# A SITUATIONER OF ILIGAN BAY FISHERIES*

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Iligan Bay is one of the six bays of Northern Mindanao (Fig. 1). Like so many bays in the Philippines, it is important for a number of economic, often competing, uses. The bay is identified as a good fishing ground as it is replete with finfishes, crustaceans, mollusks and other fishery aquatic product. It is the main source of livelihood for many municipal fishermen living in fishing communities along its coast. It also supports profitable but limited commercial fishing.

The significance of Iligan Bay in the commerce and industry of Iligan City and its vicinities is evident in the water transportation. Established pier facilities in several points around the bay serve as home ports of fishing boats and inter-island passenger and cargo boats. Vessels from foreign countries also dock on these piers either to unload cargoes or to carry exported Philippine products.

But the role of high ecological importance and with which Iligan Bay will eventually be burdened is that of being the natural receiving water for suspended solids, waste water and other effluents coming from various economic activities in the coastal and nearby upland areas.

Past investigations on the bay's fisheries were mostly centered on wider concerns, productivity, and development. Not a single research program was pursued that focused on the assessment of the marine resources and ecology of Iligan fisheries. Hence, current fisheries data on Iligan Bay are fragmented and sporadic.

This paper is an attempt to present information, albeit scattered and scanty, about Iligan Bay being a fishery resource and an ecological system.

## GEOGRAPHICAL SETTING

Iligan Bay (Fig. 2) encompasses that body of water lying between 123° 43' to 124° 25' east longitude and between 8° 10' and 8°35' north latitude. It is bounded on the west by Misamis Occidental; on the south by Iligan City and three towns of Lanao del Norte; on the east by the western municipalities of Misamis Oriental; on the southwest by an imaginary straight line drawn from Clarin River, Misamis Occidental to Maigo, Lanao del Norte; and enclosed on the North by an imaginary straight line drawn from Punta Sulawan of Laguindingan, Misamis Oriental to Plaridel, Misamis Occidental. This northern imaginary line sets Iligan Bay apart from the bigger body of marine waters of Mindanao Sea. Actually, no official document is available which provides for a legal technical description of the bay's outlying boundary. But researchers who conducted biological investigation in the bay have made use of this imaginary line in their study.

The mouth of the bay is about 80 km. With the 182 km of coastline outlining its two sides from Laguindigan to Maigo and from Clarin to Plaridel, the bay has a total estimated area of 2,000 km$^2$ (Tiin, 1991). The bay's entire watershed extends through the mountains of Misamis Oriental, Lanao del Norte and Misamis Occidental: From these highlands, 29 rivers and numerous creeks carry freshwater into the bay (Table 1).

The configuration of Iligan Bay provides easy entry and exit for open sea water, but, as a body of water, it is hardly an estuary probably because it is not sufficiently infused with freshwater from its numerous tributaries. The waters lapping the beaches of Iligan Bay is unmistakably salty except in coastal areas very close to the mouth of the rivers and especially after heavy precipitation.

## FISHERIES SECTOR

The fisheries sector of Iligan Bay consists of marine fisheries, aquaculture and inland fisheries.

## Marine Fisheries

Fishing operations in the marine waters of Iligan Bay employ 23 gear types (Table 2). Seven of them are considered major gears, namely: drive-in-set, multiple hook and line, drift gill net. hook and line, beach seine, simple hook and
line and squid jig.

The principal valuable fishery resources of Iligan Bay are the 270 species of finfishes. In addition to 9 species of dogfish sharks and other deep-water associates, the bay's stocks also include crustaceans (13 species), molluscs (15 species), cephalopods (4 species), macrobenthic algae (97 species), corals (204 species), and mangrove trees (10 species).

Finfish. A ten-month survey of the coastal waters of Naawan and Manticao (Dejarme, 1974) provides the earliest documented account on Naawan coastal finfish resource and one of the few for Iligan Bay. By using nylon gill net or fishing, the survey recorded a total of 157 fishes: 103 fishes were identified down to the species level; 15 were classified according to their family and order categories; and 35 species were known only by their local common names. Four more species were reported as unidentified (Table 3). The daily catch per operation of the gear is estimated at 1.5 kg.

A study conducted by Camaro (1983) reported that 175 species of finfishes were caught from the fishing ground of Iligan Bay between the period of August 1982 to May 1983. The study covered 58 municipal landing sites within the costal stretch from Gitagum to Plaridel. The daily mean weight of landed fish is estimated at 84.89 kg. The study also found that more than half (54.8 percent) of the landed catch was recorded in five fish landing centers, namely: San Vicente, Bajo, Oroquieta City; Tubigan, Initao, Kalangahan, Lugait, Cagayanon, Jimenez; and Initao Poblacion. Of the five landing centers, Oroquieta and Jimenez are the most productive; their combined catch record alone was 28.2 per cent of the total catch.

This high productivity of the Misamis Occidental fishing ground was again reflected in the 1985 fishery report (Table 3). During the year

the municipal fish production totalled to 1,661,684 kg consisting mostly of frigate tuna and other nine major species. Records on commercial fishing for the same year disclosed a total catch of 1,542,050 kg. for the six dominant species. BFAR Statistics (BFAR, undated) catch record for several gear types in Initao Landing Center reported 58 species of finfishes from 1984-1987. These species belong to 23 families (Table 5). The catch data from selected gears are presented in Table 6. The flying fish of the family Exocoetidae, which is considered among the major species, occur throughout the year.

The significance of small pelagic resources in Region X including Iligan Bay was reported by Yacapin (1988) for 1987. The pelagic fish production in the region was reported erratic but marked decrease was noted in 1980 and 1987. This was generally attributed to weather conditions and decreasing and increasing number of boats undertaking fishing operations in the Region. Tables 7 and 8 present the data on small pelagic landings.

In a stock assessment of Iligan Bay sardines, Caseres (1990) recorded four species from the landing sites on Ozamiz City, Misamis Occidental and Maputi, Naawan from 1987 to 1990. The species, caught by four fishing gears (Table 9), are identified as follows: *Dussumieria acuta, Sardinella negricaudata, S. melamura and S. gibbosa.* It was determined from the landed catch that drift gill net is the most effective gear for sardine fishing in Ozamiz and encircling net in Maputi. Sardines are abundant year-round in both fishing areas but the peak season is February for Ozamiz and July for Naawan.

The 1990 catch record for Initao Landing site was obtained; it indicated a particular composition of dominant species which was similar to the 1987 record. A total of 85,098.72 kg of fish was registered for the year. The number of fishing operations of selected gears and monthly volume of catch landed by 1,344 motorized ad non-motorized municipal fishing bancas are given in Table 10.

Fish production in the Lanao del Norte side of the Bay is not as impressive. Plaza (1990) listed down the dominant species of finfishes caught in Lanao del Norte and estimated the volume per municipal landing

per day at 1,048 kg. The catch composition of 1990 (Table 11) showed the dominance of 14 species of finfishes, four species of crustaceans and one species of squid. The estimated average catch per gear ranged from 1.5 kg to 20 kg. The most effective gear type is the "new look" (Table 12).

**Other Fishery Resources.** The earliest report of MSU Naawan about Iligan Bay's coastal finfish resources is provided by Dominisac and Llobrera (1974) in their study on milkfish or bangus fry. There is a bangus fry fishery in Naawan and in some other parts of the bay (Fig. 4). The 1992 records showed that May registered the highest fry collection. The occurrences of bangus fry were usually observed in two seasons; the first begins in April with its peak in May and ends in July; the second appearance starts in September and ends in December. The fries are abundant at spring tides of full moon and new moon and after precipitation.

Dogfish sharks fishery in Iligan Bay was studied in 1985-1986. Based on deep sea catches of day and night types of bottom-set long line gears, nine species of dogfish were identified (Uy, 1985). Dogfish sharks exhibit a 2:1 female to male ratio. Eleven species of fish associates were also recorded. Dogfish sharks are fished for the export value of liver oil and fins of medium size dogfish shark.

A total of 204 species of reef-forming corals (Fig. 5) belonging of 46 genera was classified in Iligan Bay (Mendoza et al, 1985). The reef-forming corals are dominated by massive porites, ramose porites, massive *Favia* and *Galaxea.*. Associate organisms of commercial value include fifteen species of shellfishes, 5 echinoderms species and 3 species of macroalgae. Observed perturbation that are adversely affecting coral communities include coral and shell collection, blast fishing with cyanide and rotenone, anchor damage and *Acanthaster plancii* infestation. The major causes of coral destruction in the bay are suspected to be heavy siltation resulting from excessive deforestation, agriculture malpractice, quarrying, and land-based structural development.

Macrobenthic algae abound in Iligan Bay. Tiin (1981) reported 98 species from the sampling sites off Kauswagan, Linamon, and Dalipuga of Lanao del Norte and Naawan, Sulawan and Alubijid of Misamis Oriental

(Fig. 6). In another sampling site, Apao (1983) reported 56 macrophytes (Fig. 7) but the species composition is similar to the one reported by Tiin (1981). A number of Sargassum species are found in the Bay (Fig. 8). They are being harvested by some coastal residents and sold in dried form to a local feed mill where they are used as a raw materials for livestock feed production (Ortega, 1981).

The scarce mangrove resource of Iligan Bay is depleted but the visual census of existing but patchy mangrove vegetation in the Bay (Fig. 9) showed that it still consists of 10 mangrove tree species.

*Modiolus metcalfei* is a resource in Misamis Occidental that forms mats within an area of the littoral zone of Danlugan, Lopez Jaena. In Tubajon, Laguindingan, another bivalve of economic importance is found and studied. The species, *Codakia tigerina*, is gathered for the Cagayan de Oro market (Jimenez et al., 1985).

Giant mantis shrimp, *Lysiosquilla maculata* inhabit the littoral zone in Polo Point, Plaridel, Misamis Occidental (Angsingco, 1985). A preliminary survey result showed that the giant mantis shrimp gave an aggregated or clumped type of distribution. The scarce density of the shrimp gave a density estimate of 3.56
individual per ha.

## Aquaculture

*Production of Prawn Fry.* The coastal water of Iligan Bay is proven to be suitable for use in the production of Sugpo fry(*Penaeus monodon)* in captivity. To date, a total of 17 commercial hatcheries (Fig. 10) are constructed along the coast of Iligan Bay (Table 13). All hatcheries (except one in Initao) are continuously being operated to produce sugpo fry for stocking in commercial fishponds. An estimated 6.8 million to 12.05 million sugpo fry are produced per production cycle or an annual production of 61.2 million to 108.45 million fry at 7-9 hatchery operations per year. The production is expected to generate P 13.5M to P 23.86M in gross sales. A sugpo hatchery profile is presented in Table 14.

The different aquaculture activities for marketable production of culturable species of aquatic plants and animals are shown in Fig. 11.

*Grow-out Ponds.* The principal culture species in the brackishwater fishponds of Iligan Bay are milkfish, sugpo, and crabs. Except for the MSU fishponds of MSU at Naawan, most of the grow-out ponds are located in Lanao del Norte and Misamis Occidental. Table 15 lists the names of fishpond owners in Misamis Occidental. The total number of hectares of brackishwater fishpond in Misamis Occidental is 1,787.5 ha.(Table 16). But of this number a greater percentage is located along the coastal area of Panguil Bay. Table 17 to 19 summarize important information about the status of fishpond operations in Misamis Oriental and Misamis Occidental.

*Seaweed Culture. Eucheuma* is the species of seaweed being cultured on commercial scale along the coast of ligan Bay. There are *Eucheuma* farms in Tubajon, Laguindingan, Misamis Oriental. The seaweed farm is a community-based activity. Because the farm site is vulnerable to monsoon winds, the production of seaweed is very seasonal. In Misamis Occidental, six licensed *Eucheuma* farmers are reported to be operating in Danao, Plaridel (Adan, 1990).

Researchers of MSU at Naawan are testing the suitability of other species of seaweed for culture in Iligan Bay. At present, studies are focused on the outplanting of *Gracilaria* in the coastal water of Naawan. Instead of the popular vegetative cuttings, the seedling used are seaweed sporelings produced in the laboratory (Uy et. al., 1992).

*Fish Culture in Net Cages.* The culture of fish using fishcages is still on its experimental stage as far as Northern Mindanao is concerned. The establishment of demonstration cages have been initiated by the Department of Agriculture and are found in the municipalities of Lopez Jaena, Baliangao, and Plaridel in Misamis Occidental (Adan, 1990). At present an enterprising community organization in Naawan is engaged in piloting the culture of rabbit fish *(Siganus Guttatus)* and Tilapia *(Oreochromis niloticus)* in the estuary of Talabaan River. The seedstock of both fish are supplied by the hatcheries of MSU Naawan (Pers. Comm.).

*Oyster Culture.* No oyster farm exists in Iligan Bay. But according to BFAR, there are suitable areas for development. An estimated potential area of 10 ha each in the provinces of Misamis Occidental and Misamis Oriental are identified for oyster culture.

## Inland Fisheries

Although population of fish are definitely present in the major tributaries of Iligan Bay, not much is known about their fisheries. Only Mandulog River has an on-going research on riverine fisheries. A preliminary report indicated that Pegok *(Therapon cancellatus)* is indigenous in Mandulog River and its occurrence is very seasonal and associated with moon phases. Pegok (Fig. 12) commands a high price in the local market and it supports artisanal fishing activity in Sitio Bayug, Iligan City (Openiano et al. 1992).

Other fish production in inland waters along the coast of Iligan Bay is focused on the culture of Tilapia in backyard farms. These farm are mostly situated in the upland barangays of three provinces of Iligan Bay.

# COASTAL POPULATION AND ENVIRONMENT

## Population

Iligan Bay has 14 coastal municipalities consisting of 298 barangays belonging to the provinces of Lanao del Norte, Misamis Occidental and Misamis Oriental (Table 20). The total population of the Bay area is more than 505,344 (there being no population data available for Bacolod, Kauswagan and Linamon). Based on the Misamis Oriental and Misamis Occidental data, the total number of fishermen is 7,792 representing 14.42 per cent of the whole population. No additional demographic data are available to describe the population of Bay.

## Commerce and Industry

In the strategic coast of the Bay are located thriving investment centers. As of 1992, the combined total investment in the industrial City of Iligan and the three Municipalities in the Lanao del Norte side of the Bay amounts to almost P120 M for 672 business establishments related to trading, manufacturing and public utilities (Table 21). The investments are led by 19 big industries (Table 22) which are all situated in Iligan City and its suburbs (Fig 13).

## Coastal Environment

**Climate.** The City of Iligan and the province of Lanao del Norte are situated at the middle of the coastal area of the Bay which lies outside the typhoon belt and has a non-seasonal climate. Rainfall is throughout the year and the heaviest is from May to December with a monthly average of three inches. The average annual rainfall is 60 inches and the average temperature is 26.60 degrees Celsius.

**Physico-chemical Conditions of Bay Waters.** Selected physico-chemical characteristics of the Bay waters were studies by Teves and Camarao (1983). The study reported that the main seawater temperatures from October to November and from May to July ranged between 29.1 to 30 degrees Celsius. These temperature levels were higher than in other months except December. Mean water, density which is influence by suspended solids, was recorded at 1.027 and found to differ insignificantly from one sampling site to another. Generally, Iligan baywaters are reportedly alkaline at ph value of 8. The pH values in March (8.53), May (8.52) and July (8.51) were found significantly higher than all other months. The highest reading of 8.56 was obtained at the wharf area of Maria Cristina Chemical Industries. No significant variations were observed in the salinity of Iligan Bay waters within different months. The salinity levels that ranged from 31.55 to 33.65°/oo are slightly lower compared to normal seawater of 33-37 S°/oo.

**Status of Marine Pollution.** Mercury is one of the two heavy metals that are already detectable in Iligan Bay waters. Reyes (1977) collected a sample of fish caught in Iligan Bay for mercury content analyses and reported that the fish samples contained mercury ranging from 0.087-0.155 ppm. Shellfish samples coming from Timoga, Iligan City and Kauswagan, Lanao del Norte were likewise analyzed for mercury content. Both samples contained mercury higher than those found in fish (Vina,1977). It was also declared that the mercury content in shellfish from Timoga have already reach the levels that are beyond the tolerable limit set at 0.5 pm and, therefore, hazardous for human consumption. The same line of investigation was pursued by Dumancas and Vina (1977) for shellfish from Timoga and Kauswagan and by Kapayan, 1973 (as cited by Daral,1981) for some finfishes collected from Initao and Lugait, Misamis Oriental and Sta. Felomina and Buruun, Iligan City. The results of their analyses corroborated the results of Vina (1977) and Reyes(1977). Selected studies on pollution of Iligan Bay are summarized in (Table 23).

Carbide waste is a conspicuous pollutant in the Bay. A study was conducted to gather information on the effect of carbide waste, a factory effluent, on the water quality of the receiving waters and the standing biomass of the macroalgae in the tidal zone of Linamon and Buru-un, Iligan City (Daitia,1989). Result showed that there are serious alterations in the characteristics of seawater, particularly the pH and filterable solids, in Buru-un and Linamon. The alterations exhibit a kind of gradation: it was very pronounced at the effluent dumping site at Buru-un and gradually decreased towards Linamon. An opposite pattern for the presence of macroalgae was observed: it was zero at the dumping site, scarcely present at the immediate vicinity, and gradually increased abundantly towards Linamon. The result of bioassay in the laboratory confirmed that carbide waste has deleterious effect on the health of macroalgae.

In Manticao, Misamis Oriental, a preliminary study was conducted to asses the water quality and species diversity of marine invertebrates in Lug-an Creek and contiguous coastal waters. The water in the creek was found to contain high concentration of ammonia and phosphate. It also indicated low dissolved oxygen, but high turbidity and temperature readings. The study further revealed that the creek has high concentration of

manganese (39 pm) and chromium (0.3 pm) which are beyond the tolerable limit set by DENR. High concentration of manganese (32.5 pm) and chromium (0.2 pm) were also detected in the water from Waigan Creek in the same vicinity.

**Marine Habitat Enhancement**

The deployment of artificial reefs (AR) which are described as structures that serve as shelter and habitat, source of food, breeding area and shoreline protection is adopted as a strategy to improve fish productivity in Iligan Bay. Modules and units of artificial reef have been installed in selected areas of Iligan Bay since 1987. They are of three types: bamboo, tire and concrete. An inventory of artificial reefs (Table 24) as of July 7, 1993 revealed that there are more than 44 AR sites along the entire stretch of the Bay (Fig. 14). The sites were installed with no less than 2,855 modules consisting of 44 per cent bamboo ARs, 6.8 per cent tire ARs and 49.32 per cent concrete ARs (Fig. 15). The installed ARs are expected to provide benefits in terms of increased fish catch to some 1780 marginal fishermen (Fig.16). Misamis Occidental has the most number of sites (23) and AR modules (223).

## SUMMARY AND RECOMMENDATION

Iligan Bay is a valuable resource for various economic uses. Its rich coastal waters exhibit high primary productivity that supports a diverse species of commercially important finfishes, crustaceans, mollusks and seaweeds. Being a fishing ground for artisanal fishing, the bay is the main source of income for many poor fishermen living in the coastal communities.

Iligan Bay is a potential site for increasing fish production through enhancing natural habitat with artificial reef for breeding and nursery and through diversified aquaculture. Its coastal waters are suitable for marine agronomy such as seaweed culture. Moreover, there are suitable sites for the culture of finfish and crustacean in cages and pens and fishponds. The inland waters can likewise be developed into freshwater finfish production areas.

Ecotourism is another development program in which the coastal resource of Iligan Bay is being put to economic use. Interesting spots located along the coastal area of Iligan Bay have already been attracting local and foreign visitors; more sites are now being eyed for development to serve the tourism program of the government.

In the future the coastal waters of Iligan Bay may also be harnessed to provide energy source. The feasibility of making use of the tidal force of coastal current, the force of coastal waves and winds, and the thermal differences of coastal waters to generate electricity may take years to demonstrate but the possibility is always there to explore. At present an exploratory endeavor along this line is being undertaken jointly by the researchers of MSU Marawi, MSU IIT and MSU Naawan.

But there is, at present, an important government development plan that is envisioned to take massive use of natural resources in the coastal area along Iligan Bay and its adjacent waters, Macajalar Bay. The plan, a 20-year agro-industrial masterplan for the Cagayan de oro-Iligan Corridor (CIC) is so encompassing that many existing economic uses are expected to be forcibly eased out or will be asked to give in and pave the way in favor of the plan. It is also commonly expected that the full swing implementation of the masterplan will consequently exert additional pollution pressure to the marine ecosystem of Iligan Bay when pollutive activities will sprout and begin operations in designated places all over the coastal area.

In order to help resolve the competing and apparently incompatible uses of Iligan Bay environs and its fisheries for economic pursuit and to advance the cause of environmental protection, it is recommended that an implementable coastal resource management plan (CRM Plan) which give due consideration to environmental conservation must be generated and integrated into the CIC Masterplan. The CRM Plan must be more comprehensive than that which is reflected in the approved CIC Masterplan and should be based on extensive scientific information from research on the coastal environmental profile of the Bay, fisheries stock inventory, and

assessment o the resources and ecology of Iligan Bay. The Plan must also include Programs for water quality monitoring and defined realistic and enforceable measures/mechanisms for effective implementation of fisheries and environmental conservation laws.

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## Table 1. Major Tributaries of Iligan Bay.

| | |
|---|---|
| Misamis Occidental | |
| | Langaran River, Plaridel |
| | Inamucan River, Plaridel |
| | Paypayan River, Lopez Jaena |
| | Oroquieta River, Oroquieta City |
| | Pinis River, Oroquieta City |
| | Aloran River, Aloran |
| | Samasap River, Jimenez |
| | Palilan River, Jimenez |
| | Maycey River, Sinacaban |
| | Lucaban River, Tudela |
| Lanao del Norte | |
| | Liangan river, Bacolod |
| | Gusong River, Bacolod |
| | Ridapon River, Bacolod |
| | Larapan River, Kauswagan |
| | Tugar River, Kauswagan |
| | Agus River, Iligan City |
| | Iligan River, Iligan City |
| | Mandulog River, Iligan City |
| Misamis Oriental | |
| | Lugait River, Lugait |
| | Manticao River, Manticao |
| | Talabaan River, Naawan |
| | Initao River, Initao |

Source: Coast and Geodetic Survey Map

## Table 2. Fishing Gears Used in Iligan Bay.

| | |
|---|---|
| Drive-in Net | Round House Seine |
| Fish Pot/Trap | Spear Fishing |
| Drift Gill Net | Fish Corral |
| Ring Net | Encircling Gill Net |
| Beach Seine/Drag Seine | Multiple Hand Line |
| Simple Hook and Line | Push Net |
| Squid Jig | Baby Trawl (Otter) |
| Bottom Set Long Line | Gill Net, Bottom Set |
| Stationary Lift Net | |

Source: Dominisac, et al. 1980.

**Table 3. Total Fish Catch and Number of Fishing Operation.**

| Month | Weight in Kg | No. of Fishing |
|---|---|---|
| 1973 | | |
| September | 245.41 | 74 |
| October | 374.66 | 275 |
| November | 134.08 | 83 |
| December | 144.42 | 144 |
| 1974 | | |
| January | 108.38 | 118 |
| February | 136.04 | 98 |
| March | 112.49 | 112 |
| April | 179.68 | 112 |
| May | 215.27 | 108 |
| June | 183.07 | 94 |

Source: Dejarme, 1974

**Table 4. Municipal and Commercial Fish catch in 1985 in Misamis Occidental.**

| Municipal Fish Catch | | Commercial Fish Catch | |
|---|---|---|---|
| Frigate tuna | 509,007 kg | Big eyed scad | 86,270 kg |
| Anchovies | 273,510 kg | Frigate tuna | 1,380,680 kg |
| White shrimp | 158,291 kg | Round scad | 7,780 kg |
| Slipmouth | 138,505 kg | Sardines | 10,370 kg |
| Siganid | 134,497 kg | Skipjack tuna | 51,020 kg |
| Mullet | 109,352 kg | Slipmouth | 5,930 kg |
| Squid | 97,219 kg | | |
| Halfbeaks | 81,141 kg | | |
| Goat fish | 81,155 kg | | |
| Wrasse and Parrot fish | 79,007 kg | | |

Source: 1985 Socio-Economic Profile of Misamis Occidental.

**Table 5. List of Families of Fish Species Recorded at Initao.**

| | | |
|---|---|---|
| Balistidae | Sphyraenidae | Lutjanidae |
| Bramidae | Xiphiidae | Scombridae |
| Carangidae | Coryphaenidae | Menedae |
| Gempylidae | Mycotophidae | Mullidae |
| Istiophoridae | Belonidae | Exocoetidae |
| Mobulidae | Hemiramphidae | Pomacentridae |
| Nemipteridae | Monocanthidae | Trichiuridae |
| Serranidae | | |

Source: BFAR

**Table 6. Gear Operations and Catch Data Recorded at Initao.**

| Fishing Data | 1984 | 1985 | 1986 | 1987 |
|---|---|---|---|---|
| Hook and Line (Motorized) | | | | |
| No. of Fishing Operations | 895 | 508 | 1,179 | |
| Catch in kilograms | 28,229 | 25,326 | 43,671 | |
| Hook and Line (non-motorized) | | | | |
| No. of Fishing Operations | 217 | | 222 | 187 |
| Catch in kilograms | 4,562 | | 1,537 | 2,365 |
| Jigger (Motorized) | | | | |
| No. of Fishing Operations | | | 43 | |
| Catch in kilograms | | | 91 | |
| Dive-in Net (Motorized) | | | | |
| No. of Fishing Operations | | | 1,430 | |
| Catch in kilograms | | | 161,275 | |
| Drift gill net (Motorized) | | | | |
| No. of Fishing Operations | | | 298 | |
| Catch in kilograms | | | | 21,456 |

Source: BFAR

**Table 7. The composition and commercial landings (tons) of the small pelagic fishes in Region X by fishing ground in 1987.**

| COMMON NAME | FAMILY | FISHING GROUND | | | | |
|---|---|---|---|---|---|---|
| | | ILIGAN BAY | MACAJALAR BAY | GINGOOG BAY | BUTUAN BAY | TOTAL |
| Frigate Tuna | *Scombridae* | 830 | 2,279 | 418 | 155 | 3,682 |
| Moonfish | *Menidae* | 143 | 47 | | | 190 |
| Roundscad | *Carangidae* | 24 | 82 | 15 | | 121 |
| Anchovies | *Engraulidae* | 12 | 8 | | | 20 |
| Big-eye scad | *Carangidae* | 89 | 26 | | | 115 |
| Indo-Pacific mackerel | *Scombridae* | 7 | 24 | 1 | | 32 |
| Round herring | *Clupeidae* | | | | | |
| Sardines | *Clupeidae* | 14 | 21 | | | 35 |
| Rainbow runner | *Carangidae* | 5 | 12 | 8 | | 25 |
| Halfbeak | *Hemiramphidae* | | 4 | | | 4 |
| TOTAL | | 981 | 2,599 | 489 | 115 | 4,224 |

Source: Yacapin, 1988

**Table 8. The composition and municipal landings (tonnes) of the small pelagic fishes in Region X by fishing ground in 1987.**

| COMMON NAME | FAMILY | FISHING GROUND | | | | | |
|---|---|---|---|---|---|---|---|
| | | ILIGAN BAY | MACAJALAR BAY | GINGOOG BAY | BUTUAN BAY | PANGUIL BAY | TOTAL |
| Sardines | *Clupeidae* | 4.0 | | 107.0 | 245.0 | 1.0 | 357.0 |
| Flying fish | *Exocoetidae* | 1.0 | 7.0 | 19.0 | 1.0 | | 28.0 |
| Roundscad | *Carangidae* | | 51.0 | 16.0 | 2.0 | | 69.0 |
| Round herring | *Clupeidae* | 0.2 | 0.2 | | | | 0.4 |
| Anchovies | *Engraulidae* | 14.0 | 38.0. | 20.0 | 27.0 | 2.0 | 101.0 |
| Indo-Pacific mackerel | *Scombridae* | 0.1 | 16.0 | 5.0 | 0.3 | 0.1 | 21.5 |
| Frigate tuna | *Scombridae* | | | | 8.3 | 0.1 | 8.4 |
| Fusiliers | *Caesionidae* | | 0.1 | 8.0 | 0.5 | | 8.6 |
| Wolf herring | *Chirocentridae* | | | | | | |
| Halfbreak | *Hemiramphidae* | 1.4 | | 0.3 | 0.7 | | 2.4 |
| Big-eye scad | *Carangidae* | | 17.0 | | | | 17.0 |
| Rainbow runner | *Carangidae* | | 13.0 | 6.5 | 1.0 | | 20.5 |
| Silverside | *Atherinidae* | 0.3 | | | 3.9 | | 4.2 |
| Moonfish | *Menidae* | 0.1 | 3.5 | 6.4 | 2.6 | | 12.6 |
| Indian Mackerel | *Scrombridae* | 3.0 | 0.2 | 0.7 | 2.0 | | 5.9 |
| Gizzard shad | *Clupeidae* | | 10.0 | | 4.0 | | 4.0 |
| Indian sardine | *Clupeidae* | | | | 14.0 | | 14.0 |
| Spanish mackerel | *Scombridae* | | | | | | |
| TOTAL | | 24.11 | 55.8 | 188.4 | 307.0 | 9.2 | 684.5 |

Source: Yacapin, 1988

Table 9. Gear Types used and their Respective Sardine Catches.

| Station 1: Ozamis City | |
|---|---|
| Fishing Gear | Catch in Kg |
| Drift Gill Net | 10,666.85 |
| Boat Seine Net | 894.35 |
| Multiple hand Line | 798.80 |
| Lift Net | 70.00 |
| **Station 1: Maputi, Naawan, Misamis Oriental** | |
| Fishing Gear | Catch in Kg |
| Encircling Gill Net | 561.16 |
| Drift Gill Net | 246 |
| Multiple hand Line | 151.16 |

Source: Caseres, 1990

Table 10. Landed Catch in Initao in 1990.

| Month | Total Catch in Kilograms | | Number of Fishing Boats | |
|---|---|---|---|---|
| | Motorized | Non-Motorized | Motorized | Non-Motorized |
| Jan | 11,142.70 | 73.50 | 140 | 3 |
| Feb | 5,976.41 | 175.10 | 95 | 10 |
| Mar | 6,587.35 | 360.00 | 96 | 11 |
| Apr | 6,252.58 | 749.40 | 100 | 23 |
| May | 15,596.43 | 320.50 | 61 | 26 |
| Jun | 3,282.20 | 509.85 | 75 | 31 |
| Jul | 1,817.30 | 296.30 | 67 | 30 |
| Aug | 2,826,30 | 121.00 | 81 | 28 |
| Sept | 6,659.00 | 135.70 | 98 | 34 |
| Oct | 10,277.00 | 126.00 | 115 | 31 |
| Nov | 5,827.00 | 129.70 | 76 | 29 |
| Dec | 5,788.80 | 68.50 | 76 | 8 |
| Total | 82,033.17 | 3,065.55 | 1,080 | 264 |
| **Grand Total** | **85,033.17** | | **1,344** | |

Source: BFAR

## Table 11. Catch Composition and Peak Season for 1990.

| Species | Fishing months |
|---|---|
| herring | March - August |
| whiting | April - September |
| grouper | January - April |
| slipmouth | October - February |
| mullet | October - February |
| theraponid | May - September |
| ray | February - July |
| shrimps | October - February |
| prawns | October - February |
| crabs | October - February |
| blue crabs | October - February |
| rabbit fish | October - February |
| spadefish | September - January |
| anchovy | May - August |
| club mackerel | February - June |
| goby | November - January |
| mojarra | March - June |
| garfish | January - June |
| squid | January - July |

Source: DA Region XII

## Table 12. Average catch/gear and major catch composition.

| | | |
|---|---|---|
| beach seine | 19 kg | anchovy and herring |
| gill net | 8.9 kg | mullet ans slipmouth crabs and shrimps |
| fish corral | 7.9 kg | shrimps, mullet, rabbit fish whiting |
| new look | 20 kg | anchovy and herring |
| multiple hand line | 10 kg | herring and lagaw |
| multiple long line | 3.25 kg | whiting, goatfish, grouper, rays |
| hook and line | 1.5 kg | whiting, slipmouth, theraponid, grouper |
| crab pot | 6 kg | blue crabs |
| push net | 18 kg | shrimps and prawns |
| baby trawl | 18 kg | shrimps and prawns |
| drive in net | 2 kg | mullet |
| crab lift net | 4 kg | mud crab |

Source: DA Region XII

**Table 13. List of Sugpo hatcheries established along Iligan Bay.**

| | Site | Fry Production | | |
|---|---|---|---|---|
| Misamis Oriental: | | | | |
| 1.) Velasco Hatchery | Gitagum | 500,000 | - | 1,000,000 |
| 2.) De Lara Hatchery | Laguindingan | 300,000 | - | 800,000 |
| 3.) Twin Gold Hatchery | Jampason, Initao | 500,000 | - | 1,000,000 |
| 4.) Galimson Hatchery | Initao | 300,000 | - | 700,000 |
| 5.) United Aqua Corp. Hatchery | Initao | 500,000 | - | 1,000,000 |
| 6.) SPDA Hatchery | MSU at Naawan | 2,000,000 | - | 2,500,000 |
| 7.) MSU-IPPP Hatchery | MSU at Naawan | 200,000 | - | 800,000 |
| 8.) SMFT Hatchery | MSU at Naawan | 300,000 | - | 500,000 |
| 9.) Yamang-Dagat Hatchery | Linangkayan, Naawan | 300,000 | - | 500,000 |
| 10.) San Jose Aquaculture hatchery | Manticao | 800,000 | - | 1,000,000 |
| 11.) GAIC Hatchery | Kalangahan, Lugait | 300,000 | - | 500,000 |
| 12.) Lugait Aquaculture Industry, Inc. Hatchery | Biga, Lugait | 300,000 | - | 500,000 |
| Lanao del Norte: | | | | |
| 13.) Andrada Hatchery | Dalipuga, Iligan City | 200,000 | - | 300,000 |
| 14.) BFAR Hatchery | Kauswagan | 200,000 | - | 300,000 |
| 15.) BELCHA Hatchery | Esperanza, Bacolod | 500,000 | - | 700,000 |
| Misamis Occidental: | | | | |
| 16.) Aquarius Hatchery | Oroquieta City | 500,000 | - | 700,000 |
| 17.) GMA Hatchery | Oroquieta City | 300,000 | - | 500,000 |
| 18.) Grace Hardware Hatchery | Oroquieta City | 300,000 | - | 500,000 |
| 19.) La Paz Hatchery | Oroquieta City | 300,000 | - | 500,000 |

Source: Personal Communication

**Table 14. Prawn Hatchery Profile, Misamis Oriental.**

| | |
|---|---|
| Date established | 1980 |
| Ownership | Single Proprietorship/corporation |
| Number of Employees | 5-8 |
| Initial Capitalization | P1.65 M |
| Gross Sales | P550,000 per annum |
| Profit Margin | 18% |
| Production capacity | 2 M fries per annum |
| Utilization rate | 54% |

Source: Adan, 1990

**Table 15. List of Some Fishpond Owners in Iligan Bay.**

| Site | | Owner |
|---|---|---|
| Plaridel | - | Regalado Tagalogon |
| Sinacaban | - | Susan Nena |
| Baliangao | - | Atay Pond |
| Plaridel | - | E. Baz |
| Plaridel | - | P. Branzuela |
| Plaridel | - | Roger Dominguez |
| Baliangao, Mis. Occ. | - | Luz Laspinas |
| Naawan, Mis. Or. | - | MSU-Naawan |

Source: Personal Communication

**Table 16. Brackishwater fishpond operation in M. Occidental.**

| | |
|---|---|
| Total pond area | 1787.564 ha |
| Operational | 1013.69 ha |
| Non operational | 773.874 ha |
| Total number of operators | 196 |
| Total number of farms | 196 |
| Undeveloped | 22 |
| Converted to ricelands, sold, abandoned, or not operated | 43 |
| Developed, operational | 131 |
| Sugpo farms | 79 |
| Intensive | 3 |
| Extensive | 76 |
| Bangus farms | 17 |
| Sugpo/Bangus farms | 34 |
| Tilapia | 1 |

Source: Adan, 1990

**Table 17. Production Profile of Fishponds in Misamis Occidental.**

| | Production in kg/ha/crop | | | Areas of Concentration |
|---|---|---|---|---|
| | Lowest | Highest | Average | |
| Sugpo (intensive) | 3400 | 7300 | 5133 | Ozamiz |
| Sugpo (extensive) | 30 | 400 | 177 | Bonifacio, Ozamiz |
| Bangus | 400 | 1000 | | Plaridel, Baliangao |
| Sugpo/Bangus | 20:20 | 2000:800 | | Plaridel, Baliangao |
| Tiplapia | 68 | | | Panoan |

Source: Adan, 1990

**Table 18. Intensive Prawn Pond Operation Profile: M. Occidental.**

| | |
|---|---|
| Ownership status | Corporation |
| Numberof employees | 5-18 |
| Initial capital | P125,000 to P2.5 M |
| Annual Gross Sales | P200,000 minimum |
| Profit margin | 40% to 50% |
| Production capacity | 3 - 8 tons per year |
| Percent utilization of pond | 50% |

Source: Adan, 1990

**Table 19. Profile of pond operations in M. Oriental.**

| | |
|---|---|
| Period established | 1980 |
| Ownership | Mostly single proprietorship |
| Number of operations per year | 2-3 |
| Duration of culture | 4-5 months |
| Stocking density | 11 to 12 fry/sq. m. |
| Survival rate | 50 - 60% |
| Initial capitalization | P559,000 to P2.0M |
| Utilization rate | 73% |
| Market | Local and foreign |

Source: Adan, 1990

**Table 20. Coastal Municipalities and Cities of Iligan Bay.**

| | NO. OF BARANGAYS | TOTAL POPULATION 1990 | COASTAL BARANGAYS (No.) | FISHERMEN (No.) |
|---|---|---|---|---|
| MISAMIS OCCIDENTAL | | | | |
| Plaridel | 33 | 28,824 | | 1,600 |
| Lopez Jaena | 28 | 19,912 | | 774 |
| Oroquieta City | 47 | 52,500 | | 1,500 |
| Aloran | 38 | 20,812 | | 150 |
| Jimenez | 24 | 20,589 | | 100 |
| Tuleda | 33 | 19,070 | | 200 |
| Sinacaban | 17 | 14,846 | | 115 |
| LANAO DEL NORTE | | | | |
| Bacolod | | | | |
| Kauswagan | | | | |
| Linamon | | | | |
| Iligan City | | 223,933 | | |
| MISAMIS ORIENTAL | | | | |
| Lugait | 8 | 11,973 | 3 | 435 |
| Manticao | 13 | 21,443 | 2 | 370 |
| Naawan | 10 | 13,345 | 3 | 556 |
| Initao | 16 | 23,113 | 6 | 1,450 |
| Libertad | 9 | 8,487 | 3 | 215 |
| Gitagum | 11 | 10,994 | 4 | 151 |
| Laguindingan | 11 | 15,503 | 3 | 176 |

Source. Da Region X.

## Table 21. Total Investment and Number of Establishments in Lanao del Norte for the Year 1992.

| SITE | TRADERS | | MANUFACTURERS | | SERVICES | |
|---|---|---|---|---|---|---|
| | No. of Establishment | Total Investment | No. of Establishment | Total Investment | No. of Establishments | Total Investment |
| ILIGAN | 286 | P24,817,747.25 | 86 | P30,679,790.53 | 276 | P63,567,457,.03 |
| LANAO DEL NORTE: | | | | | | |
| Linamon | 7 | 570,000.00 | | | 1 | 50,000.00 |
| Bacolod | 11 | 267,500.00 | 1 | 50,000.00 | 3 | 4,000.00 |
| Kauswagan | 1 | 8,000.00 | 2 | 41,200.00 | | |
| TOTAL | 305 | 25,663,247.25 | 87 | 30,670,990.53 | 280 | P63,621,457.03 |

Source: DTI, Iligan City

## Table 22. List of Big Industries of Lanao del Norte and Iligan City.

Cebu-Oxygen and Acetylene Co. Inc.
Mahayahay, Iligan City (Edilberto Soriano)

Filipinas Eslon Manufacturing Corporation
Sta. Felomina, Iligan City (Julius Racines)

Countryside Millers, Inc.
Sta. Felomina, Iligan City (Morgel Artes)

Iligan Cement Corporation
Kiwalan, Iligan City (Generoso Balero)

Mabuhay Vinyl Corporation
Assumption Heights, Iligan City (Wilfredo Mamoy)

Ma. Cristina Chemical Corporation
Assumption Heights, Iligan City (Reynaldo Leonarda)

Mindanao Ferro Alloy Corp.
Assumption Heights, Iligan City (c/o MCCI)

Mindanao Portland Cement Corporation
Kiwalan, Iligan City (Bernabe Yañez)

National Steel Corporation
Suarez, Iligan City (Policarpio Benitez)

Refractories Corporation of the Philippines
Mapalad, Iligan City (Juan Quintos)

Granex Manufacturing Corporation
Kiwalan, Iligan City (Alfredo Tabita)

Iligan Coconut Industries, Inc.
Sta. Felomina, Iligan City (Vicente Surriedo)

Ma. Cristina Fertilizer Corporation
Fuentes, Iligan City (Rodrigo Falcon)

PNOC Coal Corporation
Kiwalan, Iligan City (Marlon Dizon)

SMC-Iligan Cocnut Oil Mill
Sta. Felomina, Iligan City (Fernando Monasque)

New Tech Pulp
Ma. Cristina, Baloi, Lanao del Norte (Rolando Ramin)

Northern Mindanao Power Corporation
Mapalad, Iligan City

National Power Corporation
Ditucalan, Iligan City (Rodrigo Falcon)

Pillsbury-Mindanao Flour Milling Co.
Kiwalan Cove, Iligan City

Source: DTI Iligan City

Table 23. Status of Marine Pollution in the Bay.

| Author(s) | Study | Results |
|---|---|---|
| Kapayan (1973) | Mercury in the Finfish from Initao and Lugait, Mis. Or. and Sta. Felomina and Buru-un, Iligan City | |
| Dumancas and Viña (1977) | Mercury in Finfish from Timoga and Kauswagan, Lanao del Norte | |
| Reyes (1977) | Mercury content in Finfish of Iligan Bay | .087 - 0.155 ppm Hg content |
| Viña (1977) | Mercury in Shellfish of Timoga and Kauswagan, Lanao del Norte | Concentration is higher than in Finfish |
| Kalinawan (1986) | Water Quality in Lug-an Creek and Waiga Creek in Manticao, Mis. Or. | High concentration of ammonia and phosphates; high concentration of manganese and chromium. Low D.O., high turbidity, high $H_2O$ temp. |
| Daitia (1989) | | Effect of Carbide Waste on the Marine macrobenthic algae |

## Table 24. Inventory of Artificial Reefs As of July 7, 1993.

| Province | Project Site | No. of Modules Bamboo | Tire | Concrete | Total | No. of Beneficiaries | Date Established |
|---|---|---|---|---|---|---|---|
| Misamis Occidental | | | | | | | |
| | Santa Cruz, Kauswagan, Usokan | | | 112 | 112 | 180 | 02/5-9/90 |
| | Plaridel | | | | | | |
| | Southern Looc, Plaridel | 47 | 1 | | 48 | 50 | 11/28/89 |
| | Santa Cruz, Plaridel | | | 55 | 55 | 25 | 08/ /89 |
| | **Total** | **47** | **1** | **167** | **215** | **255** | |
| | Masabay, Lopez Jaena | 4 | 26 | 1,000 | 1,030 | 200 | 1988/1989 |
| | Danlogan, Lopez Jaena | | | 8 | 8 | 25 | 03/08/90 |
| | Eastern Poblacion, Lopez Jaena | 44 | 9 | | 53 | 60 | 05/19/88 |
| | Mansabay Bajo, Lopez Jaena | 417 | 63 | | 480 | 70 | 05/19/88 |
| | Sibugon, Sibula, Malatuhan | 247 | 20 | | 267 | | 08/ /88 |
| | Puntod, Katipa, Kapayas | | | | | | |
| | Biasong, Lopez Jaena | | | | | | |
| | **Total** | **712** | **118** | **1,008** | **1,838** | **355** | |
| | San Vicente, Oroquieta City | | | 40 | 40 | 29 | 02/16-22/90 |
| | Poblacion 1, Oroquieta City | 25 | | | 25 | 25 | 01/21/89 |
| | Taboc Sur, Oroquieta City | 25 | | | 25 | 25 | 01/24/89 |
| | San Vicente Bajo, Oroquieta City | 36 | | | 36 | 40 | 12/28/89 |
| | Canubay, Oroquieta City | 25 | | | 25 | 40 | 12/28/89 |
| | Maubod, Oroquieta City | 25 | | | 25 | 40 | 12/28/89 |
| | **Total** | **136** | | **40** | **176** | **199** | |
| | Lobogan, Tawi-Tawi, Aloran | | | 90 | 90 | 85 | 02/19-23/90 |
| | Makawa, Aloran | 60 | 1 | | 61 | 30 | 02/ /88 |
| | Conat, Aloran | 40 | | | 40 | 45 | 02/09/89 |
| | Tuburan, Aloran | | | 55 | 55 | 50 | 10/1-28/89 |
| | **Total** | **100** | **1** | **145** | **246** | **210** | |
| | Buluay, Jimenez | 35 | 1 | | 36 | 50 | 02/09/89 |
| | Taboo, Jimenez | 14 | 1 | | 15 | 35 | 02/ /87 |
| | Total | 49 | 2 | | 51 | 85 | |
| | Libertad Bajo, Sinacaban | 25 | | | 25 | 35 | 02/ /87 |
| | Sinonoc, Sinacaban | 38 | | | 38 | 45 | 02/24/89 |
| | Total | 63 | | | 63 | 80 | |
| | Cabol-anonan, Tudela | 42 | | | 42 | 66 | 01/09/89 |
| | Total | 42 | | | 42 | 66 | |

## Table 24. Inventory of Artificial Reefs as of July 7, 1993 (Cont'n.)

| Province | Project Site | No. of Modules | | | | No. of Beneficiaries | Date Established |
|---|---|---|---|---|---|---|---|
| | | Bamboo | Tire | Concrete | Total | | |
| Misamis Oriental | | | | | | | |
| | Biga, Lugait | | 8 | 4 | 12 | 23 | 07/18-21/89 |
| | Kalangahan, Lugait | 12 | 1 | | 13 | 32 | 11/23-26/88 |
| | **Total** | **12** | **9** | **4** | **25** | **55** | |
| | Punta Silum, Manticao | | 5 | 5 | 10 | 31 | 09/19-22/89 |
| | Poblacion, Manticao | 10 | 3 | | 13 | 40 | 11/22-25/88 |
| | **Total** | **10** | **8** | **5** | **23** | **71** | |
| | Maputi, Naawan | 13 | 1 | | 14 | 40 | 05/10-13/88 |
| | Linangkayan, Naawan | | 5 | 9 | 13 | 42 | 11/07-10/87 |
| | **Total** | **13** | **6** | **9** | **27** | **82** | |
| | San Pedro, Initao | | 4 | 8 | 12 | 23 | 08/14-19/89 |
| | Tubigan, Initao | 12 | 2 | | 14 | 18 | 11/16-18/88 |
| | Pagahan, Initao | 9 | 2 | | 11 | 33 | 11/16-19/88 |
| | Jampason, Initao | 5 | 1 | | 6 | | / /90 |
| | Gimangpang, Initao | | 5 | 6 | 11 | 25 | 04/26-29/89 |
| | **Total** | **26** | **14** | **14** | **54** | **99** | |
| | Gimaylan, Libertad | 12 | 2 | | 14 | 45 | 11/15-18/88 |
| | Dulong, Libertad | 4 | 5 | | 9 | 38 | 04/25-28/89 |
| | Bolok-bolok, Libertad | | 3 | 6 | 9 | 30 | 12/11-14/89 |
| | **Total** | **16** | **10** | **6** | **32** | **113** | |
| | Poblacion, Guitagom | 10 | 14 | 4 | 28 | 23 | 01/01-13/89 |
| | Matangad, Gitagum | | 6 | 6 | 12 | 37 | 07/25-29/89 |
| | **Total** | **10** | **20** | **10** | **40** | **60** | |
| | Tobajon, Laguindingan | 8 | 3 | | 11 | 24 | 09/20-23/88 |
| | Mauswagon, Laguindingan | 10 | 1 | | 11 | 25 | 09/20-23/88 |
| | **Total** | **18** | **4** | | **22** | **49** | |

Source: DA Region X

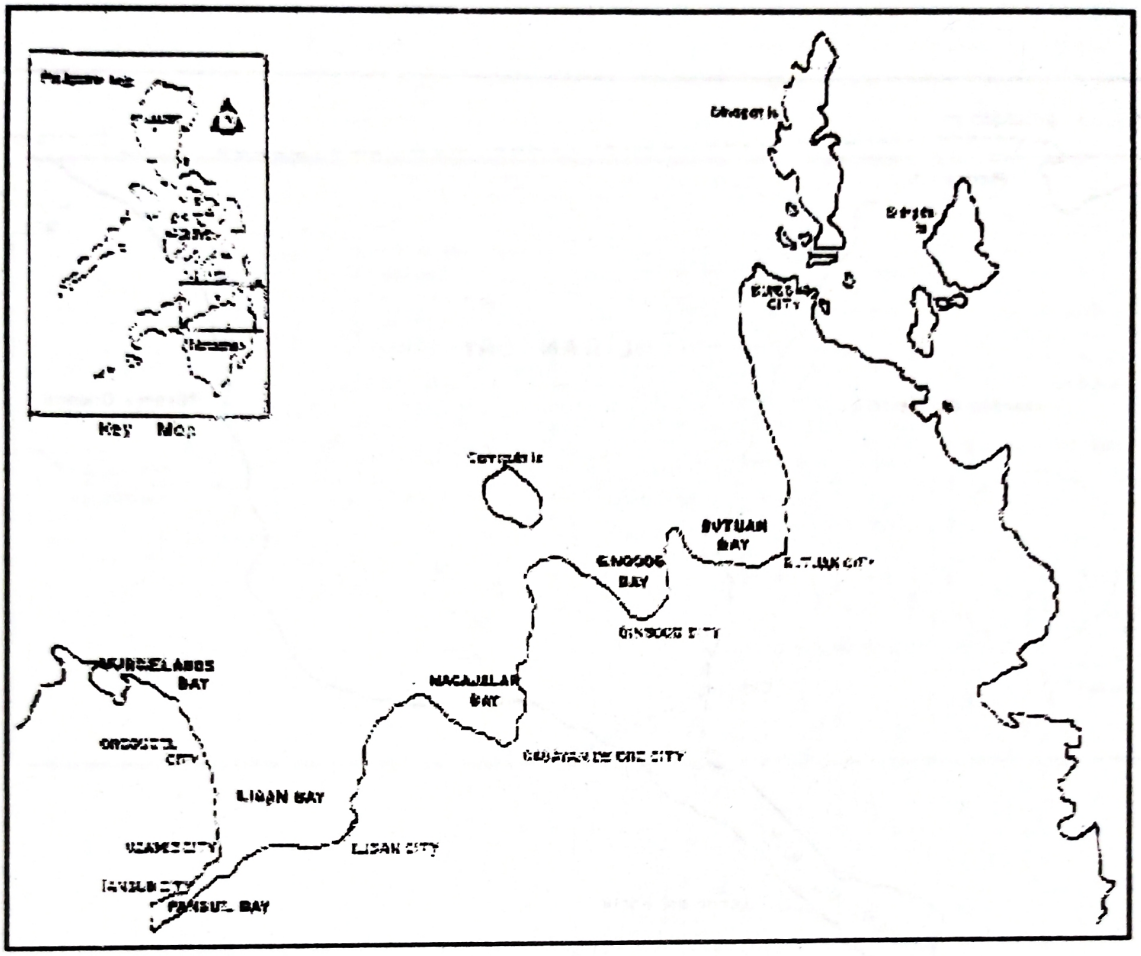


Fig. 1. Map Showing the Six Bays of Northern Mindanao.

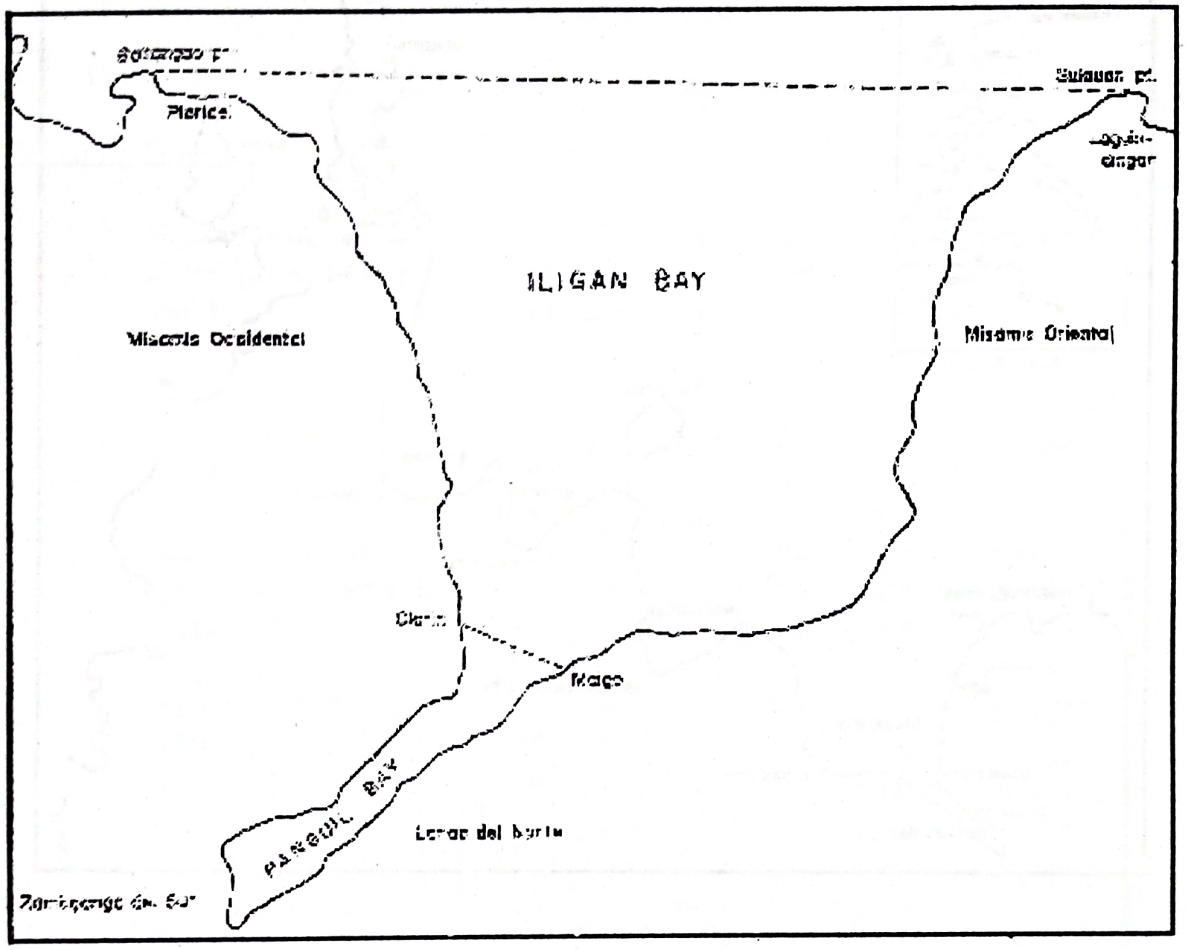


Fig. 2. Map Showing Iligan Bay and Its Boundaries.

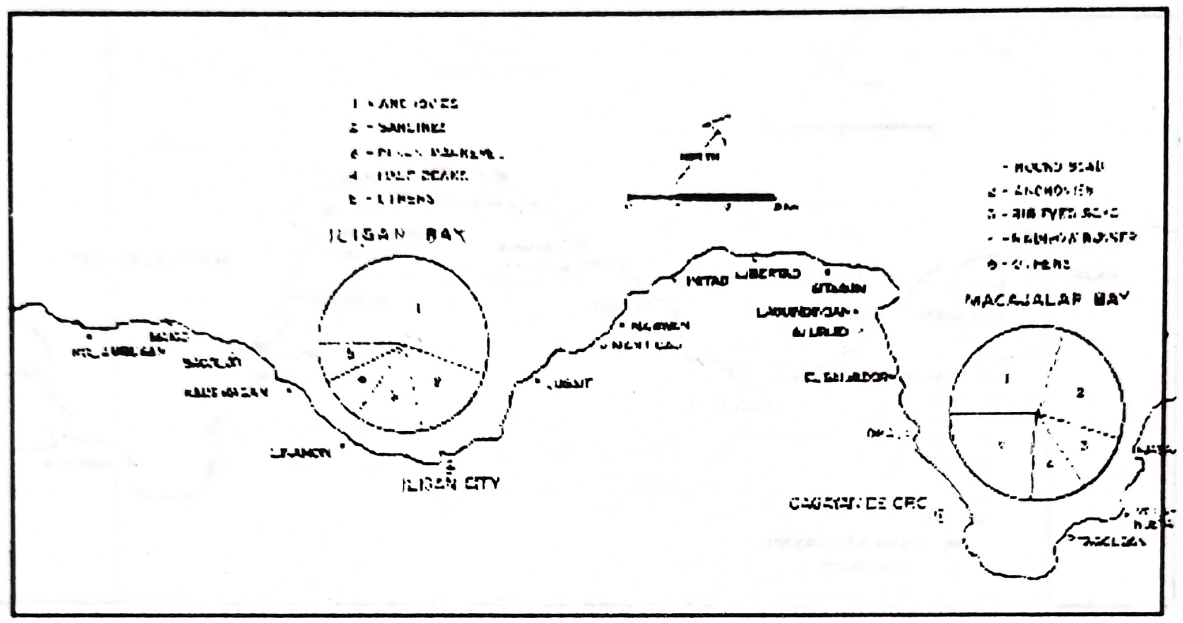


Fig. 3. Relative Abundance of Pelagic fishes in Iligan Bay and Adjacent Macajalar Bay (Source: Yacapin 1988).

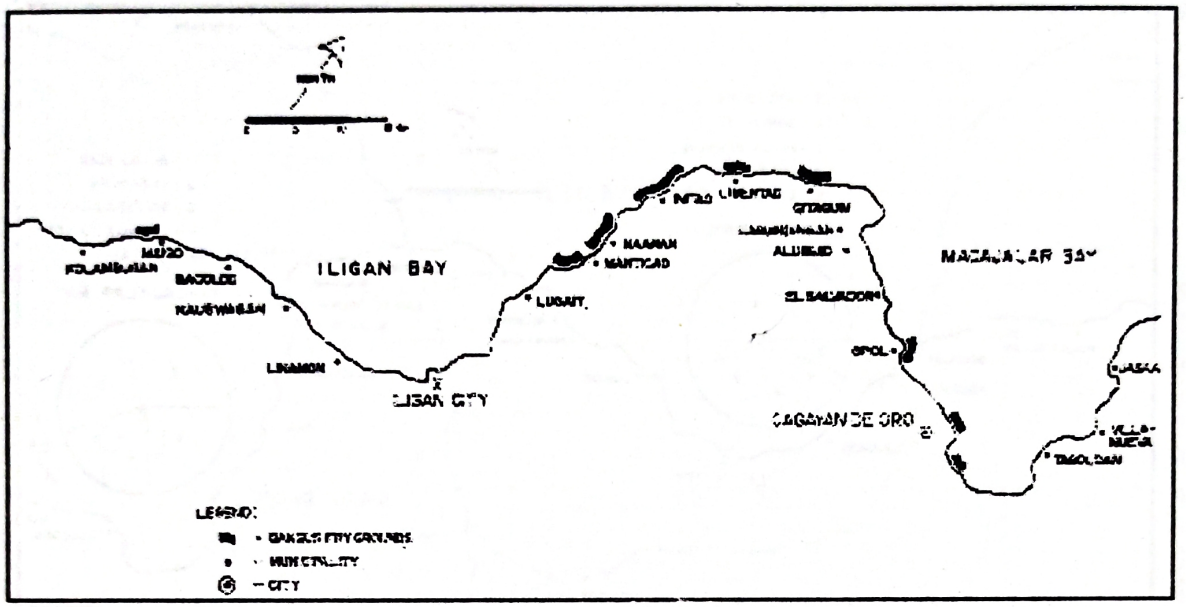


Fig. 4. Fry Grounds of Milkfish in Iligan Bay and Macajalar Bays.

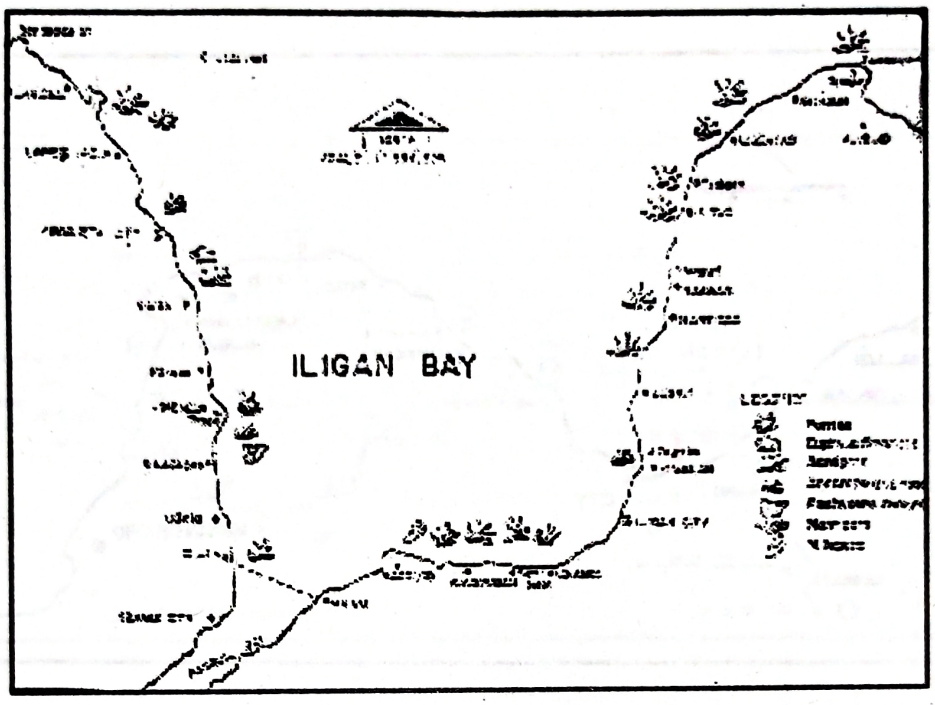


Fig. 5. Distribution Map of Dominant Coral Species of Iligan Bay (Source: Mendoza, et. al., 1985).

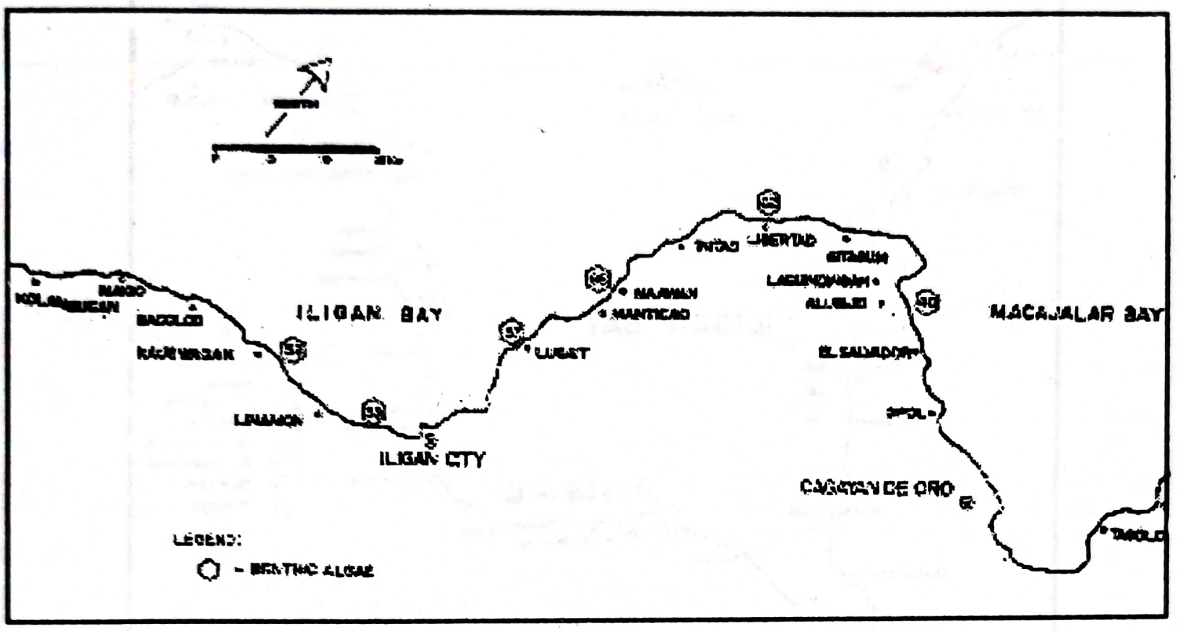


Fig 6.Distribution Map of Bentic Algae in Iligan Bay ( Source: Magpulong, et. al., 1981)

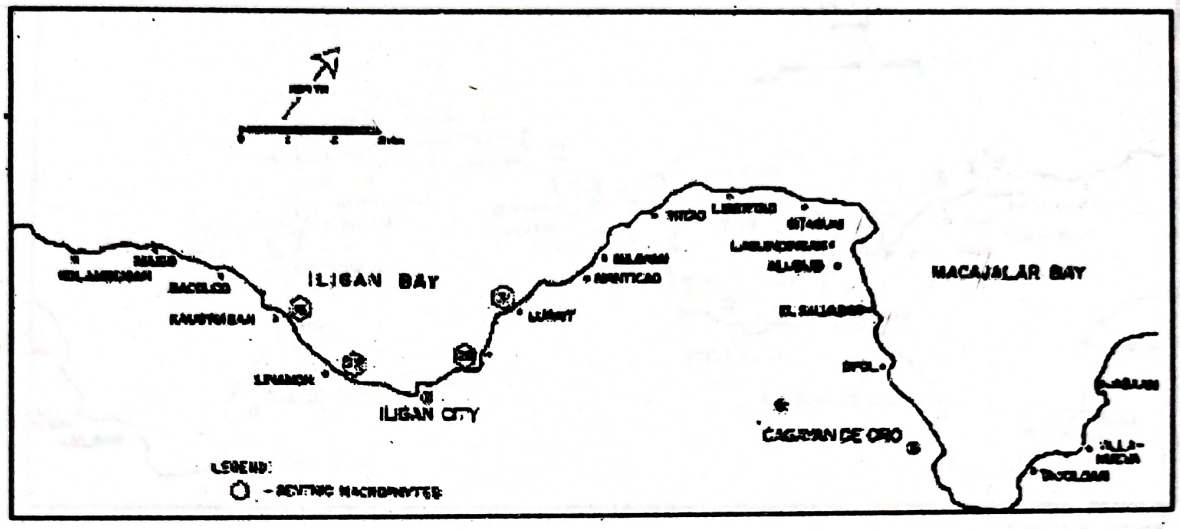


Fig. 7. Collection Sites of Benthic Macrophytes in Iligan Bay (Source: Apao & Camarao, 1989).

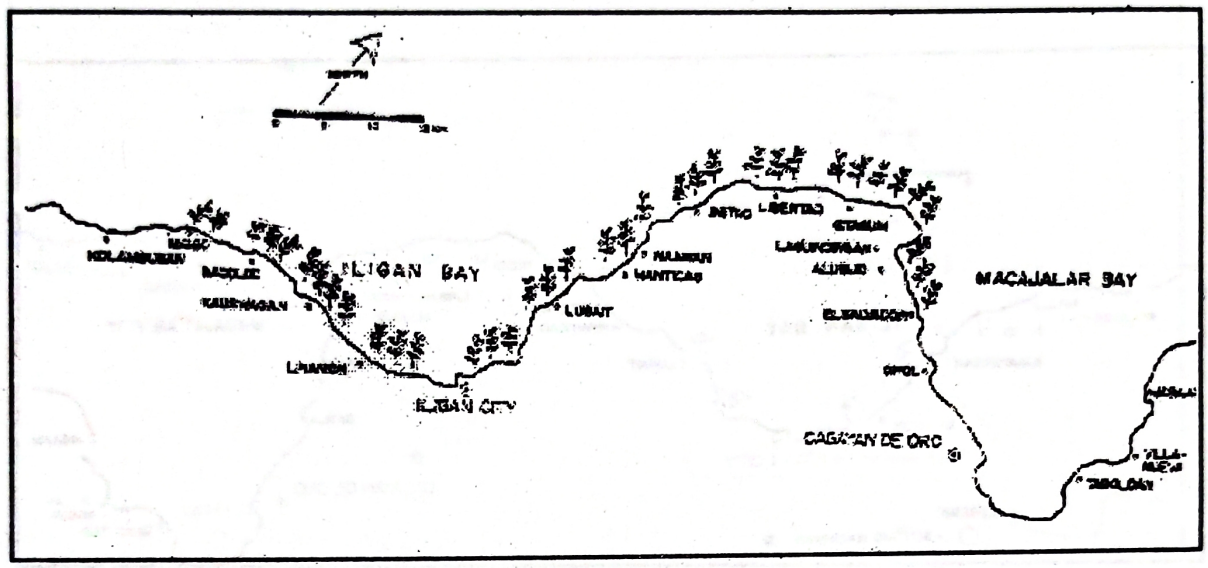


Fig. 8. Sites in Iligan Bay Where Sagrassum are harvested (Source: Ortega, 1981).

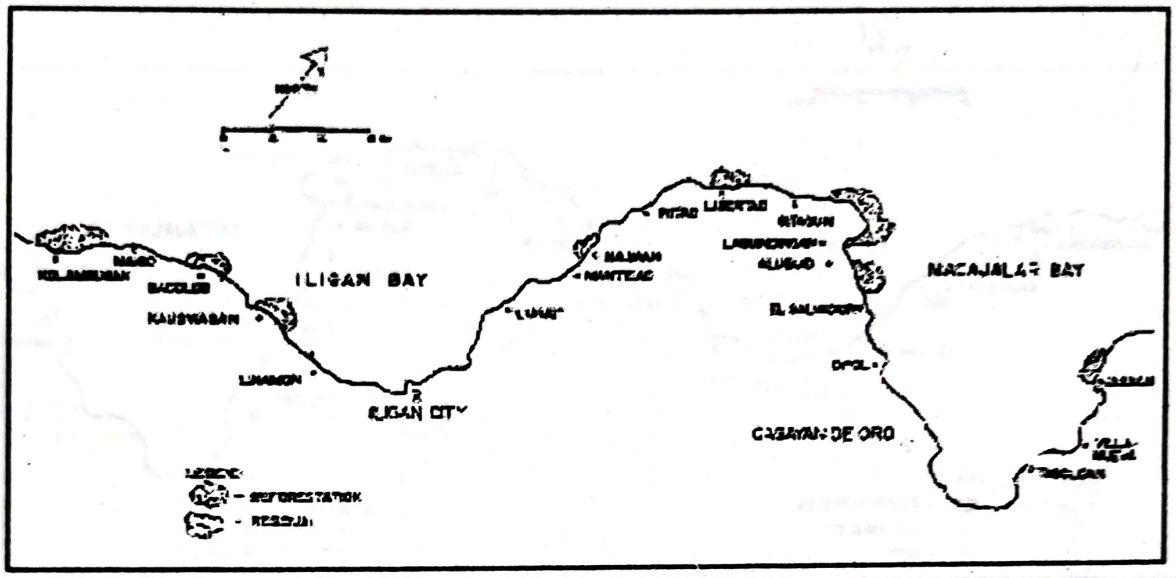


Fig 9. Mangrove Sites in the Lanao Norte and Misamis Oriental Side of Iligan Bay.

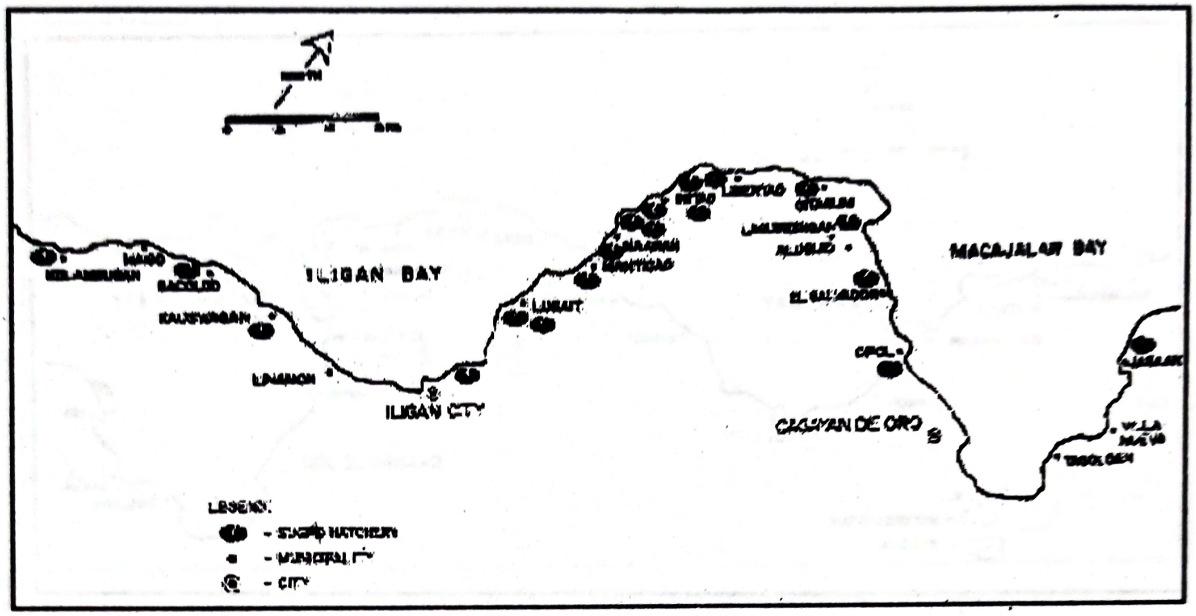


Fig. 10. Sugpo hatcheries Sites in Lanao del Norte and Misamis Oriental Side of Iligan Bay.

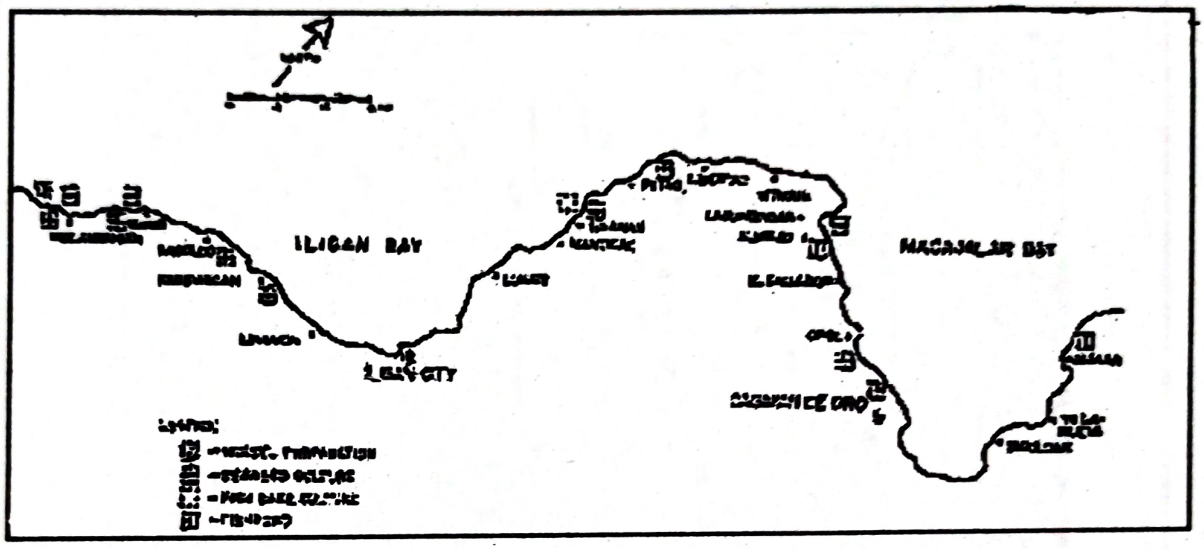


Fig. 11. Aquaculture Sites in Lanao del Norte and Misamis Oriental Side of Iligan Bay.

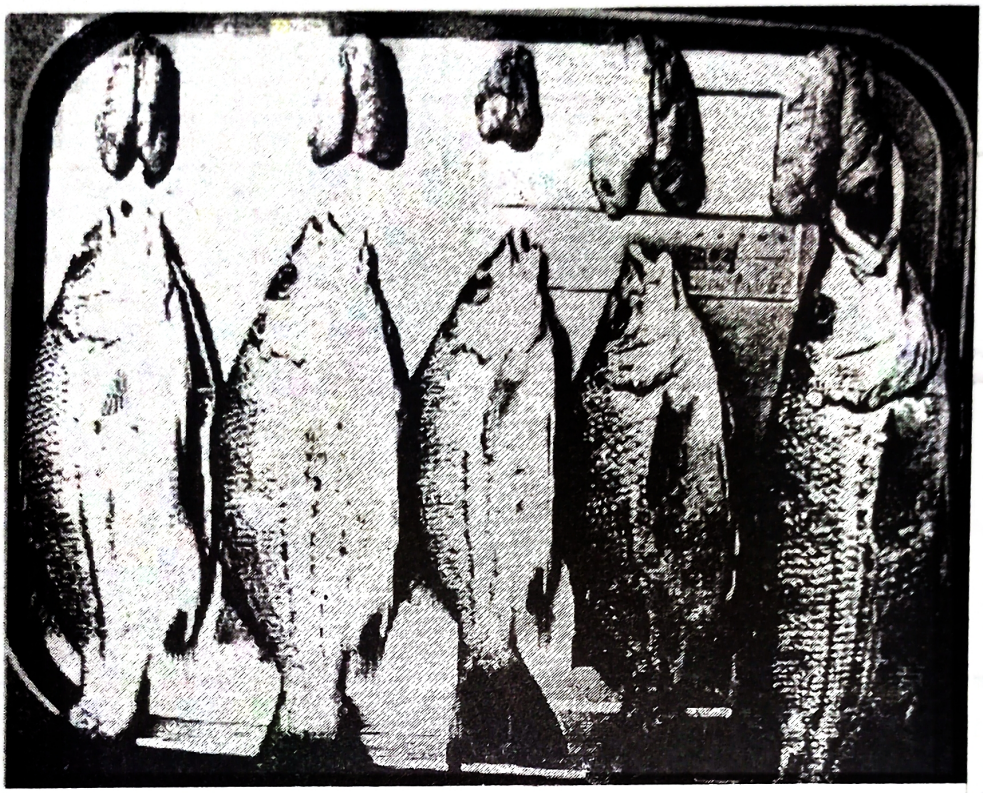

Fig. 12. Pegok, *Therapon canellatus*, from Mandulog River, Iligan City (Openiano, et. al., 1992).

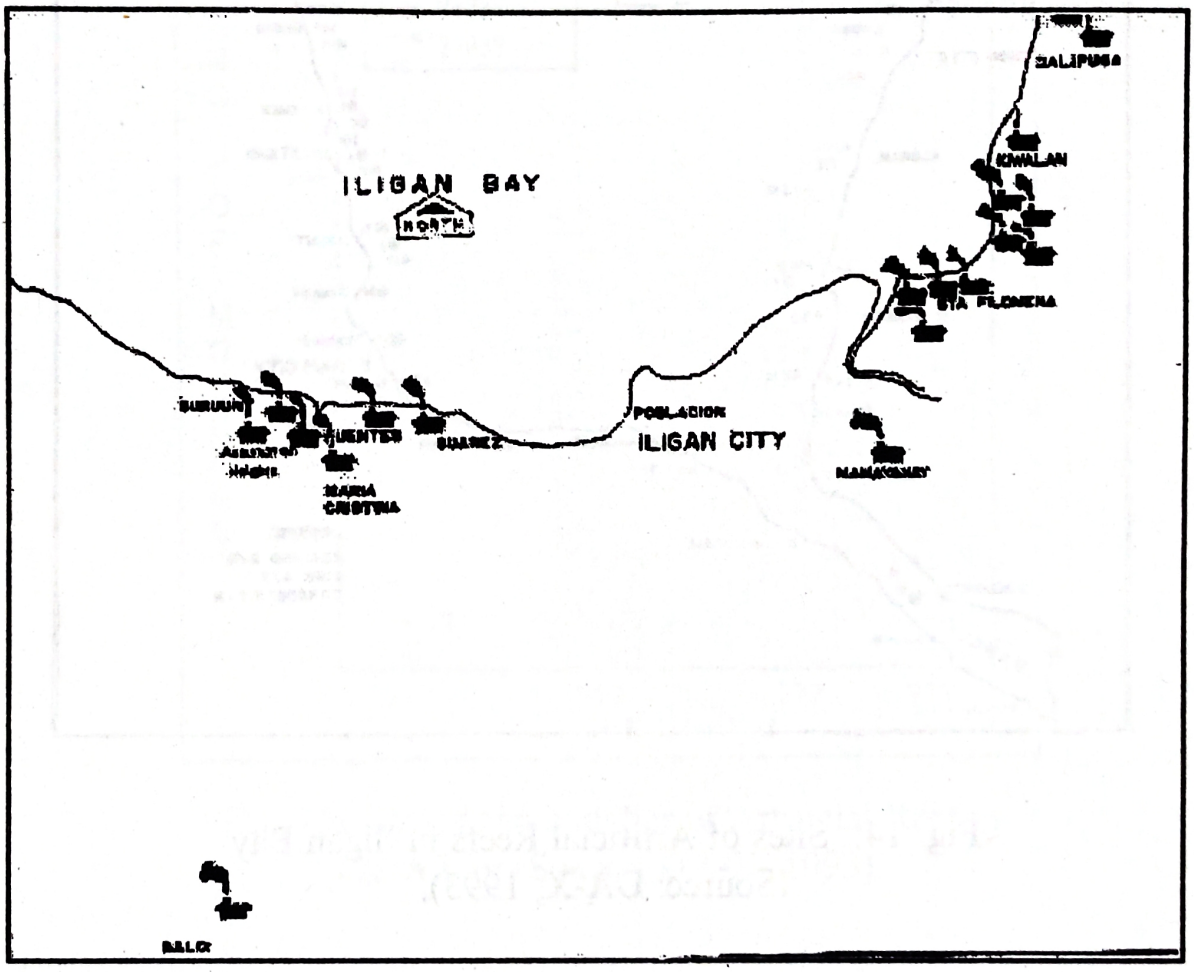


Fig. 13. Sites of 19 Big Industries in Iligan City and suburbs.

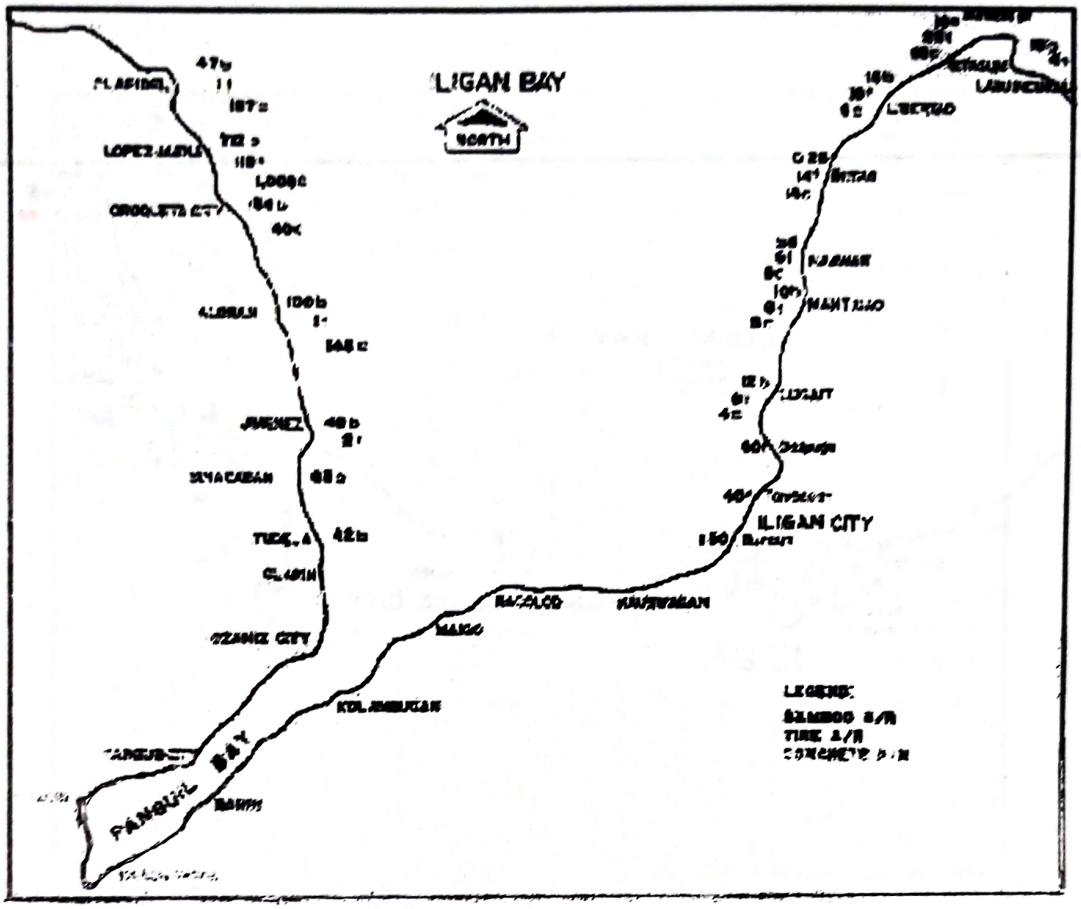


Fig. 14. Sites of Artificial Reefs in Iligan Bay (Source: DA-X, 1993).

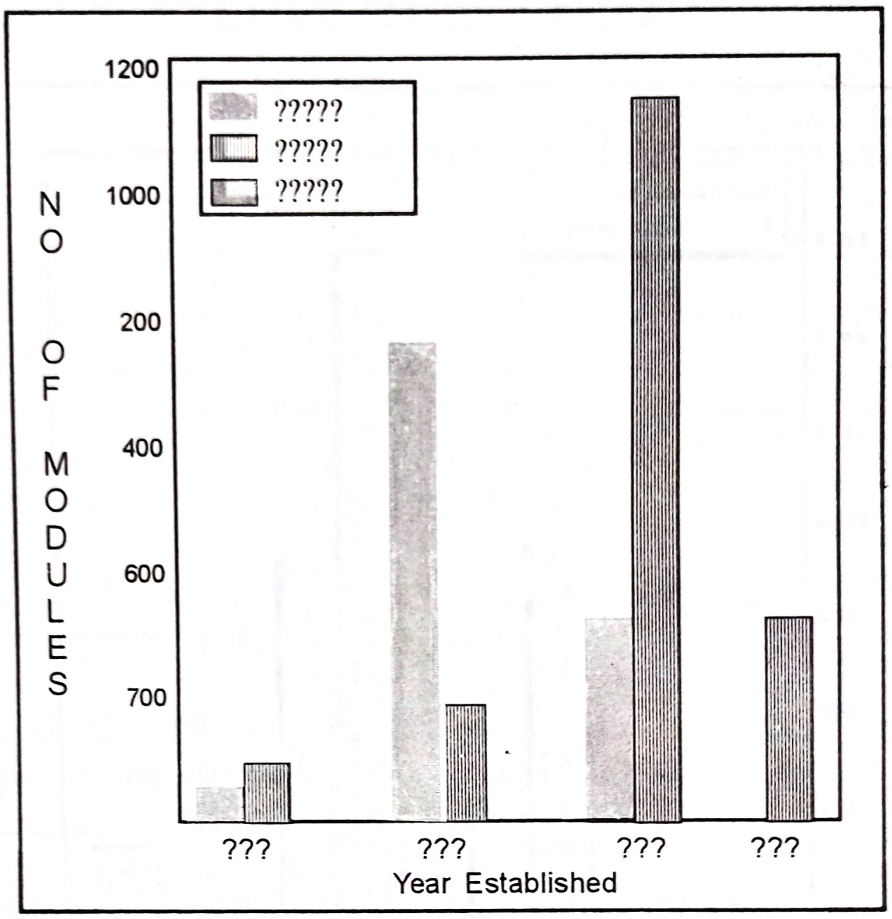


Fig. 15. Types and Number of Artificial Reef in Iligan Bay (Source: DA-X, 1993).

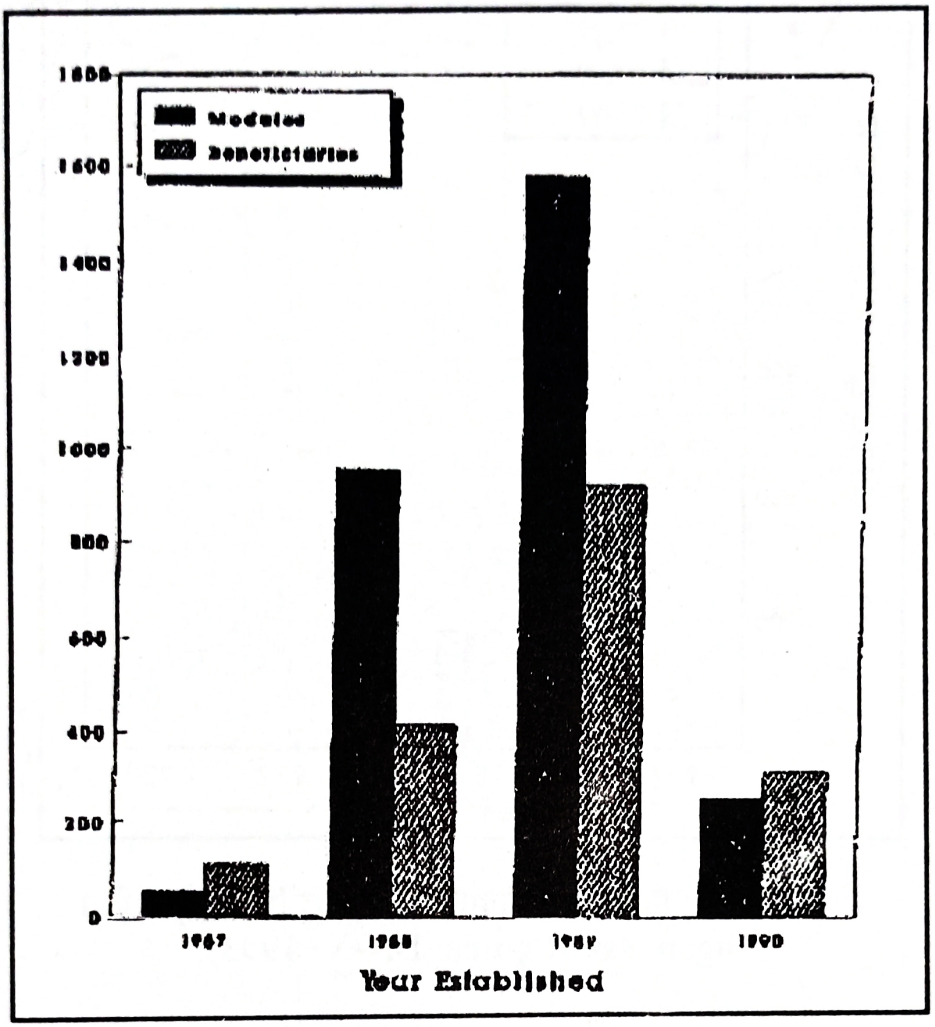


Fig. 16. Number of Fishermen-Benificiaries of Artificial Reef Projects in Iligan Bay (Source: DA-X, 1993).

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