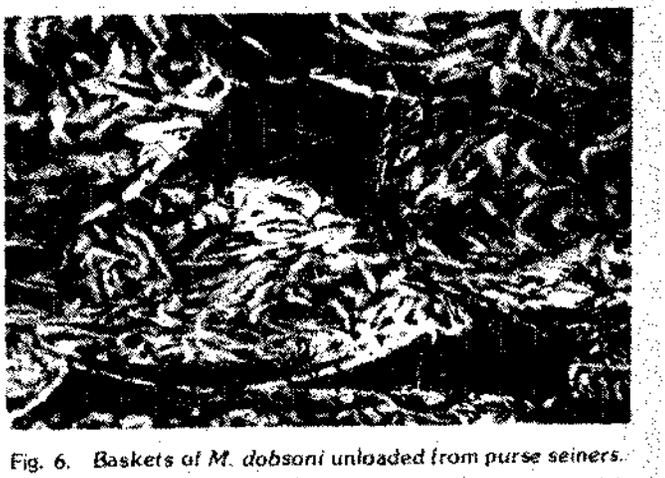

Fig. 6. Baskets of *M. dobsoni* unloaded from purse seiners.

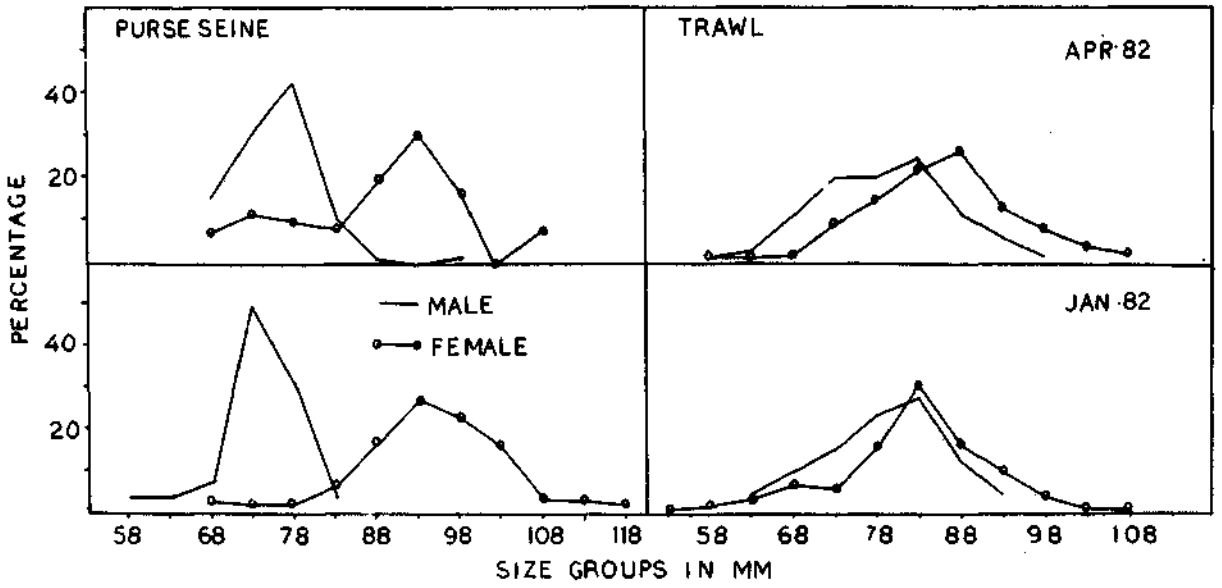

Fig. 7. Length frequency distribution of *M. dobsoni* in purse seine and trawl catches at Cochin.

On previous occasions also prawns have been caught in purse seines. For example on 1-1-82 two carriers of a purse seiner landed an estimated catch of 4,500 kg of *M. dobsoni*, which was auctioned at Rs. 65,000/-. It was interesting to note that apart from the single purse seine unit and its carriers, all other purse seine units and carriers on that day landed only oil sardine and carangids. The occurrence of *M. dobsoni* in appreciable quantities in the purse seines has been noted on few previous days also as may be seen from table 1. However, the maximum catch was recorded on 28 th April 1982. Females dominated in the purse seine catch in a ratio of 57:43, with the mature and late mature specimens forming 66% of the female population.

Size composition: Length measurements of random samples of *M. dobsoni* from purse seine landings of 1-1-82 revealed that the total length ranged from 55 to 85 mm for males with the dominant mode at 71-75 mm group and from 65 to 120 mm in females with the mode at 91-95 mm. On 28-4-82 the size ranged from 66 to 100 mm with the mode at 76-80 mm for the males, whereas the size range for the females was between 66 and 110 mm with the mode at 91-95 mm (Fig. 7). The size range and model sizes of the same species of prawn caught in the trawl nets from the same area and during the same period are also shown in the figure.

Purse seine prawn catches in Karnataka

In early September 1982, on resumption of fishing activities after the southwest monsoon, very large quantities of prawns were caught in purse seines operating at Mangalore and Malpe within the 15 m depth zone. On first 3 days of the month the catches were very high, showing a steep fall afterwards and disappearing by 8 th September. The catches of prawns by this gear during the period is estimated at 440.4 t and 320.9 t respectively at Mangalore and Malpe (Table 2), worth about 16 million rupees. In the previous two years also in September prawns were landed by purse seines at these centres. In 1980 the purse seine catches of prawns during the period were 395 t and 122.2 t in Mangalore and Malpe respectively and in 1981 much less, being 6.6 t and 15.0 t respectively at these two places. At Gangoli, situated about 60 km north of Malpe, it was surprising to note that there was very little catch of prawns in purse seines during the month, 2 t of prawns being landed only on 8 th September. At Karwar also prawns were landed by purse seines in September.

As at Cochin *M. dobsoni* (Poovalan) contributed to the bulk of the heavy catch, 98.3% and 93.3% respectively at Mangalore and Malpe. The rest of the catches constituted *Penaeus indicus* (Naaran), the Indian white prawn. However, on the first 3 days when there was very high catch

Table 2. *Prawn catch (in tonnes) in different gears during 1-8 September 1982 at Mangalore and Malpe (percentage of prawns in paranthesis)*

	Mangalore			Malpe		
	Purse seine	Trawl	Total	Purse seine	Trawl	Total
Number of units	816	1,560		754	1,547	
Total prawns	440.4	269.9	710.3	320.9	110.0	430.9
c/u in kg.	539.7	173.0		425.6	71.1	
M. dobsoni	432.8	257.1	689.9	299.5	108.6	408.1
	(98.3)	(95.2)	(97.1)	(93.3)	(98.7)	(94.7)
P. indicus	7.6	12.8	20.4	21.4	1.4	22.8
	(1.7)	(4.8)	(2.9)	(6.7)	(1.3)	(5.3)

M. dobsoni formed almost 100% of the landings. More or less the same ratio of sex distribution as at Cochin was noticed at both Mangalore and Malpe, the female to male ratio being 56:44. Around 67% of females were in spent/spent recovering stages at Mangalore and at Malpe these stages formed 42.4%. The mature and impregnated females were 22.7% and 24.4% respectively at Mangalore, while at Malpe these were 34.6% and 38.4% respectively.

Size composition: In comparison to the sizes landed at Cochin during the pre-monsoon period the sizes occurring in the purse seines at Mangalore and Malpe were much higher, mainly supported by the 1 year class and above. The sizes ranged from 76 mm to 105 mm with modal length at 91-95 mm in males and from 81 mm to 120 mm with mode at 106-110 mm in females at Mangalore. At Malpe the size ranged from 86 mm to 100 mm with mode 91-95 mm group and 91 mm to 120 mm with mode at 106-110 mm for males and females respectively, (Fig. 8). Thus the modal lengths of the species in the catches at both centres are the same. The size range and modal sizes of *M. dobsoni* caught in the trawl nets from Mangalore and Malpe during the same period are depicted in figure 2 for the sake of comparison.

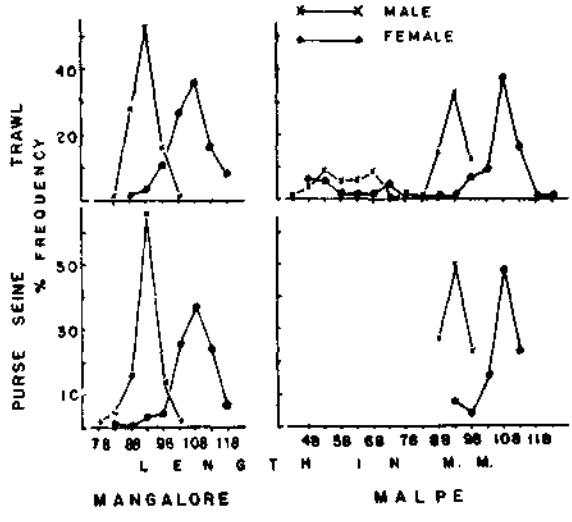

Fig. 8. Length frequency distribution of *M. dobsoni* in purse seine and trawl catches at Mangalore and Malpe.

General remarks

The sporadic occurrence of prawns in the purse seine catch on certain days appears to be brought about by the behaviour of the species. The coming up of prawns in the column of water during southwest monsoon due to upwelling nearer the shore and the resultant mud bank prawn fishery in the Ambalapuzha-Thottapally and Valappad-Nattika region of Kerala coast has been reported earlier. It has also been recorded that the pattern of fish and prawn distribution in the fishery changes due to the shoaling behaviour of the component species. However, such occurrences of prawns in the column of waters were reported during the southwest monsoon period and the present report of similar behaviour and consequent incidental catches in the purse seines in the pre-monsoon period at Cochin and immediately after the monsoon along Karnataka coast is interesting. It is quite possible that the behavioural pattern of the prawn is not dependent on upwelling.

Analysis of the sizes of the species of prawn represented in the purse seine catches in comparison to the sizes occurring in the trawl fishing grounds of the area during the same period gives certain interesting results. At Cochin a study on this line (Fig. 7) shows certain differences between the modal sizes in the two different gears, although the range in sizes is similar. The dominant size groups which are 71-75 mm in purse seine catches showed 81-85 mm in the trawl catches in the case of males, while in females they are 91-95 mm in the former and 81-90 mm in the latter. Thus the females show a higher modal length in purse seine catches while males show a lower modal length in the same when compared to trawl catches. The purse seine catches being dominated by females, the larger sizes of these females and majority of them with maturing and mature gonads would probably indicate that this behaviour of the shoals coming up in the column of water may have some connection with their spawning.

A similar analysis of the sizes of prawns represented in the purse seine and trawl catches of Karnataka coast (Fig. 8) gives a slightly different picture. The modal sizes of the prawns in the catches of both the gears in males as well as females are exactly the same in both centres, although the trawl catches at Malpe shows a much wider range in sizes when compared to the purse seine catches. Further the modal sizes of both males and females are much higher than that in the catches at Cochin. This is probably brought about by the difference in season, the reported occurrence of purse seine catches at Cochin being in January-April period and that at Mangalore and Malpe in September. However, the dominance of females in the purse seine catches of this coast along with the fact that majority of them were in spent/spent recovering stages would strengthen the point that the behaviour of the shoals moving up in the column of water is probably related with their spawning activities.

The large sizes of *M. dobsoni* occurring in the purse seine catches, particularly at Mangalore and Malpe would indicate that the population exploited consists of prawns at almost the fag end of their life and it appears that unless exploited at that time they may possibly perish due to natural mortality, especially since specimens larger than these sizes were seldom encountered in the fishery of the species any where along the coast. The occurrence of dead and decayed prawns of this species in the trawl catches during the season and large scale occurrence of shells and shell pieces noticed in the beaches and surf areas in the nearby coasts of Mangalore and Malpe towards the end of the monsoon season tend to support this view. Therefore, this seasonal exploitation of these large size prawns by purse seines may not pose any conservation problem. Though the occasional landings of prawns by purse seines at Cochin also need not be of much concern from the management point of view of prawn fishery in view of the sporadic nature, a close monitoring of purse seine catch is essential to see that purse seining does not affect the coastal trawl fishery that depends mainly on the penaeid prawn resources.

NEWS-INDIA AND OVERSEAS

Large scale destruction of turtles in West Bengal.

Destruction of turtles on a mass scale was noticed at Digha and Banksalghat in Midnapur district in West Bengal during 1981-82 season from about mid-November 1981 to February 1982.

Actually the capture of these turtles took place at Satbhai, situated between the mouths of the river Brahmani and Mahanadi in Cuttack district of Orissa. They were captured from the sea at a distance of about one km from the shore. Since all the five species of marine turtles occurring in the

Indian Seas are protected under Schedule 1 of the Wild life (Protection) Act, 1982 (October, 1977 amendment) and Government of Orissa have been imposing the law strictly within that state, the captured turtles were transported by boats to Digha and Banksalghat.

These turtles *(Lepidochelys olivacea)* weighed about 30-40 Kg each, the cost of each turtle being Rs.60/- to 80/- at Digha. Males and females were observed in the catches in equal proportions, ranging in Sizes from 620 to 750 mm (Carapace length) with the model size at 650-690 mm. They were mature and the females carried fully matured eggs.

It is estimated that a total of nearly one lakh numbers of turtles were landed at these two centres during 1981-82 season, by 15 units, each unit comprising of a motor launch and 6 country boats. The turtles are sent by trucks to Calcutta and Tata nagar for marketing.

Fig. 1. Turtles at the landing site at Digha

Such large scale distruction of mature turtles who come close to the shore for mating would probably lead to the depletion of their numbers in the coming years. It is earnestly hoped that West Bengal Government will take suitable conservation measures immediately, so that this valuable resource is not lost for ever.

Reported by S. S. Dan.

Another oceanographic research vessel for India

India has just taken delivery of an oceanographic research ship built by the Schlichting Shipyard in the Baltic Sea port of Luebeck - Travemuende and financed entirely (DM 80 Millions) by the Federal Republic of Germany.

The 100-metre-long and 16.39-metre - wide Sagar Kanya, which has a maximum speed of 14.25 knots, is one of the largest and most modern oceanographic research vessels in the world. Unlike other ships of its kind, it is capable of conducting experiments in a very wide area of oceanographic research.

The ship has a wide variety of basic outfits like laboratories, special equipment and working area to conduct research activities in geology, geophysics, meteorology, physical and chemical oceanography and marine biology.

Sagar Kanya will further expand the research activities carried out by the National Institute of Oceanography on board the indigenously-designed and built research ship Galveshani in collecting polymetallic nodules from the Indian Ocean seabed. The collection of the nodules containing manganese, nickel, cobalt and copper has assumed great significance especially after India qualified for the status of "pioneer investor" as defined by the recent U.N. Law of the Sea Conference.

The christening of the 1,300-tonne dwt vessel was done by Mrs. Zainub Khusro, wife of India's Ambassador to West Germany, Dr. A. M. Khusro.

Fungicide from shrimp shells

A scientist at Washington State University, Seattle has produced a natural fungicide out of shrimp shells. The shells of shrimps and other crustaceans are formed by a substance known as Chitin. It was found that chitosan, a compound derived from Chitin, effectively inhibits the growth of a broad range of fungi that attack plants. A solution made out of chitosan can be used directly as a fungicide suitable for spraying plant foliage or any other surface that might benefit from its anti-fungal properties.

Sea Secrets 25 (6): Nov.-Dec. 1981.

Marine mammals sleep in short naps

Marine mammals are found to sleep for shorter periods of time than some of the other animals and humans. Seals, sea lions, Walruses and sea otters are not completely restricted to water and will usually sleep on land. When far from land, they sleep at the water surface. Whales and dolphins typically sleep in short naps at the surface.

Since all marine mammals must breathe every few minutes, their sleep is adapted for regular surfacing and they rarely are completely still while

sleeping. Interestingly, the bottlenosed dolphin sleeps with only half of its brain at a time, while the other half remains awake. After an hour or so, these roles are reversed.

Most marine mammals do not sleep in regular daily patterns. A number of them have been observed continuously for several days without any noted sleeping behaviour. Humpback whales apparantly do not sleep at all during their long breeding migrations. At the same time collisions between ships and slumbering whales have also been reported.

Sea Secrets 26 (1): Jan.-Feb. 1982.

Hospital for marine mammals

The California Marine Mammal Center, located a few miles north of San Fransisco is actually a hospital for marine mammals. The staff and volunteers at the Center bestow medical supervision to mostly pinnipeds, namely seals and sea lions. The Center has been founded by Lloyd Smalley in 1975. Ever since, working 365 days of the year, often through day and night, hundreds of injured, orphaned or disoriented animals have been rescued, rehabilitated and released.

More than anything else, the Center works to get the animals back into their natural habitat, the sea in a healthy condition. Notification of an animal in distress sends the Center's rescue team into action. On location of the animal, usually exhausted youngsters stranded on the shore or injured animals, the team determines whether the animal is in real trouble. Then it is put on the rescue truck and transported to the Center, where proper medical treatment is administered, including proper nourishment and fluids in the case of dehydrated animals. A complete chart is kept on the progress of each animal with all medical treatment and husbandry care.

The average cost to care for an animal from the time of rescue to the time of release back into the sea is more than $300, which includes material costs such as transportation, food, medicine, cleaning supplies etc. but not salaries, cost of equipment and maintenance of facilities. Labour is provided by volunteer veterinarians, doctors, nurses, students and other interested individuals. There is also a scheme, the Adopt-A-Seal programme which permits anyone interested to contribute to the rehabilitation and release of a particular animal throughout its stay at the Center.

Sea Frontiers 28 (1): Jan.-Feb. 1982.

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BOOKS

Commercial Fish Farming - With special reference to fish culture in Israel. By Balfour Hepher & Yoel Pruginin. John Wiley & Sons, New York pp, 261, 1981.

The book directs the reader systematically from the selection of sites for fish farms, to the planning, construction and management of ponds, through the fish reproduction techniques used both in ponds and hatcheries. Attention is also given to common hazards in fish ponds such as anoxia, diseases and off flavours. Extensive tables are provided to simplify the planning of production schedules.

The authors draw on their long experience in research and applied fish farming in Israel and many developing nations, to present the principles underlying the management methods and the best current practices in efficient commercial fish farms. While the emphasis of the book remains on the Israeli experience, its scope has been broadened to include more general aspects. In addition to discussing the economic aspects of fish farming, the biological and physical basis important for applying proper management techniques in different environmental and socio-economic conditions are clarified.

The book would be useful for fish farm managers, fish farm biologists, research scientists, technicians and fish breeders. It also would serve as a text for professors and students of aquaculture, who will find it particularly valuable for its emphasis on the theoretical basis of aquaculture.

Compiled and prepared by M. J. George, G. Subbaraju and S. K. Dharmaraja.
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