# Chapter 3
# NATURAL RESOURCES

## MINERAL RESOURCES

Sarangani Province and GSC have rich metallic and non-metallic mineral deposits. The metallic minerals include copper, gold, and iron; the non-metallic minerals include cement lime, coal, gypsum, limestone, phosphate rock, and silica. Most non-metallic minerals are of commercial quantities particularly the cement lime, limestone, and silica. However, none of them is tapped for exploration purposes. Other resources found in the area include the guano, sand stone, and white pebbles (Table 3.1).

Sarangani Province has strongly objected to applications for exploration permits of all mining corporations filed with the Mines and Geosciences Bureau (MGB). However, mining activities in neighboring South Cotabato may impact Sarangani Bay due to the sedimentation caused by mining operations.

## FOREST RESOURCES

The province has a dipterocarp forest in all of its coastal municipalities except Maasim. Based on land classification, it covers an area of 2,304.23 $km^2$. Of the total forestland area, 33 percent (753.91 $km^2$) is considered as secondary growth forest. These areas have been logged or disturbed for some time and were able to recover. In terms of total forest and secondary forestland proportions, Maitum is the largest (71 percent), followed by Kiamba (60 percent), and Alabel (50 percent). However, in terms of total secondary forestland, Alabel is the highest (28 percent), followed by Kiamba (22 percent) (Table 3.2). However, destructive agricultural practices and illegal logging threaten these forest resources.

**Table 3.1. Mineral deposits and other resources in the profile area.**

| Municipality/City | Metallic | Non-metallic | Other resources |
|---|---|---|---|
| Alabel | Copper, gold | | Guano |
| Glan | | Phosphate rock, limestone, coal | Guano, white pebbles, sand stone |
| Kiamba | Iron, copper, gold | | |
| Maasim | Copper, gold, silica | Gypsum, limestone, cement lime, silica | Guano, sand stone |
| Maitum | Copper, gold, iron | | Guano |
| Malapatan | | Phosphate rock, limestone, coal, silica | Guano, sand stone |
| GSC | Copper, iron, gold silver | Limestone, sulfur, nitrate | Guano |

*Data from the Provincial Environment and Natural Resources Office and Provincial Planning and Development Office 1994*

Once forest cover is depleted, erosion results. This contributes to the sedimentation of the coastal area especially areas near the river mouth. In order to stop this, Sarangani Province is formulating the Provincial Forest Land Use Plan. This will serve as a framework to attain the province's long-term vision of sustainable development and well-managed resources.

**Table 3.2. Second growth forestlands of Sarangani Province.**

| Municipality | Second growth forest ($km^2$) | Percent composition |
|---|---|---|
| Alabel | 215.27 | 28.6 |
| Glan | 87.02 | 11.5 |
| Kiamba | 172.08 | 22.8 |
| Maasim | 57.66 | 7.6 |
| Maitum | 117.26 | 15.6 |
| Malapatan | 104.62 | 13.9 |
| **Total** | **753.91** | **100.00** |

*Data from the Provincial Planning and Development Office 1997*

As part of improving forest cover, DENR has distributed 1 million forest and ornamental seedlings from 1994 to 1997 for reforestation purposes. The Asian Development Bank (ADB) has also funded the implementation of the Forestry Reforestation and Community Approach Reforestation Schemes. Under this project, DENR has replanted 1,613 ha of forestland (Chiongbian 1998).

The first LGU-led community-based forest management (CBFM) project is in Sarangani. The project area covers 32,000 ha of timberland in Kiamba and Maitum. This is the first CBFM project in the Philippines initiated and generally supervised by LGUs.

**COASTAL RESOURCES**

Sarangani Province and GSC have a total coastline of 226.4 km (Figure 3.1). Figures 3.2 to 3.8 show the coastal resource maps of the municipalities and city in the Sarangani Bay Learning Area. The figures also present the uses of different areas in their jurisdiction as well as major issues involved for each area. Resources that can be

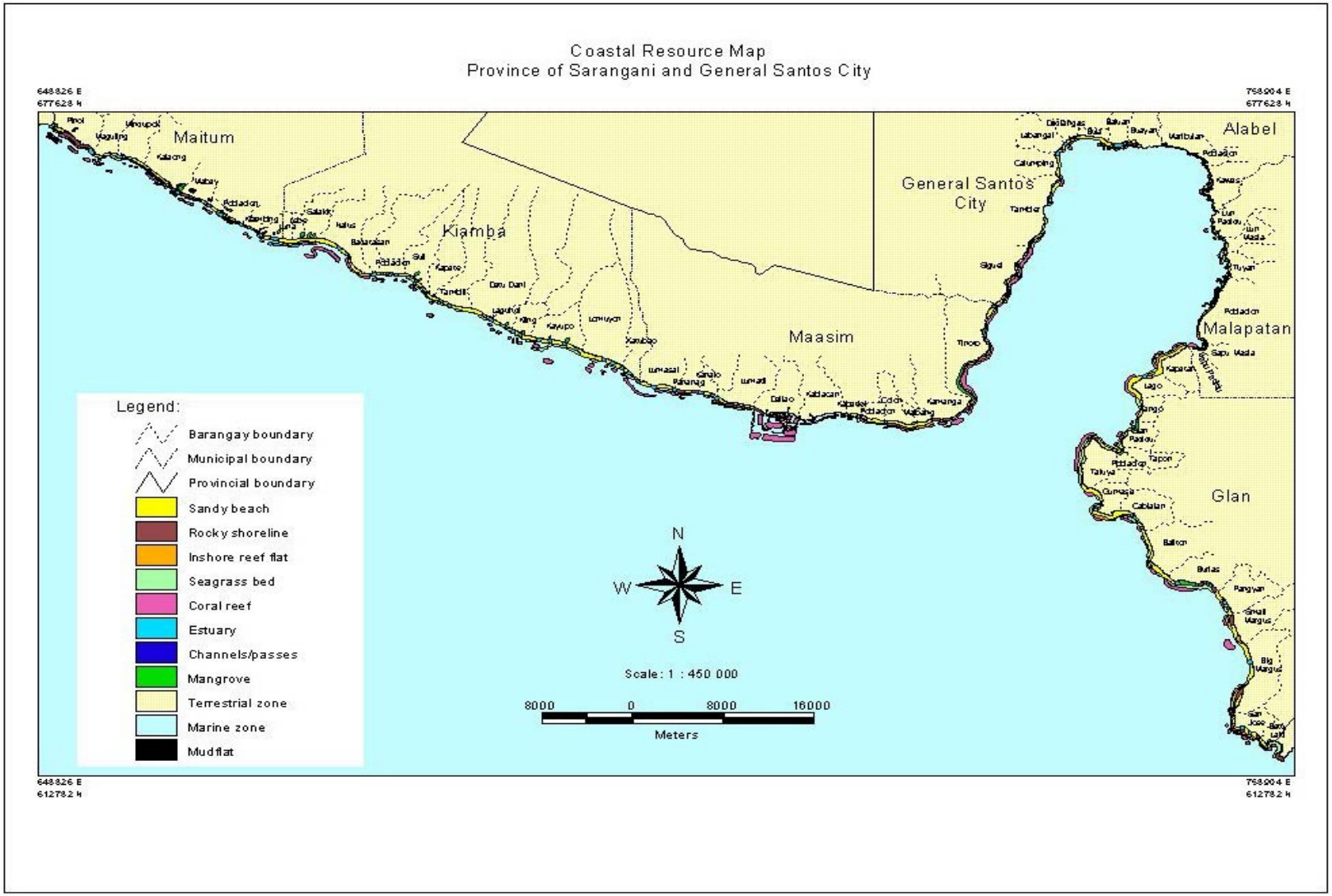



**Figure 3.1. Map of Sarangani Province and GSC showing coastal resources such as mangroves, seagrasses, and coral reefs.**

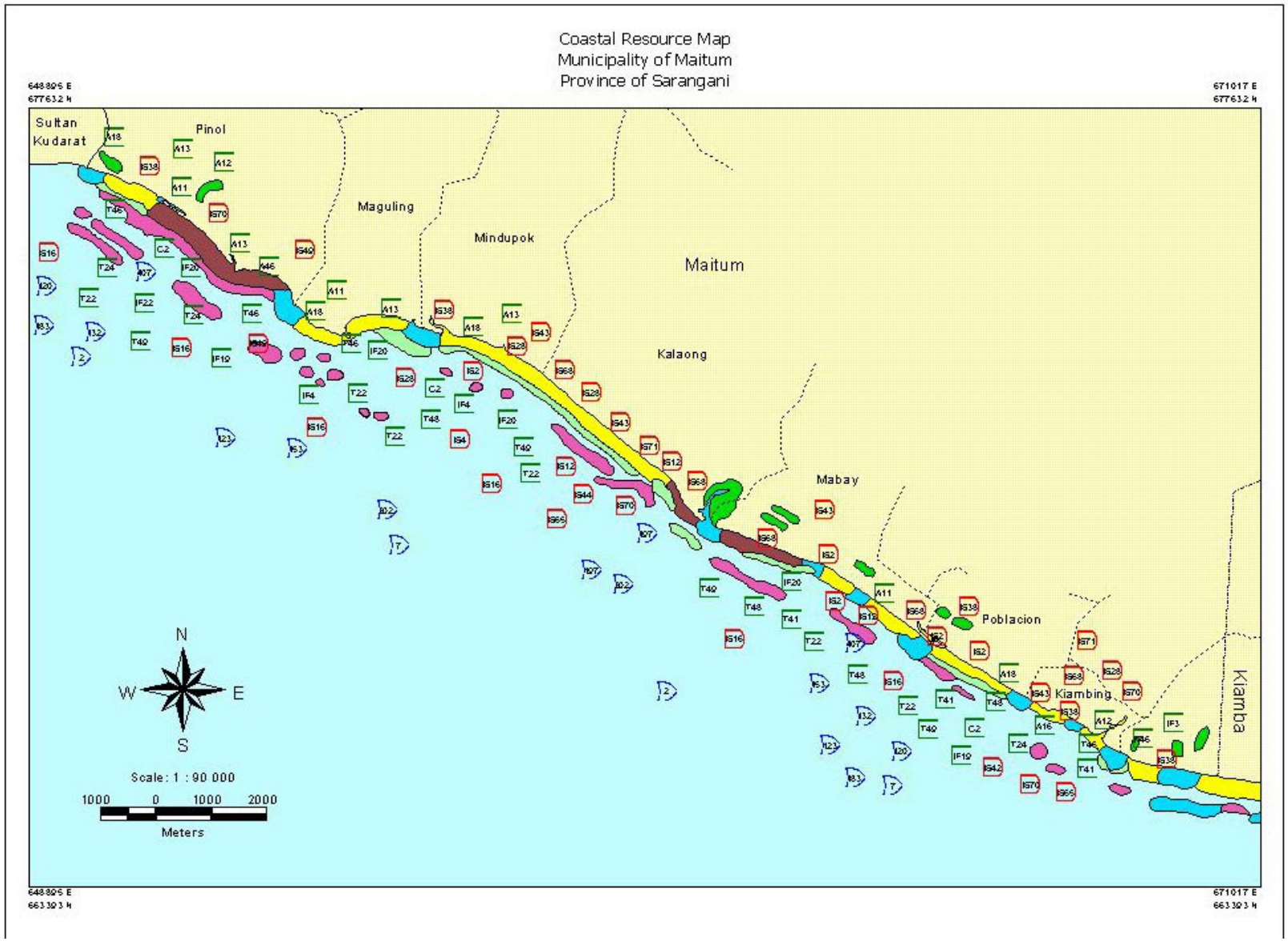



**Figure 3.2. Coastal resource map of Maitum, Sarangani Bay.**

**Maitum**


Legend:
Barangay boundary
Municipal boundary
Provincial boundary
Sandy beach
Rocky shoreline
Seagrass bed
Coral reef
Estuary
Mangrove
Terrestrial zone
Marine zone
RESOURCES
2 Dophins
7 Whales
120 Dolphin fish
123 Skip jacks
132 Flying fish
153 Moonfish
183 Snappers
197 Triggerfish
202 Tunas and mackerels
407 Octopuses
USES
A11 Fish/shrimp ponds
A12 Historical areas
A13 Settlement area
A16 Limestone quarries
A18 Mangrove timber cutting
A46 Recreational area
C2 Compressors
IF3 Electrofishing
IF4 Explosives
IF19 Torch
IF20 Poison/noxious substances
IF22 Unauthorized commercial fishing within municipal waters
T22 Hook and lines/handlines/droplines
T24 Jiggers
T41 Spears
A46 Gleaning
A48 Traps
A49 Nets
ISSUES
IS2 Beach erosion
IS4 Close access to sea
IS12 Destructive fishing
IS16 Encroachment on the fishing ground by outsiders
IS28 Lack of alternative livelihood activities
IS38 Mangrove conversion
IS42 Overfishing
IS43 Pesticide pollution
IS44 Piracy
IS49 Siltation
IS65 Habitat destruction
IS68 Pollution
IS70 Evictions
IS71 Lack of credit facilities
IS72 FAD conflicts

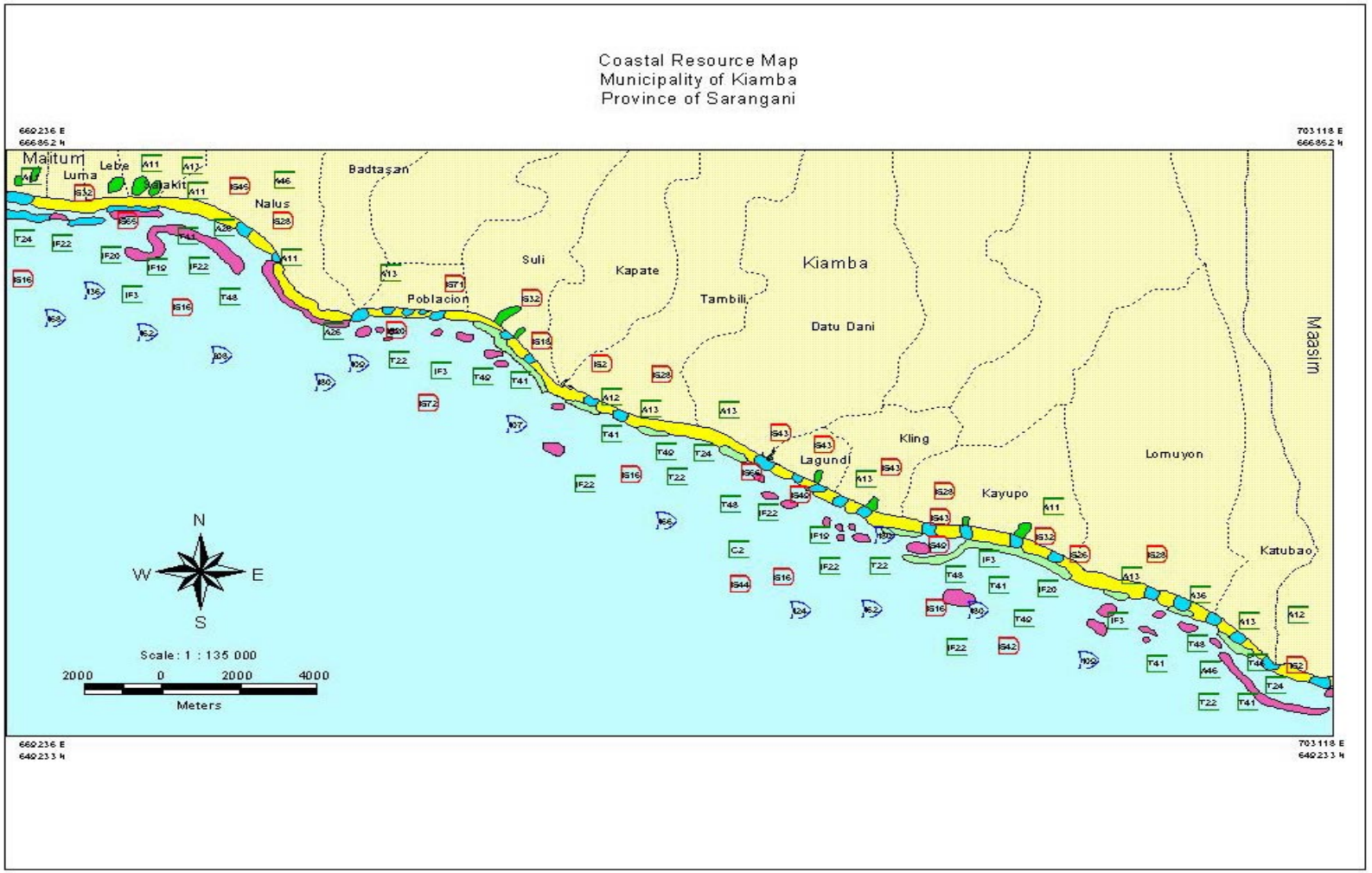
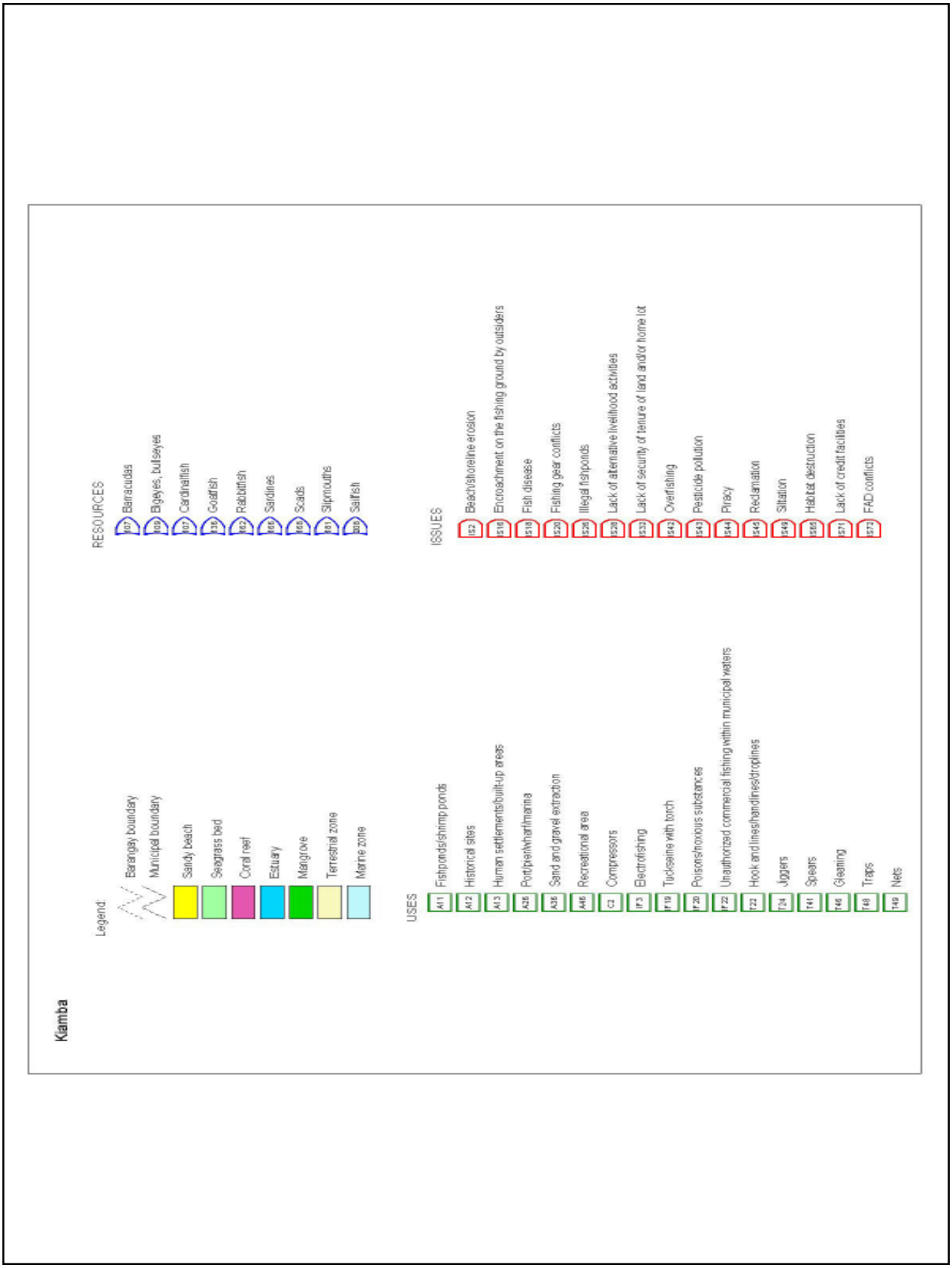



**Figure 3.3. Coastal resource map of Kiamba, Sarangani Bay.**


Kiamba
Legend
Barangay boundary
Municipal boundary
Sandy beach
Seagrass beid
Coral reef
Estuary
Mangrove
Terrestrial zone
Marine zone
RESOURCES
107 Barracudas
109 Bigeyes, bullseyes
107 Cardinalfish
116 Goatfish
102 Rabbitfish
105 Sardines
105 Scads
103 Slipmouths
105 Sailfish
USES
A11 Fishponds/shrimp ponds
A12 Historical sites
A13 Human settlements/built-up areas
A35 Port/pier/wharf/marina
A36 Sand and gravel extraction
A46 Recreational area
C2 Compressors
F3 Electrofishing
F19 Tuckseine with torch
F20 Poisons/noxious substances
F22 Unauthorized commercial fishing within municipal waters
T22 Hook and lines/handlines/droplines
T24 Jiggers
T41 Spears
T46 Gleaning
T48 Traps
T49 Nets
ISSUES
I52 Beach/shoreline erosion
S516 Encroachment on the fishing ground by outsiders
S518 Fish disease
S520 Fishing gear conflicts
S526 Illegal fishponds
S528 Lack of alternative livelihood activities
S533 Lack of security of tenure of land and/or home lot
S542 Overfishing
S543 Pesticide pollution
S544 Piracy
S545 Reclamation
S549 Siltation
S565 Habitat destruction
S571 Lack of credit facilities
S572 FAD conflicts

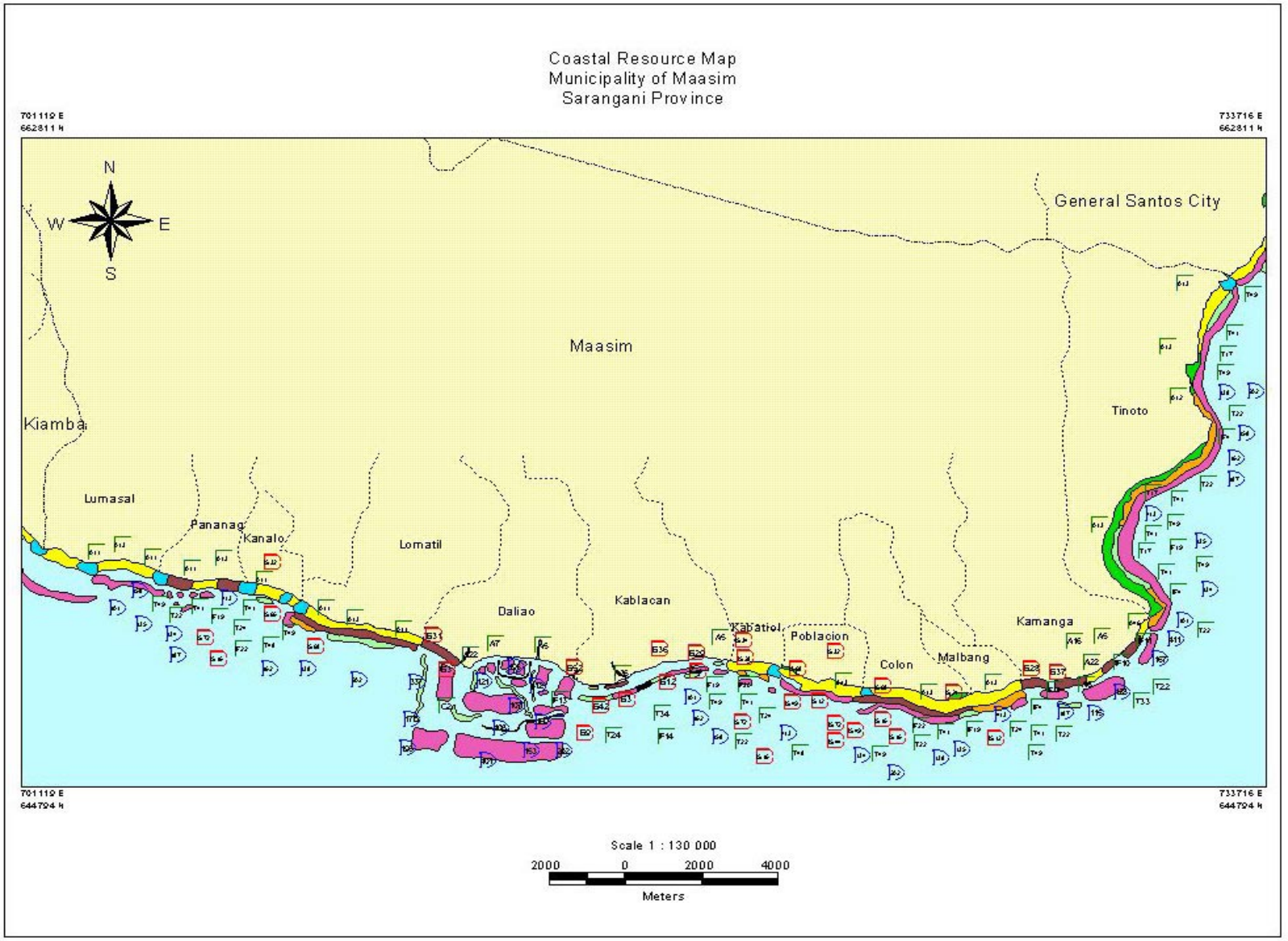



**Figure 3.4. Coastal resource map of Maasim, Sarangani Bay.**

**Maasim**

Legend:

- Barangay boundary
- Municipal boundary
- Sandy beach
- Rocky shoreline
- Inshore reef flat
- Seagrass bed
- Coral reef
- Estuary
- Mangrove
- Terrestrial zone
- Marine zone
- Mudflats

RESOURCES

- R01 Anchovies
- R07 Barracudas, seapikes
- R08 Batfish, leaffish
- R15 Clownfish, anemone fish
- R21 Dottybacks
- R26 False whitings, blanquillos
- R34 Fusiliers
- R35 Garfish
- R37 Tun shells
- R38 Groupers
- R53 Moonfish
- R56 Parrotfish
- R62 Rabbitfish
- R67 Sawfish
- R69 Scorpionfish
- R77 Shrimpfish, razorfish
- R87 Stingrays
- R95 Threadfin breams, spinechecks
- R96 Tripletails
- R02 Tunas and mackerels
- R11 Cowries
- R01 Coconut crabs
- R12 Spiny rock lobsters
- R13 Squids

USES

- T17 Fish corrals
- T22 Hook and lines/handlines/droplines
- T33 Reef seines
- T24 Jiggers
- T34 Ring nets
- T41 Spears
- T48 Traps
- T49 Nets
- IF4 Explosives
- IF10 Harvest of helmet shells
- IF11 Harvest of kapis
- IF13 Harvest of marine turtles and eggs
- IF14 Harvest of milkfish
- IF18 Tuckseine with torch
- IF20 Poisons/noxious substances
- IF22 Unauthorized commercial fishing within municipal waters
- A5 Coconut farms
- A6 Drainage canals
- A7 Educational reservations
- A11 Fishponds/shrimp ponds
- A12 Historical sites
- A13 Human settlements/built-up areas
- A16 Limestone quarries
- A22 Nipa harvesting
- A36 Sand and gravel extraction
- A46 Recreational area
- C2 Compressors

ISSUES

- IS3 Breakage of corals
- IS9 Declining fish catch
- S12 Destructive fishing
- S16 Encroachment on the fishing ground by outsiders
- S21 Flooding
- S28 Lack of alternative livelihood activities
- S29 Lack of law enforcement
- S31 Lack of organization
- S32 Lack of security of tenure of land and/or home lot
- S34 Landslide
- S36 Low awareness
- S37 Low prices of fishery products
- S42 Overfishing
- S44 Piracy
- S49 Siltation
- S52 Upland erosion
- S65 Habitat destruction
- S68 Pollution
- S72 FAD conflicts

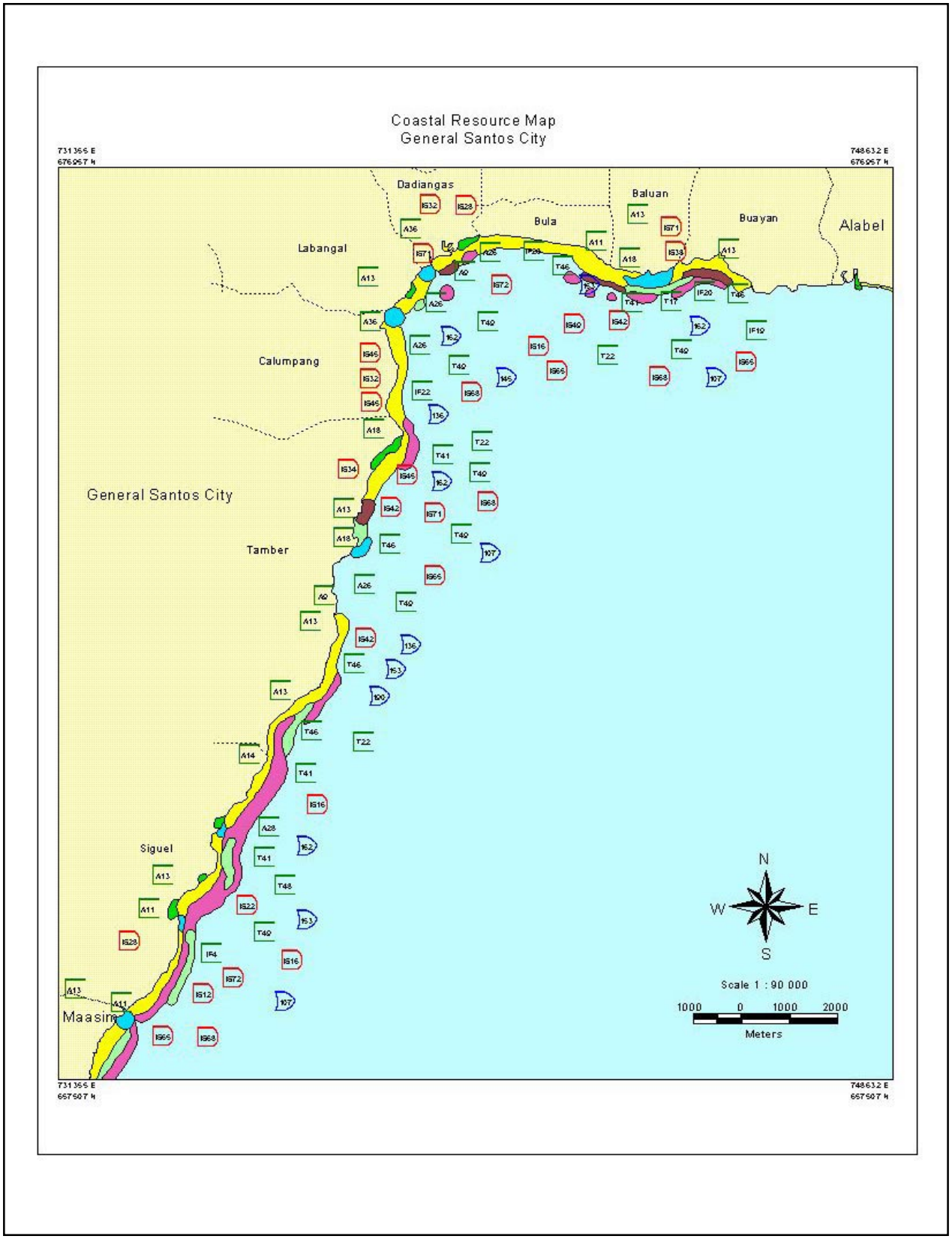



**Figure 3.5. Coastal resource map of General Santos City, Sarangani Bay.**

General Santos City

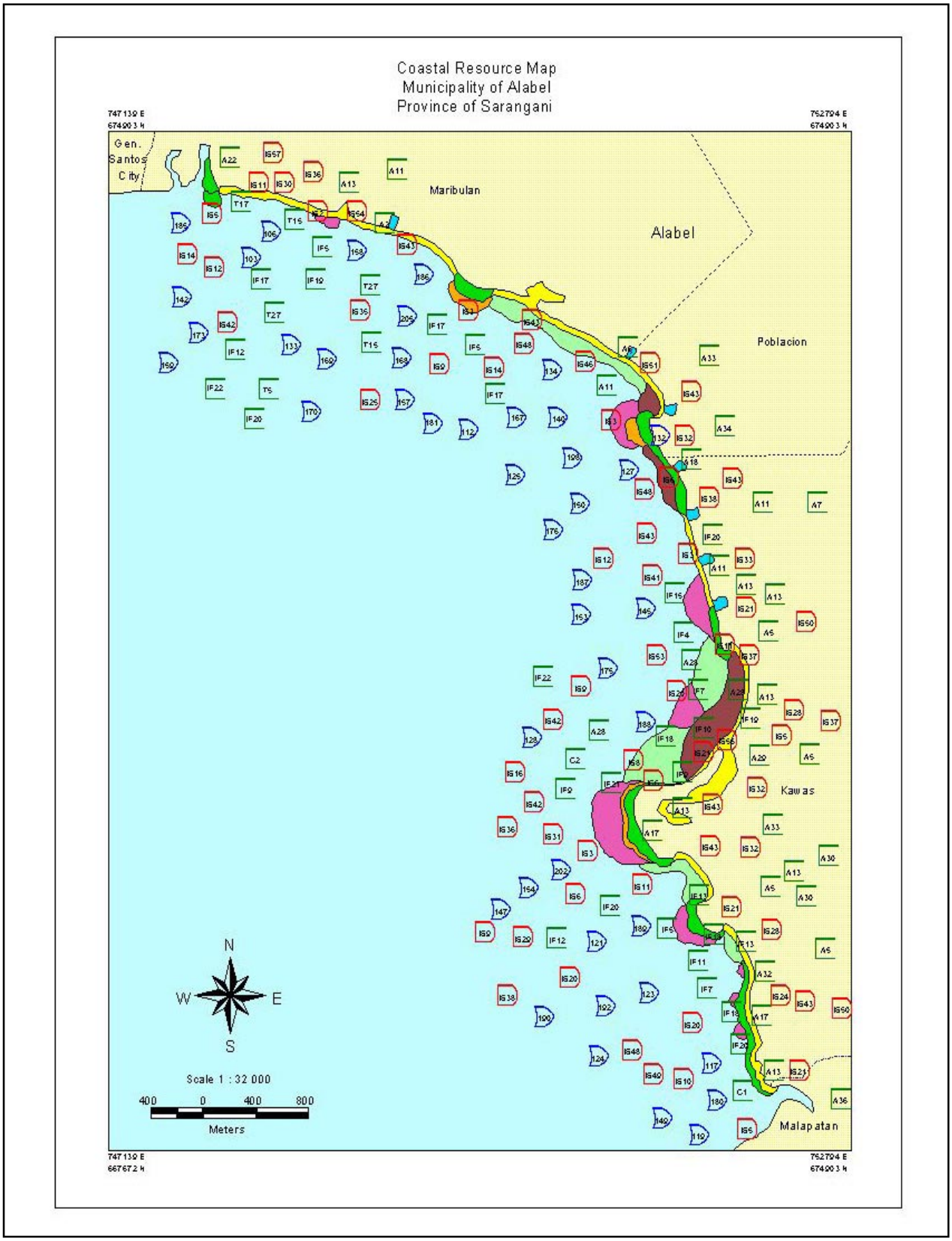



**Figure 3.6. Coastal resource map of Alabel, Sarangani Bay.**


Alabel
Legend:
Barangay boundary
Municipal boundary
Sandy beach
Rocky shoreline
Inshore reef flat
Seagrass bed
Coral reef
Estuary
Mangrove
Terrestrial zone
Marine zone
USES
A2 Anchorage
A5 Coconut farms
A6 Drainage canals
A7 Educational reservations
A11 Fishponds/shrimp ponds
A13 Human settlements/built-up areas
A17 Mangrove plantations
A18 Mangrove timber cutting
A22 Nipa harvesting
A28 Protected areas (formal and informal)
A29 Public laundry areas
A30 Public parks/plazas
A32 Resorts
A33 Rice paddies
A34 Roads, bridges
A36 Sand and gravel extraction
C1 Beach seines
C2 Compressors
F4 Explosives
F5 Fine mesh nets (less than 3 cm) for unexempted species
F7 Fishing without license
F9 Harvest of giant clams
F10 Harvest of helmet shells
F11 Harvest of kapis
F12 Harvest of manta rays
F13 Harvest of marine turtle and eggs
F15 Harvest of triton shell
F17 Not honoring closed seasons
F18 Other gears (banned by local legislation)
F19 Tuckseine with torch
F20 Poisons/noxious substances
F21 Superlights within municipal waters
F22 Unauthorized commercial fishing within municipal waters
T5 Bottom set gill nets
T15 Encircling gill nets
T17 Fish corrals
T27 Multiple hook and line
RESOURCES
103 Anglerfish and frogfish
106 Bandfish
112 Bonefish
117 Cornetfish
119 Damselfish
121 Dottybacks
123 Eagle rays and cow-nosed rays
124 Eel blennies
125 Eel-tailed catfish
127 False trevallies
128 False whitings, blanquillos
132 Flying fish
133 Fork-tailed catfish
134 Fusiliers, bananafish
140 Hairtails, cutlass fish
142 Hammerhead sharks
145 Jacks, cavallas, crevallies, trevallies, darts
147 Leatherjackets
149 Manta rays, devil rays
150 Milkfish
153 Moonfish
154 Moorish idols
157 Mullets
158 Parrotfish
159 Pomfrets, butterfish
167 Sawfish
168 Scads
169 Scorpionfish, lionfish, turkeyfish, stonefish
170 Seabasses, sandbasses, sea perches, barramundi
173 Sea-haarders, bonnetmouths
174 Sergeantfish, cobias
176 Sharks
180 Slipmouths, ponyfish
181 Snake eels
185 Spadefish, scats
186 Squirrelfish and soldierfish
187 Stingrays, skates, electric rays
188 Surgeonfish, tangs, unicornfish
189 Sweepers
190 Sweetlips and grunts
192 Tenpounders
198 Tripletails
202 Tunas and mackerels
205 Wolf herrings
ISSUES
IS2 Beach/shoreline erosion
IS3 Breakage of corals
IS6 Coliform pollution
IS8 Coral bleaching
IS9 Crown-of-thorns epidemic
IS10 Declining fish catch
IS11 Decreased estuary circulation
IS12 Defoliation/loss of vegetation
IS13 Destructive fishing
IS14 Diversion of fresh water
IS16 Encroachment on the fishing ground by outsiders
IS20 Fishing gear conflict
IS21 Flooding
IS24 Hunting
IS25 Illegal fishing
IS26 Lack of alternative livelihood activities
IS29 Lack of law enforcement
IS30 Lack of legislation
IS31 Lack of organization
IS32 Lack of security of tenure of land and/or home lot
IS33 Lack of social services
IS35 Loss of rare/endangered species
IS36 Low awareness
IS37 Low prices of fishery products
IS38 Mangrove conversion
IS41 Oil spills
IS42 Overfishing
IS43 Pesticide pollution
IS46 Red tide
IS48 Shellfish contamination
IS49 Siltation
IS50 Smuggling
IS51 Theft of gears and accessories
IS53 Use conflicts
IS54 Use rights conflicts
IS55 Waste dumping
IS57 Weak organization

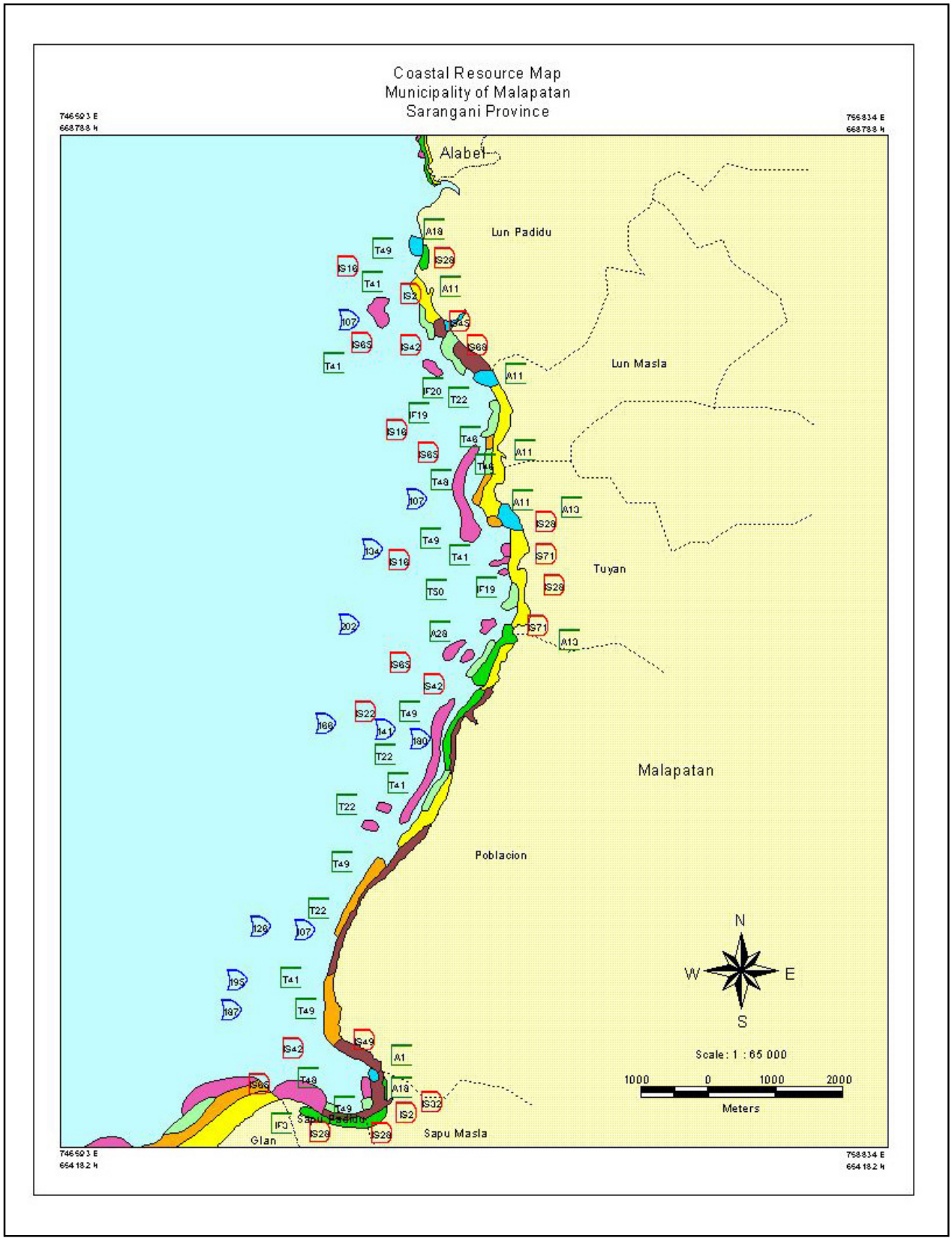



**Figure 3.7. Coastal resource map of Malapatan, Sarangani Bay.**

Malapatan


Legend:
Barangay boundary
Municipal boundary
Sandy beach
Rocky shoreline
Inshore reef flat
Seagrass bed
Coral reef
Estuary
Mangrove
Terrestrial zone
Marine zone
USES
A1 Airports
A11 Fishponds/shrimp ponds
A13 Human settlements/built-up areas
A16 Mangrove timber cutting
A28 Protected areas (formal and informal)
IF3 Electrofishing
IF19 Tuckseine with torch
IF20 Poisons/noxious substances
T22 Hook and lines/handlines/droplines
T41 Spears
T46 Gleaning
T48 Traps
T49 Nets
T50 Cuttle traps
RESOURCES
107 Barracudas
126 Emperor breams
134 Fusiliers, bananafish
141 Halfbeaks
166 Sardines
180 Slipmouths
187 Stingrays
195 Threadfin breams
202 Tunas and mackerels
ISSUES
IS2 Beach/shoreline erosion
IS16 Encroachment on the fishing ground by outsiders
IS22 Heavy metal pollution
IS28 Lack of alternative livelihood activities
IS32 Lack of security of tenure land and/or home lot
IS42 Overfishing
IS45 Reclamation
IS49 Siltation
IS65 Habitat destruction
IS68 Pollution
IS71 Lack of credit facilities

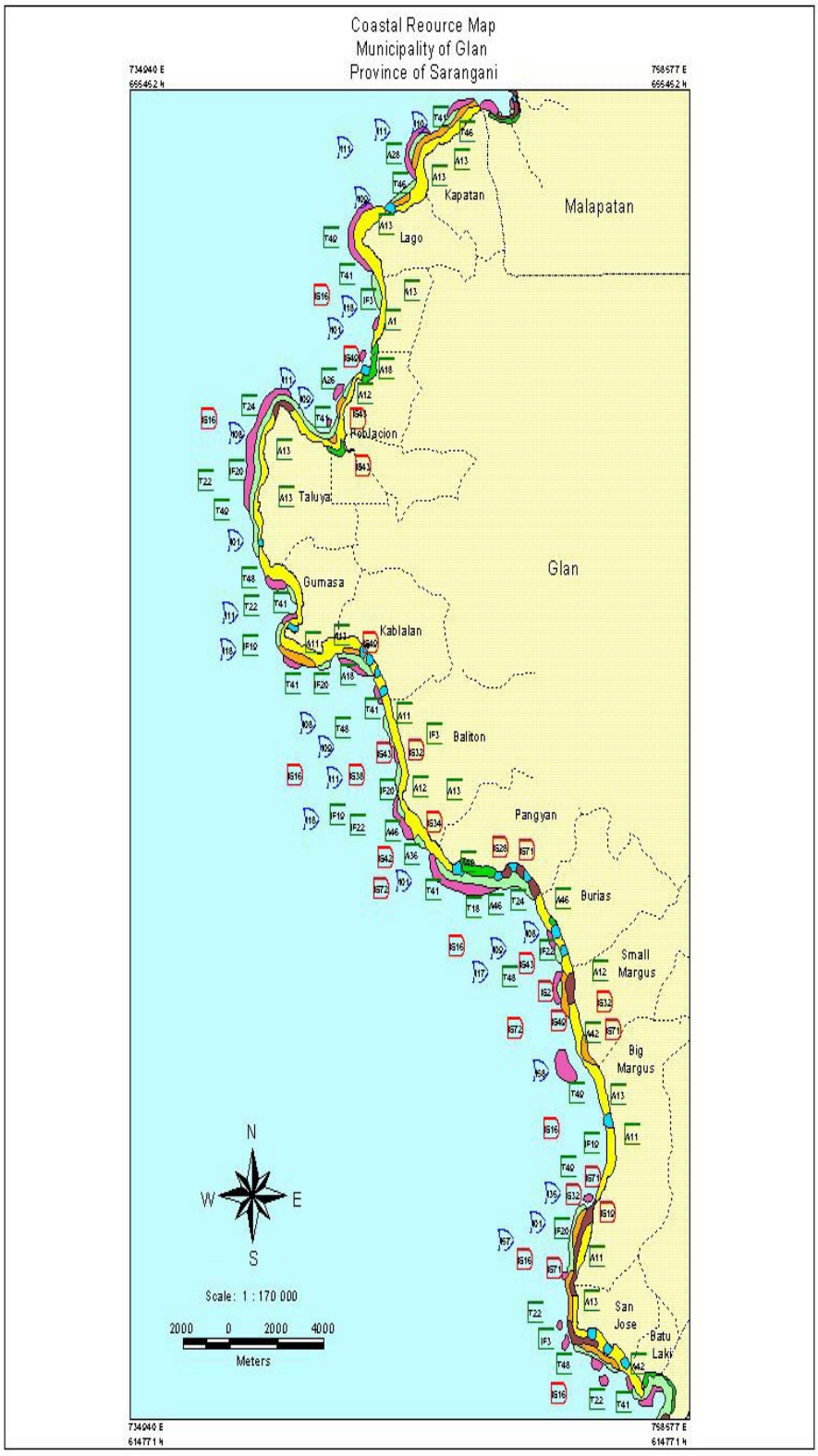



**Figure 3.8. Coastal resource map of Glan, Sarangani Bay.**

Glan


Legend:
Barangay boundary
Municipal boundary
Sandy beach
Rocky shoreline
Inshore reef flat
Seagrass bed
Coral reef
Estuary
Mangrove
Terrestrial zone
Marine zone
RESOURCES
101 Anchovies
108 Batfish
109 Bigeyes, bulleyes
110 Billfish
111 Blennies
117 Cornetfish
118 Croakers
135 Garfish
157 Mullets
158 Parrotfish
USES
A1 Airports
A11 Fishponds/shrimp ponds
A12 Historical sites
A13 Human settlements/built-up areas
A16 Mangrove timber cutting
A26 Port/pier/wharf/marina
A28 Protected areas (formal and informal)
A36 Sand and gravel extraction
A42 Agricultural land
A46 Recreational area
IF3 Electrofishing
F19 Tuckseine with torch
F20 Poisonous/noxious substances
F22 Unauthorized commercial fishing within municipal waters
T18 Fish pots and crab pots
T22 Hook and line
T24 Jiggers
T41 Spears
T46 Gleaning
T48 Traps
T49 Nets
ISSUES
S2 Beach/shoreline erosion
S16 Encroachment on the fishing ground by outsiders
S19 Fish kills
S29 Lack of alternative livelihood activities
S32 lack of security of tenure of land and/or home lot
S34 Landslide
S38 Mangrove conversion
S42 Overfishing
S43 Pesticide pollution
S49 Siltation
S71 Lack of credit facilities
S72 FAD conflicts

observed along the Sarangani and GSC coastline include the white sand beaches fronting the Celebes Sea and thick mangrove forest in the inner side of Sarangani Bay (Figure 3.9). Other coastal resources found in the area include the following major marine communities: seagrasses, seaweeds, coral reefs, and reef fishes. These major communities have been assessed on separate occasions by the academe, various national government agencies (NGAs), NGOs, and foreign-funded projects such as CRMP and MGP. The results of the survey are presented below.

**Figure 3.9. Extensive beach of Barangay Salakit, Kiamba.**

**Mangrove Community**

Mangroves play an important role in the ecological stability of the coastal ecosystem and other nearby ecosystems. They act as buffer zone against typhoons and tidal waves, prevent soil erosion, and serve as land builders through soil accretion. They serve as nursery grounds for marine fishes, crustaceans, and other marine invertebrates. They provide refuge for wildlife such as birds, rodents, reptiles, amphibians, and mammals.

There is inadequate information on the mangrove community in the profile area. Most of the available information focus on species identification and aerial cover estimate.

**Table 3.3. Mangrove forestlands of the profile area.**

| Municipality/ City | Mangrove forest (ha) | Source |
|---|---|---|
| Alabel | 7.4 | Glan CENRO (1996) |
| Glan | 57.0 | Glan CENRO (1996) |
| Kiamba | 7.0 | CRMP (1998) |
| Maasim | 150.0 | MPDO (1994) |
| Maitum | 15.0 | CRMP (1998) |
| Malapatan | 22.9 | CRMP (1998) |
| GSC | 8.3 | City ENRO (1988) |
| **Total** | **267.6** | |

*CENRO - Community Environment and Natural Resources Office*
*CRMP - Coastal Resource Management Project*
*ENRO - Environment and Natural Resources Office*
*MPDO - Municipal Planning and Development Office*

For the province, using combined data from municipal profiles and the Provincial Environment and Natural Resources Office (PENRO), the mangrove forestlands were estimated at 267.6 ha. Most of these are situated in the municipalities of Maasim, Malapatan, and Glan.

On the other hand, based on land use statistics used by Louis Berger International, Inc. (LBII 1993),

the area covered with mangrove forest is about 508 ha. However, LBII claimed that this is an overestimate based on aerial survey and ground truthing observations. According to LBII's studies, the existing mangrove forest is found in the following areas: a) at the southwestern coastline in Tinoto Bay and Linao Cove, Maasim and London and Banwalan, GSC; b) at the northern coastline in Bula, Baluan, and Buayan, GSC; and c) at the eastern coastline in Kawas, Alabel, and Malapatan down to Poblacion, Glan (see Figure 3.1).

Studies by Silliman University (SUML 1997) also provided an estimate of mangrove forest area of around 25 ha. However, it covers only the area within Sarangani Bay proper and is less than the area reported by the LGUs to CRMP.

Large tracts of mangrove forest have been cut down to give way to aquaculture ponds. Statistics show that there are 670 ha of fishponds in Sarangani Province. However, it is very hard to estimate how much of these are former mangrove areas. Mangroves are also being used for firewood, notably in Malapatan (Figure 3.10) and Alabel and in some coastal *barangay*s of GSC. Continued destruction of mangrove habitats occurs because of ease in collection by coastal dwellers rather than from a lack of alternative sources and a lack of concerted enforcement effort by the government. In the past 30 years, it has been estimated that the reclamation of mangroves was as high as 50 percent, and this has greatly contributed to the decline of fishery products.

**Figure 3.10. Natural growth mangroves in Malapatan-Maasim area.**

Based on the surveys conducted, 10 mangrove species were identified within Sarangani Bay (Table 3.4). The most common species belong to the genera *Avicennia* (*api-api*), *Rhizopora* (*bakawan*), and *Sonneratia* (*pagatpat*).

**Seagrass Community**

Seagrasses are confined to relatively shallow intertidal and subtidal areas. Distribution of seagrass is limited to the narrow shallow area along the coast since steep slopes characterize the bottom topography.

To date, available information on the extent of area covered by seagrasses has been based on the satellite image classified by the National Mapping and Resources

**Table 3.4. List of mangrove species in Sarangani Bay.**

| Mangrove species | Local name |
|---|---|
| **RHIZOPHORACEAE** | |
| *Rhizophora mucronata* | *Bakhaw baye* |
| *Rhizophora apiculata* | *Bakhaw laki* |
| *Ceriops decandra* | *Malatangal* |
| **AVICENNIACEAE** | |
| *Avicennia marina* | *Piape baye* |
| **SONNERATIACEAE** | |
| *Sonneratia alba* | *Pagatpat* |
| **COMBRETACEAE** | |
| *Terminallia catappa* | *Talisay* |
| **MYRSINACEAE** | |
| *Aegiceras floridum* | *Tinduk-tindukan* |
| **EUPHORBIACEAE** | |
| *Excoecaria agallocha* | *Alipata, Buta-buta* |
| **FABACEAE** | |
| *Pongamia pinnata* | *Taualis* |
| **LYTHRACEAE** | |
| *Pemphis acidula* | *Bantigi* |

*Source: LBII (1993); SUML (1997)*

Information Agency (NAMRIA) in 1993. The image was based on spot multi-spectral data taken on 5 April 1987. It covers only the area of Sarangani Bay. Based on NAMRIA's preliminary classification, the shallow reef areas with seagrasses cover an area of 9.81 $km^2$ from Taliak Point, Maasim to Lefa Point, Glan.

Aside from NAMRIA, LBII (1993) also did visual identification and aerial cover estimates of the seagrass community. The coastal areas identified with seagrass communities include Tinoto, Maasim; Tambler, GSC; Malapatan; Taluya, Gumasa; and Burias, Glan (Figure 3.1). The identified species were *Enhalus acoroides*, *Halophila* spp., and *Thalassia hemprichii* (Table 3.5).

**Table 3.5. List of seagrass species identified in the coastal areas of Sarangani Province and GSC.**

| Seagrass species | Municipalities where they are found |
|---|---|
| *Cymodocea rotundata* | Malapatan, Glan, Alabel, Kiamba |
| *Cymodocea serrulata* | Glan |
| *Enhalus acoroides* | Maasim, Alabel, Glan |
| *Halodule pinifolia* | Maasim, Malapatan, Glan, Alabel, Kiamba |
| *Halodule uninervis* | Glan, Alabel |
| *Halophila ovalis* | Maasim, Malapatan, Alabel, Kiamba |
| *Halophila spinulosa* | Kiamba |
| *Syringodium isoetifolium* | Maasim, Malapatan, Glan, Alabel |
| *Thalassia hemprichii* | Maasim, Malapatan, Glan, Alabel |
| *Thalassodendron ciliatum* | Glan |

*Source: LBII (1993); SUML (1997)*

SUML (1997) also did a separate survey of the seagrass community in the area. The survey included the following: Kawas Point, Alabel; Gumasa and Lago Point, Glan; Linao Cove and Tinoto, Maasim; Lun Padidu, Malapatan; and Poblacion, Kiamba. In these areas, seagrass covers an estimated area of 0.27 $km^2$. Aside from the previously mentioned species, other species observed were *Cymodocea, Syringodium, Halophila,* and *Thalassodendron*. The latter species is rare and can only be found in southern Philippines. Small quantities of this species were observed in Gumasa. However, a wide bed of this species has been found in Batulaki, Glan by the Sarangani CRMP team. The team also observed seagrass communities of *Thalassia* and *Enhalus* in Siguel, GSC.

Siltation coming from the rivers and tributaries emptying into Sarangani Bay poses a major threat to the seagrass ecosystem. Unfortunately, no action has been taken to address the problem. So far, no solution has been implemented for this problem, since some of the sources fall outside of the jurisdiction of Sarangani and GSC.

**Coral Reef and Reef Fish Communities**

LBII (1993) also conducted coral reef assessment in the area. A total of 28 reef areas along the coasts of Sarangani Province and GSC have been surveyed. Of the 28 sites surveyed, only 8 sites have coral cover exceeding 50 percent; 6 sites between 40 and 49 percent; 2 sites between 30 and 39 percent; and the rest of the 12 sites, below 30 percent. The sites with coral cover greater than 50 percent are found in Tinoto Bay, Maasim; Glan; Alabel; and Malapatan (Table 3.6, Figure 3.1).

**Table 3.6. Percentage coral cover, substrate, and algae in the profile area.**

| Location | Hard corals | Soft corals | Algae | Dead corals | Sand and silt | Rubble |
|---|---|---|---|---|---|---|
| **ALABEL** | | | | | | |
| Kawas Point | 58.06 | 2.80 | 1.68 | 11.26 | 13.52 | 9.70 |
| **GLAN** | **37.89** | **15.03** | **4.21** | **12.79** | **12.68** | **13.75** |
| Burias Point | 26.64 | 12.50 | 0.60 | 19.90 | 20.56 | 21.80 |
| Sagby Point | 46.58 | 12.44 | 0.10 | 18.58 | 16.70 | 5.60 |
| Nibong | 40.53 | 21.77 | 0.00 | 7.27 | 21.00 | 0.00 |
| Taluya Point | 11.96 | 59.36 | 0.00 | 18.88 | 7.30 | 2.50 |
| Bato Maputi | 43.84 | 29.06 | 0.00 | 11.04 | 10.70 | 5.36 |
| Lago Point | 75.34 | 0.00 | 0.00 | 7.86 | 9.00 | 7.70 |
| Hagdan Point | 25.96 | 12.64 | 16.92 | 6.76 | 12.64 | 19.88 |
| Tinaca Point | 29.52 | 13.24 | 9.22 | 6.02 | 14.46 | 19.74 |
| Tikang Point | 14.83 | 7.27 | 7.20 | 15.03 | 11.60 | 39.00 |
| Manibong | 46.20 | 0.00 | 4.50 | 20.48 | 12.84 | 12.56 |
| Dongon | 65.94 | 3.08 | 7.14 | 11.92 | 3.00 | 4.92 |
| Gumasa | 27.32 | 8.94 | 4.88 | 9.68 | 12.38 | 25.96 |
| Batulaki | | | | | | |
| **GSC** | | | | | | |
| Tambler | 22.41 | 0.00 | 0.15 | 6.01 | 26.92 | 29.66 |
| Bual Point | | | | | | |
| **MALAPATAN** | **50.66** | **7.66** | **6.34** | **10.26** | **9.28** | **9.65** |
| Malapatan (north) | 44.88 | 8.32 | 7.66 | 20.52 | 11.06 | 5.70 |
| Malapatan (south) | 56.44 | 7.00 | 5.02 | 0.00 | 7.50 | 13.60 |
| **MAASIM** | **46.35** | **8.23** | **8.20** | **7.34** | **8.69** | **14.38** |
| Linao Cove | 65.16 | 0.00 | 6.42 | 5.47 | 0.00 | 20.28 |
| Malbong | 39.05 | 29.27 | 1.37 | 2.90 | 0.00 | 24.27 |
| Lumasal | 37.80 | 3.02 | 5.86 | 26.34 | 10.80 | 4.70 |
| Katubao | 27.08 | 13.44 | 25.10 | 3.80 | 9.04 | 15.10 |
| Tampuan Point (slope) | 16.48 | 15.58 | 5.84 | 1.34 | 22.70 | 31.18 |
| Tinoto Bay (mangrove) | 55.19 | 0.00 | 2.42 | 2.77 | 24.93 | 7.13 |
| Tampuan Point (wall) | 63.76 | 2.36 | 15.67 | 6.01 | 0.12 | 3.62 |
| Tampat Point | 47.34 | 0.10 | 7.16 | 8.56 | 8.28 | 17.66 |
| Tinoto Bay (cliff) | 65.27 | 10.26 | 3.96 | 8.85 | 2.33 | 5.50 |

*Source: LBII (1993)*

Based on LBII's report, 42 coral genera were identified. The dominant genera are *Acropora*, *Porites*, *Diploastrea*, *Goniopora*, *Montipora*, and *Favites*.

At the time of the LBII study, dynamite fishing was prevalent. This was the response of subsistence fishers against the purse seine method of commercial fishers.

Both methods are highly destructive to corals. However, based on interviews conducted in 1994, dynamite fishing was not as prevalent as in the past. However, commercial fishing within municipal waters was still a problem.

Other destructive fishing methods used in Sarangani Bay that have caused degradation to the coral cover include *lintig* or *muro-ami* and poison fishing.

**Figure 3.11. Excellent cover of *Acropora* (branching corals) found in Tuka Marine Park, Kiamba.**

Apart from destructive fishing, there has also been some extraction of corals (Figure 3.11). However, this is not so prevalent. Only a small trade in dried and painted corals by Badjaos exists in resort beaches in the area. This is primarily because tourism is not developed in the area.

Table 3.7 shows that the reefs are heavily exploited. This is indicated by the small size of fish and the scarcity of commercially valuable species. However, abundance and diversity are dependent on coral cover. In all of the sites surveyed by SU, most fish were small with very few species of commercial value. It is obvious that habitat degradation and overfishing have taken their toll.

A major threat to corals as well as the whole coastal ecosystem is the sedimentation due to erosion and siltation of denuded watershed and improper agricultural practices. These threats and issues are described in more detail in Chapter 7.

**Table 3.7. Number of fish species, fish abundance, and biomass estimates in Sarangani Province including GSC.**

| Municipality/City | No. of sites surveyed | Area surveyed ($m^2$) | No. of fish species | Density (no./$m^2$) | Range of biomass (mt/$km^2$) | Commercially important species | |
|---|---|---|---|---|---|---|---|
| | | | | | | No. of species | Biomass (mt/$km^2$) |
| Alabel | 1 | 500 | 8 | 1 | 1.63 | 37 | 10.75 |
| Glan | 13 | 6,100 | 42 | 2 | 9.57 | 140 | 3.03-102.22 |
| GSC | 1 | 300 | 7 | 1 | 3.00 | 30 | 19.23 |
| Kiamba | 2 | 1,000 | 7 | 1 | 2.39 | 45 | 11.65-15.95 |
| Maasim | 9 | 3,900 | 50 | <1 | 8.16 | 138 | 12.75-57.51 |
| Malapatan | 2 | 1,000 | 9 | 2 | 0.36 | 44 | 2.56-6.26 |

*Source: LBII (1993). No data collected for the Municipality of Maitum.*

Within the reef area surveyed, fish species composition and production value estimates were also conducted (Table 3.7). A total of 191 reef fishes were identified. Fish biomass estimates ranged from 2.56 to 102.22 mt/km$^2$. The highest fish biomass estimate was observed in Glan, while the lowest was in Malapatan. The highest fish biomass estimates for commercially important species were observed in Glan (9.57 mt/km$^2$) and Maasim (8.16 mt/km$^2$) represented by 42 and 50 species, respectively (LBII 1993).

Among the fish species observed, the most represented families are Pomacentridae (42 species), Labridae (34), Chaetodontidae (18), and Acanthuridae (12) (Table 3.8).

**Table 3.8. List of fish families and species observed.**

| Family | Common name | No. of species | |
|---|---|---|---|
| | | MGP (1993) | CRMP (1999) |
| Aulostomidae | Surgeonfish | 12 | 21 |
| Acanthuridae | Cardinalfish | 3 | 9 |
| Apogonidae | Trumpetfish | 1 | 0 |
| Balistidae | Triggerfish | 5 | 7 |
| Blennidae | Blenny | 0 | 1 |
| Caesionidae | Fusilier | 4 | 8 |
| Carangidae | Scad and jack | 2 | 2 |
| Centriscidae | Shrimpfish | 1 | 1 |
| Chaetodontidae | Butterflyfish | 18 | 23 |
| Cirrhitidae | Hawkfish | 3 | 5 |
| Dasyatidae | Stingray | 1 | 1 |
| Diadontodae | Porcupine fish | 0 | 2 |
| Ephippidae | Batfish | 0 | 2 |
| Fistulariidae | Flutemouth | 1 | 2 |
| Gobiidae | Goby | 1 | 0 |
| Haemulidae | Sweetlip | 1 | 4 |
| Holocentridae | Squirrelfish | 4 | 8 |
| Labridae | Wrasse | 34 | 38 |
| Lethrinidae | Emperor | 1 | 1 |
| Lutjanidae | Snapper | 5 | 6 |
| Microdesmidae | | 2 | 0 |
| Monacanthidae | Filefish | 2 | 5 |
| Mullidae | Goatfish | 9 | 9 |
| Muraenidae | Moray eel | 2 | 2 |
| Nemipteridae | Threadfin bream | 1 | 4 |
| Ostraciidae | Boxfish | 1 | 3 |
| Pinguipedidae | Sandperch | 1 | 3 |
| Plotosidae | Sea catfish | 1 | 1 |
| Pomacanthidae | Angelfish | 7 | 6 |
| Pomacentridae | Damselfish | 42 | 50 |
| Priacanthidae | Big-eye | 8 | 5 |
| Scaridae | Parrotfish | 6 | 11 |
| Scorpaenidae | Scorpionfish and stonefish | 0 | 0 |
| Serranidae | Grouper | 8 | 21 |
| Siganidae | Rabbitfish | 0 | 0 |
| Sphyraenidae | Barracuda | 1 | 0 |
| Syngnathidae | Seahorse | 1 | 0 |
| Synodontidae | Lizardfish | 0 | 3 |
| Tetraodontidae | Pupperfish | 3 | 4 |
| Zanclidae | Moorish idol | 1 | 1 |
| | | **193** | **269** |

*Source: LBII (1193) and Participatory Coastal Resource Assessment 1998-99*

The family Pomacentridae (damselfishes) is the most numerous fish species. This includes the following species: *Chromis ternatensis* (18 percent of the total numerical abundance), *Neoglyphidodon melas* (13 percent), *Chromis atripectoralis* (8 percent), *Acanthochromis polyacanthus* (7 percent), *Pomacentrus coelestis* (7 percent) and *Pomacentrus moluccensis* (6 percent). The most dominant species by biomass are represented by the species *Neoglyphidodon melas* (22 percent of the total biomass), *Taeniura lymma* (12 percent), *Chromis ternatensis* (8 percent), *Ctenochaetus striatus* (5 percent), and *Pomacentrus moluccensis* (3 percent).

**Seaweeds**

The only available seaweed information in the area came from the studies conducted by SUML (1997). Sixty-six species were identified belonging to division Chlorophyta (green algae), Cyanophyta (blue-green algae), Phaeophyta (brown algae) and Rhodophyta (red algae).

The most common seaweed species sold in the market are *Caulerpa* sp. (*lato*) and *Eucheuma* sp. (*guso*). In Kawas, Alabel, fisherfolk allege that there is a bed of *Caulerpa* sp. covering an area of at least a hectare at 70 ft deep. However, this has yet to be verified.

**Other Marine Fauna**

LBII (1993) has indicated that marine mammals such as whales, dolphins, and sea turtles are common in the area. The Earth Island Institute (EII) confirmed this report and indicated that there are 5 species of whales and 7 species of dolphins in the area. However, there is no available listing of species observed. Sharks have also been observed in the area, particularly, the whale shark (*Rhincodon typus*).

*Dugong* (*Dugong dugon*) is present in the area particularly in Glan and Kiamba (Figure 3.12). Researchers of the Department of Agriculture-Bureau of Fisheries and Aquatic Resources (DA-BFAR) and other agencies who monitor Sarangani Bay have verified this. *Dugong* have also been found beached in the coastal areas of Glan.

**Figure 3.12. *Dugong* washed on the shoreline of Sarangani Bay in Glan.**

Surfacing sea turtles is a common sight in the coastal waters of Sarangani. The most

**Figure 3.13. Newly hatched green sea turtles found in Lomuyon, Kiamba.**

common species is the green sea turtle (*Chelonia mydas*) and on some occasions the hawksbill (*Eretmochelys imbricata*). The presence of sea turtles in the area was also verified by the CRMP team which saw the animal above and underwater in Kawas, Alabel, and Kiamba, respectively (Figure 3.13).

**Tuka Marine Sanctuary, Kiamba**

One marine sanctuary in Sarangani Bay has been carefully monitored since 1997 with the assistance of UP-MSI and CRMP in collaboration with local government and academia in Sarangani. The Tuka Marine Sanctuary in Kiamba covers about 10 hectares of coral reef area and was marked with buoys and signs in 1998. Although the ordinance was only recently passed, the sanctuary has been practically enforced since 1997 and has demonstrated the positive results of coral reef protection. The living hard corals inside the santuary have improved from an average cover of 42.7 percent in 1998 to 55 percent in 2001 (Figure 3.14). Similarly, the abundances of fish inside and outside of the sanctuary have increased substantially over the 3 year period (Figure 3.15).

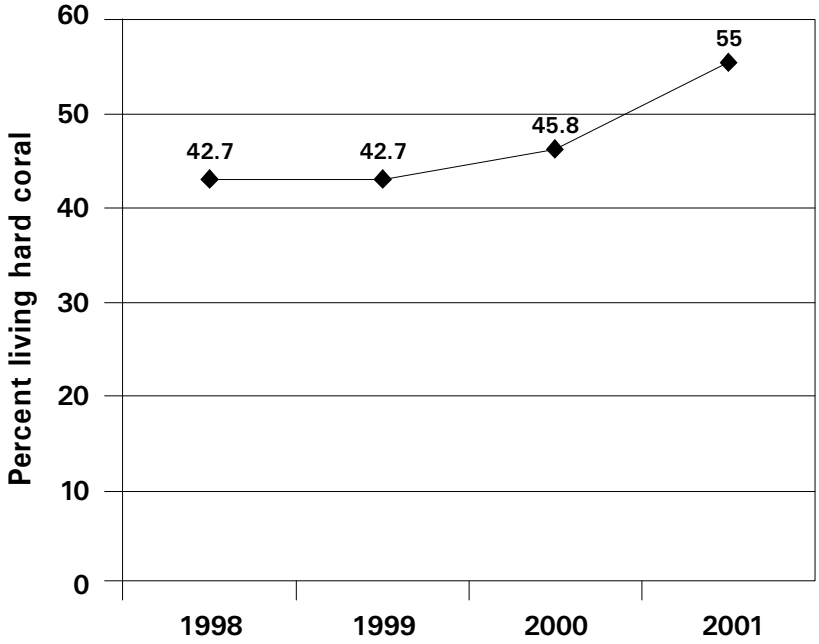



**Figure 3.14. Change in living hard coral cover inside the Tuka Marine Sanctuary from 1998 to 2001.**
*Source: Uychiaoco* et al*. 2001*

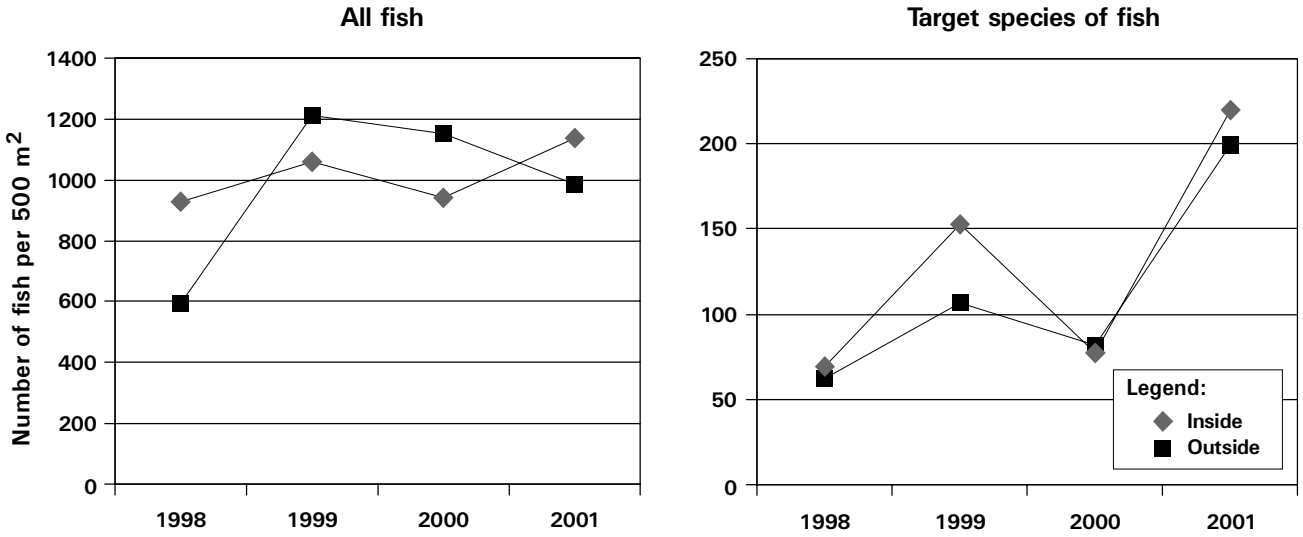



**Figure 3.15. Change in fish abundances (number of individuals within 500 $m^2$ area) inside and outside of the Tuka Marine Sanctuary from 1998 to 2001.**
*Source: Uychiaoco* et al*. 2001*

**SUMMARY**

The rich coastal and marine resources of Sarangani Bay are being increasingly impacted by development. Trends indicate declining coral reef and mangrove areas and deteriorating water quality. The productive coastal ecosystems require protection and management and stabilization of water quality to ensure long-term fish production and access to the other associated benefits of these valuable coastal resources.