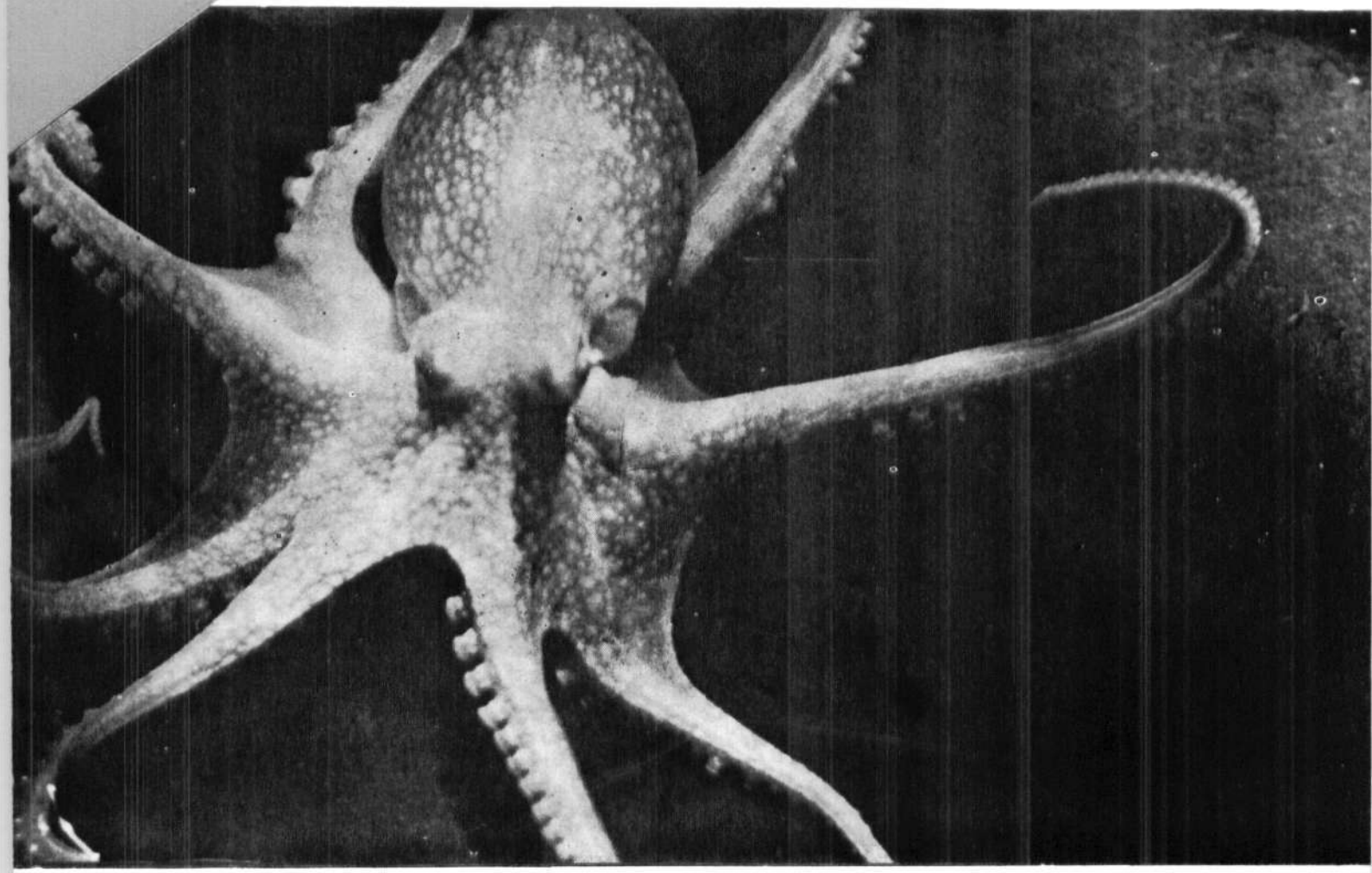
CMFRI
bulletin 37

JUNE 1985

CEPHALOPOD BIONOMICS, FISHERIES AND RESOURCES OF THE EXCLUSIVE ECONOMIC ZONE OF INDIA

Edited by : E. G. SILAS



CENTRAL MARINE FISHERIES RESEARCH INSTITUTE
(Indian Council of Agricultural Research)
P.B. No. 2704, Cochin 682 031, India

9

CEPHALOPOD FISHERIES AT SELECTED CENTRES IN INDIA

E. G. Silas, R. Sarvesan, M. M. Meiyappan, K. Prabhakaran Nair, K. Satyanarayana Rao, Kuber Vidyasagar, Y. Appanna Sastri, P. V. Srinivasan and B. Narayana Rao

Abstract

The cephalopod fisheries at eleven selected centres, Waltair, Kakinada, Madras, Portonovo, Mandapam, Rameswaram and Kilakarai on the east coast and Vizhinjam, Cochin, Mangalore and Bombay on the west coast have been studied and the annual and seasonal trends of the total cephalopod catches, species composition and CPUE investigated. Cephalopods were obtained in appreciable quantities in trawl nets in most of the areas studied. There is an organized fishery with hooks and lines for cuttlefish and squids at Vizhinjam. (Trivandrum).

Introduction

Squids and cuttlefishes are obtained as by-catch in conventional gears such as shore seines, boat seines, hooks and lines and trawl nets from the inshore waters at a number of centres along both coasts of India. As the cephalopods have become an important item of export they are being sought by the industry and a good amount of interest is evinced in the resources at some of the major centres in the country. The specieswise production of cephalopods caught in different gears ; the percentage in total landings ; and the CPUE of cephalopods at eleven centres viz., Waltair, Kakinada, Madras, Portonovo, Mandapam, Kilakarai and Rameswaram on the east coast and Bombay, Mangalore, Cochin and Vizhinjam on the west coast have been investigated and the results are presented here.

Fishery at Waltair

Waltair (Visakhapatnam) is one of the most important centres for cephalopods on the east coast and squids and cuttlefish are caught in three gears viz., shore seines, boat seines and trawl nets. During 1976-80, 833.6 t of squids and cuttlefishes were landed by all the gears together forming 3.7% of total landings. The average annual landings were 166.7 t in which *Loligo duvaucelii* was predominant accounting for 46.6% and the other species in the order of abundance were *Sepia aculeata* (26.1%), *Sepiella inermis* (9.0%), *Sepia pharaonis* (8.4%), *Sepia brevimana* (6.2%), *Sepia prashadi* (2.0%), *Doryteuthis singhalensis* (1.5%) and *Loliolus investigatoris* (0.2%). The catches of trawlers of the erstwhile Exploratory Fisheries Project are dealt with in Chapter 10.

About 18 shore seines operate in Lawson's Bay in the period October-May and squids and cuttlefishes are caught in small quantities. The annual catches were low and varied from 19 kg to 818 kg (Fig. 1). *Loligo duvaucelii* was the common species in the catches and a few individuals of *Sepia aculeata*, *S. pharaonis* and *Sepiella inermis* occurred in the catches occasionally.

About twenty five boat seines which operate for prawns, perches and clupeoids off Waltair coast at a distance of 3 to 5 km from the shore at depths of 5 to 8 m net squids in small quantities. The boat seine cephalopod catches consist of a single species the squid *Loligo duvaucelii* and its annual catches varied from 158 kg (1977) to 1,445 kg (1978) accounting for 0.6% and 2.9% of total catches (Fig. 1). In 1976 and 1980 *Loligo duvaucelii* was not found in the boat seine catches.

A total of 200 trawlers operate off Waltair coast between Lat. 17° and 18°N and Long. 82°30' and 84°E at depths of 10-70 m. The estimated total cephalopod production of the trawlers during 1976-'80 was 829.9 t and average annual production was 166 t

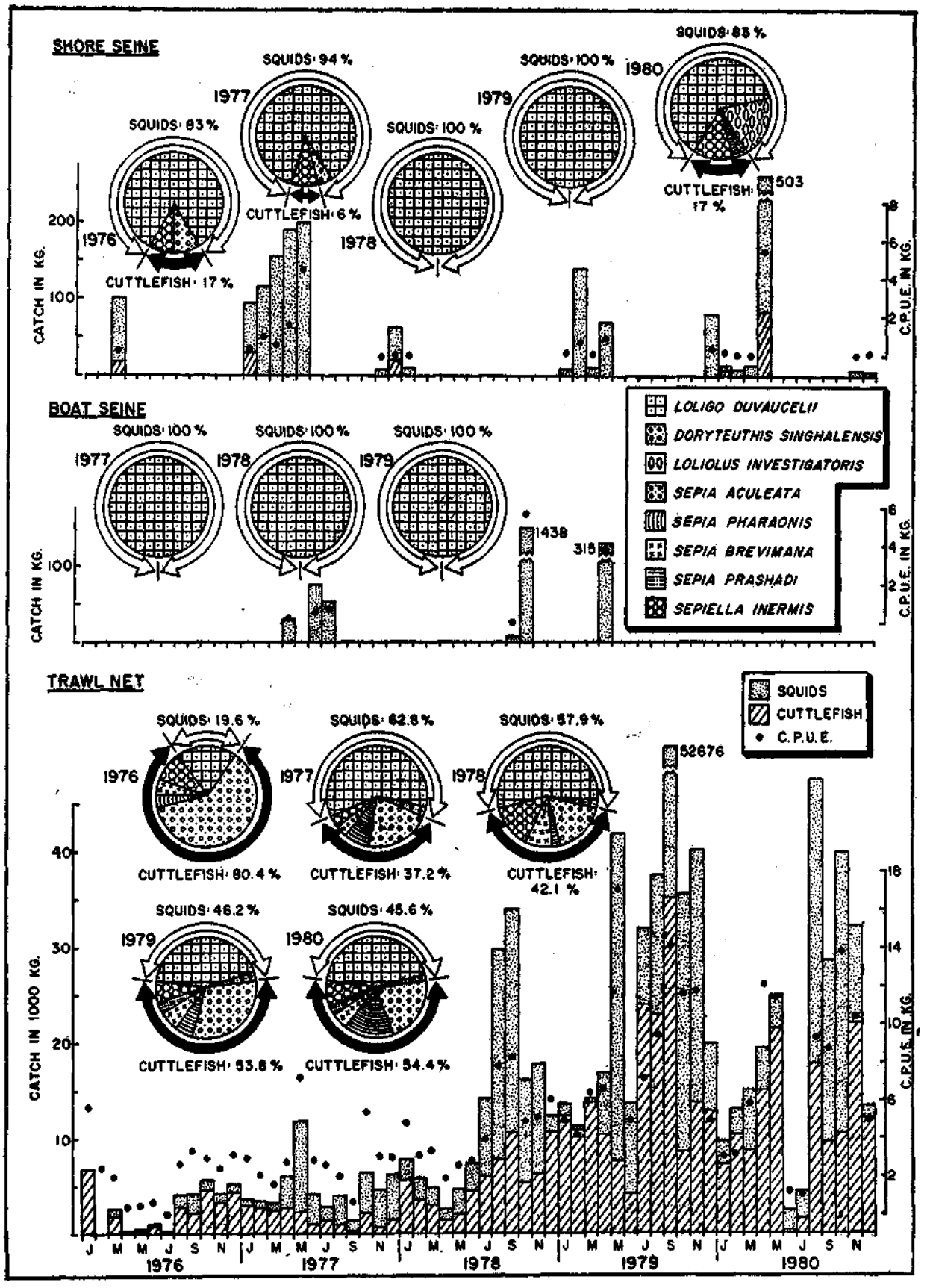


FIG. 1. Monthly total cuttlefish and squid catches, CPUE and annual species percentage composition of cuttlefishes and squids landed by shore seines and boat seines at Lawson's Bay, and trawlers at Waltair (Visakhapatnam) during 1976-'80.

forming 3.7% in total trawl catches. During the five year period *Loligo duvaucelii* was the dominant species (46.4%), *Sepia aculeata* was next in importance (26.2%) and the abundance of the other species is similar to that in all-gears combined figures. The annual cephalopod landings of the trawlers progressively increased from 36,302 kg in 1976 to a peak of 329,059 kg in 1979 and there was a sharp decline in the catches by 23.9% to 250,520 kg in 1980 with a decrease in effort by only 2.4%. The CPUE showed a similar trend with a maximum of 8.7 kg in 1979. During 1976 squids formed only 19.6% of cephalopod landings while in 1977 they amounted to 62.8% (Fig. 1). During 1978-'80 there were no large differences in the catches of squids and cuttlefishes the annual percentages of the two groups varying between 45.6% and 57.9% and 42.1% and 54.4% respectively.

Among squids, *Loligo duvaucelii* was the predominant species and formed 95-99% of the catches. The landings of this species rose from 7,104 kg in 1976 to 145,085 kg in 1979 and declined to 110,267 kg in the next year. The peak months for *L. duvaucelii* were May, August and September to November when the CPUE also was higher than in other months. *Doryteuthis singhalensis* and *Loliolus investigatoris* were represented only in very small quantities.

The cuttlefish landings which amounted to 29,190 kg in 1976 showed a rise to 176,915 kg in 1979 and a fall to 136,202 kg in 1980. Five species *S. aculeata*, *S. pharaonis*, *S. brevimana*, *S. prashadi* and *S. inermis* comprised the cuttlefish catches. The annual landings of *S. aculeata* varied between 12,045 kg (1977) and 102,245 kg (1979) and the best months were September to February. The annual landings of *S. pharaonis* increased from 1976 and high landings of 18,570 kg and 41,948 kg were obtained in 1979 and 1980. For this species the peak months were March and September to December. *S. brevimana* amounted to only 1,733 kg and 2,626 kg in 1976 and 1977 but the landings increased several fold and amounted to 14,409 kg and 20,618 kg in 1978 and 1979 respectively. Peak catches of this species were obtained in February, July, September and November. *S. prashadi* occurred in small numbers in January and March, 1978 but in the next two years it was caught in a number of months and the annual landings amounted to as much as 11,380 kg in 1979. Highest catches were obtained in January and February. The landings of *S. inermis* were very low in 1976-'77. But there was a ten to twelve fold rise in subsequent years the annual landings amounting to 21,656 kg and 24,102 kg. The peak months for this species are July to October.

Fishery at Kakinada

Cephalopods are obtained along Kakinada coast mainly in trawl catches. In shore seines *L. duvaucelii*, *S. aculeata* and *S. inermis* are caught in stray numbers. There are about 150 trawlers at Kakinada which operate between Lat. 16°35' and 17°25' N and Long. 82°20' and 83°10' E at depths of 5-70 m. Kakinada is one of the major centres for cephalopods and total production in the period 1976-'80 was 747,355 kg which indicates an average annual production of 149,471 kg forming 1.1% of trawl landings. In the cephalopod landings during 1976-80 *S. aculeata* and *S. inermis* were the dominant species (35.1% and 32.7% respectively), *L. duvaucelii* was the next dominant species (24.9%) and the others represented were *S. pharaonis* (7.1%) and *L. investigatoris* (0.2%).

The annual cephalopod landings rose from 105,634 kg in 1976 to an all time high of 256,783 kg in 1977 (Fig. 2) following an increase in effort by about 43%. During the period 1978-80 when there was not much significant change in the effort put in, the landings were lesser and stabilized at 124,151 kg-139,916 kg. The monthly catches of cephalopods showed much variation in different years but it could be stated that good catches are got generally from September to May. The monthly CPUE of cephalopods varied from 0.6 kg to 27.5 kg and high CPUEs were recorded in March, May and August-December. The cuttlefishes were dominant in trawl catches forming 67.8% to 79.6%. Squids accounted for only 20.4% to 32.2% in 1976-'80 and were represented by *L. duvaucelii* mostly with an annual catch which varied from 25,362 kg (1979) to 58,758 kg (1977). The peak catches were obtained in the months May, August, September and December. 1,099 kg of *Loliolus* sp. were got in trawl nets in September 1978.

Cuttlefish landings comprised of three species *S. aculeata*, *S. pharaonis* and *S. inermis* and the peak months for cuttlefishes were January, March, May and September-December. *S. aculeata* was the dominant species (46.9%) among cuttlefishes and the annual catch varied from 22,158 kg (1978) to 129,719 kg (1977) with high CPUEs in January, March, September and December. The annual catches of *S. pharaonis* varied between 3,808 kg (1978) and 26,468 kg (1980). The yearly catches of *S. inermis* varied between 27,989 kg (1976) and 62,769 kg (1978) with maximum CPUEs from August to December.

Fishery at Madras

Trawlers based at Madras obtain cephalopods by otter trawling between Lat. 12°20'N and 14°N and

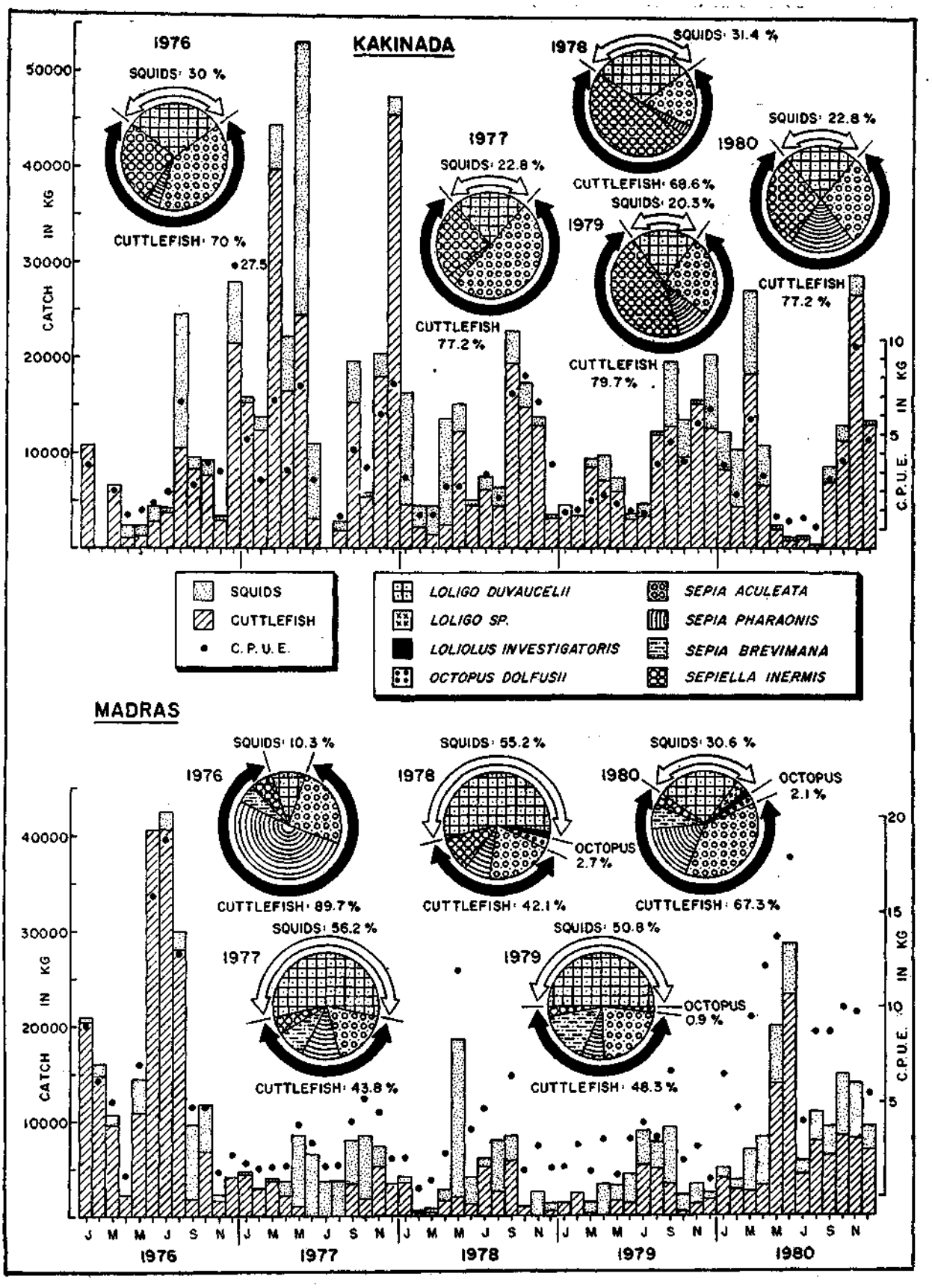


FIG. 2. Monthly total cuttlefish and squid catches, CPUE and annual species percentage composition of cuttle fishes and squids landed by trawlers at Kakinada and Madras during 1976-'80.

Long 80°20' and 80°40'E at depths of 10-30 m. The estimated cephalopod production of the trawlers during the years 1976-'80 was 517,442 kg with an average annual production of 103,688 kg, forming 6.4% of trawl landings. *L. duvaucelii*, *S. pharaonis* and *S. aculeata* were the common species in the catches forming 29.1%, 28.7% and 26.7% respectively and the other species in the order of abundance are *S. brevimana*, *S. inermis*, octopods, *Loligo* sp. *Loliolus investigatoris*, *Euprymna stenodactyla* and *S. prashadi*. The annual cephalopod catch was highest, 205,383 kg in 1976 and in the succeeding years it decreased following a fall in effort by 5.5% to 56.5% and only in 1980 there was a recovery of the fishery with landings of 137,815 kg (Fig. 2). The peak periods of catches varied much in the five years but usually large catches were obtained during January and May-October. The monthly CPUE varied markedly from 0.65 kg to 18.8 kg. The annual CPUE varied between 2.6 kg (1977) and 9.5 kg (1980). The relative contribution of squids and cuttlefishes varied over the years. In 1976 and 1980 squids formed 10.3% and 30.6% and in 1977-'79 they amounted to as much as 50-8%-56.2%. Cuttlefish formed 89.7% and 67.3% in 1976 and 1980 respectively but in 1977-'79 they accounted for only 42.1% to 48.3%. Octopods occurred sporadically in trawl catches between February and September and annual catches of 476 kg to 2,940 kg were obtained off Madras coast during 1978-'80. As in the catches off Waltair and Kakinada, *L. duvaucelii* was the predominant species forming 84.6% to 100%. Good catches of the squids were got from April to June and in August and November. The annual CPUE showed a rise from 0.80 kg in 1976 to 2.4 kg in 1980. *Loligo* sp. and *Loliolus investigatoris* formed 0.2% to 10.5% of squid catches.

The best months for cuttlefishes were January and May-August. The annual landings of *Sepia aculeata* varied from 11,297 kg (1979) to 52,499 kg (1980) forming 27.9% to 56.6% of the cuttlefish landings. The annual CPUE increased from 0.5 kg in 1977 to 3.6 kg in 1980. *Sepia pharaonis* was the dominant cuttlefish species in 1976 with a catch of 108,760 kg (59% of cuttlefish catch). The annual landings of this species varied between 3,452 kg and 24,719 kg (4.1% to 26.7% of cuttlefish landings) during 1977-'80. The annual catches of *Sepia brevimana* varied from 5,890 kg to 10,632 kg. *Sepiella inermis* formed 5.5% to 12.7% of the cuttlefish landings with yearly catches of 1,610 kg to 13,355 kg and CPUE of 0.1 kg to 0.5 kg and *Sepia prashadi* occurred only in very small quantities in two years, viz., 1977 and 1980. The dumpling squid *Euprymna stenodactyla* and octopods were also represented in the trawl catches in small quantities only.

Fishery at Portonovo

About 40 trawlers trawl off Portonovo coast between Lat. 11°10' and 12° N and Long. 79°55' and 80°10'E and moderately good catches of squids and cuttlefish occur. During the period May, 1976 to December, 1978 an estimated catch of 28,315 kg of cephalopods were obtained and the average annual catch was 10,618 kg forming an average of 1.3% of the total trawl catches. *Sepiella inermis* and *Sepia aculeata* were the dominant species in the cephalopod landings at Portonovo forming 39.3% and 37.6% respectively. *Sepia pharaonis* is third in importance (18.7%) and two species *Loligo duvaucelii* (3.9%) and *Euprymna stenodactyla* (0.5%) were of minor importance.

The contribution of squids to the total cephalopod catches was only 16.4% and the rest consisted of cuttlefishes in 1976 but in 1977 and 1978 squids contributed only 2.4 to 3.3% while cuttlefishes amounted to 97.6% and 96.7%. The estimated annual cephalopod landings amounted to 16,158 kg in 1977 and decreased to 9,250 kg in 1978 (Fig. 3). There was a shift in the species domination from 1976 when the fishery was mainly supported by *Sepia aculeata* to later years when *Sepiella inermis* dominated in the catches. The annual catches of *Loligo duvaucelii* were low, 111 kg. and 526 kg.

Cuttlefish catches were better in January and from May to August compared to other months. Among cuttlefishes the catches of *Sepia aculeata* varied from 1,815 kg to 4,483 kg (28.7% to 74.7%), those of *Sepia pharaonis* from 388 kg to 4,892 kg (0.1% to 31.3%) and those of *Sepiella inermis* 227 kg to 6,257 kg (0.3% to 51.6%). In March and July small numbers of *Euprymna stenodactyla* were obtained by a few trawlers.

Fishery at Mandapam

About 120 trawlers based at Mandapam do otter trawling throughout the year and cephalopods are got in the trawl catches in greater or lesser quantities. Trawling is carried out between Lat. 9°10' and 10°N and Long. 79° and 79°20' E at depths of 10-40 m. In the period January, 1976 to September, 1978, a total of 83,611 kg of cephalopods were landed and average annual catch was 30.4 t forming 0.5% of total trawl production.

The estimated annual cephalopod landings amounted to 40,579 kg in 1976 and decreased by 41.1% to 23,903

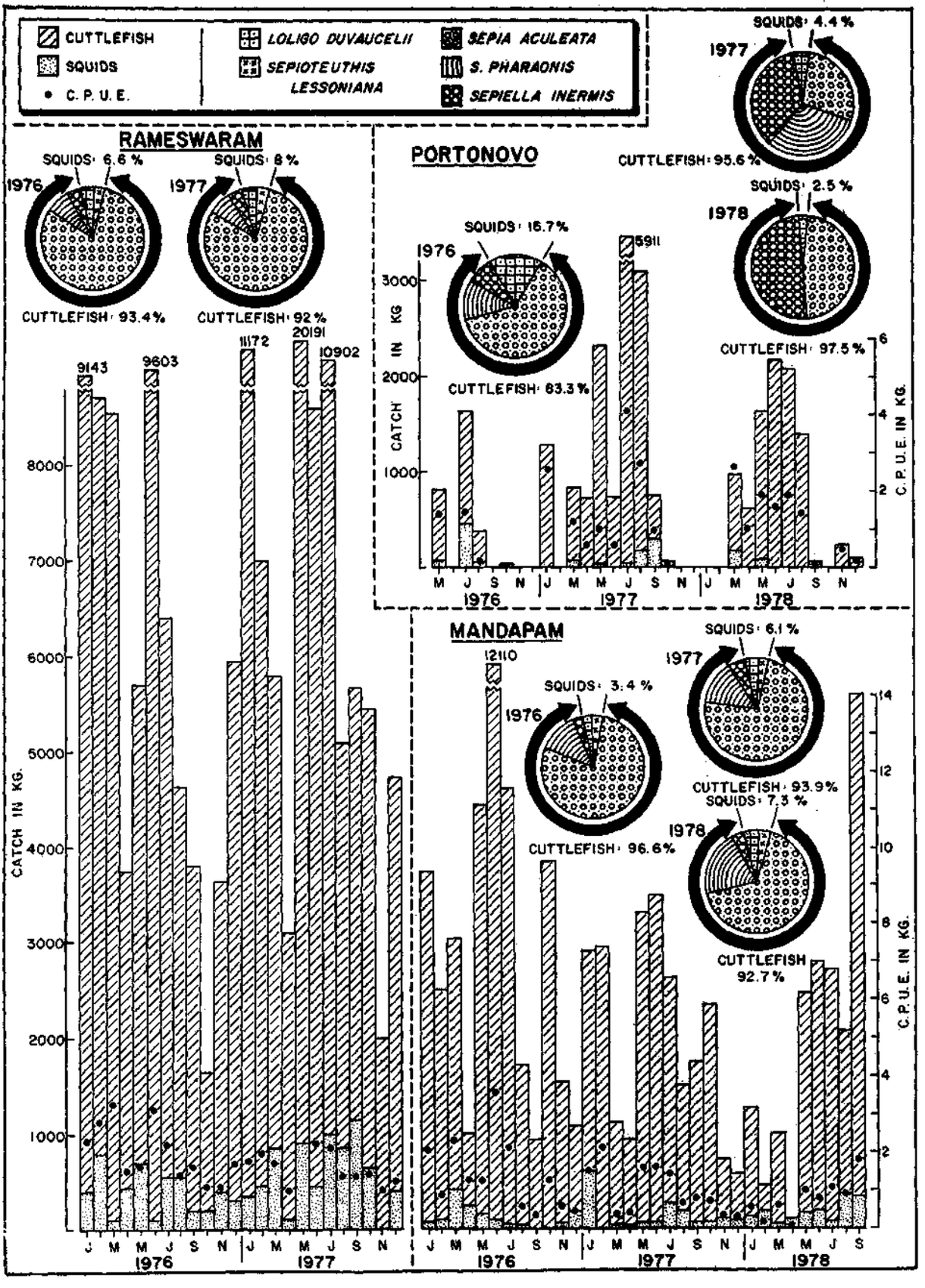


Fig. 3. Monthly total cuttlefish and squid catches, CPUE and annual species percentage composition of cuttlefishes and squids landed by trawlers at Portonova and Mandapam during 1976-'78 and Rameswaram during 1976-'77.

kg in 1977 with a decrease in effort by 8.7% (Fig. 3). The catches during the period January-September, 1978 were 19,129 kg which were only slightly lower than those in the corresponding period of the previous year (20,643 kg). Along Mandapam coast the best months for cephalopods were May to July.

Cuttlefishes predominated in cephalopod catches forming as much as 92.7% to 96.6% and squids accounted for the rest (3.4% to 7.3%). The annual cephalopod catches amounted to 39,213 kg in 1976 and decreased by 42.8% in 1977. The best cuttlefish catches were obtained in January, May to July and October. The cuttlefish landings consisted of three species *S. aculeata*, *S. pharaonis* and *Sepiella inermis* of which *S. aculeata* was the dominant one constituting 69.8 to 83.2%. *Sepia pharaonis* accounted for 11.7 to 20.1% and *Sepiella inermis* 1.7% to 5.6%. The CPUEs of cuttlefishes were generally higher in the months January to July than in other months. The catches of the common species *Sepia aculeata* amounted to 33,765 kg in 1976 but decreased by as much as 47.2% to 17,813 kg in 1977 which is indicative of wide fluctuations in yearly catches. During 1976 and 1977, the landings of *Sepia pharaonis* amounted to 4,777 kg and 3,299 kg respectively. *Sepiella inermis* is a minor component of the catches with annual landings of 671 kg and 1,334 kg in the two years. The annual squid landings amounted to only 1,366 kg and 1,457 kg in 1976 and 1977. *Loligo duvaucelii* formed 25.1% to 34.5% and the rest consisted of *Sepioteuthis lessoniana* in the two years.

Fishery at Rameswaram

About 140 trawlers which do bottom trawling between Lat. 9°20′ and 10°N and Long. 79°10′ and 79°40′ E land cephalopods. The fishing grounds coincide to a large extent with those of the trawlers based at Mandapam. The cephalopod landings at Rameswaram amounted to 160.6 t during 1976-77 forming 1.1% of the total trawl landings. The annual landings increased from 70,823 kg in 1976 by 26.7% to 89,773 kg in 1977 (Fig. 3) following an increase in the boat trips by 34.3% in the year. The average CPUE of cephalopods was slightly higher (2.15 kg) in 1976 compared to that (1.93 kg) in 1977. The cephalopod landings were high in two periods in the year viz., January to March and May to July or September.

As in the cephalopod catches at Mandapam, in the landings at Rameswaram also, cuttlefishes dominated forming 92.1% to 93.4% and squids amounted to only 6.6% to 8.0% (Fig. 3). The best months for cuttlefishes were the same as those for total cephalopods. The species composition of cuttlefishes was similar to that in the Mandapam landings. During 1976 and 1977, *Sepia aculeata* amounted to 58,463 kg (82.5%) in total cephalopod landings and 73,936 kg (82.3%), *Sepia pharaonis* formed 5,332 kg (7.5%) and 6.082 kg (6.8%) and *Sepiella inermis* 2,348 kg (3.3%) and 2,617 kg (2.9%) respectively. The squid catches amounted to 4,685 kg in 1976 and 7,138 kg in 1977. In contrast to landings at Mandapam *Loligo duvaucelii* was the dominant species forming 54.7% to 62.6% among squid catches and *Sepioteuthis lessoniana* accounted for only 37.4% to 45.3%.

Fishery at Kilakarai

The squid *Sepioteuthis lessoniana* is caught in the shore seines *Kara valai* and *Ola valai* and handlines. The annual landings of the species from *Kara valai* varied between 3,781 kg and 4,797 kg during 1973-'75 but in 1977 the catches were very low, 329 kg. The fishing season for the squid extends from January to May or June in the area. In some years as in 1973 and 1974 it was caught in small quantities in the second half-year period also. The peak catches are got in the months January to March and June and high CPUEs ranging from 9.3 kg to 15.6 kg were noticed in the months of peak landings. *Sepioteuthis lessoniana* formed 5.5% to 9% of the total *Kara valai* landings during 1973-'75 but accounted for only 0.5% in 1977. Apart from *Sepioteuthis lessoniana* stray numbers of *Sepia aculeata* were obtained rarely in March, 1974. In earlier decades the special type of shore seines *Ola valai* used to be employed regularly in the period January-June and *Sepioteuthis lessoniana* were caught in large numbers along the Ramanathapuram coast (Rao, 1954). But in the recent years this net is employed only occasionally even during the fishing season. The reason for this is that the fishermen owning the nets go to work in trawl fishing where they get better income. *Sepioteuthis lessoniana* landings of *Ola valai* varied from 213 kg to 761 kg during the fishing seasons of 1973-75 and the catch was 207 kg in 1977. This species was the predominant one in the catches of the gear forming 83.8% to 93.9%. The monthly CPUE of the species varied over a range of 3.8 kg to 11.6 kg.

Sepioteuthis lessoniana is caught in small quantities in handlines in the Mandapam area and around Rameswaram Island in the period October to March or April and sometimes up to June. The handlines are used by fishermen from a dug out canoe or standing in shallow coastal waters. The annual landings from this gear were meagre, 143 kg to 480 kg with monthly CPUEs

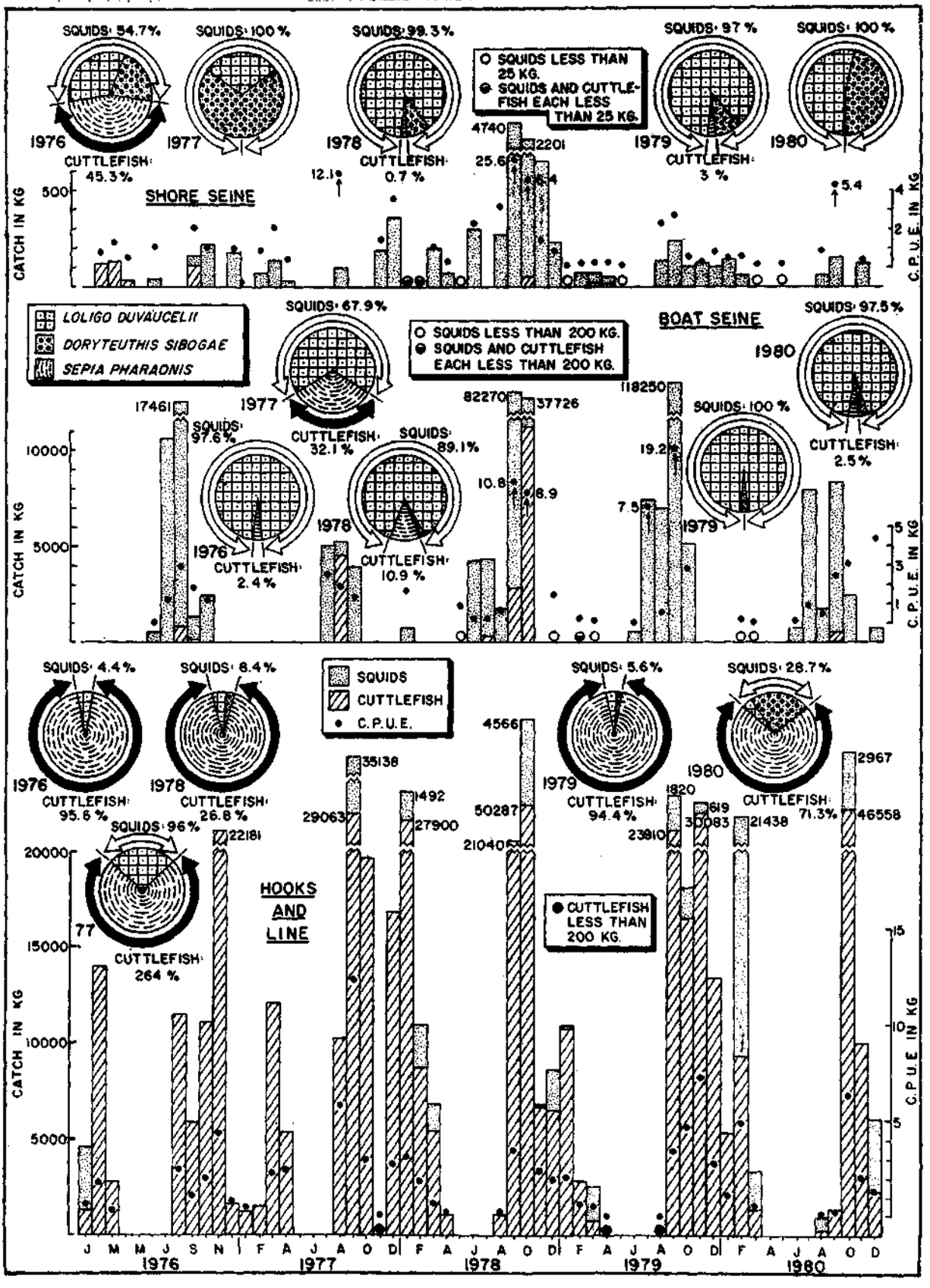


FIG. 4. Monthly total cuttlefish and squid catches, CPUE and annual species percentage composition of cephalopods landed by shore seines, boat seines and hooks and lines at Vizhinjam during 1976-'80.

of 0.9 kg to 12.4 kg. In earlier times the squids were caught with hand jigs by fishermen squatting on a look-out pole called *machan* (Hornell, 1917).

Fishery at Vizhinjam

Squids and cuttlefishes are obtained at Vizhinjam (Trivandrum) in shore seines, boat seines and hooks and lines. The total cephalopod production at Vizhinjam during the years 1976-'80 was 909.9 t and the three gears contributed 1.3%, 37.2% and 61.5% respectively. The average annual production was 181,783 kg and *L. duvaucelii, Doryteuthis sibogae* and *Sepia pharaonis* accounted for 41.7%, 4.1% and 54.2% respectively. 82.9% of total *L. duvaucelii* production were got in boat seines and 14.6% in hooks and lines. 84.7% of *Doryteuthis sibogae* were caught in hooks and lines, 10.3% in boat seines and 5% in shore seines. 95.8% of the cuttlefish *S. pharaonis* were obtained in hooks and lines and 4.1% in boat seines. Earlier, Radhakrishnan (1973) reported good annual catches fluctuating between 43,871 kg and 176,759 kg during 1965-67 in the period October-November to February-March.

About six shore seines operate at Vizhinjam and the total cephalopod production of shore seines during 1976-'80 was 11,898 kg with an average annual landings of 2,380 kg which form 2.4% of total shore seine landings. The annual cephalopod catch of shore seines increased steeply by more than ten times from 859 kg in 1976 to 8,698 kg in 1978 following a rise in effort by 54% but decreased to 565 kg in 1980 with fall in effort by 37.5% (Fig. 4). Cephalopods form 0.7% to 5.9% of total shore seine catches (average 2.4%). The peak season is September to November. Squids were predominant or occurred exclusively forming 54.7% to 100% and cuttlefishes accounted for 0.7% to 45.3%. In the landings of the five year period 1976-80 *Loligo duvaucelii* formed 80.1%, *Doryteuthis sibogae* 15.9% and *Sepia pharaonis* 4%. At times stray individuals of *Sepioteuthis lessoniana, Sepia aculeata* and *Sepiella inermis* occurred in the catches.

About 200 boat seines are operated at Vizhinjam and in recent years in addition to these, boat seines belonging to neighbouring fishing villages also operate and land at Vizhinjam. This net is used from April to October and in some years up to December or March. The total cephalopod production of boat seines during 1976-80 was 338,352 kg with an average annual production of 67,670 kg accounting for 2.3% of total landings. The squid and cuttlefish production increased over four times from 33,092 kg in 1976 to 138,211 kg in 1979 with increase in effort by 54% and exhibited a sharp decline to 21,738 kg in 1980 following a fall in the number of units by 52.5% (Fig. 4). July to September or October is the peak period of boat seine cephalopod fishery when highest catches were got. Squids were the dominant cephalopods constituting 67.9% to almost 100% while cuttlefishes formed only 0.01% to 32.1%. Among the squids *Loligo duvaucelii* formed 88.4% to 100% and *Doryteuthis sibogae* 0.5% to 11.3%. Solitary individuals of *Sepioteuthis lessoniana* occurred occasionally. High values of CPUE of *L. duvaucelii* were observed in September and October. *Sepia pharaonis* was the only cuttlefish species obtained in boat seines and its CPUE varied over a low range of 0.01% kg to 2.6 kg.

Hooks and lines are the gear in which the major part of the squid and cuttlefish catches are obtained along Vizhinjam coast. About 150-200 catamarans go out for fishing with this gear. The estimated cephalopod production of hooks and lines during 1976-'80 was 558,668 kg with an average annual landings of 111,734 kg. The annual cephalopod catches increased from 73,601 kg in 1976 by nearly 100% to 141,029 kg in 1978 although the effort decreased by 9.5%. In 1980 the landings were less, being 107,735 kg even though there was an increase in the effort put in by 8.3% as compared to 1978 (Fig. 4). The cephalopods formed 7.1% to 16.6% (average 11.5%) of the total annual hook and line fishery landings. The best months for cephalopod catches were February-March and September-October, sometimes extending up to December.

In the cephalopod catches, squids formed only 4.4% to 28.7% (average 14.8%) whilst the cuttlefishes represented by a single species *S. pharaonis* accounted for 71.3% to 95.6% (average 85.2%). *L. duvaucelli* formed 69.3% to 100% during 1976-'79, but in 1980 it accounted for only 14.6% of the squid landings indicating large variations in the contribution to the fishery. *Doryteuthis sibogae* amounted to 30.7% to 31.1% of the landings in 1978-79 and as much as 85.4% in 1980. The peak months for *L. duvaucelii* was September when the CPUE was high. *Doryteuthis sibogae* occurred in the catches only during some months, January to February or March and October and was obtained in good quantities in February, 1980. The peak catches of *S. pharaonis* were obtained in the months September to January in Vizhinjam area and high CPUEs were noticed in the months August to November and in some years, in January also.

Fishery at Cochin

Cephalopods are caught by shrimp trawlers off Cochin coast between Lat. 9°50′ and 10°10′ N and Long. 75°15′

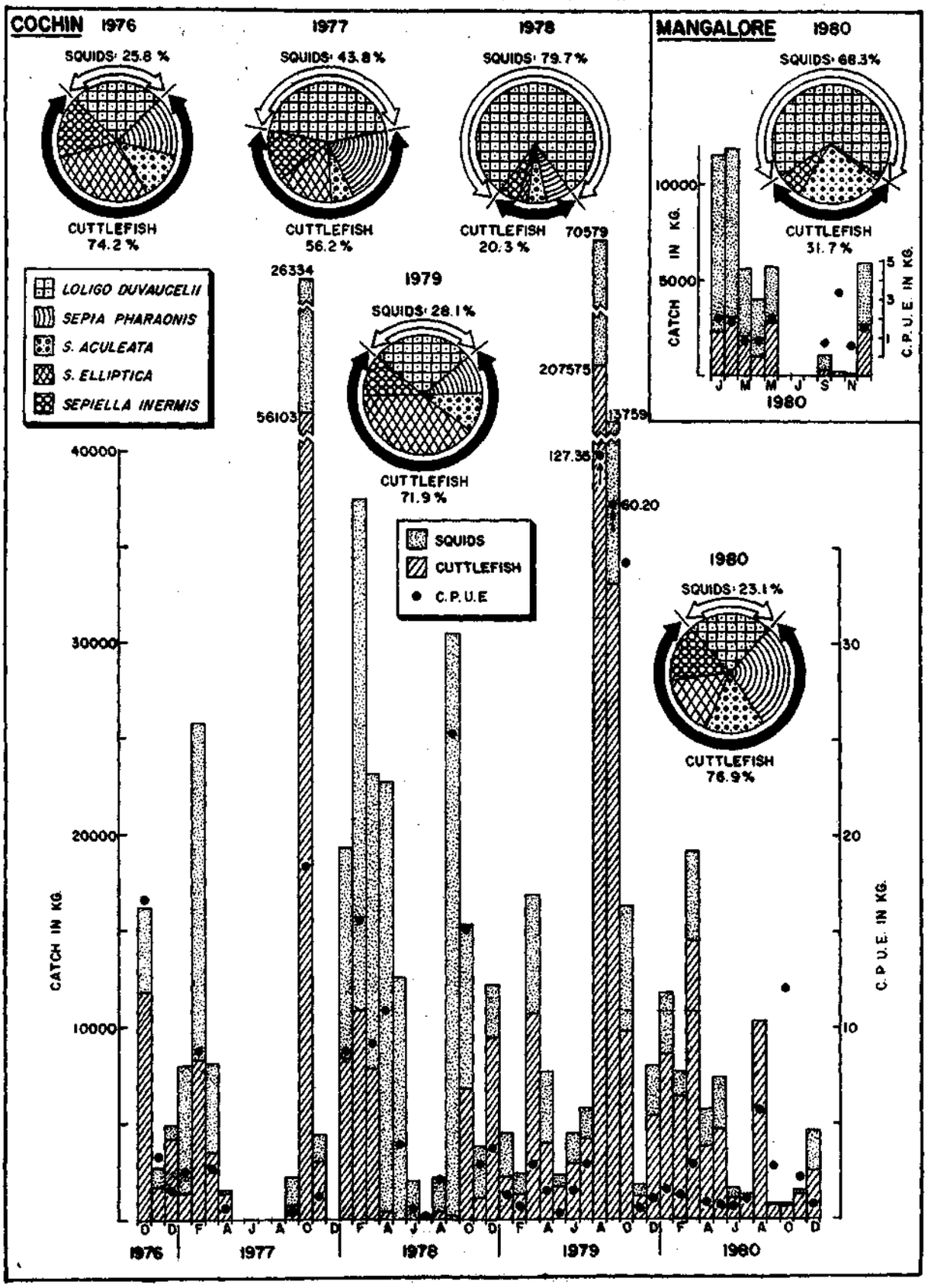


FIG. 5. Monthly total cuttlefish and squid catches, CPUE and annual species percentage composition of cuttlefish and squid landed by trawlers at Cochin during 1976-'80, and at Mangalore during 1980.

and 76°10′ E at 15-50 m depth. On an average about 140 trawlers do otter trawling in the area for prawns, and cephalopods are caught as by-catch. In the period 1977-'80 the estimated total cephalopod production was 781.9 t with an average annual production of 195.5 t. The total squid and cuttlefish landings rose from 132,313 kg in 1977 to 395,104 kg in 1979 although there was a marginal decrease in effort by 10.2%. In 1980 there was a sharp decline in the landings to 72,560 kg although there was an increase in the fishing effort by 7.2% (Fig. 5). The drastic decline in the landings in 1980 was due to the operation of much reduced number of trawlers in the months July to November owing to the non-availability of prawns. Cephalopods formed 0.8% to 3.5% of the total annual trawler landings at Cochin and were obtained throughout the year. The landings showed two distinct peaks one during January to February or March and another from August to October. The CPUE varied widely in different months. Very high CPUEs were recorded in October 1977 (18.4 kg), February, 1978 (16.6 kg), September, 1978 (25.3 kg), October, 1978 (15.1 kg), August, 1979 (127.4 kg), September, 1979 (60.2 kg), October, 1979 (34.2 kg) and October, 1980 (12.0 kg). The total squid landings increased from 57,974 kg in 1977 to 144,943 kg in 1978 when they formed 79.7% of cephalopod catch but later showed a downward trend and in 1980 they accounted for only 16,759 kg. The peak periods for squids were the same as for cephalopods as a whole. The cuttlefish landings were highest, 284,065 kg (71.9%) in 1979 but decreased to 55,801 kg in 1980.

The squid landings consisted almost entirely of *L. duvaucelii* which formed 99.9% to 100%. *Loliolus investigatoris* were caught in small quantities in the months July-August in 1978 and 1979. The monthly CPUE of *L. duvaucelii* fluctuated over a wide range of 0.1 kg to 32.3 kg, the highest values being in the months of peak catches. The cuttlefish catches consisted of four species viz., *S. aculeata*, *S. pharaonis*, *S. elliptica*, and *S. inermis* the landings of all of which showed an ascending trend with peak catches in 1979 and sharp decline in 1980. The relative contribution of the four species varied very much. The dominant species were *S. pharaonis* and *S. elliptica* in 1977, *S. aculeata* and *S. pharaonis* in 1978 and 1980 and *S. elliptica* in 1979. The landings of *S. aculeata* were low, 7,701 kg in 1977, rose steeply to 41,918 kg in 1979 and underwent sharp decline to 12,006 kg in 1980. *S. pharaonis* catches were highest, 42,402 kg in 1979 and decreased by as much as 50.2% in the next year. *S. elliptica* exhibited wide yearly fluctuations, the catches decreasing from 20,235 kg in 1977 to 4,701 kg in 1978 shooting upto 1,58,354 kg in 1979 and declining by 92% in the succeeding year. The catches of *S. inermis* were highest, 41,391 kg in 1979 and fell to 11,326 kg in the next year. Corresponding to the trend of the landings, the CPUE of all the four component species exhibited an increase in 1979 and a sharp fall in 1980. The best months for all the four cuttlefish species were August to October.

Fishery at Mangalore

Cephalopods are caught by about 200 trawlers off Dakshina Kannada (South Kanara) coast between Lat. 12°30′ and 13°10′ N and Long. 74°30′ and 74°45′ E at depths of 9 to 40 m. The estimated annual cephalopod catches in 1980 amounted to 45,897 kg (Fig. 5) and they formed 0.2% to 1.7% of the total trawl catches in the various months except in October when for 52 boat trips 177 kg of cephalopods were landed, and since in that month, the total trawl landings were poor (363 kg) cephalopods accounted for 47.97%. The best months for cephalopods in 1980 were January and February. In March, May and December moderately good catches were got and the catches were lowest in September and October.

Squids represented by a single species *Loligo duvaucelii* were predominant component of cephalopods and they formed 68.3% of the catches. The rest of the catch of 31.7% comprised of three species of cuttlefishes *Sepia aculeata*, *S. pharaonis* and *Sepiella inermis*. The estimated annual catch of *Loligo duvaucelii* was 31,353 kg and that of the next common species was 11,126 kg accounting for 24.2%. *Sepia pharaonis* and *Sepiella inermis* were obtained in very small quantities and formed only 0.6% and 7% of the cephalopod landings. The average CPUEs of *L. duvaucelii* and *S. aculeata* were 0.99 kg and 0.35 kg whilst those of *S. pharaonis* and *S. inermis* were very low. The best months for *L. duvaucelii* were December to March and the peak periods for *S. aculeata* were December to March and May.

Fishery at Bombay

Cephalopods are caught mainly by trawlers off Bombay coast between Lat. 18° and 20° N and Long. 72° and 73° E at depths of 30-50 m. In *dol* nets operated in the area for Bombay duck, squids and cuttlefishes occur in stray numbers. About 100 to 150 trawlers land at two centres Sassoon Duck and New Fishery Jetty at Bombay. During 1977'-80 the trawlers landed a total of 4,580.8 t of cephalopods with an average annual catch of 1,145.2 t which formed 3.9% of total

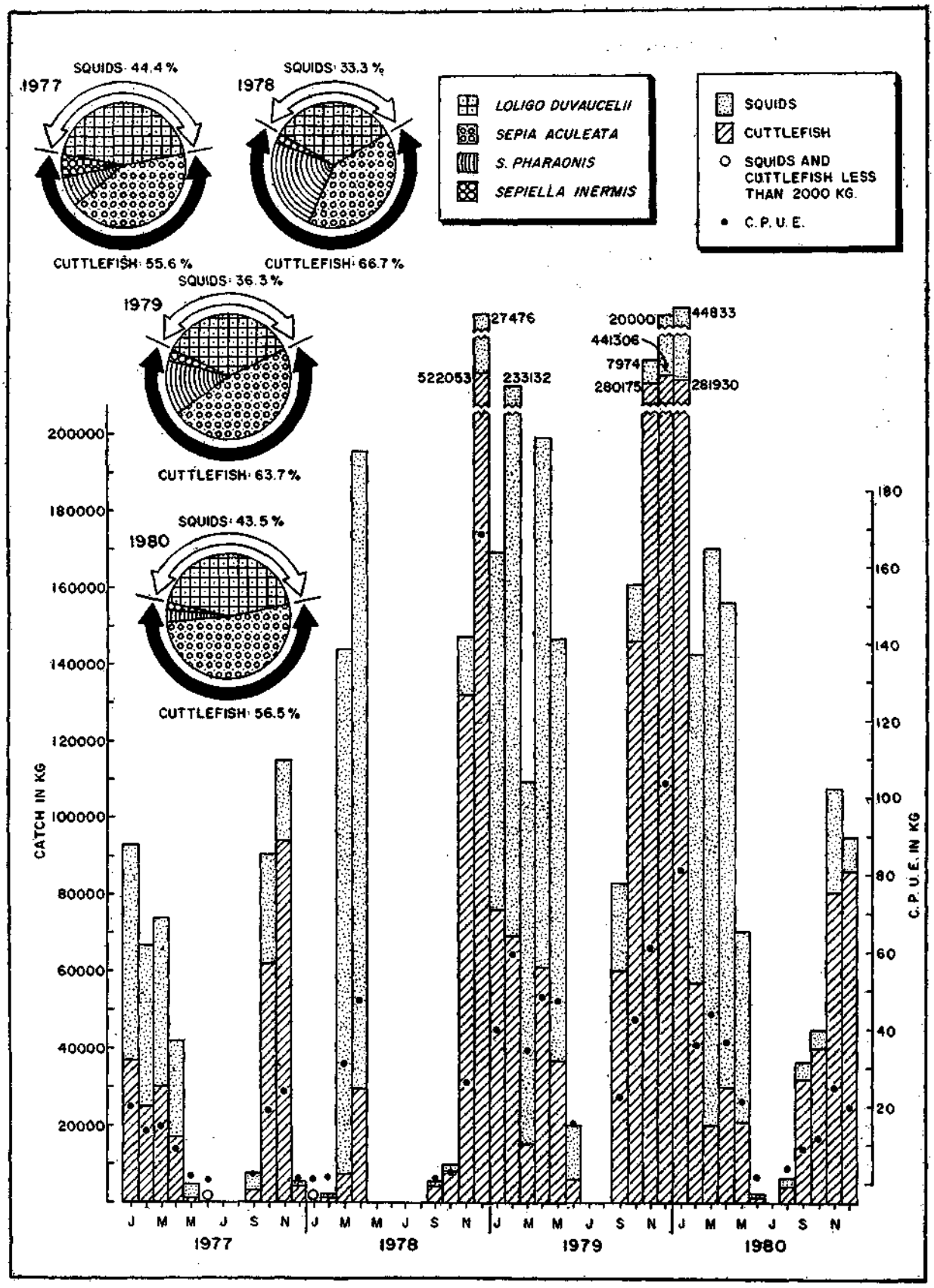


Fig. 6. Monthly total cuttlefish and squid catches, CPUE and annual species percentage composition of cuttlefish and squids landed by trawlers at Bombay during 1977-'80.

trawl catches. The annual estimated cephalopod catches at both the centres together show a gradual rise from 494,553 kg in 1977 to a maximum of 1,872, 142 kg in 1979 and thereafter a decrease by as much as 38.1% to 1,158,471 kg in 1980 though there was an increase in effort by 5% (Fig. 6). The CPUE showed a trend similar to that of the catches and it was highest, 47.56 kg in 1979.

Squids formed 33.3% to 44.4% of cephalopod catches and the rest consisted of cuttlefish. The annual squid catches varied from 219,686 kg (in 1977) to 680,296 kg (in 1979) and cuttlefish catches between 274,687 kg in 1977 and 1,191,846 kg. When the total squid and cuttlefish catches in the four year period are considered it is seen that cuttlefish are dominant forming 61.7% and squids account for 38.3%. A very interesting seasonal pattern is seen in the occurrence of squids and cuttlefishes in Bombay area. Squids are common in the period January to May or June and cuttlefishes are abundant in the period September-December.

When the total cephalopod landings of trawlers during the period 1977-'80 are considered together, it is seen that *Sepia aculeata* was the dominant species forming 46.3%, *Loligo duvaucelii* was the second dominant species (38.3%) and the others obtained were *Sepia pharaonis* (13.7%) and *S. inermis* (1.7%).

The annual landings of *L. duvaucelii* varied from 219,686 kg (1977) to 680,296 kg (1979). The catches of the squid were especially good in the periods March-April, 1978, January-May, 1979 and February-April, 1980 when the CPUE varied from 21.9 kg to 41.6 kg. The annual catches of *Sepia aculeata* ranged from 208,062 kg (1977) to 878,432 kg (1979) and decreased to 606,933 kg in 1980. *S. pharaonis* showed a similar trend of catches with a rise from 38,261 kg in 1977 to 286,826 kg in 1979 and a fall to 34,070 in 1980. Peak landings of *S. aculeata* were obtained in the period September to December and maximum catches of *S. pharaonis* during October-December, when the CPUEs were also high. The yearly total landings of *S. inermis* varied between 5,550 kg (1978) and 28,544 kg (1977), and the best months for this species were November to January.

REFERENCES

ABDULLA, I. M. AND A. Z. IDRUS 1978. The fish processing industry in peninsular Malaysia. *Proc. Symp. Fish Utilization Technology and Marketing in the IPFC Region, 18th Session,* Manila, Philippines : 45-60.

ADAM, W 1934. Cephalopoda. Result Sci. Voy. Ind. Orient. Meerl. *Mem. Mus. r. Hist. Nat. Belgique,* **2** (16) : 1-28.

ADAM, W 1937. Notes sur les cephalopodes : VII—sur un cas de regeneration chez *Sepioteuthis lessoniana* Lesson, 1830. *Bull. Mus. r. Hist. nat. Belg.* 13 (45) : 1-4.

ADAM, W. 1938. Sur quelques cephalopodes octopodes des iles Andamans. *Bull. Mus. r. Hist. nat. Belgique,* **14** (7) : 1-25.

ADAM, W. 1939a. Notes sur les cephalopodes. 13. Sur une nouvelle espece de Sepia, *Sepia winckworthi* sp. nov. *Bull. Mus. r. Hist. nat. Belgique,* **15** (32) : 1-11.

ADAM, W. 1939b. The Cephalopoda in the Indian Museum, *Calcutta. Rec. Indian Mus.,* **41** : 61-110.

ADAM, W. 1939c. Cephalopoda. Pt. I. Le genre *Sepioteuthis* Blainville, 1824. *Siboga Exped. Monographie,* **55a** : 1-33.

ADAM, W. 1939d. Les cephalopodes de l'expedition du Siboga Pt. II. Revision des especes Indo-Malaises du genre *Sepia* Linne, 1758. Pt. III. Revision du genre *Sepiella* (Gray) Steenstrup, 1880. *Siboga Exped. Monographie,* **55b** : 35-122.

ADAM, W. 1954. Cephalopoda. Pt. III & IV. Cephalopodes a l'exclusion des genres *Sepia, Sepiella* et *Sepioteuthis. Siboga Exped. Monographie,* **55c** : 123-193.

ADAM, W. 1959. Les Cephalopodes de la mer Rouge. Mission Robert Ph. DOLLFUS en Egypte (1927-1929), *Res. Sci.* 3 *partie,* **28** : 125-193.

ADAM, W. 1960. Cephalopoda from the Gulf of Aquaba. Contr. Knowl. Red Sea. 16. *Bull. Sea-Fish. Res. Stn. Israel,* **26** : 3-26.

ADAM, W. 1965. Redescription deDeux Especes de *Sepia* Insuffisamment Decrites par J. Steenstrup, 1875. *Vidensk. Medd. fra Dansk naturh. Foren.,* **128** : 169-176.

ADAM, W. 1973. Contributions to the knowledge of the Red Sea. No. 47. Cephalopoda from the Red Sea. *Bull. Sea-Fish. Res. Stn. Haifa,* : 9-47.

ADAM, W. 1975. Notes sur les cephalopodes. 26. Une nouvelle espece de *Todarodes todarodes filippovae* sp. nov. de l' Ocean Indian. *Biologie, Bull. Inst. r. Sci. nat. Belg.,* **50** (9) : 1-10.

ADAM, W. 1979. The Sepidae (Cephalopoda, Decapoda) in the collection of the Western Australian Museum. *Rec. W. Aust Mus.,* 7 (2) : 109-212.

ADAM, W., AND W. J. REES. 1966. A review of the cephalopod family Sepiidae. *John Murray Exped. Sci. Rept.,* **11** (1) : 1-165.

ALAGARAJA, K. 1984. Simple methods for estimation of parameters for assessing exploited fish stocks. *Indian J. Fish.,* **31** : 177-208.

ALAGARSWAMI, K. 1966. On the embryonic development of the squid (? *Sepioteuthis arctipinnis* Gould) from the Gulf of Mannar. *J. Mar. Biol. Ass. India.* 8 (2) : 278-284.

ALDRICH, F. A., AND M. M. ALDRICH 1968. On the regeneration of the tentacular arm on the giant squid *Architeuthis dux* Steenstrup (Decapoda, Architeuthidae). *Can. J. Zool.,* **46** (5) : 845-847.

ALLAN, J. K., 1945. Planktonic cephalopod larvae from the Eastern Australian coast. *Rec. Aust. Mus.,* **21** (6) : 317-350.

ANON 1977. Development potential of selected fishery products in the regional member countries of the Asian Development Bank. 7 : *The international market for cephalopods.* SCS/DEV/76/16 : 95 p.

ANON 1981. Three questions on octopus. *Fishery Jour.* 13 (Yamaha Motor Co., Japan) : 1-8.

ANON, 1982. Review of Methods used for studying and Assessing squid resources. *IPFC : RRD/82/5 Date March* 1982, *Sydney, Australia,* 7 p.

ANON, 1983. South China Sea Fisheries Development and Coordinating Programme. Joint ADB/FAO (SCSP-INFOFISH Market Studies. Vol. V. The International Market for Cephalopoda. SCS/DEV/83/24, 53 p.

ARAVINDAKSHAN, P. N., AND M. SAKTIVEL 1973. The location of cephalopod nurseries in the Indian Ocean. *Handbook to the International Zooplankton Collections,* **5** : 70-75.

ASHMOLE, N. P., AND M. J. ASHMOLE 1977. Comparative feeding ecology of sea birds of a tropical oceanic island. *Yale Univ. Peabody Mus. Nat. Hist., Bull.,* **24** : 1-131.

BAL, D. V., AND K. VIRABHADRA RAO 1984. *Marine Fisheries* Tata McGraw Hill Publishing Company Ltd., New Delhi, 470 p.

BALINSKY, B. I. 1981. *Introduction to Embryology.* Philadelphia, Pa. : Saunders College, 688 p.

BAPAT, S. V., N. RADHAKRISHNAN AND K. N. RAMACHANDRA KARTHA. 1972. A survey of the trawl fish resources off Karwar, India. Symposium on Demersal Fisheries, *Proc. Indo-Pacific Fish. Coun.,* **13** (3) : 354-383.

BAPAT, S. V. *et al.* 1982. Fishery resources of the Exclusive Economic Zone of the northwest coast of India. *Bull. Cent Mar. Fish. Res. Inst.,* **33** : 86 p.

BARNARD, K. H. 1947. Rare squid at the cape (*Thysanoteuthis rhombus* Troschel). *J. Conch. Lond.,* **22** : 286.

BELYAEV, G. M. 1962. Beaks of cephalopod molluscs in oceanic bottom deposits. *Okeanologila*, 2 (2) : 311-326.

BELYAEVA, G. F. 1979. Squids of the Indian Ocean as intermediate hosts of helminths. *In* : Bauer, O. N. (Ed.), Abstracts of proceedings : 7th All-Union Conference on Fish-parasites and Diseases. Nauka, Moskow, 1979 : 1-131.

BEN-YAMI, M. 1976. *Fishing with light*. FAO Fishing Manual Fishing News Books Ltd., England, 121 p.

BERRY, S. S. 1912. The Cephalopoda of the Hawaiian Isladns. *Bull. U. S. Bur. Fish.*, 32 : 257-362.

BERTALANFFY, L. VON. 1938. A quantitative theory of organic growth. *Hum. Biol.*, 10 (2) : 181-213.

BIDDER, A. M. 1950. The digestive mechanism of the European squids, *Loligo vulgaris, L. forbesii, Alloteuthis media* and *A subulata. Quart. Jour. Micr. Sci.*, 91 (1) : 1-32.

BOLETZKY, S. V. 1977. Post-hatching behaviour and mode of life in cephalopods. *Symp. Zol. Soc. London*, 381, 557-567.

BOYCOTT, B. B. 1957 The cuttlefish *Sepia. New Biol.*, (25 : 98-118.

BRAZIER, J. 1892. *List of the Cephalopoda in the collection of the Australian Museum.* Sydney, 3 p.

BROCK, J. 1886. Indische Cephalopoden. *Zool. Jb.*, 2 : 591-624.

BRUGGEN, A. C. VAN. 1962. *Thysanoteuthis rhombus* in Algoa Bay. *Ann. of the Natal Museum*, 15 : 267-272.

BURGESS, L. A. 1967. *Loliolus rhomboidalis*, a new species of loliginid squid from the Indian Ocean. *Bull. Mar. Sci.*, 17 (2) : 319-329.

CADDY, J. F. (ed.). 1983a. Advances in assessment of world cephalopod resources. *FAO Fish. Tech. Pap.*, (231) : 452 p.

CADDY, J. F. 1983b. The Cephalopods : Factors relevant to their population dynamics and to the assessment and management of stocks. *In* : Caddy, J. F. (ed.), Advances in assessment of world cephalopod resources. *FAO Fish. Tech. Pap.*, (231) : 416-452.

CAILLIET, G. M. AND D. L. VAUGHAN, 1983. A review of the methods and problems for quantitative assessment of *Loligo opalescens. Biol. Oceanogr.*, 2 : 379-400.

CALLAN, H. G. 1940. The absence of a sex hormone controlling regeneration of the hectocotylus in *Octopus vulgaris* L. *Pubbl. Staz. Zool. Napoli*, 18 : 15-19.

CHANDRA MOHAN, P. AND D. RATNA RAO. 1978. On the occurrence of *Sepietta owenlana* (Cephalopoda) from Visakhapatnam. *Current Sci.*, 47 (22) : 879-880.

CHELLAPPA, D. E. 1959. A note on the night fishing observation from a *kelong. J. Mar. Biol. Ass. India.* 1 (1) : 93-94.

CHIKUNI, S. 1983. Cephalopod resources in the Indo-Pacific Region. *In* : Caddy, J. F. (ed.), Advances in assesament of world cephalopod resources. *FAO Fish. Tech. Pap.*, (231) : 264-305.

CHUN, C. 1910. Die Cephalopoden. I. Teil : Depopsida. *Wissenchaftliche Ergebnisse deutschen Tiefsee—Expedition 'Valdivia'* 1898-1899, 18 : 1-402.

CHUN, C. 1915. Cephalopoda. II. Teil : Myopsida, Octopoda. *Wissenchaftliche Ergebnisse deutschen Tiefsee-Exedition* 'Valdivia' 1898-1899, 18 : 405-552.

CLARKE, M. R. 1962 a. The identification of cephalopod 'Beak' and the relationship between beak size and total body weight. *Bull. Brit. Mus., (N.H.) Zoology* 8(10) : pl. 13-22, 421-480.

CLARKE, M. R. 1962 b. Significance of cephalopod beaks. *Nature*, 193 (4815) : 560-64.

CLARKE, M. R. 1966. A review of the systematics and ecology of oceanic squids. *Adv. Mar. Biol.*, 4 : 91-300.

CLARKE, M. R. 1980. Cephalopoda in the diet of sperm whales of the southern hemisphere and their bearing on sperm whale biology. *Discovery Rept.* 37 : 1-324.

CLARKE, M. R. AND C. C. LU. 1974. Vertial Distribution of Cephalopods at 30°N 23°W in the North Atlantic. *J. Mar. biol. Ass. U.K.* (1974) 54 : 969-984.

CLARKE, M. R. AND C. C. LU. 1975. Vertical Distribution of Cephalopods at 18° N and 25°W in the North Atlantic, *Ibid.*, (1975) 55 : 165-182.

CLARKE, M. R. AND N. MAC LEOD. 1974. Cephalopod remains from a sperm whale caught off Vigo Spain. *J. Mar. Biol. Assoc. U.K.*, 54 : 959-968.

CLARKE, M. R. AND N. MAC LEOD. 1976. Cephalopod remains of whales caught off Iceland. *J. Mar. Biol. Assoc. U.K.*, 56 : 733-749.

CLARKE, M. R. 1977. Beaks, nets and numbers. *Symp. Zool. Soc. Lond.*, 38 : 89-126.

CMFRI, 1957. Annual Report of the Chief Research Officer for the year ending 31st March 1956. *Indian J. Fish.*, 4 (2) : 387-418.

CMFRI, 1980. Industrial fisheries off Visakhapatnam coast. based on exploratory surveys during 1972-1978. *Mar. Fish. Infor. Serv. T & E Ser.*, No. 15 : 1-15.

CMFRI. 1981. By-catch of the shrimp fishing in India. *Mar. Fish. Inform. Serv.* T & E. Ser. No. 28 : 1-13.

CMFRI. 1982. Trends in marine fish production in India—1981. *Mar. Fish. Infor. Serv.* T & E. *Ser.* No. 41 : 1-32.

COLLINS, S. AND M. DUNNING. 1981. Tasman squid studies demonstrate gill netting effective. *Aust. Fish.*, 40 (8) : 4-6.

COTTON, B. C., AND F. K. GODFREY. 1940. The Mollusca of south Australia. Pt. 2. Scaphopoda, Cephalopoda, Aplaco phora and Crepipoda. Adelaide, 317-600.

COURT, W. G. 1980. Japan's squid fishing industry. *Mar. Fish Rev.*, 42 (7-8) : 1-9.

COUSTEAU, J. Y., AND P. DIOLE. 1973. *Octopus and Squid—The Soft Intelligence.* A & W Visual Library, New York, 304 p.

CSIR. 1962. *The Wealth of India. Raw Materials Vol. 4 Supplement. Fish and Fisheries.* Com. Sci. Ind. Res., New Delhi, 132 p.

DAYARATNE, N. M. P. J. 1978. A preliminary study on the cuttle fish catches from the Wadge Bank trawler fishery. *Bull. Fish. Res. Stn. Sri Lanka*, 29 : 21-35.

DEES, LOLA T. 1961. Cephalopods : cuttlefish, octopus, squides *Fish. Leaf.* (524) : 1-10.

DEFRETIN, R. AND A. RICHARD. 1967. Ultrastructure de la glande optique de *Sepia officinalis* L. (Mollusque, Cephalopode) Miss en evidence de la secretion et de son controle photoperio dique. *C. R. Hebd. Seances Acad. Sci., Ser. D* **265** : 1416-1418.

DELL, R. K. 1952. The recent Cephalopoda of New Zealand. *Bull. Dom. Mus. Wellington,* (16) : 1-157.

DESHMUKH, V. M. 1973. Fishery and biology of *Pomadasys hasta* (Bloch). *Indian J. Fish.,* **20** (2) : 497-522.

DEVADOSS, P. AND P. K. MAHADEVAN PILLAI. 1973. Observations on the food of juveniles of *Psettodes erumei* (Bloch). *Indian J. Fish.,* **20** (2) : 664-667.

DEVADOSS, P. AND P. K. MAHADEVAN PILLAI. 1979. Observations on the food and feeding habits of the eel *Muraenesox cinereus* (Forskal) from Porto Novo. *Indian J. Fish.,* **26** (1 & 2): 244-247.

DONG, Z. 1981. The Present status of the prospects of cephalopod resources in the West Pacific. *J. Fish. China,* **5** (3) : 263-70 (Not consulted in original)

DRACOVICH, A. AND J. A. KELLY JR. 1963. A biological study and some economic aspects of squid in Tampa Bay, Florida. *Proc. Gulf and Carib. Fish. Inst.,* 15th Annual Session (1962) 87-102.

DRAGOVICH, A. AND T. POTTHOFF. 1972. Comparative study of food of skipjack and yellowfin tunas off the coast of West Africa. *Fish. Bull. U.S.,* **70** : 1087-1110.

DRUZHININ, A. D. 1972. Observations on the trawl fishery of Southern Burma. Symposium on Demersal Resources, *Proc. Indo-Pacific Fish. Coun.,* **13** (3) : 151-209.

DRUZHININ, A. D. 1973. On the fishery resources of the Gulf of Aden and some adjacent areas. FAO, Rome, DP 9/12 PDY 64/501/7.

DULHUNTY, A. F., AND GAGE, P. W. 1971. Selective effect of an Octopus Toxin on action potentials. *J. Physiol. (London),* **218** : 433-445.

DURCHON, M. AND A. RICHARD. 1967. Etude, en culture organo-typique, du role endocrine dela glande optique dans la maturation ovarienne chez *Sepia officinalis* L. (Mollusque, Cephalopode). *C. R. Hebd. Seances Acad. Sci., Ser. D* **264** : 1497-1500.

EFP. 1979a. Fishing news and notes. Survey of EEZ. *Explo. Fish. Project Newsletter.* **2** (2) : 21-23.

EFP. 1979b. Results of operation of M. V. *Matsyanireekshani* along northwestern part of Indian EEZ during May to October, 1979. Survey of EEZ Series. No. 2. *Exp. Fish. Project,* Bombay : 1-15.

EFP. 1979c. Results of the exploratory fishing conducted during 1978-79. *Bull. Explo. Fish. Project.* **9** : 66 pp.

EFP. 1982. Results of exploratory survey of fishery resources of Wadge Bank. *Progress Report 1. Explo. Fish. Project,* Bombay : 26 p.

FAO. 1983. Year book of Fishery Statistics 1981 : Catches and Landings. *FAO Yearb. Fish. Stat.* (52).

FAO/UN. 1961. Report to the Government of India on a survey of the Fishery Resources of the Bay of Bengal. Project FAO/ETPA 158-53, based on the work of V. M. Naumov, FAO/TA Marine Fisheries Biologist.

FERAL, JEAN-PIERRE. 1978. La regeneration des de la seiche *Sepia officinalis* (Cephalopoda, Sepioidea) (1). I-Etude Morphologique. *Cahiers de Biologie Marine,* XIX : 355-361.

FIELDS, W. G. 1965. The structure, development, food relations, reproduction and life history of the squid, *Loligo opalescens* Berry. *Calif. Dept. Fish and Game, Fish Bull.* (131) : 1-108.

FILIPPOVA, J. A. 1968. New data on the Cephalopoda of the Indian Ocean. *Proc. Symp. Mollusca,* Mar. Biol. Ass. India, Pt. 1 : 257-264.

FISCUS, C. H. 1982. Predation of marine mammals on squids on the eastern North Pacific Ocean and the Bering Sea. *Mar. Fish. Rev.,* **44**(2) : 1-10.

FISHERY AGENCY OF JAPAN. 1976. Report on cruise of the R. V. SHOYO MARU in the North Arabian Sea Survey, in cooperation with the IOP, FAO, to assess the pelagic fish stocks, 2 October 1975—14 January 1976. *Res. Dev. Div., Fish. Agen. Japan,* 110 pp.

FISHERY AGENCY OF JAPAN. 1977. Report on cruise of the R. V. SHOYO MARU in the North Arabian Sea, in cooperation with IOP, FAO, to assess the pelagic fish stocks, 2 October 1976—13 January 1977. *Res. Dev. Div., Fish. Agen. Japan.* 165 p.

FLECKER, H. AND COTTON, B. G. 1955. Fatal bites from Octopus. *Med. J. Aust.,* **2** : 329-331.

FREEMAN, S. E. AND TURNER, R. J. 1970. Muculotoxin, a potent toxin secreted by *Octopus maculosus* Hoyle. *Toxicol. Appl. Pharmacol.,* **16** : 681-690.

GAGE, P. W. AND A. F. DULHUNTY. 1979. Effects of toxin from the Blue-ringed Octopus *Haplochlaena maculosa.* In : Marine Toxins and other bioactive marine Metabolites Ed. Y. Hashimoto, *Jap. Sci. Soc. Press.* Ch. 3 : 85-106.

GEORGE, A. I., M. S. NAZIR AHMED AND T. N. SIVADASAN ASARI 1976. Observations on the carangid fishery of Vizhinjam coast, Trivandrum, with special reference to *Decapterus dayi.* (Wakiya). *Bull. Dept. Fish. Kerala,* 1 (1) : 9-15.

GEORGE, P. C., B. T. ANTONY RAJA AND K. C. GEORGE. 1977. Fishery Resources of Indian Economic Zone. *Silver Jubilee Souvenir,* Integ. Fish. Proj., October, 1977 : 79-116.

GHIRETTI, F. 1960. Toxicity of octopus saliva against Crustaceans. *Ann. N. Y. Acad. Sci.* 90, 726-741.

GOODRICH, E. S. 1896. Report on a collection of Cephalopoda from the Calcutta Museum. *Trans. Linn. Soc. London,* **7** : 1-24.

GOPALAKRISHNAN, P. 1970. Some observations on the shore ecology of the Okha coast. *J. Mar. Biol. Ass. India,* **12** (1 & 2) : 15 - 34.

GOULD, A. A. 1852. 12. Mollusca and shells United States Exploring Expedition 1838-1842 under the command of C. Wilkes, 510 p.

GRAVELY, F. H. 1941. Shells and other animal remains found on the Madras beach. I. Groups other than snails etc. (Mollusca : Gastropoda). *Bull. Madras Govt. Mus. (New Ser.). Nat Hist.*, 5 (1) : 112 p.

GRIEB, T. M., AND R. D. BEEMAN. 1978. A study of spermatogenesis in the spawning population of the squid, *Loligo opalescens In* : Recksiek, C. W. and H. W. Frey (eds.) Biological, oceanographic, and acounstic aspects of the market squid, *Loligo opalescens* Berry. *Calif. Dept. Fish. and Game, Fish Bull.*, 169 : 11-21.

GRIFFIN, L. E. 1900. The anatomy of *Nautilus pompilius*. *Mem. Nat. Acad. Sci.*, 8 (5) : 1-197.

GRIMPE, G. 1926. Biologische Beobachtungen an *Sepia officianales*. *Verhandl. D. Zool. Gen. Suppl. Zool. Anz.* 31 : 148-153.

GULLAND, J. A. (Ed.). 1970. The fish resources of the ocean. FAO/Fishing News (Books) Ltd., Surry, England, 255 p.

HAMABE, M., C. HAMURO AND M. OGURA. 1982. *Squid jigging from* small boats. FAO Fishing Manuals, Fishing News Books Ltd., Farnham, England, 74 p.

HAMABE, M., T. KAWAKAMI, Y. WATABE AND T. OKUTANI. 1976a. Perspectives for Japanese Overseas squid fisheries. *FAO Fish. Rep.* 170 (Suppl. 1) : 47-52.

HAMABE M. T. KAWAKAMI, Y. WATABE T. OKUTANI AND K. IKEDA. 1976b. Review of cephalopod resources and their exploitation by Japan. *FAO Fish. Rep.* 170 (Suppl. 1) : 1.3·

HAMURO, C. AND S. MIZUSHIMA. 1976. Concept and design of the 99 GT Squid jigging vessel. *FAO Fish. Rep.* 170 (Suppl. 1) : 103-106.

HANKO B. 1913. Uber einen gespaltenen arm von *Octopus vulgaris*. *Wilhelm Roux Arch. Entw. Mech. Org.* 37 : 217-222.

HERDMAN W. A. 1903-1906. *Report to the Government of Cyelon on the Pearl Oyster Fisheries of the Gulf of Mannar (with Supplementary Reports upon the Marine Biology of Ceylon Naturalists). Roy. Soc. London* 1 : 1-307 : 2 : 1-300 : 3 : 1-384 : 4 : 1-326 : 5 : 1-452.

HERNANDO A. M. (JR) AND E. C. FLORES. 1981. The Philippines squid fishery : A review. *Mar. Fish. Rev.* 43 (1) : 13-20.

HIDA, T. S. AND W. T. PEREYRA. 1966. Results of bottom trawling in Indian Seas by R/V ANTON BRUNN in 1963. *Proc. Indo-Pacific Fish. Coun.* 11 (2) : 156-171.

HIXON, R. F. 1983. *Loligo opalescens*. In Ed. P. R. Boyli Cephalopod Life-Cycles. Vol. I. Species accounts. Academic Press. pp. 95-114.

HODGKIN, A. L. 1964. The conduction of the nervous Impulse. Liverpool Univ. Press, Liverpool, England, pp. 20-29.

HORNELL, J. 1917. The edible molluscs of Madras Presidency. *Madras Fish. Bull.*, 11 : 1-51.

HORNELL, J. 1922. The common molluscs of South India. *Madras Fish. Bull.*, 14 : 97-215.

HORNELL, J. 1950. Fishing in many waters. Chapter XV. Fishing for *Octopus*, Cuttlefish and Squid. *Cambridge Univ. Press. Cambridge*, 130-135.

HORNELL, J. 1951. *Indian Molluscs. Bombay Nat. Hist. Society, Bombay*, 96 p.

HOWARD, F. G. 1981. Cephalopods : An under utilized resource. *Scotish Fisheries Bulletin*, 46 : 26-29.

HOYLE, W. E. 1885a. Brief notice of the 'Challenger' Cephalopoda (p. 472). *Rep. Scient. Resul. Voy. 'Challenger'* (1873-76), Narrative 1, 657 p.

HOYLE, W. E. 1885b. Diagnoses of new species of Cephalopoda collected during the cruise of H.M.S. 'Challenger'. Part I. The Octopoda. *Ann. Mag. nat. Hist. Ser.* 5, 15 : 222-236.

HOYLE, W. E. 1885c. Diagnoses of new species of Cephalopoda collected during the cruise of H.M.S. 'Challenger' Part II. The Decapoda. *Ann. Mag. nat. Hist. Ser.* 5, 16 : 181-203.

HOYLE, W. E. 1885d. Preliminary report on the Cephalopoda collected by H.M.S. 'Challenger'. Part I. The Octopoda *Proc. Roy. Soc. Edinburgh*, 13 : 94-114.

HOYLE, W. E. 1885e. Preliminary report on the Cephalopoda collected by H.M.S. 'Challenger'. Part II. The Decapoda *Proc. Roy. Soc. Edinburgh*, 13 : 281-310.

HOYLE, W. E. 1886. Report on the Cephalopoda collected by H.M.S. 'Challenger' during the years 1873-1876. *Rep. Scien Resul. Voy. 'Challenger'* (Zoology), 16 (44) : 1-245.

HOYLE, W. E. 1904a. *Sepia burnupi* n. sp. from Natal. *J. Conch. London*, 11 : 27-28.

HOYLE, W. E. 1904b. Report on Cephalopoda collected by Prof. Herdman at Ceylon, 1902. *Rep. Ceylon Pearl Oyster Fish.* 2, Suppl. 14 : 185-200.

HOYLE, W. E. 1905. The Cephalopoda. *In :* S. Gardiner. *The Fauna and Geography of the Maldive and Lacceadive Archipelagoes*, 2, Suppl. 1; 575-988.

HOYLE, W. E. 1907a. The Cephalopoda. The marine fauna of Zanzibar and East Africa from collections made by Cyril Crossland in 1901-1902. *Proc. Zool. Soc. London*, 450-461.

HOYLE, W. E. 1907b. Reports on the marine biology of the Sudanese Red Sea. 6. On the Cephalopoda. *J. Linn. Soc* (Zool.), 31 : 35-43.

HURLEY, A. C. 1977. Mating behaviour of the squid *Loligo opalescens*. *Mar. Behav. Physiol.*, 4 : 195-203.

HURLEY, G. V. 1980. Recent development in the squid, *Illex illecebrous* fishery of Newfoundland, Canada. *Mar. Fish Rev.*, 42 (7-8) : 15-22.

IMBER, M. J. 1975. Lycoteuthid squids as prey of petrels in New, Zealand Seas. *N. Z. J. Mar. Freshw. Res.*, 9 : 483-492.

IMBER, M. J. 1978. The squid families Cranchiidae and Gonatidae. (Cephalopoda : Teuthoidea) in the New Zealand region. *New Zealand J. Zool*, 5 (3) : 445-484.

INSTITUTE OF MARINE RESEARCH. 1975. Report on Cruise Nos. 1 and 2 of R/V DR. FRIDTJOF NANSEN, Indian Ocean Fishery and Development Programme. Pelagic Fish Assessment Survey of North Arabian Sea. Bergen, Institute of Marine research, 15 p.

ISHI, M. 1977. Studies on the growth and age of the squid, *Ommastrephos bartrami* (Le Sueur) in the Pacific off Japan *Bull. Hokkaido Reg. Fish. Res. Lab.*, (42) : 25-36.

IVERSEN, I. L. K. AND L. PINKAS. 1971. A pictorial guide to beaks of certain eastern Pacific Cephalopods. *In* : Food habits of Albacore, bluefin tuna and Bonito in Californian Waters. *Fish. Bull.*, 152 : 83-105.

JAMES, P. S. B. R. 1967. The ribbon fishes of the family Trichiuridae of India. Memoir 1, *Mar. Biol. Ass. India*, 228 p

JAUNICO, M. 1980. Development in South American squid fisheries. *Mar. Fish. Rev.*, 42 (7-8) : 10-14.

JAYABALAN, N. AND K. RAMAMURTHI. 1977. Cephalopods of Porto Novo. *J. Annamalai Univ.* (Sci.), 31 : 29-34.

JAYAPRAKASH, A. A. 1974. Food and feeding habits of juveniles of 'Koth' *Otolithoides brunneus* (Day) in Bombay waters. *Indian J. Fish.*, 21 (1) : 127-140.

JMFRCC. 1980. Report of feasibility study 1978 on squid jigging fisheries in the southwestern Pacific Ocean, 178 p.

JONES, R. 1981. The use of length composition date in fish stock assessments (with notes on VPA and COHORT analysis). *FAO Fish. Circ.*, (734) : 55 p.

JONES, S. 1968. The molluscan fishery resources of India. *Proc. Symp. Mollusca*, Mar. Biol. Ass. India, Pt. 111 : 906-918.

JOTHINAYAGAM, J. T. 1981. Studies on *Sepiella inermis* (Ferrusac and d'Orbigny) population occurring along the Madras coast. *Proc. Symp. Echol. Anim. Popul.*, Zool. Surv. India, Pt. 1 : 83-89.

JUANICO' MARCELO, 1983. Squid Maturity Scales for population analysis. In : Caddy J.F. (ed). Advances in Assessment of Cephalopod Resources. *FAO Fish. Tech. Pap.* (231) : 341-378.

KAGWADE, P. V. 1969. Food and feeding habits of *Polynemus heptadactylus* Cuv. and Val. *Indian J. Fish.*, 16 (1 & 2), 188-197.

KALAVATI, C. AND C. C. NARASIMHAMURTI. 1977. *Steinhausia spraguei* n.s.p.a microsporidian parasite of the excretory cells found inthe renal appendages of *Sepia elliptica*. *Rivista Parassit.* 38(2-3 : 271-275.

KALAVATI, C. AND C. C. NARASIMHAMURTI 1980. A new dicyemid mesozoan *Dodecadicyema loligoi* n. gen., n. sp. from the renal appendages of *Loligo* sp. *Poc. Indian Acad. Sci (Anim. Sci.)*, 89 (3) : 287-292.

KALAVATI, C., C. C. NARASIMHAMURTI AND T. SUSEELA 1978. A new species of *Dicyemmennea, D. coromandelensis* n. sp. from *Sepia elliptica* Hoyle. *Proc. Indian. Acad. Sci.*, 87 B (6) : 161-167.

KAREKAR, P. S. AND D. V. BAL. 1958. The food and feeding habits of *Polynemus indicus* (Shaw). *Indian J. Fish.*, 5 (1) : 77-94.

KARNEKAMP, C. 1979. An aberrantly shaped sheild of *Sepia* sp. and a response to this. *Kreukel. Amst.*, 15 (7-8) : 60.

KARPOV, KONSTANTIN, A. AND G. M. CAILLIET 1978. Prey composition of the Market Squid, *Loligo opalascens* Berry in relation to depth and location of capture, size of squid and sex of spawning squid. *Calif. Coop. Ocean Fish. Invest. Repts.* 20 : 51-57.

KSAAHARA, S. AND T. NASUMI. 1976. Present status and future aspects of the fishery for the common squid *Todarodes pacificus* (Steenstrup) in the sea of Japan. *FAO Fish. Rep.*, 170 (Suppl. 1): 30-46.

KAWAKAMI, T. 1980. A review of sperm whale food. *Sci. Rep. Whales Res. Inst.*, (32) : 199-218.

KAWATA, H., K. KATAYA, U. AND T. TAKAHASHI 1955. Studies on the complete utilization of whole fish IV. The chemical composition of some fish viscera and the soluble feed made from cuttlefish liver. *Bull. Japan. Soc. Sci. Fish.*, 21 (7) : 503-508.

KLOSS, C. B. 1902. *Andaman and Nicobars*, Reprint 1971, Vivek Publishing House, Delhi, 373 p.

KORE, B. A. AND M. C. JOSHI 1975. Food of the squid *Loligo duvauceli* d'Orbigny. *Proc. Indian Acad. Sci.*, 81 B (1) : 20-28.

KRISHNAMURTHI, B 1957. Fishery resources of the Rameswaram Island. *Indian J. Fish.*, 4 (2) : 229-253.

KRUMHOLZ, L. A. AND D. P. DE SYLVA. 1958. Some foods of marlins near Bimini, Bahamas. *Fla. Ocar. Res. Publ.*, 28 : 1-31

KUMARAN, M 1964. Studies on the food of *Euthynnus affinis affinis* (Cantor), *Auxis thazard* (Lacepede), *Auxis thynnoides* Bleeker and *Sarda orientalis* (Temminck and Schlegel) *Proc. Symp. Scombroid Fishes*, Mar. Biol. Ass. India, Pt. 11 : 599-606.

KUTHALINGAN, M. D. K., G. LUTHER, S. LAZARUS AND K PRABHAKARAN NAIR 1982. Experimental trawling off Vizhinjam *Mar. Fish. Infor. Serv. T & E Ser.*, No. 40 : 5-7.

LANE, F. W. 1962. *Kingdom of the octopus. The life history of* the *Cephalopoda*. The worlds of science (Zoology) Pyramid Publications, New York. 287 p.

LANGE, A. M. AND M. PSISSENWINE, 1980. Biological considerations relevant to the management of squid (*Loligo pealei* and *Illex illecebrosus*) of the northwest Atlantic. *Mar. Fish. Rev.*, 42 (7-8) : 23-38.

LANGE, A. M. T., AND M. P. SISSENWINE 1983. Squid resources of the northwest Atlantic. *In :* Caddy, J. F. (ed.), Advance. in assessment of world cephalopod resources. *FAO Fish. Tech. Pap.* (231) : 21-54.

LANGE, M. M. 1920. On the regeneration and finer structure of the arms of the cephalopods. *J. exp. Eool.* 31 (1) : 1-57.

LONG, D. AND W. F. RATHJEN 1980. Experimental jigging for squid off the Northeast United States *Mar. Fish. Rev.*, 42 (7-8) : 60-66.

LU, C. C. AND M. R. CLARKE. 1975. Vertical distribution of cephalopods at 40°N, 53°N and 60°N at 20°W in the North Atlantic. *J. Mar. biol. Assn. U.K.* (1975) 55 : 153-163.

LU, C. C. AND M. R. CLARKE. 1975. Vertical distribution of cephalopods at 11°N, 20°W in the North Atlantic. *Ibid.* (1975) 55 : 369-389.

LUTHER ,G,. P. N. RADHAKRISHNAN NAIR, G. GOPAKUMAR AND K. PRABHAKARAN NAIR 1982. Present status of small-scale traditional fishery at Vizhinjam. *Mar. Fish. Infor. Serv TN & E Ser.*, o. 38 : 1-16.

MAES, V. O. 1967. The littoral marine molluscs of Cocos—Keeling Islands (Indian Ocean). *Proc. Acad. Nat. Sci. Phila.*, **119** (4) : 93-217.

MAHADEVAN, S. AND K. NAGAPPAN NAYAR 1967. Underwater ecological observations in the Gulf of Mannar off Tuticorin. *J. Mar. Biol. Ass. India*, **9** (1) : 147-163.

MAHADEVAN S. AND K. NAGAPPAN NAYAR 1974. Ecology of pearl oysters and chank beds. The commercial molluscs of India. *Bull. Centr. Mar. Fish. Res. Inst.*, **25** : 106-121.

MAKSIMOV, V. P. 1969. Pitanie bol'skegla zogo tuntsa (*Thunnus obesus* Lowe) i mechry by (*Xiphias gladius* L.). Vostochnoi chasti tropicheskogo i Atlantikil, Atl. Nauchno-Issled. Int. Rybn. Khoz. Okenogr. (Atl. NIRO). **25** : 87-99 (Engl. transl. Fish. Res. Bd. Can. Transl. Ser. 2248).

MAISY, A. L. 1916. The Cephalopoda of the Indian Museum. *Rec. Indian Mus.*, **12** : 185-247.

MAISY, A. L. 1927. The Cephalopoda of the South African Museum. *Ann. S. African Mus.*, **25** : 151-167.

MATSUMOTO, G. 1976. Transportation and maintenance of adult squid (*Doryteuthis bleekeri*) for physiological studies. *Biol. Bull.*, **150** : 279-285.

MAY R. M. 1933. La formation des terminaisons nerveuses dans les ventouses du bras regenere du cephalopode *Octopus vulgaris* Lam. *Ann. St. Oceanogr. Salammbo* **7** : 1-15.

MENON, K. K. P. 1978. Fish processing industry in India. *Proc. Symp. Fish Utilization Technology and Marketing in the IPFC Region*, 18th Session, Manila, Philippines, 73-84.

MERCER, M. C. 1974. Modified Leslie - Delury assessments of the northern pilot whale (*Gobicephalus malaena*) and annual production of the short-finned squid (*Illex illecebrosus*) based upon their interaction at Newfoundland. *ICNAF Res. Doc.*, 74/49 : 14p.

MERCER, M. C., R. K. MISRA, G. V. HURLEY. 1980. Sex determination of the ommastrephid squid *Illex illecebrosus* using Beak morphometrics. *Can. J. Fish. Aquat. Sci.*, **37** : 283-286.

MIENIS, H. K. 1977. Squid from the stomach of a deep water shark. *Correspondentieblad ned. Malac. Veren.*, **178** : 707.

MIENIS, H. K. 1978. Who found *Spirula* or *Argonauta* on the Mediterranean coast of Israel or in the Red Sea *Levantina*, **15** : 170-172.

MIMURA, K. AND STAFF OF NRFRL 1963. Synopsis of biological data on yellowfin tuna, *Neothunnus macropterus* Temminck and Schlegal, 1842. *FAO Fish. Rep.* **6** (2) : 319-349.

MISAKI, H. AND T. OKUTANI 1976. Studies on early life history of Decapodan Mollusca—VI. An evidence of spawning of an oceanic squid, *Thysanoteuthis rhombus* Troschel, in the Japanese waters. '*Venus*', *Jap. Jour. Malacology*, **35** (4) : 211-213.

MOJUMDER, P. 1969. Food of the catfish *Tachysurus thalassinus* (Ruppell). *Indian J. Fish.*, **16** (1 & 2) : 161-169.

MOJUMDER, P. AND S. S. DAN 1979. Studies on food and feeding habits of catfish *Tachysurus tenuispinis* (Day). *Indian J. Fish.*, **26** (1 & 2) : 115-124.

MOSES, S. T. 1948. A preliminary report on the Cephalopoda of Baroda. *Bull. Dept. Fish. Baroda State*, **13** : 1-3.

MOSES, S. T. 1949. A preliminary report on the cephalopods of Baroda. *Proc. 35th Indian Sci. Congr.*, 198.

MOYNIHAN, M. 1975. Conservation of displays and comparable sterotyped patterns among cephalopods. In : Eds. Bacrends, Beer and Manning : *Function and Evolution in Behaviour*, Chapter 13 : 276-291.

MOYNIHAN, M. 1983. Notes on the behaviour of *Idiosepius pygmaeus* (Cephalopoda : Idioseplidae). *Behaviour*, **85** : (1-2) : 42-57.

MOYNIHAN, M. AND A. RODANICHE, 1977. Communications, Crypsis and mimicry among Cephalopods. In : How animals communicate (Seb-cock, T.A. Ed). Indiana Univ. Press, Bloomington.

MOYNIHAN, M. AND A. F. RODANICHE. 1982. Behaviour and Natural History of the Caribbean reef squid *Sepioteuthis sepioidea* with a consideration of social, signal and defensive pattern. for difficult and dangerous environments. pp. 1-151. Verlag Paul Parey. Berlin and Hamburg.

MPEDA 1976. Processing of cuttlefish and squid for export. *Indian Sea Foods*, XII (2 & 3) : 21-29.

MPEDA 1985. *Statistics of marine products exports* 1983. The Marine Products Export Development Authority, Cochin 264 p.

MUKUNDAN, C. 1968. Molluscs in Indian tradition and economyl *Souvenir, Symp. Mollusca*, Mar. Biol. Ass. India, Cochin, January 12-16, 1968 : 45-52.

MURATA, M. AND M. IAMI, 1977. Some information on the ecology of the oceanic squid, *Ommastrephes bartrami* (Lesueur) and *Onychoteuthis boreali japanicus* Okada in the Pacific Ocean of Northeastern Japan. *Bull. Hokkaido Reg. Fish. Res. Labs*, (42) : 1-23.

MURATA, M., M. ISHI, AND M. OSAKO 1981. On the regeneration of tentacle of the oceanic squid *Ommastrephes bartrami* (Lesueur). *Bull. Hokkaido Reg. Fish. Res. Lab.*, 46 : 1-14.

MUTHU, M. S., K. A. NARASIMHAM, G. SUDHAKARA RAO, Y. APPANNA SASTRY AND P. RAMALINGAM 1975. On the commercial trawl fisheries off Kakinada during 1967-70. *Indian J. Fish.*, **22** (1 & 2) : 171-186.

NAGABHUSHANAM, R. 1968a. Physiology of chromatophores in Cephalopoda. *Proc. Symp. Mollusca*, Mar. Biol. Ass, India, Pt. II : 568-571.

NAGABHUSHANAM, R. 1968b. Studies on neurosecretion in Mollusca. *Proc. Symp. Mollusca*, Mar. Biol. Ass. India, Pt. II : 572-579.

NAIR, R. V. AND K. K. APPUKUTTAN. 1973. Observations on the food of deep sea sharks *Halaelurus hispidus* (Alcock), *Eridacnis radcliffei* Smith and *Iago omanensis* Compagno and Springe *Indian J. Fish.*, **20** (2) : 575-583.

NAIR, S. GOPALAN 1958. A preliminary account of the fisheries of Vizhinjam. *Indian J. Fish.*, **5** (1) : 32-55.

NARASIMHAM, K. A., G. SUDHAKARA RAO, Y. APPANNA SASTRY AND W. VENUGOPALAN 1979. Demersal fishery resources off Kakinada with a note on economics of commercial trawling. *Indian J. Fish.*, 26 (1 & 2) : 90-100.

NARASIMHAMURTI, C. C. 1979. The emeriid, *Aggregata kudoi* n. sp. from *Sepia elliptica*. *Angewandte parasit*, 20 (3) : 154-158.

NATARAJAN, N. AND R. NATARAJAN 1980. Food and feeding habits of *Psettodes erumei* (Bloch and Schn.) and *Pseudorhombus arsius* (Ham. Buch.). *Matsya*, 6 : 30-42.

NATSUKARI, Y. 1983. Taxonomical and morphological studies on the Loliginid squids—III. *Nipponololigo*, a new subgenus of the Genus *Loligo*. *Venus, The Jap. Jour. Malacol.*, 42 (4) 313-318.

NAZUMI, T. 1975 Notes on the species of squids collected in the Tajima region of the Japanese Sea, 1974. *Bull. Hyogo Pref Fish Stn.*, 15 : 9-13 (in Japanese)

NELSON, M. *et al.*, 1983. On the fishery and biology of the giant squid *Dosidicus gigas* in the Gulf of California, Mexico *In:* Caddy, J. F. (ed), Advances in assessment of world cephalopod resources. *FAO Fish Tech. Pap.*, 231 : 306-340

NISHIMURA S. 1966. Notes on the occurrence and biology of the oceanic squid, *Thysanoteuthis rhombus* Troschel in Japan. *Publ. Seto. Mar. Biol. Lab.*, 14 (4) : 327-349.

NIXON, N. AND J. B. MESSENGER 1977. The biology of the cephalopods. Proceedings of a Symposium held at the Zoological Society of London on 10 and 11 April 1975. *Symp. Zool. Soc. London*, 38 : 615 p.

OGURA, M. 1976. Fishing tackle and fishing efficiency in squid *jigging*. *FAO Fish. Rep.*, 170 (Suppl. 1) : 99-102.

OGURA, M. AND T. NASUMI 1976. Fishing lamps and light attraction for squid jigging. *FAO Fish. Rep.*, 170 (Suppl. 1 : 93-98.

OKADA, Y. 1933. Animal of *Spirula*. *Venus*, 3 (1) : 144-145.

OKUTANI, T. 1970. A small collection of gastropod and decapod molluscs from the Scychelles Bank, Indian Ocean, by the trawling vessel KOYO-MARU, 1968. *Venus, The Jap. Jour. of Malacology*, 29 (4) : 123-130.

OKUTANI, T. 1973a. Preliminary note on planktonic Oegopsid cephalopod larvae obtained by the International Indian Ocean Expedition. *J. mar. biol. Ass. India*, 15 (1) : 213-217.

OKUTANI, T. 1973b. Guide and keys to squid in Japan. *Bull. Tokai. Reg. Fish. Res. Lab.*, (74) : 83-111.

OKUTANI, T. 1977. Stock assessment of cephalopod resources fished by Japan. *FAO Fish. Tech. Pap.*, (173) : 62 p.

OKUTANI, T. 1980. Useful and latent cuttlefish and squids of the world. Published from National Coop. Ass. of Squid Processors for the 15th Anniv. of its foundation : 66 p.

OKUTANI, T. AND SUZUKI, K. 1975. Concurrence of bathpyelagic *Spirula spirula* and epipelagic *Argonauta boettgeri* in stomach contents of a yellowfin tuna from the Indian Ocean. *Venus, The Jap. Jour. of Malacology*, 34 (1 & 2) : 49-51.

OKUTANI, T. AND TUNG, I. H. 1978. Review of biology of commercially important squids in Japanese and adjacent waters. 1. *Symplectoteuthis oualaniensis* (Lesson). *Veliger*, 21 (1) : 87-94.

OOMMEN, V. P. 1966. The Octopoda of the Kerala coast. I. A new species of the genus *Berrya*, Adam 1943. *Bull. Dept.. Mar. Biol. Oceanogr. Univ. Kerala*, 2 : 51.

OOMMEN, V. P. 1967. New records of octopoda from the Arabian Sea. *Bull. Dept. Mar. Biol. Oceanogr., Univ. Kerala*, 3 : 29.

OOMMEN, V. P. 1971. *Octopus varunae*, a new species from the west coast of India. *Bull. Dept. Mar. Biol. Oceanogr., Univ Cochin*, 5 : 69.

OOMMEN, V. P. 1975. New records of decapod cephalopods from the Arabian Sea. *J. mar. biol. Ass. India*, 17 (2) : 186-190.

OOMMEN, V. P. 1976. A new species of the genus *Opisthoteuthis* Verrill, 1883 (Cephalopoda : Mollusca) from the southwest coast of India. *J. mar. Biol. Ass. India*, 18 (2) : 368-374.

OOMMEN, V. P. 1977a. Two octopods new to Arabian Sea. *Indian J. Fish.*, 24 (1 & 2) : 25-32.

OOMMEN, V. P. 1977b. Studies on the food, feeding and fishery of certain cephalopods from the west coast of India. *Bull. Dept. Mar. Sci. Univ. Cochin*, 8 : 73-152.

ORTMANN, A. S. 1891. Cephalopoden von Ceylon. *Zool. Jb. Syst.*, 5 : 669-678.

OSAKO, M. AND M. MURATA 1983. Stock assessment of cephalopod resources in the Northwestern Pacific. *In :* Caddy, J. F. (ed.), Advances in assessment of world cephalopod resources. *FAO Fish. Tech. Pap.*, (231) : 55-144.

OWEN, R. 1832 Memoir on the Pearly Nautilus *Nautilus pompilius* Linnaeus, London, 68 p.

PADMANABHAN, V. 1970. On new fish products—Cuttlefish and squids. Quart. Newsletter, Govt. of India, Indo-Norwegian Project, 2 (2 & 3): 4-6.

PANDIT, A. R. AND N. G. MAGAR 1972. Chemical composition of *Sepia orientalis* and *Loligo vulgaris*. *Fish Technol*, 9 (2): 122-125.

PARIN, N. V. 1967. The materials on the distribution and biology of the snake mackerel—*Gempylus serpens* Cuv. (Pisces) Gempylidae in the Pacific and Indian Ocean : *Vopr. Icthhyology*, 7 (6) : (in Russian), 990-999.

PARONA, C. 1900. Sulla dicotomia della braccia nei cefalopod. *Boll. Musei Lab. Zool. Anat. Comp. r. Univ. Genova*, 96 : 1-7.

PAULY, D. AND N. DAVID 1981. ELEFANI, a BASIC program for the objective extraction of growth parameters from length frequency data. *Meeres forsch*, 28 (4) : 205-211.

PAYNE, R. L. 1978. Note on possible priorities for future commercial fisheries of demersal and small pelagic species. *Report of the FAO/Norway Workshop on the Fishery Resources of the North Arabian Sea*, 2 : 194-201.

PFEFFER, G. 1912. Die Cephalopoden der Plankton—Expedition. Zugleich eine monographische Ubersicht der Oepgopsiden Cephalopoden. *Ergebnisse der Plankton—Expedition der Humbodt—Stiftung*, 2 : 1-815.

PERRIN, W. F., R. R. WARNER, C. H. FISCUS AND D. B. HOLTS 1973. Stomach contents of porpoise *Stenella* spp. and Yellowfin tuna, *Thunnus albacares*, in mixed-species aggregations. *Fish. Bull U.S.*, 71 : 1077-1092.

PICKFORD, G. E. 1946. *Vampyroteuthis infernalis* Chun. An archaic dibranchiate cephalopod. I. Natural history and distribution. *Dana Rept.*, 29 : 1-40.

PICKFORD, G. E. 1949a. Distribution of the eggs of *Vampyroteuthis infernalis* Chun. *J. mar. Res.*, 8 (1) : 73-83.

PICKFORD, G. E. 1949b. *Vampyroteuthis infernalis* Chun. An archaic dibranchiate cephalopod. II. Extrnal anatomy. *Dana Rept.*, 32 : 1-132.

PICKFORD, G. E. 1952. The Vampyromorpha of the Discovery Expedition. *Discovery Repts.*, 26 : 197-210.

PICKFORD, G. E. 1959. Vempyromorpha. *Galathea Rept.*, 1 : 243-253.

PICKFORD, G. E. 1974. *Cistopus indicus* (Orbigny) : A common Indo-Malayan species of Octopus. *J. mar. biol. Ass. India*, 16 (1) : 43-48.

PORTMANN, A. 1952. Les luas dorsaux de *Tremactopus violaceus* delle chiaje. *Revue Suisse Zool.*, 59 (13) : 288-293.

PRASAD, R. R. AND P. V. RAMACHANDRAN NAIR 1973. India and the Indian Ocean fisheries. *J. Mar. Biol. Ass. India*, 15 (1) : 1-19.

RABINDRANATH, P. 1966. Biology and seasonal distribution of the pelagic food fishes of Travancore coast. *Kerala Univ. Publ.*, 1-140.

RADHAKRISHNAN, N. 1973. Pelagic fisheries of Vizhinjam. *Indian J. Fish.*, 20 (2) : 584-598.

RAHAMAN, A. A. 1967. Gonad and hapatic indexes of the Indian cephalopods *Sepioteuthis arctipinnis* Gould and *Sepia aculeata* Ferrussae and d'Orbigny. *Proc. Indian Acad. Sci.* 67 B (3) : 104-113.

RAHAMAN, A. A. 1980. Ecological observations on spawning of a few invertebrates of the Madras coast. *J. Madurai Kamaraj Univ.* (Sci.), 9 (1) : 71-77.

RAJAGOPAL, K. V., S. RAVICHANDRA REDDY AND K. SAKUNTALA 1977. Fish baits : Need for collection, care, preparation and propagation in India. *Seafood Export Juor.*, 9 (5) : 9-13.

RAJU, G. 1964. Observations on the food and feeding habits of the oceanic skipjack *Katuswonus pelamis* (Linnaeus) of the Laccadive Sea during the years 1958-59. *Proc. Symp. Scombroid Fishes*, Mar. Biol. Ass. India, Pt. II : 607-625.

RANCUREL, P. 1971. Less contenus stomacauxd ' *Alepisaurus ferox* daus le Sud-oues Pacifique (Cephalopods). *Cah. O.R.S.T. O.M. Ser. Oceanogr.* 8 (4) 3-87.

RANCUREL, P. 1976. Note suries Cephalopodes des contenus stomacaux de *Thunnus albacares* (Bonnaterre) dans le Sud" ouest Pacifique. *Ibid.*, 14(1) : 71-80.

RAO, K. SRINIVASA 1964. Observations on the food and feeding habits of *Scomberomorus guttatus* (Bloch and Schneider) and the juveniles of *S. lineolatus* (Cuvier and Valenciennes) *S. commerson* (Lacepede) from the waltair coast. *Proc. Symp. Scombroid Fishes*, Mar. Biol. Ass. India Pt. II : 591-598.

RAO, SUBBA M. V. 1977. Molluscs of Digha coast, West Bengal. 2. Bivalvia, Scaphopoda and Cephalopoda. *Newsl. Zool. Surv. India*, 3 (5) : 298-302.

RAO, K. VENKATASUBBA 1968. Some aspects of the biology of ' ghol ' *Pseudosciaena diacanthus* (Lacepede). *Indian J. Fish.*, 10 (2) : 413-459.

RAO, K. VIRABHADRA 1954. Biology and fishery of the Palk-Bay squid *Sepioteuthis arctipinnis* Gould. *Indian J. Fish.*, 1 : 37-66.

RAO, K. VIRABHADRA 1958. Molluscan Fisheries. *Fisheries of the West Coast of India. Cent. Mar. Fish. Res. Inst.*, : 55-59.

RAO, K. VIRABHADRA 1969a. Molluscs have many uses. *Indian Frmg.*, 29 (9) : 41-45.

RAO, K. VIRABHADRA 1969b. Distribution pattern of the major exploited marine fishery resources of India. *Bull. Cent. Mar. Fish. Res. Inst.*, 6 : 1-69.

RAO, K. VIRABHADRA 1973. Distribution pattern of the major exploited marine fishery resources of India. *Proc. Symp. Living Resources of the Seas around India*, CMFRI Special Publication : 18-101.

RAO, K. VIRABHADRA AND K. DORAIRAJ 1968. Exploratory trawling off Goa by the Government of India fishing vessels. *Indian J. Fish.*, 15 (1 & 2) : 1-14.

RAO, S. R., S. M. SHAH AND R. VISVANATHAN 1968. Calcium, Strontium and Radium content of molluscan shells. *J. Mar. Biol. Ass. India*, 10 (1) : 159-165.

RAY, H. C. 1937. Contribution to the knowledge of the molluscan fauna of Maungmagan, Lower Burma (with descriptions of one new genus and species of the Family Turridae (Gastropoda)). *Indian Mus.*, Calcutta, 8 : 1-150.

RAYUDU, G. V. AND P. CHANDRA MOHAN 1982. A note on the fishery of squids and cuttlefish of Visakhapatnam. *Seafood Exp. Jour.*, 14 (4) : 23-27.

REES, W. J. 1949. Note on the hooked squid, *Onychoteuthis banksi*. *Proc. malac. Soc. Lond.*, 28 : 43-45.

RIGGENBACH, E. 1901. Beobachtung uber selbstverstummehung *Zool. Anz.*, 24 : 587-593.

ROBSON, G. C. 1921. On the Cephalopoda obtained by the Percy Sladen Trust Expedition to the Indian Ocean in 1905. *Trans Linn. Soc. London*, 17 (2) : 429-442.

ROBSON, G. C. 1924a. Preliminary report on the Cephalopoda (Decapoda) procured by the S. S. ' Pickle '. *Rep. Fish. mar. biol. Surv. Union S. Africa*, 3, *Spec. Rept.*, 9 : 1-14.

ROBSON, G. C. 1924b. On the Cephalopoda obtained in South African waters by Dr. J. D. F. Gilchrist in 1920-1921. *Proc, Zool. Soc. London* : 589-686.

ROBSON, G. C. 1926a. Notes on the cephalopoda. No. 1. Descriptions of two new species of *Octopus* from southern India and Ceylon. *Ann. Mag. nat. Hist.*, Ser. 9, 17 : 159-167.

ROBSON, G. C. 1926b. The Cephalopoda obtained by the S. S. ' Pickle ' (Supplementary Report). *Fisheries and Marine Biological Survey Report*, No. 4, *for the year* 1925, 1-6.

ROBSON, G. C. 1929. *A Monograph of the Recent Cephalopoda.* Part I. *Octopodinae*. British Museum (Nat. Hist.) London, 236 p.

ROBSON, G. C. 1932. A monograph of the recent cephalopoda. Part II. The Octopoda (excluding the Octopodinae), London. British Museum (Natural History), 359 p.

ROPER, C. F. E. 1966. A study of the genus *Enoploteuthis* (Cephalopoda : Oegopsida) in the Atlantic ocean, with a redescription of the type species, *E. leptura* (Leach, 1817). *Dana Rept.*, 66 : 1-46.

ROPER, C. F. E., M. J. SWEENEY AND C. E. NAUEN 1984. Cephalopods of the world. An annotated and illustrated catalogue of species of interest to fisheries. *FAO Fish. Synop.*, (125) 3 : 277 p.

ROPER, C. F. E. AND R. E. YOUNG. 1975. Vertical distribution of pelagic cephalopods. *Smithsonian Contr. Zool.*, No. 209 : 1-51.

ROPER, C. F. E., R. E. YOUNG AND G. L. VOSS 1969. An illustrated key to the families of the order Teuthoidea (Cephalopoda). *Smithson. Contrib. Zool.*, 13 : 32 p.

ROSENBERG, P. 1973. The Giant Axon of the squid : A useful preparation for neurophisiological and pharmacological studies. F. Reiner Ed. *Methods of neurochemistry*, Vol. IV, Marcel Dekker, New york, 327 pp.

SAITO, R. 1976. The Japanese fishery (jigging) for *Nototodarus sloani sloani* in New Zealand waters. *FAO Fish. Rep.*, 170 (Suppl. 1) : 53-60.

SANDERS, M. J. 1979. Development of fisheries in areas of the Red Sea and Gulf of Aden. Preliminary stock assessment for the cuttlefish *Sepia pharaonis* taken off the coast of the People's Democratic Republic of Yemen. FAO Field Document, FAO-FI-RAB- 77/008, 58 p.

SANDERS, M. J. 1981. Revised stock assessment for the cuttlet fish *Sepia pharaonis* taken off the coast of the Peoples' Democratic Republic of Yemen. RAB/77/008/13. 44p. FAO, Project for the development of fisheries in areas of the Red Sea and Gulf of Aden, Cairo, Egypt.

SANDERS, M. J. AND M. BOUHLEL 1981. Interim report of a mesh selection study conducted in the People's Democratic Republic of Yemen on the cuttlefish *Sepia pharaonis*. FAO/UNDP Project on Development of Fisheries in areas of the Red Sea and Gulf of Aden : 35 p.

SANDERS, M. J. AND M. BOUHLEL 1983. Mesh selection study conducted in the People's Democratic Republic of Yemen on the cuttlefish *Sepia pharaonis*. *In :* Caddy, J. F. (ed.), Advances in *assessment of World Cephalopod Resources, FAO Fish. Tech. Pap.*, 231 : 181-203.

SANJEEVA RAJ, P. J. AND M. KALYANI 1971. *Euprymna morsei* (Verrill, 1881) (Sepiolidae : Cephalopoda) from the Indian Coast. *J. mar. biol. Ass. India*, 13 (1) : 135-137.

SANTHANAKRISHNAN, G. 1982a. Diversified markets for Indian marine products. *Seafood Export Jour.*, 14 (4) : 9-12.

SANTHANAKRISHNAN, G. 1982b. Dried squid. Part I. A value-added diversified product and its potential export markets *Seafood Export Jour.*, 14 (6) : 9-11.

SANTHANAKRISHNAN, G. 1982c. Dried squid. Part 2. A note on processing, packing and storing. *Seafood Export Jour.* 14 (7) : 1-13.

SANTHANAKRISHNAN, G. 1984. Diversification of products and markets. Octopus and un-exploited marine resource for diversification. *Seafood Export Jour.*, 15 (9) : 11-16.

SARVESAN, R. 1969a. Catalogue of molluscs. 2. Cephalopoda. *Bull. Cent. Mar. Fish. Res. Inst.*, 9 : 23-25.

SARVESAN, R. 1969b. Some observations on parental care in *Octopus dollfusi* Robson (Cephalopoda : Octopodidae). *J. Mar. Biol. Ass. India*, 11 (1 & 2) : 203-205.

SARVESAN, R. 1974. V. Cephalopods. *In :* The Commercial Molluscs of India. *Bull. Centr. Mar. Fish. Res. Inst.*, 25 : 63-83.

SARVESAN, R. 1976. On the occurance of *Sepia trygonia*. (Rochebrune) (Cephalopoda : Sepiidae) in Gulf of Mannar, *Indian J. Fish.*, 23 (1 & 2) : 256-260.

SASAKI, M. 1929. A monograph of the dibranchiate cephalopods, of the Japanese and adjacent waters. *Fac. Agric. Hokkaido Univ.*, Suppl., 20 : 1-357.

SASTRY, H. M. C. AND L. M. SRIKAR 1982. Protein and related changes in cuttlefish *Sepia aculeata* in iced storage. *Symposium Son Harvest and Post-harvest Technology of Fish, 24-27 November 1982, Cochin, Soc. Fish. Technologists.* Abstract.

SATO, T. 1976. Results of exploratory fishing for *Dosidicus gigas* (d' Orbigny) off California and Mexico. *FAO Fish. Rep.*, 170 (Suppl. 1) : 61-67.

SATO, T. AND H. HATANAKA 1983. A review of assessment of Japanese distant-water fisheries for cephalopods. *In :* Caddy, J. F. (ed.), Advances in assessment of world cephalopod resources. *FAO Fish. Tech. Pap.*, (231) : 145-180.

SATYAMURTHI, S. T. 1956. The mollusca of Krusadai Island (In Gulf of Mannar). II. Scaphopoda, Pelecypoda and Cephalopoda. *Bull. Madras Govt. Mus. (New Ser.) Nat. Hist. Sect.*, 1 (2) Pt. 7 : 202 p.

SAUNDERS, W. B. 1981. The species of living *Nautilus* and their distribution. *Veliger*, 24 (1) : 8-17.

SEKHARAN, K. V., M. S. MUTHU, K. VENKATA SUBBA RAO, V. RAMAMOHANA RAO, P. MOJUMDER AND S. REUBEN 1973. Exploratory trawling on the continental shelf along the north-western part of the Bay of Bengal. *Proc. Symp. Living Resources of the Seas around India*, CMFRI Spl. Publication : 280-337.

SHEBEY, D. J. AND S. F. VIK, 1980. 'Sake-ika' : Dried squid processing squipment and markets. *Marine Fisheries Review*, 42 (7-8) : 92 p.

SHENOY, A. S. 1985. Squids from India to Japan. *Infofish marketing Digest, (FAO)*, No. 2 : 43-44.

SHIN, P. K. S. 1982. The Hong Kong Squid Fishery. In Review of National Squid Fisheries, IPFC/RRD/82/Inf. 8 (a), March 1982, Sydney, Australia, 10 p.

SILAS, E. G. 1963. Synopsis of biological data on dogtooth tuna *Gymnosarda unicolor* (Ruppel) 1838 (Indo-Pacific). *FAO Fish. Rep.*, 6 (2) : 877-899.

SILAS, E. G. 1968. Cephalopoda of the west coast of India collected during the cruises of the research vessel 'VARUNA', with catalogue of the species known from the Indian Ocean. *Proc. Symp. Mollusca.* Mar. Biol. Ass. India, Pt. I : 277-359

SILAS, E. G. 1969a. Exploratory fishing by R. V. VARUNA. *Bull. Cent. Mar. Fish. Res. Inst.*, 12 : 86 pp.

SILAS, E. G. 1969b. Pelagic fisheries of the Indian Ocean *Indian Frmg.*, 19 (9) : 63-66.

SILAS, E. G., S. K. DHARMARAJA AND K. RENGARAJAN 1976 Exploited marine fishery resources of India—a synoptic survey with comments on potential resources. *Bull. Cent. Mar. Fish Res. Inst.*, 27 : 25 p.

SILAS, E. G., K. S. RAO, R. SARVESAN, K. P. NAIR AND M. M. MEIYAPPAN 1982. The exploited squid and cuttlefish resources of India : A review. *Mar. Fish. Infor. Serv. T & E Ser.*, No. 34 : 1-16.

SILAS, E. G. AND P. P. PILLAI 1982. Resources of tunas and related species and their fisheries in the Indian Ocean. *Bull. Cent. Mar. Fish. Res. Inst.*, 32 : 174 p.

SIVALINGAM, D. AND S. KRISHNA PILLAI, 1983. Preliminary experiments on breeding of cephalopods. *Proc. Symp. Coastal Aquaculture.*, Part 2, Mar. Biol. Assn. India, 633-635.

SIVAPRAKASAM, T. E. 1967. Observations on the food and feeding habits of *Papastromateus niger* (Bloch) of the Saurashtra coast. *Indian J. Fish.*, 10 (1) : 140-147.

SREENIVASAN, A. 1962. Two cases of bacterial discolouration of squids. *Curr. Sci.*, 31 (9) : 381-382.

SREENIVASAN, P. V. 1974. Observations on the food and feeding habits of the 'Torpedo Travally' *Megalaspis cordyla* (Linnaeus) from Vizhinjam Bay. *Indian J. Fish.*, 21 (1) : 76-84.

STEENSTRUP, J. J. 1856. Hectocotyldannelsen hos octopodslaegsterne *Argonauta* og *Tremactopus*, oplyst ved Iagttagelse at lignende Dannelser hos Blacksprunt-terne i Almindelighed K. *danske Vidensk. Selsk. Skr.*, 5 *R.*, 4 : 186-215, 2 pl.

SULLIVAN, D., AND J. M. CULLEN. 1983. Food of the squid *Notodarus gouldi* in Bass Strait. *Aust. J. Mar. Freshw. Res.*, 34 : 261-85.

SULOCHANAN, P. AND M. E. JOHN 1982. Cephalopod resources in southwest coast of India. *Symposium on Harvest and Post-harvest Technology of Fish*, 24-27 *November*, 1982, *Cochin* Soc. Fish. Technologists, Abstract.

SUMMERS, W. C. 1969. Winter population of *Loligo pealei* in the Mid-Atlantic bight. *Boll. Bull.*, 137 (1) : 202-216.

SUMMERS, W. C. 1983. *Loligo pealei.* In Ed. P. R. Boyle *Cephalopod Life Cycles*, Vol. 1 : Species accounts. Academic Press. pp. 115-142.

SURAYANARAYANAN, A. AND K. K. ALEXANDER 1980. Biochemical studies on the molluscan muscle. 2. Studies on the muscles of some bivalves and cephalopods. *J. Anim. Morph. Physiol.* 27 (1-2) : 180-189.

SUSEELAN, C. AND K. V. SOMASEKHARAN NAIR 1969. Food and feeding habits of the demersal fishes off Bombay. *Indian J. Fish.*, 16 (1 & 2) : 56-74.

TAKAHASHI, T. 1965. Squid meat and its processing. *In :* Fish as Food. G. Borgstrom (ed.), Academic Press, New York : 339-354.

TAKI, I. 1981. A catalogue of the Cephalopoda of Wakayama Prefecture. *In :* A catalogue of molluscs of Wakayama Prefecture, The Province of Kii. 1. Bivalvia, Scaphopoda and Cephalopoda. Sato mar. biol. Lab. Japan, 301 p.

TALBOT, F. H. AND M. J. PENRITH 1963. Synopsis of biological data on species of the genus *Thunnus* (*Sensu lato*) (South Africa). *AFO Fish. Rep.*, 6 (2) : 608-646.

TAMPI, P. R. S. 1959. The ecological and fisheries characteristics of a salt water lagoon near Mandapam. *J. Mar. Biol. Ass. India*, 1 (2) : 113-130.

TANIKAWA, E. AND M. SUNO 1952. Studies on the complete utilization of the squid (*Ommastrephes sloanii pacificus*) 5. Nutritive value and digestibility of squid meat. *Bull. Fac. Fish. Hokkaido Univ.*, 3 (1) : 73-94.

TASAKI, I. 1968. *Nerve Excitation.* Charles C. Thomas Springfield Illinois, pp. 200-26.

THIELE, J. 1915. *In :* Chun, C. Wiss. Ergebn. Deutsche Tiefsee Exped., Bd. 18 Pt. 2.

THOLASILINGAM, T., G. VENKATARAMAN, K. N. KRISHNA KARTHA AND P. KARUNAKARAN NAIR 1968. Results of the exploratory trawl fishing on the continental slope of the southwest coast of India by M. F. V. 'Kalava'. *Indian J. Fish.* 11 (2) : 547 558.

THORE, S. 1945. On the Cephalopoda of Professor O. Carlgren's Expedition to South Africa in 1935. K. fysiogr. Sallsk. Lund Forh., 15 : 49-57.

TOLL, R. B. AND S. C. HESS. 1981. Cephalopods in the diet of the sword fish, *Xiphias gladius* from the Florida Strait. *Fish. Bull. U.S.* 79(4) : 765-774.

TRETHEWIE, E. R. 1965. Pharmacological effects of the venom of the common octopus, *Hapalochlaena maculosa. Toxicon* 3 : 55-59.

TUNG, IH-HSIU 1976. On the reproduction of common squid, *Symplectoteuthis oualaniensis* (Lesson). *Rep. Inst. Fish.* Biol. Taipei, 3 (2) : 26-48 (in Chinese with English summary).

TUNG, IH-HSIU, CHI-SHENG LAN AND CHIEN-CHIN-HU 1973. The preliminary investigation for exploitation of common squid resources. *Rep. Inst. Fish. biol., Taipei*, 3 (1) : 211-247 (in Chinese with English summary).

TSENG, A. R. 1974. Fishery management issues in the Indian Ocean. Indian Ocean Programme, FAO, Rome, IOFC/DEV/74/35 : 39 p.

UNDP/FAO 1974a. Survey Results 1972/73. *Progress Report No.* 6 : 141 p.

UNDP/FAO 1974b. Plankton—Fish eggs and larvae studies. *Progress Report No.* 7 : 21 p.

UNDP/FAO 1976a. Survey Results 1973/74. *Progress Report No.* 12 : 32 p.

UNDP/FAO 1976b. Survey Results 1974/75. *Progress Report No.* 13 : 21 p.

UNDP/FAO 1976c. Pelagic fishery Investigation on the southwest coast. *Final Report of the Norwegian Agency for International Development* (NORAD) *and the Institute of Marine Research Bergan* : 55 p.

UNDP/FAO 1976d. A synopsis of the information on pelagic resources off the southwest coast of India. *Progress Report No.* 18 : 31 p

UNDP/FAO 1977. Report of acoustic survey along the southwest coast of India, November 1976. Progress Report, 1. FAO, Rome FIRS-IND/75/0348 : 28 p.

UNNITHAN, K. A. 1982. Observations on the biology of cuttlefish *Septella inermis* at Mandapam. *Indian J. Fish.*, 29 (1 & 2) : 101-111.

VERGHESE, G. 1981. Present status of small scale fisheries in Lakshadweep. *Bull. Cent. Mar. Fish. Res. Inst.*, 30 B : 60-64.

VELAIN, C. 1877. Remarques generales an sujet de la faune des iles St. Paul et Amsterdam, Suivies d'une description de la faune malacologique des deux iles. *Archs. Zool. exp. gen.*, 6 : 1-144.

VENKATARAMAN, R. AND K. DEVADASAN 1978. Marine products processing industry in India : Its growth and future prospects *Proc. Symp. Fish Utilization Technology and marketing in the IPFC Region, 18th Session*, Manila, Philippines : 38-44.

VERRILL, A. E. 1881a. Report on the cephalopods and on some additional species dredged by the U. S. Fish Commission Steamer ' Fish-hawk ', during the season of 1880. *Bull. Mus. Comp. Zool.*, 8 : 99-116.

VERRILL, A. E. 1881b. Regeneration of lost parts in the squid *Loligo pealei. Amer. J. Sc.*, (3rd ser.), 21 : 333-334.

VERRILL, A. E. 1882. Report on the cephalopods of the northeastern coast of America. *Rep. U. S. Comm. Fish and Fisheries*, 1879, 7 : 211-455.

VOSS. G. L. 1956. A review of the cephalopods of the Gulf of Mexico. *Bull. mar. Sci. Gulf. Carib.*, 6 (2) : 85-178.

VOSS, G. L. 1962. South African cephalopods. *Trans. R. Soc. S. Africa*, 36 (4) : 245-272.

VOSS, G. L. 1963. Cephalopods of the Phillippine Islands. *Bull. U. S. nat. Mus.*, 234 : 1-180.

VOSS, G. L. 1967. Some bathypelagic cephalopods from South African waters. *Ann. S. African Mus.*, 50 (5) : 61-88.

VOSS, G. L. 1973. Cephalopod resources of the world. *FAO Fish. Circ.* (149) : 75 p.

VOSS, G. L. 1977. Present status and new trends in cephalopod systematics. *Symp. Zool. Soc. London*, 38 : 49-60.

VOSS, G. L. AND D. S. ERDMAN 1959. *Thysanoteuthis rhombus*, a large cephalopod new to Western Atlantic. *Mar. Lab. Univ. Miami, Nautilus*, 73 (1) : 23-25.

VOSS, G. L. AND G. R. WILLIAMSON 1971. *Cephalopods of Hongkong*. Government Press, Hongkong : 138 p.

VOVK, A. N. 1972. Method of determining maturing stages in gonads of the squid *Loligo pealei. Zoologicheskiy Zhurnal* (USSR), 51 (1) : 127-132. (Translation Ser. No. 2337, 1973, Fish Res. Bd. Can.)

WELLS, M. J. 1962. Brain and Behaviour of Cephalopods. Heines mann, London.

WELLS, M. J. 1966. Cephalopod Sense organs. *In* Physiology of Mollusca, Edited by K. M. Wilbur and C. M. Younge, New York, Academic Press. Vol. 2 : 523-45.

WELLS, M. J. 1978. Octopus : Physiology and behaviour of an advanced invertebrate. Chapman and Hall London and John Wiley and Sons, New York, 417 p.

WELLS, M. J. AND J. WELLS. 1972.Sexual display and mating of *Octopus vulgaris* Cuvier and *O. cyanea* gray and attempts to alter performance by manupulating the glandular condition of animals. *Animal Behav.* 20 : 293-308.

WILLIAMS, F. 1964. The Scombroid fishes of East Africa. *Proc. Symp. Scombroid Fishes*, Mar. Biol. Ass. India, Pt. I : 107-164.

WILLIAMS, 1967. Longline fishing for tuna off the coast of East Africa, 1958-1960. *Indian J. Fish.*, 10 (1) : 233-290.

WILLY, A. 1902. *Contribution to the natural history of the pearly nautilus Part 6. of Zoological Results based on material from New Britain, New Guinea, Loyalty Islands.* (34) Cambridge.

WINCKWORTH, R. 1926. A list of Cephalopoda in the Colombo Museum. *Spolia Zeylan.*, 13 : 323-331.

WICNKWORTH, R. 1936. Marine Mollusca from South India and Ceylon. 4. A new Indian *Sepia. Proc. Malac. Soc. London* 22 : 16-23.

WOLFF, G. A. 1984. Identification and estimation of size from the beaks of 18 species of Cephalopods from the Pacific Ocean. *NOAA Tech. Rept. NMFS* 17 : 1-50.

WOLFF, G. A. AND J. H. WORMUTH. 1979. Biometric Separation of the beaks of two morphologically similar species of the squid family Ommastrophidae. *Bull. Mar. Sci.* 29(4) : 587-592.

WORMS, J. 1983. World fisheries for cephalopods : A synoptic overview. *In :* Caddy J. E. (ed.), Advances in Assessment of world cephalopod Resources, *FAO Fish. Tech. Pap.*, (231) : 1-20.

WORMUTH, J. H. 1976. The biogeography and numerical taxonomy of the Oegopsid squid family Ommastrephidae in Pacific Ocean. *Bull. Scripps. Inst. Oceanogr.*, 23 : 90 p.

WULKER, G. 1920. Ueber Cephalopoden des Roten Meeres. *Sneckenbergiana*, 2 : 48-58.

YAJIMA, S. AND S. MITSUGI 1976. Japanese squid jigging gear. *FAO Fish. Rep.*, 170 (Suppl. 1) 85-88.

YAMANAKA, H. 1976. Summery Report on cruise of R. V. *SOHYO MARU* in the Northern Arabian Sea, Oct. 1975-Feb. 1976. Far Seas Fisheries Research Laboratory, Japan Fisheries Agency pp. 1-9 with 30 figs, 7 tables, 6 plates and 2 appendices.

YAMANAKA, H., Y. NISHIGAWA AND J. MORITA 1976. Summary Report on cruise of the R. V. SHOYO MARU in the North Arabian Sea. FAO/UNDP Indian Ocean Programme Technica Report No. 11, 47 p.

YAMAZAKI, T. AND M. CHUENCHITPONG. 1981. Survey Report on squid stick-held dip net at Ban PHE District. *SEAFDEC Training Dept.* MP/No. **10** : 1-14.

YAMAZAKI, T. P., MASTHAWEE AND S. SAKARANG. 1983. Survey Report on a *new type of squid lift net. SEAFDEC Training Dept.* TD/MP/15 : 1-16. June 1983.

YAMASHITA, Y. 1976. The octopus Fishery of Hokkaido. Suppl. to the Report of the Expert Consultation on Fishing for Squid and other cephalopods. FAO Fish. Rep. (170) Suppl. 1, 142-143.

YEOH, Q. L. AND Z. MERICAN 1978. Processing of non-commercial and low-cost fish in Malaysia. *Proc. Symp. Fish Utilization Technology and Marketing in the IPFC Region, 18th Session,* Manila, Philippines : 572-580

YOUNG, R. E. 1975. A brief review of the biology of the oceanic squid, *Symplectoteuthis oualaniensis* (Lesson). *Comp. Biochem. Physiol.* **52 B** : 141-143.

YOUNG, J. Z. 1962. Courtship and mating by the coral reef octopus (*O. horridus*). *Proc. Zool. Soc. London,* **138** : 157-62.

YOUNG, J. Z. 1965. The Central Nervous System of *Nautilus. Philos. Trans. R. Soc. Biol. Sci.,* 249 : 1-25.

YOUNG, J. Z. 1971. Anatomy and Nervous system of *Octopus vulgaris.* Clarandon Press, Oxford.

YOUNG, J. Z. 1977. Brain, behaviour and Evolution. *Symp. Zool. Soc. London,* **38** : 377-434.

YOSHIKAWA, N. 1978. Fisheries in Japan. Squid and cuttlefish, Publ. by Japan Marine Products Photo Materials Association. Tokyo, 162 p.

ZUEV, G. V. 1971. *Cephalopods from the northwestern part of the Indian Ocean, Moscow,* 223 pp.

ZUEV, G. V. AND K. N. NESIS 1971. *Squid (Biology and Fishery),* Pishchevaya Promyshlennost Press, Moscow.

ZUPANOVIC, S. AND S. Q. MOHIUDDIN 1973. A survey of the fishery recources in the northeastern part of the Arabian Sea. *J. mar. Biol. Ass. India,* **15** (2) : 496-537.