BULLETIN No. 11

# OBSERVATIONS ON THE FISH CATCHES OF SOME POACHING VESSELS RECENTLY INTERCEPTED ALONG THE NORTH WEST COAST OF INDIA

GOVERNMENT OF INDIA
EXPLORATORY FISHERIES PROJECT,
BOMBAY.

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N u m b e r 11

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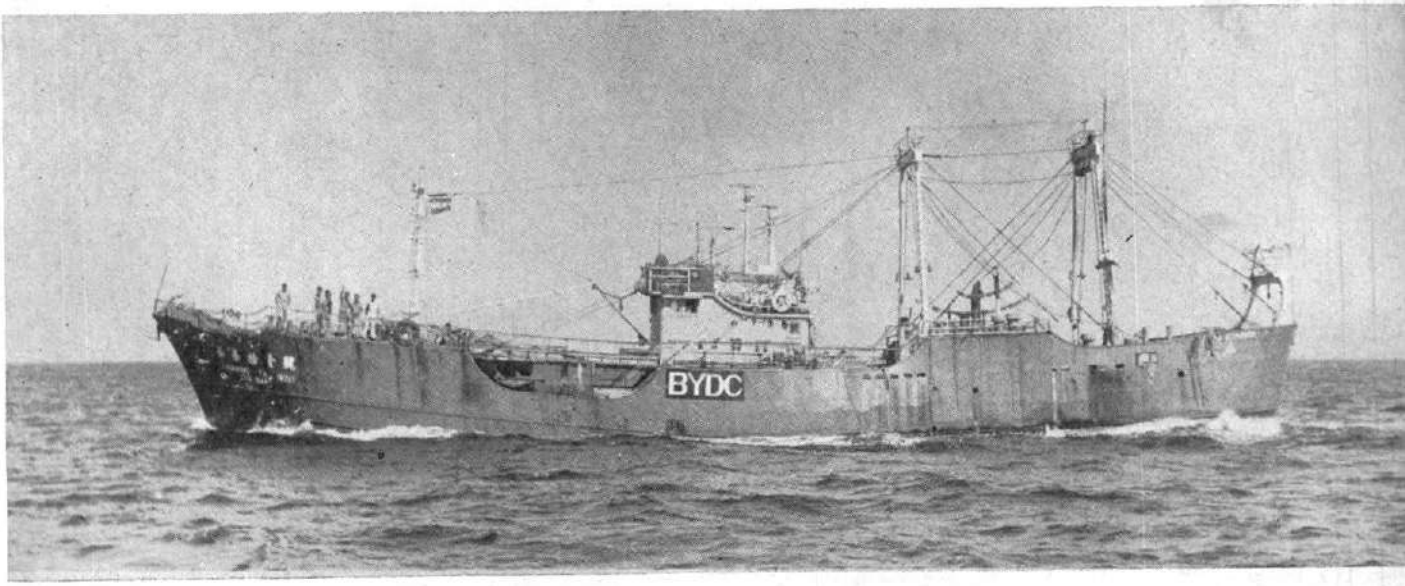
By

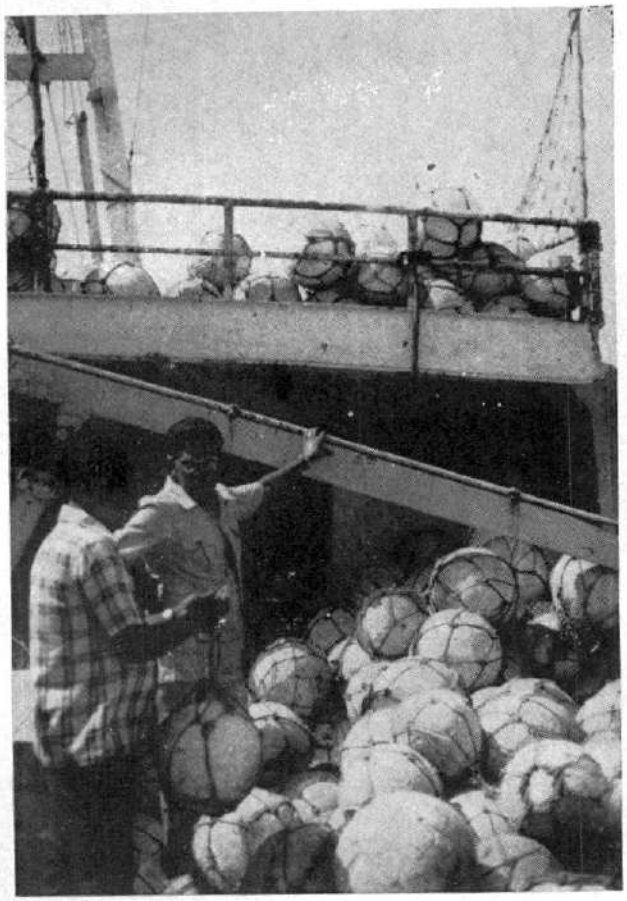
K. M. Joseph

JULY 1981

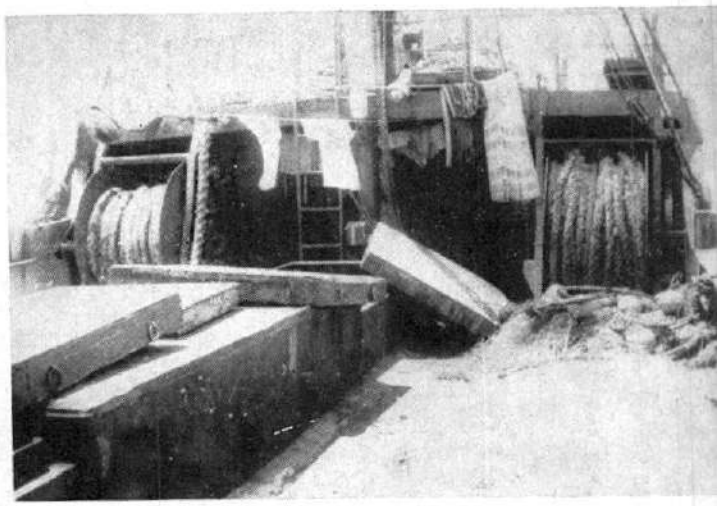
EXPLORATORY FISHERIES PROJECT
GOVT. OF INDIA
BOTAWALA CHAMBERS
SIR PHEROZSHAH MEHTA ROAD
B O M B A Y - 1.
I N D I A




Charang Tai No. 11-One of the Taiwanese stern trawlers



A view of the gill netter-Note the net hauler and thermocole floats



A view of the trawl winch loaded with trawl warp

C O N T E N T S

# INTRODUCTION

The Coast Guard has intercepted eight Taiwanese fishing vessels engaged in poaching along the North west coast of India between January and March 1981. A few of these vessels were intercepted by the Coast Guard on the basis of information passed on to it by the survey vessels of the Exploratory Fisheries Project operating from its Porbandar base. The author has had occasion to observe six of these vessels and to study the catch landed by them. Of these five are trawlers while the sixth is a gill netter/drifter. Of the trawlers, two are bull trawlers.

It is gathered that these vessels were not having any information on board about their fishing activity or their movement from place to place, catch etc. at the time of their interception. All the six vessels were apprehended from the coastal and offshore waters between Porbandar and Jakhau. The purpose of this paper is to disseminate whatever useful information on the catch etc. of these vessels which could be gathered to those who are concerned with or engaged in sea fishing or its promotion. In the absence of details of areas fished etc. the author has made an attempt to interpret the data on the basis of his personal knowledge of the fish resources of the Arabian sea and of the North west coast of India in particular, the results of operation of the exploratory fishing vessels along the west coast of India etc.

## VESSELS, FISHING GEAR AND MANNING

### Vessels

The general specifications of the vessels to the extent these could be gathered are furnished in Tables 1 and 2. As already stated due to the lack of relevant documents on board etc. the details given in some cases are nearest approximation.

| Name of vessel | Length OAL m | Beam m | Draught m | G.R.T. | B.H.P. | Fresh water (tonnes) | Fuel (tonnes) |
|---|---|---|---|---|---|---|---|
| 1. CHIA HUNG No.21 | 36 | 6.0 | 4.0 | 320 | 1100 | 15 | 160 |
| 2. CHIA HUNG No.22 | 36 | 6.0 | 4.0 | 320 | 1100 | 15 | 160 |
| 3. CHARANG TAI No.11 | 40 | 7.0 | 4.0 | 320 | 1250 | 18 | 160 |
| 4. SHANG TOONG No.1 | 40 | 7.0 | 4.0 | 320 | 1250 | 18 | 160 |
| 5. MENG YU No.1 | 30 | 6.0 | 3.0 | 204 | 600 | 15 | 90 |
| 6. TUNG LIEN No.1 | 36 | 6.0 | 3.0 | 251 | 550 | 17 | 90 |

TABLE .1. Major specifications of the six Taiwanese vessels

The make of the main engine in all cases is (NIGATA (Japanese). The vessels are provided with two auxiliary engines of suitable H.P. (Yanmar, 80-200 H.P.) depending on the size of the vessels and type of refrigeration

etc. The refrigerant is Ammonia in almost all cases. Four out of six vessels were fitted with Radar (Furuno) having range upto 80 nautical miles while all vessels had echo-sounders (Simrad/Furuno) and Radio telephones. The vessels are fitted with two Radio telephones, one of 200-250 and the other of 50 W output. The number of bunks provided for the crew are approximately 60% of the total number of crew on board.

| Name of the vessel | Type of stern | Type of fishing | No. of crew | Freezer tonnes/ day | Frozen storage (-25°C) cu.m. |
|---|---|---|---|---|---|
| | | | | Blast freezer | |
| 1.CHIA HUNG No.21 | Transom type with ramp | Bull trawling | 17 | 6 | 220 |
| 2.CHIA HUNG No.22 | -do- | -do- | 16 | 6 | 220 |
| 3.CHARANG TAI No.11 | -do- | Stern trawling | 17 | 8 | 250 |
| 4.SHANG TOONG No.1 | -do- | -do- | 18 | 8 | 250 |
| 5.MENG YU No.1 | Transom type | -do- | 15 | 6 | 180 |
| 6.TUNG LIEN No.1 | Cruise type | Drifting/ gill-netting | 16 | 4 | 180 |

TABLE .2. Type of outfitting, crew capacity etc. of Taiwanese vessels

From the foregoing it may be seen that these vessels are provided with only bare essential machinery and equipment required for the conduct of fishing, fish preservation and navigation. The main

design and construction criteria of these vessels appear to be to provide maximum storage capacity for fuel and fish. The simplicity of these vessels should serve as an eye opener to the Indian fishing industry/trawler building industry and others concerned with the promotion of deep sea fishing in our country.

Fishing gear and methods

It has not been possible to find out the exact size of the trawl nets due to various reasons. The nets were made of polyathelene and polypropylene twines of 3 to 5 mm dia. The foot rope is weighted with rubber discs of 12-16 cms dia made out of ordinary used automobile tyre. The trawl warp is of nylon combination rope of 20-25 cm dia. All the trawlers are provided with hydraulic split-two-drum trawl winches of very large size. The winches were located aft of the wheel house.

The gillnetter was using drift nets made of twisted polypropylene twine of less than 1.5 cm dia. The mesh size ranges from 12-16 cm (stretched). The foot rope is of 8 mm dia nylon rope and was weighted with small lead sinkers at an interval of about 30 cm. The float is made of thermocole and is of 30 cm dia. The vessel operates about 200-300 pieces of net, each of 100 m length and 20 m height. An hydraulic net hauler is used for hauling the net.

Manning and mode of operation

The vessels have three officers viz. Master, Engineer and Master Fisherman, besides other crew members. While the three officers are permanent employees, the crew are reported to be employed on contract basis for each cruise. They are understood to be paid a subsistance wage plus a share of the catch.

The crew are provided with dry ration. The fresh water provided does not appear to be enough even to meet drinking and cooking requirements for the normal voyage of 3 months. According to the information gathered, these vessels once they leave their port of registration in Taiwan, do not touch any other ports during their pre-planned fishing voyage of about 3 months duration. The hard working nature of crew and the condition under which they work viz., dry ration, rationed drinking water, 24 hours fishing operation, etc. for 3 months out at sea at a time, should also set examples to our crew on board deep sea fishing vessels.

## CATCH COMPOSITION

General observations on the species composition of the Fisheries, of North west coast

Since all the six vessels have been confiscated from the North west coast of India and since these vessels, as already discussed elsewhere in this paper, did not have information about the areas fished etc., recapitulation of the available information on

the species composition of the catch from the region may be useful in evaluating the catch landed by them. The Exploratory Fisheries Project has been surveying the demersal fisheries resources of this region since the fifties. The results of these surveys have indicated abundance of Elasmobranchs, Pomfrets, Sciaenids, Horse mackerel, Cephalopods, Sea bream, Ribbon fish, "Karkara", "Dagol", Barracuda etc. along the North west coast of India. Elasmobranchs which include Sharks, Rays and Skates are represented mainly by Scoliodon spp., Pristis spp., Rhinobatus spp., Rhynchobatus spp., Aetobatus spp., Dasyatis spp., etc. The main species constituting the group Sciaenids are "Ghol" - Pseudosciaena diacanthus, "Koth" - Otolithoides brunneus and "Dhoma" comprising all the small sized species of Sciaenids. There are two important species of Pomfrets, Silver Pomfret, Pampus argenteus and Black Pomfret, Parastromateus niger. The Ribbon fishes comprise Trichiurus lepturus, Eupleurogrammus muticus and Lepturacanthus savala whereas Eels are represented by Muraenosox talabonoides, M. Cinereus and Gymnothorax spp. Horse mackerel (Megalaspis cordyla), Sea bream (Argyrops spp.), "Karkara" (Pomadasys hasta), "Dagol" (Chorinemus spp.), Barracuda (Sphyraena spp.), Tuna like fishes (Euthynnus spp., Thunnus spp., Auxis thazard, Sarda orientialis), Cat fish (Tachysurus spp.), Seer fish (Scomberomorus spp.), "Karli" (Chirocentrus spp.), "Tam" (Lutjanus spp.) and Soles of the general Psettodes, Cynoglossus, Solea etc. are the other important species of fishes occurring in this region. This area is also well known for Cephalopods consisting mainly of Squids - Loligo spp. and Cuttle fish - Sepia spp. Among lobsters,

Rock lobster and Sand lobster are common, the former is represented by Panulirus polyphagus and latter by Thenus orientalis. Recent surveys also indicate the existence of a potentially rich fishery for Thread fin bream - Nemipterus spp. In addition to the above listed fish species, several other varieties of fishes, prawns, etc. are also caught in small quantities and are generally grouped under 'miscellaneous' category. While summarising the results of trawl fishing along North west coast of India, Joseph (1974) states that compared to the other parts of the Indian coast, the demersal fishery of the North west coast of India comprises relatively less number of species.

Catch composition of Matsya Nireekshani and Taiwanese trawlers

The Project is exploring the demersal fisheries resources along the North west coast by employing a number of vessels including Matsya Nireekshani a 40 m trawler from its Bombay, Veraval, Kandla/Porbandar bases since the fifties. The Taiwanese vessels were confiscated on different dates during January-March '81 as stated elsewhere. Since these vessels have an endurance of three months, catch data of the corresponding three months i.e. January, February and March and the preceding three months i.e. December, November and October '80 (in all six months from October '80 to March '81) of Matsya Nireekshani is analysed and presented along with the pooled data of all the five Taiwanese trawlers in Figs. 1 and 2. While the figures

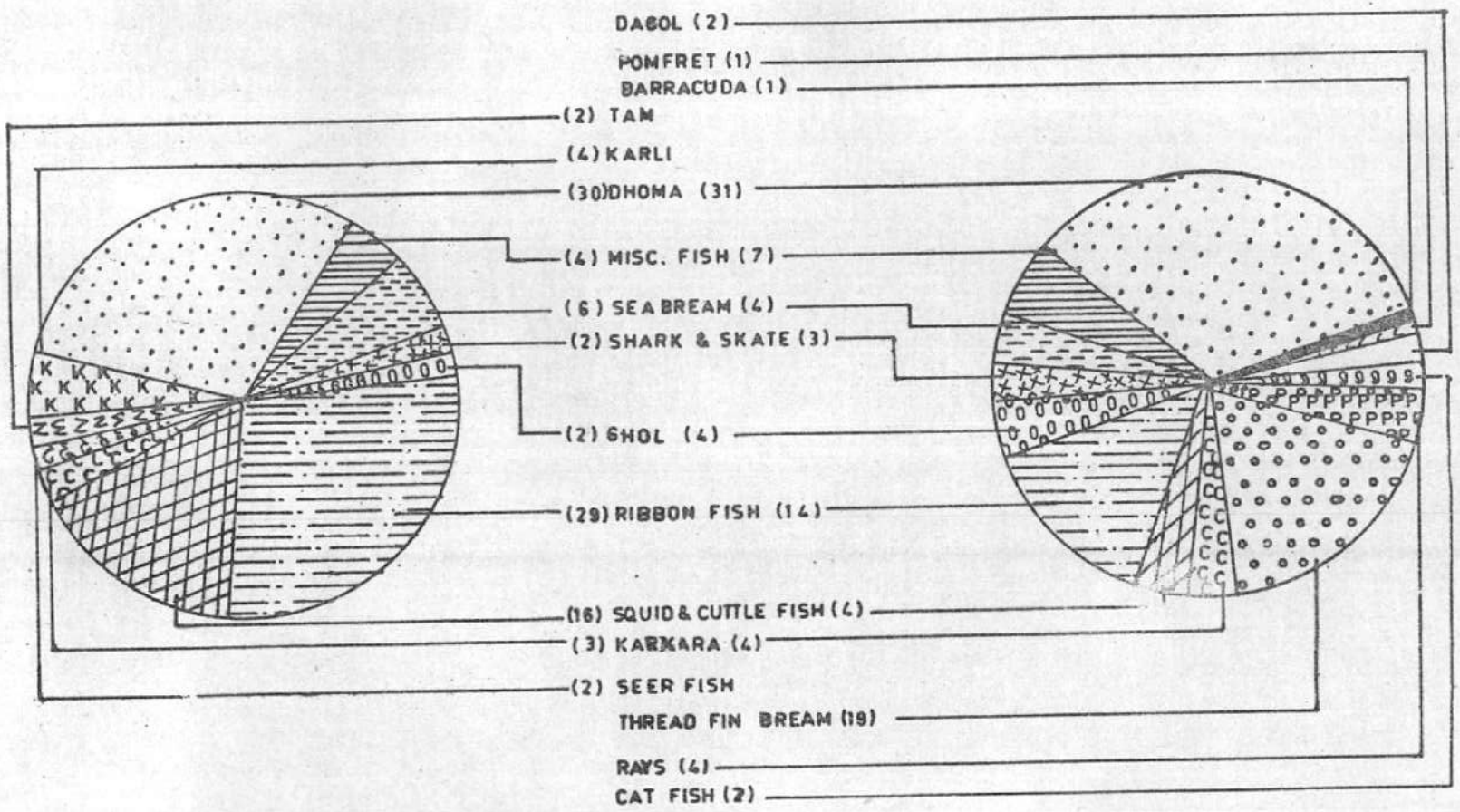



Fig. 1 SPECIES COMPOSITION OF THE CATCHES OF THE FIVE TAIWANESE TRAWLERS

Fig. 2 SPECIES COMPOSITION OF THE CATCHES LANDED BY MATSYA NIREEKSHANI FROM OCTOBER 80 TO MARCH 81

provide the percentage of important species/groups only, Annex-I furnishes the details of all the species landed including their quantities. The total catch of the five Taiwanese trawlers amounted to about 311 tonnes of fish whereas Matsya Nireekshani landed about 247 tonnes of fish during the six months referred to above. Table 3 shows the catch landed by each Taiwanese vessel.

| Sl. No. | Name of the vessel confiscated | Catch tonnes | Sale proceeds in '000 Rs. | Average price /kg Rs. | Type of fishing |
|---|---|---|---|---|---|
| 1. | CHIA HUNG No.21 | 102.5 | 82.2 | 0.80 | Bull trawling |
| 2. | CHIA HUNG No.22 | 94.7 | 67.8 | 0.72 | -do- |
| 3. | SHANG TOONG No.1 | 62.9 | 84.5 | 1.34 | Stern trawling |
| 4. | CHARANG TAI No.11 | 44.8 | 63.6 | 1.42 | -do- |
| 5. | MENG - YU No.1 | 5.8 | 11.1 | 1.93 | -do- |
| 6. | TUNG LIEN No.1 | 20.6 | 11.5 | 0.56 | Gill netting |

TABLE 3. Details of catch landed etc. of Taiwanese vessels

It can be seen from the Fig.1 that the catch composition of Matsya Nireekshani for the said period is "Dhoma" 31%, Threadfin bream 19%, Ribbon fish 14%, Sea bream 4%, Squids and Cuttle fish 4%, Cat fish 2%, Dagol 2%, "Karkara" 4%, "Ghol" 4%, Pomfrets 1%, Rays 4% and Sharks and Skates 3%. The catches of the Taiwanese trawlers (Fig. 2) comprised "Dhoma" 30%, Sea bream 6%, Ribbon fish 29%, Squids and Cuttle fish 16%, "Karkara" 3%, "Tam" 2%, "Ghol" 2%, Sharks and Skates 2%, Karli 4% and Seer fish 2%.

On comparing the catches of Matsya Nireekshani with those of Taiwanese vessels, it can be seen that the percentage composition of "Dhoma", Sea bream, "Karkara", Sharks and Skates is more or less the same whereas there are some variations in the percentage composition of Squids and Cuttle fish, Ribbon fish, Pomfret, Cat fish, "Karli", "Dagol" and Rays. It may be seen that the percentage of Cat fish, "Ghol", "Dagol" and Pomfrets were relatively more in the catches of Matsya Nireekshani while those of Ribbon fish (29%), "Karli", Squids and Cuttle fish (16%) and Seer fish were more in the catches of Taiwanese vessels. It may be noted that 34% of M.T.Murena's bottom trawl catch from the North west coast consisted of Ribbon fish (Swaminath et al, 1978). Threadfin bream which is found in relatively deeper waters was not found in the catches of Taiwanese vessels. There is, however, striking similarity between the catch composition of Taiwanese vessels and that of Matsya Nireekshani.

Catch composition - different type of vessels

The percentage composition of catches obtained by different types of vessels are separately studied so as to compare and examine its variations. The percentage composition of the important varieties in respect of Matsya Nireekshani, Taiwanese stern and bull trawlers are furnished in Fig. 3.

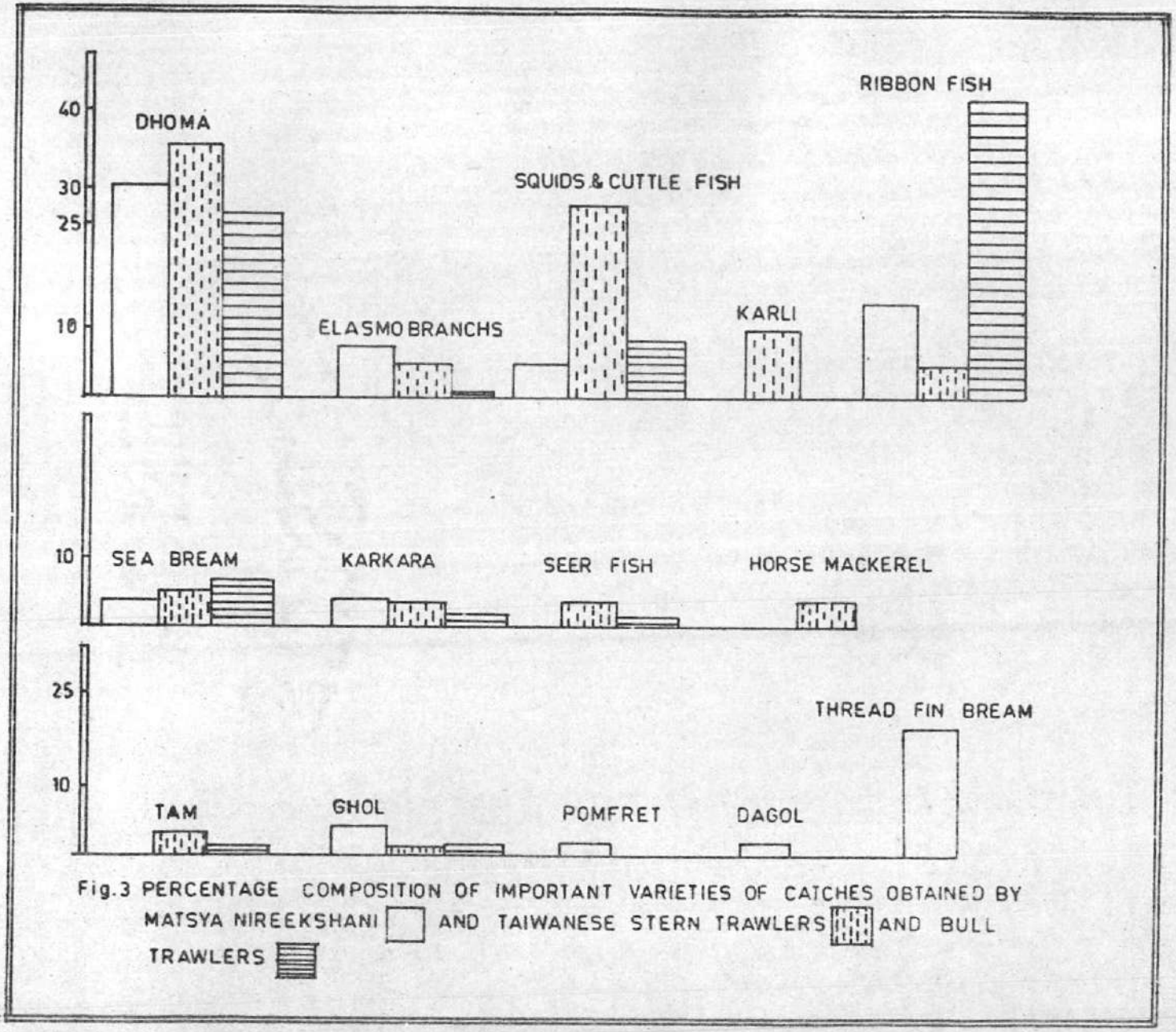



Fig.3 PERCENTAGE COMPOSITION OF IMPORTANT VARIETIES OF CATCHES OBTAINED BY MATSYA NIREEKSHANI ☐ AND TAIWANESE STERN TRAWLERS ▨ AND BULL TRAWLERS ▤

Stern trawlers

The stern trawlers viz., Shang Toong No.1 Charang Tai No.11 and Meng Yu No.1 landed a total of about 113 tonnes of fish. These catches are analysed for their species composition so as to compare the same with the available data in this regard pertaining to North west coast of India. The percentage composition of important species present in the catches of these vessels are depicted in Fig.4, whereas complete details including quantity of various species landed by them are given in Annex-2. It can be noted from the figure and the annexure that "Dhoma" (35%), Squids and Cuttle fish (28%) and "Karli" (10%) together accounts for 73% of the total catch. Other groups, viz. Sharks and Skates, Rays, Ribbon fish, Sea bream, "Karkara", "Ghol", Horse mackerel, "Tam" and Seer fish are present in percentages varying between 1 to 4. Other species were represented by less than one percent. There is close similarity (Fig. 3) between the percentage composition of "Karkara", Sea bream, Shark and Skates and "Dhoma" of Matsya Nireekshani and that of Taiwanese stern trawlers. Taiwanese stern trawlers had relatively high percentage of Squid and Cuttle fish, "Karli", Horse mackerel and seer fish while Matsya Nireekshani had higher percentage of Ribbon fish, Threadfin bream, Pomfret, "Ghol" etc. The absence of Threadfin bream in the catches of Taiwanese trawlers is significant. Joseph (op.cit.) while giving region-wise catch composition from the North west coast of India, based on the results of the operation of a number of stern trawlers,

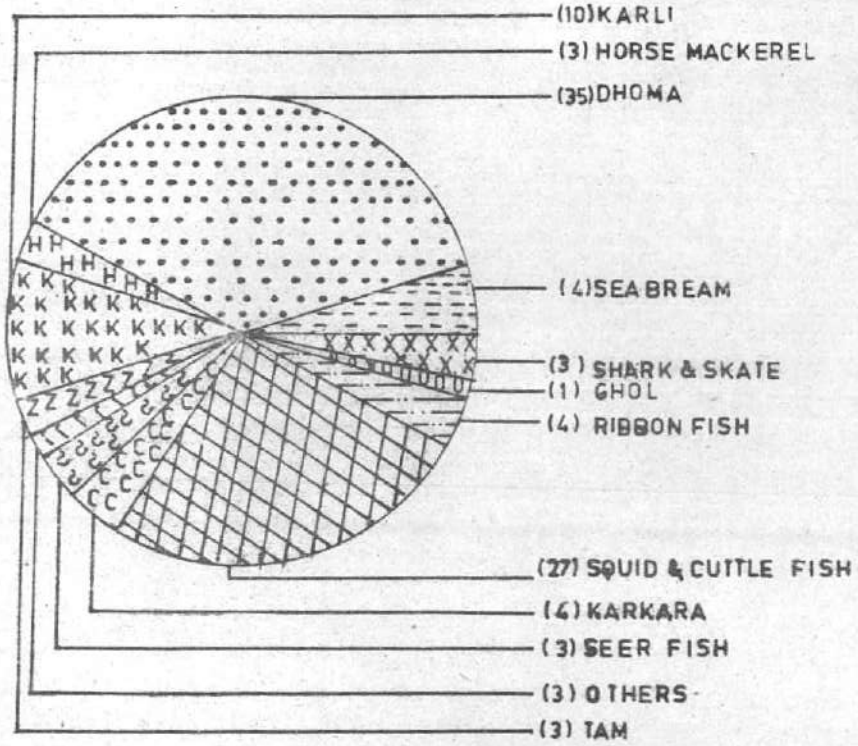



FIG: 4 SPECIES COMPOSITION OF THE THREE TAIWANESE STERN TRAWLERS.

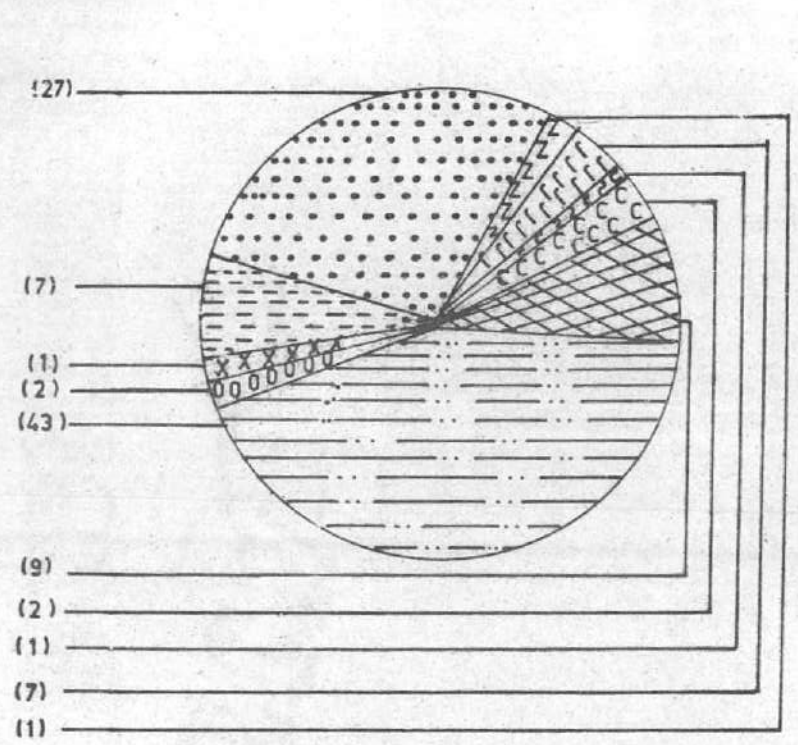



FIG: 5 SPECIES COMPOSITION OF THE TAIWANESE BULL TRAWLERS.

remarked that "Dhoma" formed 25 to 50% of the total catch in all the regions except Dawaraka. He further points out that the occurrence of all other species is less than 10%, barring a few categories of fish. This is in close agreement with the catch composition worked out in respect of Taiwanese single boat trawling.

Bull trawlers

The total catch of the two bull trawlers viz., Chia Hung No.21 and Chia Hung No.22 amounted to 197 tonnes. Species-wise catch composition of important varieties landed by these vessels is furnished in Fig.5. The details of the percentage composition of all species are given in Annex 2. It can be seen from the figure that ribbon fish and "Dhoma" together accounts for 70 percent of the catch. Ribbon fish contributed to 43% of the catches while "Dhoma" accounted for about 27%. The percentage composition of Squids and Cuttle fish (9%) and Sea bream (7%) is significant, whereas rest of the varieties were found in varying quantities of less than 3 percent. The percentage composition of "Dhoma", Squid and Cuttle fish etc. bears close similarity to that of Matsya Nireekshani (Fig. 3). Ribbon fish constituted 34% of the total bottom trawl catch of M.T.Murena from the region as already stated elsewhere in this paper.

A comparison of the catch composition of stern trawlers with that of bull trawlers (Figs. 3, 4 & 5) reveals that percentage composition of "Dhoma", "Karli"

and Squid and Cuttle fish is high in the case of single stern trawlers. On the contrary, the pair trawlers have recorded significantly high percentage of Ribbon fish(43%).

Two of the Project vessels, M.T. Ashok and M.T.Pratap charted the fishing grounds by bull trawling in 1953-'55 and the highest average catch per hour recorded is 703 kg. New India Fisheries Company carried out bull-trawling on commercial lines in Bombay-Saurashtra waters during 1957-'62. Results of these operations show the catch composition as "Ghol" (Pseudosciaena diacanthus) 5.5%, "Koth" (Otolithoides brunneus) 1.36%, "Dhoma" 18.82%, "Dara" (Polydactylus indicus) 2.53%, "Shende" (Polynemus heptadactylus) 3.26%, "Karkara" (Pomadasys hasta) 8.44%, "Wam" (Muraenosox talabonides) 12.73%, Cat fish 7.96%, "Kati" (Ilisha filigera) 3.33%, Pomfrets 1.39%, Prawns 0.6%, Elasmobranchs 14.30% and miscellaneous fishes 20.18% (Anon, 1970). There appears to be very little similarity between the percentage composition of catches of the Taiwanese bull trawlers and the New India Fisheries bull trawlers, although basically most of the species remain the same. The high percentage of ribbon fish in the catches of Taiwanese vessels have made the percentage composition of most of the species non-comparable.

Drifter

The Taiwanese drifter, Tung Lien No.1 landed a total catch of 20,634 kg. Major constituents of the catch was tuna and tuna like fishes 10,483 kg and horse mackerel 9,121 kg. An analysis was carried out so as to know the percentage composition of different species

contributing to the catch. The results of this analysis are presented in Table 4.

| Species | Catch kg | Percentage |
|---|---|---|
| Tuna and tuna like fishes | 10,483 | 50.8 |
| Horse mackerel | 9,121 | 44.2 |
| Shark | 418 | 2.0 |
| Skates | 317 | 1.7 |
| Rays | 200 | 0.9 |
| Dhoma | 65 | 0.4 |

TABLE 4. Percentage composition of catch landed by Gill netter

The table indicates that the catch was mainly constituted by tuna and tuna like fishes (50.8%) and Horse mackerel (44.2%). Other groups viz. Sharks, Skates, Rays and "Dhoma" together contributed to only 5% of the total catch. M.T.Murena during her second cruise (Dwivedi et al 1977) located a very productive area (22-67) for horse mackerel in Dwaraka region while attempting midwater trawling. Horse mackerel was the dominant variety constituting about 72% of the total catch from this region. These findings are in concurrence with the high percentage of this variety recorded in the drift net catches. The absence of Seer fish, Pomfret, etc. in the catch is rather surprising.

## CONCLUSIONS

1. From the data presented it may be seen that there is absolutely no doubt about the fact that the catches landed by the confiscated Taiwanese vessels, were caught from Saurashtra waters. Almost all the species landed by the vessels are not only identical to the species landed by the Exploratory Fisheries Project vessels and some of the commercial fishing vessels, but the species-wise composition of a number of species are closely comparable. The contribution of "Dhoma" for instance was about 31, 35 and 27% respectively to the catches of Matsya Nireekshani, the Taiwanese stern trawlers and the bull trawlers. The Ribbon fish catch composition of Matsya Nireekshani (14%), M.T.Murena (34%) and the Taiwanese trawlers (29%) are also comparable having regard to the type and mode of operation of these foreign commercial fishing vessels and the exploratory fishing vessels. The similarity between the percentage composition of "Ghol", "Karkara", Shark and Skate, Sea bream, etc. in the catches of Taiwanese trawlers and the catches of Matsya Nireekshani is also noteworthy. The difference in the percentage composition of some species such as Squid and Cuttle fish, "Karli", etc. may be due to the mode of operation of the poaching vessels. It stands to reason to assume that these vessels were fishing in relatively deeper and distant waters during day time and in shallow waters during night time so as to avoid detection by our authorities. The occurrence of Squid and Cuttle fish in sizeable quantities in depth range 50-90 m in this region, is evident from the recent observations of Matsya Nireekshani (Anon, 1980). Matsya Nireekshani

has recorded a catch per hour of 50-125 kg/hr of Squid and Cuttle fish from areas 22-67, 22-68, 22-69, etc. Having regard to these facts it may safely be concluded that the species encountered by the confiscated Taiwanese vessels are representative of typical demersal fishes occurring along the Saurashtra coast. It has been reported that in 8 sets of bottom trawling carried out during October-January 1977 on the continental shelf of Pakistan, only two genera of Sciaenids, Otolithus ruber and Argyrosomus spp. were present and the total number of individuals of these species caught in the operations were only 18 (Yamanaka et al, 1977). This lends further evidence to the conclusion drawn here that the species caught by all these Taiwanese poaching vessels and their percentage composition are representative of the demersal fish fauna of the North west coast of India.

2. Informed sources (Anon. 1981) place the catch taken by the Taiwanese vessels from the West coast of India at 18,000 tonnes in 1978. It will be interesting to note that about 42 percent of the 1978 Taiwanese fish landing of about 8,85,000 tonnes was caught from deep sea and distant waters mainly by trawlers of 50 G.R.T. and above (Anon. 1979 and 1980). With a land mass of only about 35,600 sq.km and a population of 17 million, fish provides not only livelihood for about 29% of Taiwanese, but also earns substantial amount of foreign exchange for it. Fish is the main stay of Taiwanese diet and the per capita consumption of fish is about 35 kg. It has about 2000 fishing vessels of 50 G.R.T. and above. Under the circumstances, with very little continental shelf of its own, Taiwan and Taiwanese vessels have to look for fishing grounds elsewhere.

3. The absence of Threadfin bream (Nemipterus spp.) in the catches of both the bull trawlers and the stern trawlers is rather significant in the light of the results obtained by the exploratory fishing vessels of the Project during recent times. It has been observed that one of the main groups of demersal fish occurring between 90-200 m depth, is Threadfin bream. In fact catch rate upto 122 kg per hour of this group was obtained by the vessel Matsya Nireekshani from 90-150 m depth in the region. The other predominant group available in deeper waters, namely, perch like fishes (Sweet lips) belonging to the genus Gaterin was also not found in the catches of Taiwanese trawlers. This perhaps indicates that the Taiwanese trawlers were carrying out fishing within 90 m depth and lends further support to the preliminary observations of the Project that the demersal fish resources in deeper waters of the North west coast may not be as rich as it is in the coastal waters.

4. An interesting observation which emerges from the species composition of the Taiwanese trawlers is the presence of comparatively low percentages of "Wam", "Koth", "Shende", "Ghol", "Karkara" and "Dara" which have been found to occur in substantial quantities in the catches of the bull trawlers of New India Fisheries etc. (Anon. op.cit., Jayaraman et al 1959 and Rao 1967). This may be due to either one or both of the following reasons. Firstly it can be due to the fact that the Taiwanese vessels were fishing mainly in the Kutch-Jakhau region whereas the occurrence of "Wam", "Dara", "Karkara", etc. are reported to be more in Veraval-Dwaraka region.

The question whether there is a decline in the catch of these groups of fish also deserves examination. There appears to be no conclusive evidence to show that there is decline in any group except in the case of "Dara". The fact that Matsya Nireekshani's catches consisted of 4% of "Ghol" deserves special mention. It is also remarkable that the demersal fish resources of the Saurashtra region as evidenced by the surveys conducted by the 17.5 m trawlers of the Project consisted of 3 and 6 percent respectively of "Wam" and "Ghol" (Joseph, 1980). It may therefore be assumed that relatively low incidence of these groups in the Taiwanese trawler catches may be due to the difference in the fishing ground in the same region.

5. Another interesting finding is the high incidence of Cuttle fish and Squid (28%) in the catches of Taiwanese stern trawlers. This also lends further support to the preliminary findings of the Project that there exists a potentially rich resource of Cephalopods along the North west coast (Anon, op.cit.).

6. It is worthwhile to examine why the Taiwanese fishing vessels and fishing vessels of other foreign countries continue to poach in this region. Besides the remoteness of the area, the relatively low level of fishing activity in the region may be an important reason. However by far, the most important reason has to be the abundance of the fisheries resources itself. It may be recalled in this context that Saurashtra waters is one of the most explored region along the Indian waters by the Exploratory

Fisheries Project etc. Systematic demersal fisheries survey was started in the year 1949, by Govt.of India vessels, M.T.Ashok and M.T.Pratap by otter trawling and bull trawling. These efforts were further strengthened by the Japanese trawler Taiyo Maru No.17 and two pairs of bull trawlers belonging to the New India Fisheries Company viz. Arnala-Paj and Satpati - Pilotan. These exploratory and commercial fishing operations have given very encouraging results.

M.T.Ashok and M.T.Pratap during bull trawling obtained an average catch of about 700 kg per hour. Subsequent bull trawling operations by the commercial vessels could record an average catch rate upto 900 kg/hr (1957-'62). Highest average catch rate to the tune of 947 kg/hr was obtained from Kutch region, followed by Porbandar (700 kg/hr), Cambay (667 kg/hr), Dwaraka(646 kg/hr) and Veraval (604 kg/hr). Recent bottom trawling survey by M.T.Murena has also shown promising catch rates from many of the areas fished by the vessel. The areas 22-67, 22-68, etc., areas believed to have been fished by Taiwanese vessels, have yielded catch rates of 500 kg/hr and more both during bottom trawling and mid water trawling by M.T.Murena (Dwivedi, et al and Swaminath et al, op.cit.). Thus single boat trawling as well as pair boat trawling over the years have proved that there are very rich fishing grounds all along the North-west coast of India. While assessing the regional abundance of catches in Bombay-Saurashtra waters Jayaraman et al (op.cit.) have stated that the Dwaraka region was the richest for 'all fish' and also for quality fishes. Later Rao (op.cit.) on analysing the data collected by the New India Fisheries

vessels claimed that Kutch region was better than any other region in respect of catch rates in general and quality fishes in particular.

Recent exploratory fishing operations of M.T.Murena, Matsya Nireekshani, etc. as discussed elsewhere in this paper, also indicate the presence of rich demersal/midwater fish resources in the region. The surveys conducted by the vessel Matsya Nireekshani during the last two years indicates the possibility of obtaining 12-15 tonnes of catch per day by bottom trawling if carried out on commercial footing. While assessing the demersal fish resources of Indian waters recently [illegible] Joseph (op.cit) has estimated potential yield for the North west coast within 40 fm depth at about 6,98,000 tonnes. The present yield from this region is about 2,82,000 tonnes (Anon 1980) which shows that the current level of exploitation of this resource is just about 40%. This clearly indicates further scope for increasing the production by many fold from the region. Inspite of the wealth of information made available on the abundance of the resources, their seasonal variations, location of prospective fishing grounds etc., it may be noted that our efforts to exploit the demersal fishery resources of this region are still far less than required. The fishing industry has therefore to gear up itself to exploit these self replenishing, but perishable resources on a rational basis.

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ANNEX - 1

Percentage composition of the catches, landed by Matsya Nireekshani (October '80-March '81) and the Taiwanese Trawlers

| Vessel / Species | Taiwanese trawlers | | Matsya Nireekshani | |
|---|---|---|---|---|
| | Quantity (kg) | Percentage | Quantity (kg) | Percentage |
| Dhoma | 93,094 | 30.0 | 76,573 | 31.0 |
| Ribbon fish | 90,533 | 29.1 | 34,581 | 14.0 |
| Squid and cuttle fish | 48,540 | 15.6 | 10,233 | 4.1 |
| Sea bream | 18,679 | 6.0 | 9,504 | 3.8 |
| Karli | 11,634 | 3.7 | - | - |
| Karkara | 8,921 | 2.9 | 10,272 | 4.2 |
| Ghol | 5,981 | 1.9 | 9,934 | 4.0 |
| Shark and skate | 5,580 | 1.8 | 7,904 | 3.2 |
| Seer fish | 5,569 | 1.8 | 71 | 0.0 |
| Tom | 5,158 | 1.7 | 307 | 0.1 |
| Horse mackerel | 2,876 | 0.9 | - | - |
| Frigate mackerel | 1,928 | 0.6 | 107 | 0.0 |
| Rays | 1,476 | 0.5 | 10,374 | 4.2 |
| Caranx | 1,483 | 0.5 | 611 | 0.2 |
| Pomfret | 799 | 0.3 | 3,096 | 1.3 |
| Wam | 573 | 0.2 | 363 | 0.1 |
| Other perches | 270 | 0.1 | 604 | 0.2 |
| Sole | 253 | 0.1 | - | - |
| Cat fish | 75 | 0.0 | 4,578 | 1.9 |
| Sand lobster | 16 | 0.0 | - | - |
| Dagol | 124 | 0.0 | 4,553 | 1.8 |
| Koth | - | - | 1,119 | 0.5 |
| Barracuda | - | - | 2,292 | 0.9 |
| Kati | - | - | 1,324 | 0.5 |
| Threadfin bream | - | - | 45,809 | 18.5 |
| Miscellaneous fish | 7,156 | 2.3 | 12,810 | 5.5 |
| Total/Average | 310,718 | 100.0 | 247,009 | 100.0 |

ANNEX. 2

Percentage composition of the catches of the Taiwanese Stern and Bull trawlers

| Vessel / Species | Stern trawlers Quantity (kg) | Stern trawlers Percentage | Bull trawlers Quantity (kg) | Bull trawlers Percentage |
|---|---|---|---|---|
| Dhoma | 40,155 | 35.4 | 52,939 | 26.8 |
| Squids and cuttle fish | 31,296 | 27.6 | 17,655 | 9.0 |
| Karli | 10,954 | 9.7 | 680 | 0.3 |
| Ribbon fish | 4,997 | 4.4 | 85,536 | 43.4 |
| Sea bream | 4,941 | 4.4 | 13,737 | 7.0 |
| Karkara | 4,239 | 3.7 | 4,682 | 2.4 |
| Seer fish | 3,502 | 3.1 | 2,067 | 1.0 |
| Tam | 2,855 | 2.5 | 2,303 | 1.2 |
| Horse mackerel | 2,876 | 2.5 | - | - |
| Shark | 1,766 | 1.6 | 748 | 0.4 |
| Rays | 1,476 | 1.3 | - | - |
| Ghol | 1,402 | 1.2 | 4,579 | 2.3 |
| Skate | 1,189 | 1.0 | 1,877 | 1.0 |
| Wam | 573 | 0.5 | - | - |
| Sole | 358 | 0.3 | 215 | 0.1 |
| Caranx | 312 | 0.3 | 1,171 | 0.6 |
| Pomfret | 218 | 0.2 | 581 | 0.3 |
| Other perches | 103 | 0.1 | 270 | 0.1 |
| Kati | 78 | 0.1 | - | - |
| Dagol | 124 | 0.1 | - | - |
| Barracuda | 45 | - | - | - |
| Rock lobster | 4 | - | - | - |
| Frigate mackerel | - | - | 1,928 | 1.0 |
| Cat fish | - | - | 75 | 0.0 |
| Miscellaneous fish | - | - | 6,209 | 3.1 |
| Total/Average: | 113,463 | 100.0 | 197,252 | 100.0 |