Chapter 3
NATURAL RESOURCES

Inherent in the growth of the Malalag Bay Area (MBA) is the availability of its natural resources. This chapter presents the extent and status of mineral, forests, and coastal resources found in the MBA.

MINERAL RESOURCES

Based on the Mines and Geosciences Bureau (MGB) records, eleven mineral resources occur in Davao del Sur including gold, silver, lead, copper, chromium, limestone, white clay, molybdenum, sulphur, phosphate, and guano. However, the size of deposits on these resources is not known.

The MBA has a protected forest of 2,367 ha and a production forest of 1,947 ha.

Although gold has been discovered in Malalag and the people have been extracting it through the panning method, these mineral deposits remain to be explored. Malalag also has copper, manganese, limestone, and phosphate rocks. Hagonoy and Padada are rich in sand and gravel which remain as the main source for infrastructure development in the bay and neighboring areas. Table 3.1 lists the mineral resources found in the MBA.

FOREST RESOURCES

The MBA has a protected forest of 2,367 ha and a production forest of 1,947 ha. The MBA no longer has old growth or secondary growth forests; what remain are areas classified into timberlands. However, these areas only have patches of big trees with most of the area already denuded and deforested. Among the five municipalities, Sta. Maria has the largest timberland with an area of 10,396 ha, followed by Malalag with 7,281 ha.

Table 3.1. Mineral resources of the MBA.

Mineral	Hagonoy	Padada	Sulop	Malalag	Sta. Maria
Copper					
Manganese					
Limestone					
Phosphate					
Sand and gravel					

Source: PSPT (1994).

Rehabilitation of the denuded forestlands is one of the priority programs of the DENR.

According to the Local Government Support Office in 1994, forest denudation has accelerated the loss of top soil, increased the severity and frequency of floods, increased siltation to downstream farms, settlements and various coastal habitats, and decreased the supply of water for domestic and agricultural use.

With the alarming condition of the forestry resources, the DENR implemented the Integrated Social Forestry Project (ISFP) within Davao del Sur. In 1993, a total of 1,022 ha of denuded forest were reforested. Rehabilitation of the denuded forestlands is one of the priority programs of the DENR.

The DENR is also implementing Integrated Social Forestry (ISF) where deserving forest occupants are given security of tenure through the issuance of Certificate of Stewardship Contracts (CSCs) with a duration of 25 years and renewable for another 25 years. From 1993 to 1996, the DENR has issued a total of 586 CSCs to farmer beneficiaries in the MBA. The municipality of Sta. Maria had the highest number of CSCs issued (506) involving an area of 1,191.35 ha (Table 3.2).

The forest-environment sector has long been beset with issues concerning denudation of the upland areas to critical levels due to misuse and abuse of forest resources. The growing population is contributing to this trend.

COASTAL RESOURCES

During the participatory coastal resource assessment (PCRA) mapping in 1997, the coastal residents in the MBA identified the most abundant and most commercially valuable resources found near their coastal communities. Traditional fishing methods and other activities in the area as well as problems and issues were also identified.

Table 3.2. Certificate of Stewardship Contracts and corresponding area issued by the DENR under the Integrated Social Forestry Project in the MBA.

Municipality	*Barangay*	Year established	No. of projects	No. of CSCs issued	Area (ha)
Hagonoy	Balutakay	1993	1	1	0.36
Malalag	Pitu	1993	1	31	62.07
	Pitu	1996	2	43	103.27
Padada	Palili		1	5	18.65
Sta. Maria	Mamacao, San Agustin, Ogpao, Tanglad, Sto. Niño	1993	5	253	524.89
	Buca	1995	1	162	439.86
	Basiawan, Buca, Kidadan, Pongpong, Tanglad	1996	6	91	226.60
Total			**17**	**586**	**1,375.70**

Source: PPDO (1993, 1996).

Results of the mapping showed that a considerable area of coral reefs, mangroves, and seagrasses still exist in all municipalities (Table 3.3). The following section shows the coastal resource map of each municipality as well as the transect diagrams of the coastal *barangays* presenting the resources, uses, and issues in relation to the various habitats.

Table 3.3. Habitats in the MBA.

Habitats	Hagonoy (ha)	Padada (ha)	Sulop (ha)	Malalag (ha)	Sta. Maria (ha)	Total
Sandy beach	119	45	26	48	184	422
Rocky shoreline	-	-	-	23	99	122
Inshore flat	107	207	117	21	59	511
Seagrass beds	160	88	25	118	353	744
Coral reef	95	80		108	385	668
Estuary	12	-	0.24	1	118	131.24
Mangrove	47	18	9	42	137	253
Mudflat	175	119	30	53	94	471
Terrestrial zone	4,635	3,623	15,259	7,932	21,488.47	52,937.47
Marine zone	12,822	814	276	845	37,944	52,701

Hagonoy

Of the 21 *barangays* of Hagonoy, five are coastal, which occupy 2,472 ha, about 20 percent of the total land area of Hagonoy. Although only 18 percent of the population live near the coastal areas, the entire population is dependent on fisheries.

As seen in Figure 3.1, the areas of habitats mapped through the PCRA are as follows:

- Sandy beach 119 ha
- Inshore flat 107 ha
- Seagrass bed 160 ha
- Coral reef 95 ha
- Estuary 12 ha
- Mangrove 47 ha
- Mudflat 175 ha

The most abundant fishery resources are mackerel, sardines, mullet, hairtail, goatfish, grouper, moonfish, sailfish, scallops, and clams. Fishing methods used are beach seine, bottom set gill net, fish pot, hook and line, push net, and troll line.

The coastal resources of Hagonoy are beset by problems and issues such as beach/shoreline erosion, coral bleaching, declining fish catch, destructive fishing, fishing gear conflicts, lack of alternative livelihood activities, lack of law enforcement, mangrove conversion, pesticide pollution, siltation, waste dumping, water turbidity, and sand extraction.

HAGONOY FACTS AND FIGURES

***Barangays* (21):** Aplaya, Balutakay, Clib, Guihing, Hagonoy Crossing, Kibuaya, La Union, Lanuro, Lapulahao, Leling, Mahayahay, Malabang, Maliit Digos, New Quezon, Paligue, Poblacion, Sacub, San Guillermo, San Isidro, Sinayawan, Tologan

Coastal *Barangays* (5): Aplaya, Balutakay, Guihing, Leling, Paligue

Total Land Area: 11,664 ha

Coastal Land Area: 2,472 ha

Length of Coastline: 8 km

Population: 41,752

Population of Coastal *Barangays*: 7,346

Specific resources, uses, and issues in the five coastal *barangays* of Hagonoy are presented in Figure 3.2.

Legend:

HABITATS
- Sandy beach
- Rocky shoreline
- Inshore flats
- Seagrass beds
- Coral reef
- Estuary
- Mangrove
- Terrestrial zone
- Marine zone
- Mudflats
- Municipal boundary
- Road

RESOURCES
- 202 Mackerels
- 207 Sardines
- 210 Mullets
- 211 Hairtails
- 217 Goatfish
- 223 Groupers
- 224 Moonfish
- 231 Sailfish
- 301 Scallops
- 306 Clams

USES
- T3 Beach seine
- T5 Bottom set gill net
- T18 Fish pot
- T22 Hook and line
- T27 Multiple hook and line
- T31 Push net
- T45 Troll line

ISSUES
- I52 Beach/shoreline erosion
- I56 Coral bleaching
- I59 Declining fish catch
- I512 Destructive fishing
- I520 Fishing gear conflicts
- I529 Lack of alternative livelihood activities
- I521 Lack of law enforcement
- I538 Mangrove conversion
- I543 Pesticide pollution
- I549 Siltation
- I557 Waste dumping
- I564 Water turbidity
- I562 Sand extraction

Figure 3.1. Coastal resource map of the municipality of Hagonoy, Davao del Sur.

	HABITATS				
	Terrestrial zone	**Mangrove**	**Sandy beach/mudflat**	**Seagrass bed/ coral reef**	**Marine zone**
Resources	Crop, trees, animals, houses, garden	Fishpond, swamp, mangroves	Sandy beach, cottage, trees, beach resort, finfish, corals, seagrass, crustaceans, mollusks, muddy beach	Shellfish, finfish, seagrass, coral reef, mollusks, corals, crustaceans	Pump boat, fish, fish corals, reef, finfish, seaweeds
Uses	Food, shelter, livelihood, lumber, beautification	Habitat, fuel, lumber, house construction, shelter, livelihood	Shelter, livelihood, recreation, habitat, lumber, food, fish shelter, breeding	Food, livelihood, shelter, breeding, fish habitat, food for fish, human food	Livelihood, foodfish habitat
Issues	Sanitation problem, illegal cutting of trees, soil erosion, pollution, stray animals	Illegal cutting, soil erosion, siltation	Sanitation, flooding/ drainage, prostitution, pollution, damaged fish shelter, illegal fishing, soil erosion, siltation	Illegal fishing, pollution, commercial fishing, overfishing, fishing by outsiders	Limited fish because of the damage of corals and stones, illegal fishing, pollution, commercial fishing

Figure 3.2. Hagonoy transect diagram (Barangays Aplaya, Balutakay, Guihing, Leling, and Paligue).

Malalag

Of the 15 *barangays* of Malalag, three are coastal. Although coastal areas occupy only 11 percent of the total land area of Malalag, almost 28 percent of the population are coastal dwellers and dependent on coastal resources.

As seen in Figure 3.3, the areas of habitats mapped through the PCRA are as follows:

- Sandy beach 48 ha
- Rocky shoreline 23 ha
- Inshore flat 21 ha
- Seagrass bed 118 ha
- Coral reef 108 ha
- Estuary 1 ha
- Mangrove 42 ha
- Mudflat 53 ha

The most abundant fishery resources are rabbitfish, mackerel, parrotfish, sardines, mullet, snapper, slipmouth, goatfish, oysters, and clams. Fishing methods used are bag net, fish corral, fish pot, hook and line, spear fishing, troll line, and gleaning.

The coastal resources of Malalag are beset by problems and issues such as coliform pollution, destructive fishing, encroachment on the fishing ground by outsiders, lack of alternative livelihood activities, siltation, and absence of revenue from docking vessels.

MALALAG FACTS AND FIGURES

***Barangays* (15):** Bagumbayan, Baybay, Bolton, Bulacan, Caputian, Ibo, Kiblagon, Lapulapu, Mabini, New Baclayon, Pitu, Poblacion, Rizal, San Isidro, Tagansule

Coastal *Barangays* (3): Bagumbayan, Baybay, Bulacan

Total Land Area: 18,612 ha

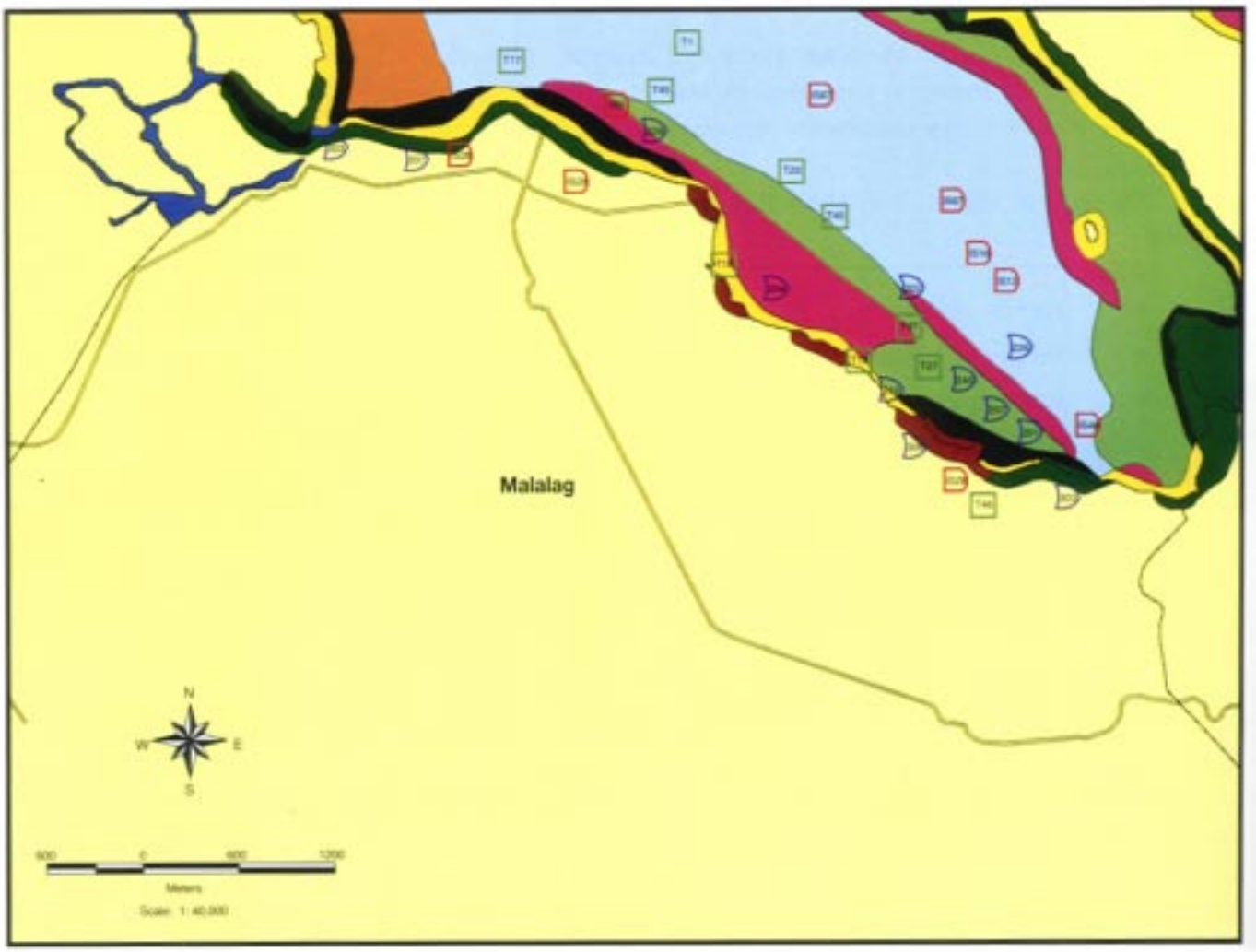
Coastal Land Area: 2,040 ha

Length of Coastline: 8 km

Population: 30,733

Population of Coastal *Barangays*: 8,590

Specific resources, uses, and issues in the three coastal *barangays* of Malalag are presented in Figure 3.4.



Legend:

HABITATS

- Sandy beach
- Rocky shoreline
- Inshore flats
- Seagrass beds
- Coral reef
- Estuary
- Mangrove
- Terrestrial zone
- Marine zone
- Mudflats
- Municipal boundary
- Road

RESOURCES

- 201 Rabbitfish, spinefeet
- 202 Mackerels
- 204 Parrotfish
- 207 Sardines
- 210 Mullets
- 226 Snappers
- 228 Slipmouths
- 240 Goatfish
- 303 Oysters
- 306 Clams

USES

- T1 Bag nets
- T17 Fish corral
- T18 Fish pot
- T22 Hook and line
- T27 Multiple hook and line
- T41 Spear fishing
- T45 Troll line
- T46 Gleaning

ISSUES

- IS5 Coliform pollution
- IS12 Destructive fishing
- IS16 Encroachment on the fishing ground by outsiders
- IS28 Lack of alternative livelihood activities
- IS49 Siltation
- IS67 Absence of revenue from docking vessels

Figure 3.3. Coastal resource map of the municipality of Malalag, Davao del Sur.

	HABITATS				
	Terrestrial zone	**Mangrove**	**Sandy beach/mud-flat/rocky shoreline**	**Seagrass bed/ coral reef**	**Marine zone**
Resources	*Gemilina*, *ipil-ipil*, *cogon*, *hagonoy*, banana, coconut tree, bamboo, mangoes, cacao, vegetable, houses, school, chapel, clinic, *barangay* hall, fish landing hall, basketball court, deep well, mosque, cemetery, cooperative, day care center, barracks, gasoline station, animal, seawall	Mangrove, fishpond, house, coconut, banana, cacao	Sand, stone boats, mud	Crabs, shellfish, seagrass, fish, corals, sea cucumber, stone	Fish, artificial reef
Uses	Lumber, firewood, copra, foods, resting place, livelihood, potable water, education, shelter, peace, health, business, prayer meeting, protection	Lumber, firewood, livelihood, shelter, copra, food, breeding ground	Serve as beach, docking area	Food, breeding ground, fish shelter, decoration, fish sanctuary	Breeding ground, shelter, food
Issues	Strong wind, overcutting, illegal cutting, stray animals, solid/ chemical waste disposal, lack of potable water, unpassable road, flood site, denudation, overgrazing, lack of sanitation	Waste disposal, lack of sanitation, mangrove depletion	Very dirty, garbage, pollution, quarrying sand and gravel	Overfishing, illegal fishing, occasional fish killing, pollution	Overfishing, illlegal fishing, *lampornas*, dynamite, oil spill

Figure 3.4. Malalag transect diagram (Barangays Bagumbayan, Baybay, and Bulacan).

Padada

Of the 17 *barangays* of Padada, four are coastal, occupying about 25 percent of the total land area of Padada. Almost 20 percent of the population are coastal dwellers.

As seen in Figure 3.5, the areas of habitats mapped through the PCRA are as follows:

- Sandy beach 45 ha
- Inshore flat 207 ha
- Seagrass bed 88 ha
- Coral reef 80 ha
- Passes/Channels 236 ha
- Mangrove 18 ha
- Mudflat 119 ha

PADADA FACTS AND FIGURES

***Barangays* (17):** Almendras Disrict, Don Sergio Osmeña, Harada Butai, Lower Katipunan, Lower Limonzo, Lower Malinao, NC Ordaneza District, Northern Paligue, Palili, Piape, Punta Piape, Quirino District, San Isidro, Southern Paligue, Tologan, Upper Limonzo, Upper Malinao

Coastal *Barangays* (4): Palili, Piape, Punta Piape, San Isidro

Total Land Area: 4,503 ha

Coastal Land Area: 1,133 ha

Length of Coastline: 6 km

Population: 22,384

Population of Coastal *Barangays*: 4,279

The most abundant fishery resources are sardines, big-eye scads, mullets, moonfish, therapons, whitings, goatfish, spotted mojarras, scallops, and clams. Fishing methods used are bottom set gill net, drive-in net, fish corral, crab and fish pot, hook and line, torch fishing, push net, spear fishing, and troll line.

The coastal resources of Padada are beset by problems and issues such as breakage of corals, coral bleaching, declining fish catch, destructive fishing, encroachment on the fishing ground by outsiders, fish kills, fishing gear conflicts, lack of alternative livelihood activities, lack of law enforcement, lack of legislation, low awareness, mangrove conversion, overfishing, pesticide pollution, and siltation.

Specific resources, uses, and issues in the four coastal *barangays* of Padada are presented in Figure 3.6.

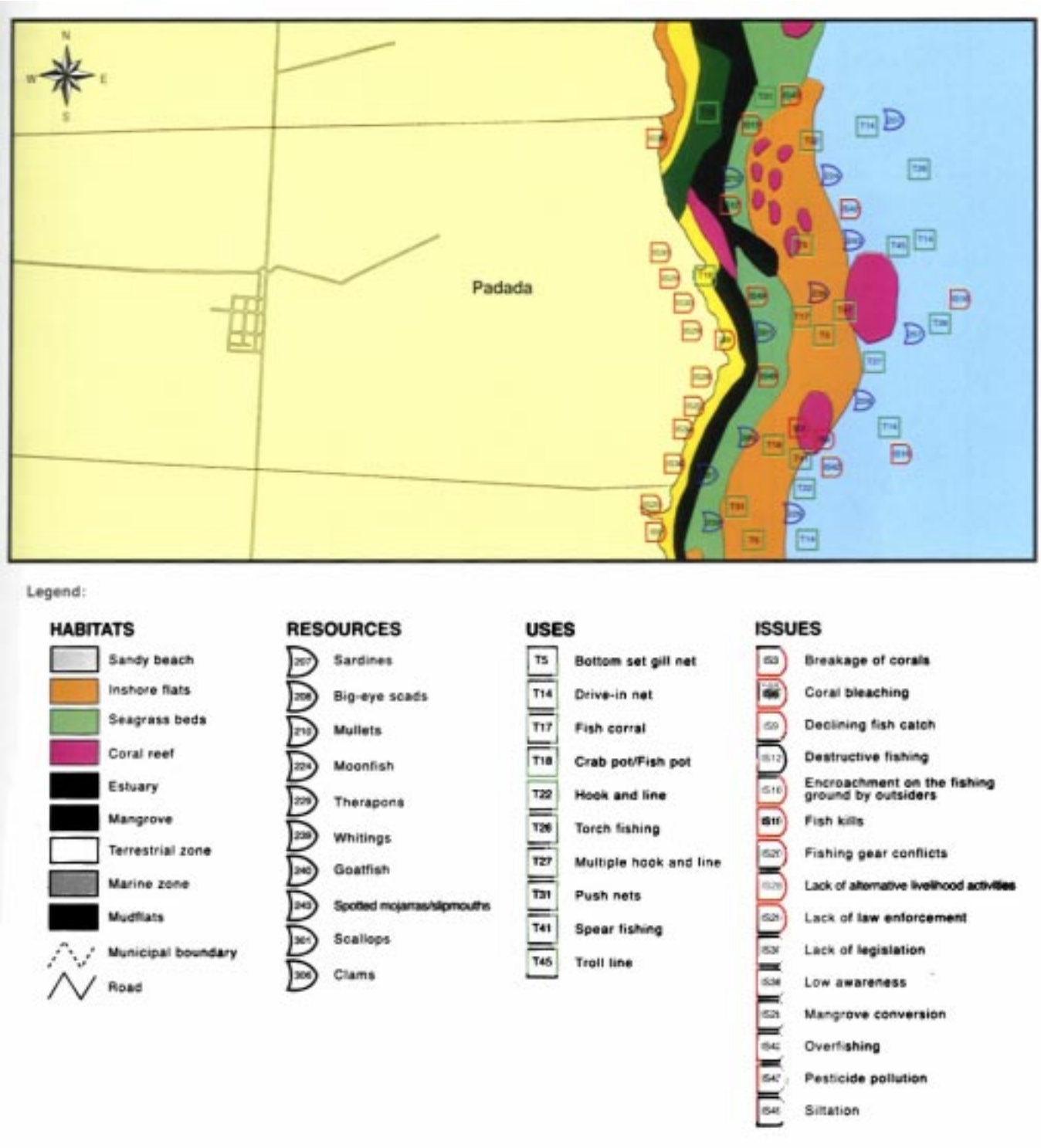


Figure 3.5. Coastal resource map of the municipality of Padada, Davao del Sur.

	HABITATS				
	Terrestrial zone	**Mangrove**	**Sandy beach/mudflat**	**Seagrass bed/coral reef/inshore flat**	**Marine zone**
Resources	Coconut, tree, banana, fruit trees, corn, house, multi-purpose hall, school, chapel	Fishponds, aroma shrubs, mangroves, sand, crabs, mudfish, shellfish, mud	Beach, sand, seawall, shellfish, fish	Seagrass, shellfish, corals, milkfish fry, crabs, shrimps, finfish, starfish, sea urchin, sea cucumber, sand, stone, guard house	Fish, shellfish, shrimps, squids, crabs, reptiles, artificial reef
Uses	Food, shelter, lumber, livelihood, protection, education, religious services, meeting place, residential	Aquaculture, food, source of livelihood, shellfish habitat, residential	Buffer zone, docking area, picnic area	Food, livelihood, nursery, breeding ground, shellfish habitat, fish habitat, protection against illegal fishing	Food, livelihood, fish habitat, rehabilitation
Issues	Illegal cutting, erosion, lack of security, sanitation, lack of potable water, chemical pollution, waste pollution, use of poisonous plant extract	Security on home lot ownership, pollution	Pollution, beach erosion	Exploitation of shellfish, destruction of habitats, illegal fishing, destructive fishing, dynamite fishing, use of poisonous plant extract, waste pollution, fishing by outsiders, beach seine, scissors net	Illegal fishing, destructive fishing, cyanide fishing by outsiders, compressor, using poisonous substances

Figure 3.6. Padada transect diagram (Barangays Palili, Piape, Punta Piape, and San Isidro).

Sta. Maria

Of the 22 *barangays* of Sta. Maria, eight are coastal, occupying almost 32 percent of the total land area. Thirty-seven percent of the population reside in these *barangays*.

As seen in Figure 3.7, the areas of habitats mapped through the PCRA are as follows:

- Sandy beach 184 ha
- Rocky shoreline 99 ha
- Inshore flat 59 ha
- Seagrass bed 353 ha
- Coral reef 385 ha
- Estuary 118 ha
- Mangrove 137 ha
- Mudflat 94 ha

The most abundant fishery resources are rabbitfish, sardines, big-eye scads, round scads, mullet, spotted snapper, skipjacks, tunas, scallops, and clams. Fishing methods used are bag net, beach seine, cover net, hook and line, squid jigger, and troll line.

The coastal resources of Sta. Maria are beset by problems and issues such as beach/shoreline erosion, declining fish catch, encroachment on the fishing ground by outsiders, illegal fishing, lack of alternative livelihood activities, lack of social services, low prices of fishery products, theft of fishing gear/accessories, and absence of revenue from docking vessels.

STA. MARIA FACTS AND FIGURES

***Barangays* (22):** Basiawan, Buca, Cadaatan, Datu Daligasao, Datu Intan, Kidadan, Kinilidan, Kisulad, Malalag Tubig, Mamacao, Ogpao, Poblacion, Pongpong, San Agustin, San Antonio, San Isidro, San Juan, San Pedro, San Roque, Sto. Niño, Sto. Rosario, Tanglad

Coastal *Barangays* (8): Basiawan, Kisulad, Mamacao, Ogpao, San Agustin, Sto. Niño, Sto. Rosario, Tanglad

Total Land Area: 20,478 ha

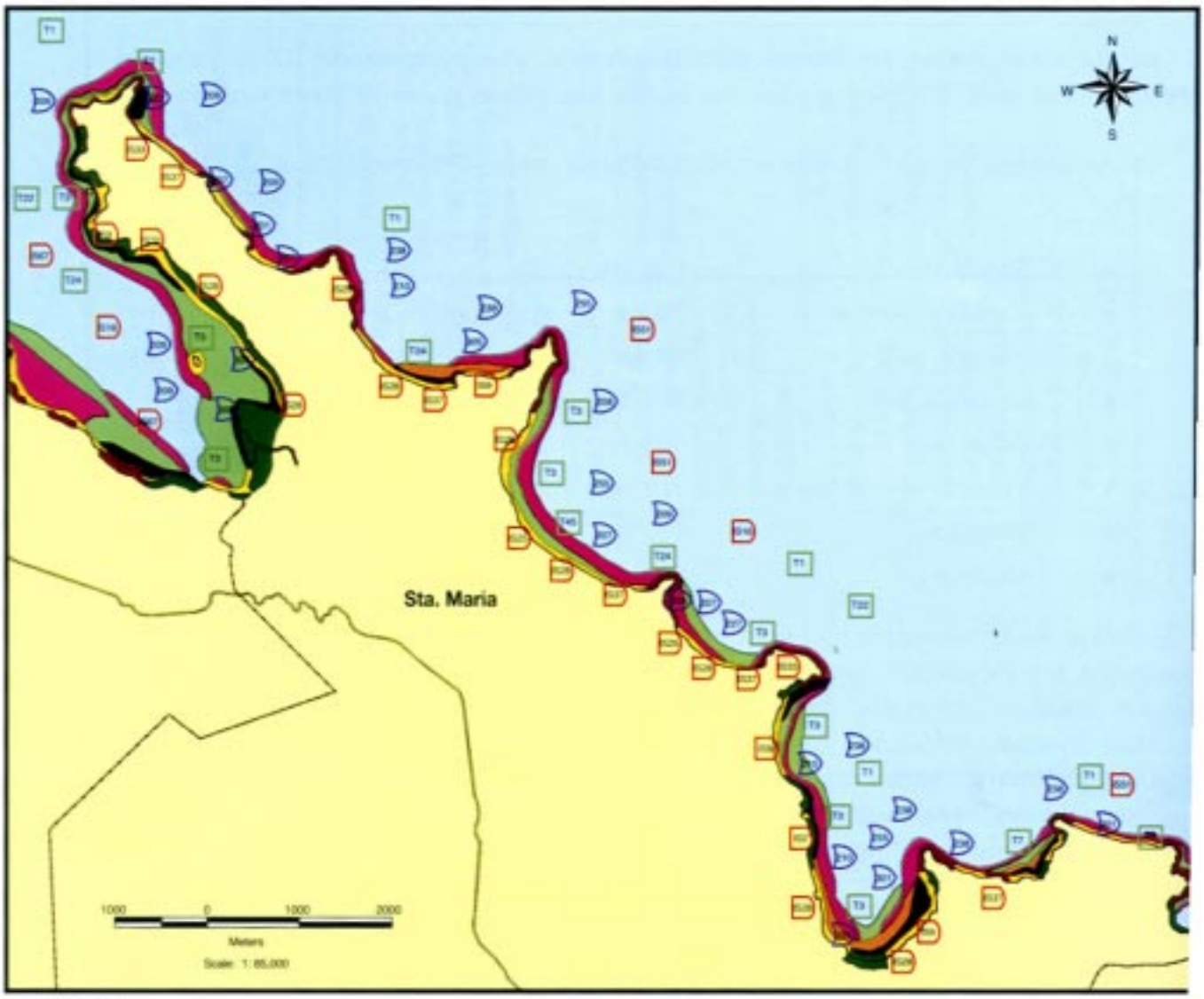
Coastal Land Area: 6,487 ha

Length of Coastline: 46 km

Population: 41,919

Population of Coastal *Barangays*: 15,691

Specific resources, uses, and issues in the eight coastal *barangays* of Sta. Maria are presented in Figure 3.8.



Legend:

HABITATS
- Sandy beach
- Rocky shoreline
- Inshore flats
- Seagrass beds
- Coral reef
- Estuary
- Mangrove
- Terrestrial zone
- Marine zone
- Mudflats
- Municipal boundary
- Road

RESOURCES
- 201 Rabbitfish, spinefeet
- 207 Sardines
- 208 Big-eye scads
- 209 Round scads
- 210 Mullets
- 227 Spotted snapers
- 238 Skipjacks
- 255 Tunas
- 301 Scallops
- 305 Conches

USES
- T1 Bag nets
- T3 Beach seine
- T17 Cover net
- T22 Hook and line
- T24 Squid jigger
- T27 Multiple hook and line
- T45 Troll line

ISSUES
- IS2 Beach/shoreline erosion
- IS9 Declining fish catch
- IS16 Encroachment on the fishing ground by outsiders
- IS25 Illegal fishing
- IS28 Lack of alternative livelihood activities
- IS33 Lack of social services
- IS37 Low prices of fishery products
- IS51 Theft of fishing gears and accessories
- IS47 Absence of revenue from docking vessels

Figure 3.7. Coastal resource map of the municipality of Sta. Maria, Davao del Sur.

	HABITATS						
	Terrestrial zone	**Mangrove**	**Estuary/ mudflat**	**Sandy beach/ rocky shoreline**	**Seagrass bed/ coral reef**	**Inshore flat**	**Marine zone**
Resources	Houses, community, cooperative, chapel, day care center, deep well, garden, trees, *gemilina*, *ipil-ipil*, *cogon*, *hagonoy*, coconut, banana, fruit trees, crops, cacao, corn, animals, livestock, human	Mangrove, oyster, shellfish, finfish, fish, fry, crustaceans, crabs, fishpond, residential	Milkfish, mudfish, shrimps, crabs	Sandy beach, muddy beach, sand, stone, beach cottages, waiting shade, boats, finfish, shellfish, fish, crabs, seabirds, coconut, *lambayong*	Corals, reefs, fish, shellfish, finfish, seagrass, crustaceans, mollusks, sea cucumber, sand, stone	Finfish, shellfish, crustaceans, mollusks, reptile, sand, stone	Fish, artificial reef
Uses	Residential, education, business, potable water, beautification, agricultural, livelihood, lumber, copra, food, shelter, farming, firewood, roof material	Livelihood, food, habitat, timber, firewood, house construction, wind breaker, decoration, residential	Food, livelihood	Livelihood, food, habitat, recreation, docking, infrastructure purposes, educational, sanitation	Livelihood, fish and organism habitat, food, fish, decoration, breeding ground of fish, navigation	Livelihood, food, habitat, habitual fishing	Livelihood, food, habitat, navigation
Issues	Tidal/wave control, povesamanation area, home and lot, illegal cutting of trees, denudation, bald mountain, overgrazing, soil erosion, sanitation problem, no potable water, unpassable road, flood site, waste disposal, pollution, stray animals, slow development, low income, lack of security	Poisoning, mangrove cutting, improper zoning, soil erosion, siltation, pollution, sanitation	Poisoning/ pesticide, illegal expansion, community passing and access	Illegal fishing, destructive fishing, soil erosion, siltation, flooding, drainage, insecurity of home lot tenure, illegal foreshore use, land occupation, labor and employment, no proper management	Illegal fishing, overfishing, fishing by outsiders, commercial fishing, superlight, fine mesh net, pollution, siltation	Depletion of fishery resources, navigational obstruction, zoning problem, commercial fishing, obnoxious substance, use of poisonous plant extract	Depletion of fishery resources, habitat destruction, zoning problem, delineation of boundary, dynamite fishing, anchorage

Figure 3.8. Sta. Maria transect diagram (Barangays Basiawan, Kisulad, Mamacao, Ogpao, San Agustin, Sto. Niño, Sto. Rosario, and Tanglad).

Sulop

Of the 25 *barangays* of Sulop, only one is coastal. It occupies about 2 percent of the total land area of Sulop. Two percent of the population are coastal dwellers.

As seen in Figure 3.9, the areas of habitats mapped through the PCRA are as follows:

- Sandy beach 26 ha
- Inshore flat 117 ha
- Seagrass bed 25 ha
- Estuary 0.24 ha
- Passes/Channels 250 ha
- Mangrove 9 ha
- Mudflat 30 ha

SULOP FACTS AND FIGURES

***Barangays* (25):** Balasinon, Buguis, Carre, Clib, Harada Butai, Katipunan, Kiblagon, Labon, Laperas, Lapla, Litos, Luparan, Mckinley, New Cebu, Osmeña, Palili, Parami, Poblacion, Roxas, Solongvale, Tagolilong, Talao, Talas, Tanwalang, Waterfall

Coastal *Barangay* (1): Balasinon

Total Land Area: 15,526 ha

Coastal Land Area: 288 ha

Length of Coastline: 3 km

Population: 25,968

Population of Coastal *Barangay*: 494

The most abundant fishery resources are rabbitfish, mackerels, sardines, snappers, therapons, whitings, goatfish, silver side, scallops, and oysters. Fishing methods used are fish corral, blue crab pot, hook and line, push net, and gleaning.

The coastal resources of Sulop are beset by problems and issues such as declining fish catch, destructive fishing, encroachment on the fishing ground by outsiders, lack of alternative livelihood activities, siltation, and water turbidity.

Specific resources, uses, and issues in the lone coastal *barangay* of Sulop are presented in Figure 3.10.

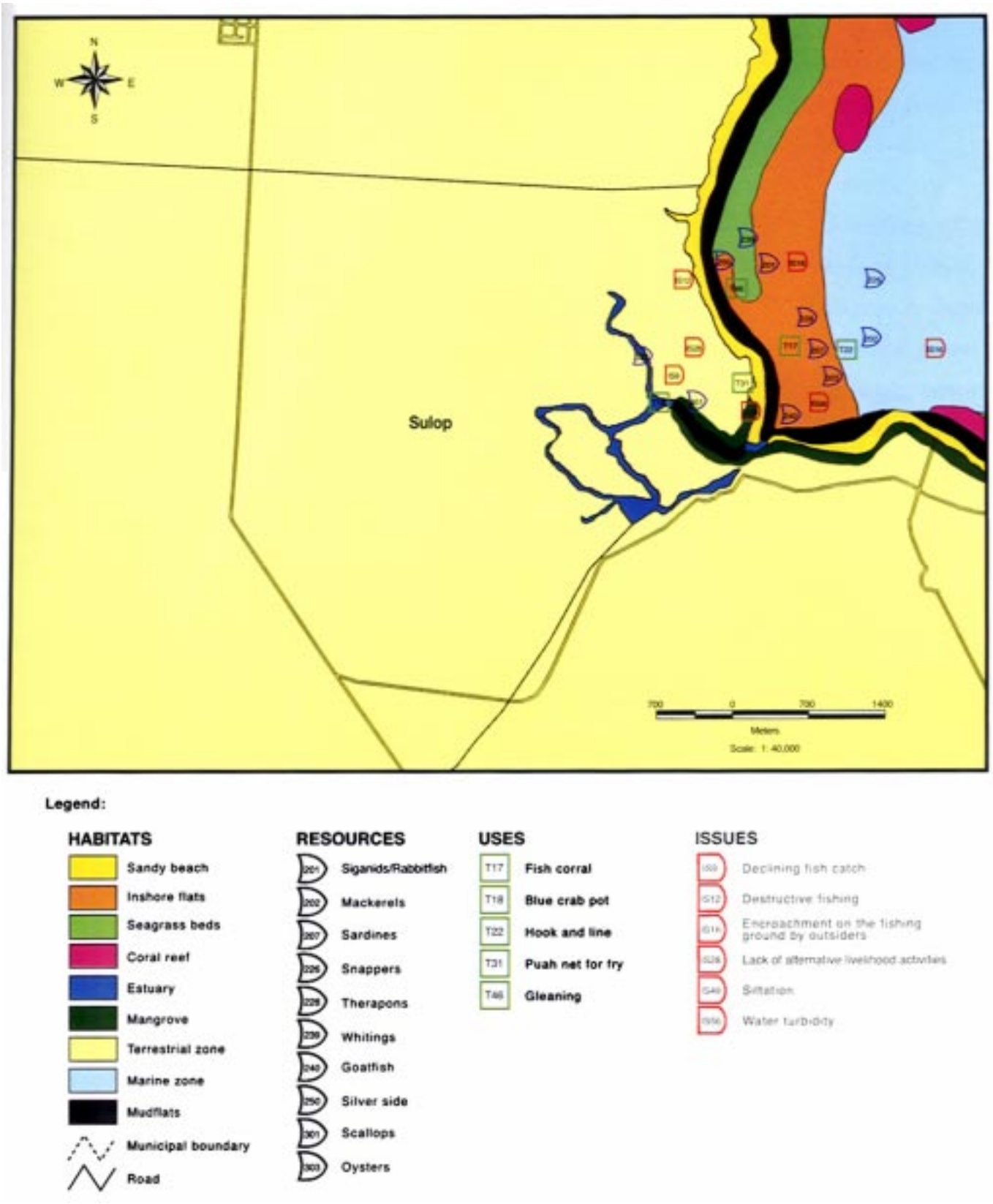


Figure 3.9. Coastal resource map of the Municipality of Sulop, Davao del Sur.

	HABITATS					
	Terrestrial zone	**Mangrove**	**Estuary/ mudflat**	**Sandy beach**	**Inshore flat**	**Marine zone**
Resources	Residential, community	Oyster, mangrove, shellfish, fish, crabs	Milkfish, mudfish, shrimps, crabs	Sandy beach, shellfish, fish, crabs, seabirds	Crustaceans, mollusks, reptiles	Fish
Uses	Residential, agricultural, livelihood	Habitat, livelihood, timber, firewood	Food, livelihood	Livelihood, food, habitat	Livelihood, food, habitat	Livelihood, food, habitat
Issues	Tidal/wave control, povesamanation area, home and lot	Poisoning, mangrove cutting, improper zoning, siltation	Poisoning/ pesticide, community passing and access	Illegal fishing, siltation, navigation area, passage	Water turbidity, encroachment on the fishing ground by outsiders	Encroachment on the fishing ground by outsiders

Figure 3.10. Sulop transect diagram (Barangay Balasinon).

The MBA coastal resources are varied and diverse, providing food and employment for a majority of the populace primarily through fisheries. Their biological diversity has great ecological and economic significance and must, therefore, be conserved and sustainably developed. However, pollution and overexploitation, among others, increasingly threaten these important marine resources.

An essential link to the food chain and a niche for breeding of various fishes, mangroves have not been given the importance they deserve.

1. Mangroves

Mangroves are an important resource for coastal communities. Primary uses of mangroves include fuel wood, timber, medicinal products, and poles for building.

Similar to forestlands, intense exploitation has consequently resulted in the near extinction of the mangrove ecosystem within the coastal zone. From a considerable area of marshlands with thick mangroves of years past, only patches of mangroves are left today. An essential link to the food chain and a niche for breeding of various fishes, mangroves have not been given the importance they deserve. The poor state of the mangrove ecosystem was caused by its conversion into fishponds and the unregulated cutting for firewood.

In 1987, remote sensing images of Malalag Bay by the National Mapping and Resource Information Authority (NAMRIA) estimated the mangrove cover at 78.52 ha. From the survey conducted by the Silliman University Marine Laboratory (SUML) in February 1997, the total mangrove area was only 7 ha (Table 3.4). The areas surveyed were Sulop, Malalag, and Sta. Maria. Mangroves were in patches at Sitio Bolo, Bulacan, Baybay, and Taguicon, Malalag. Of 16 species noted in the survey, the most common were *Rhizophora mucronata* and *Sonneratia alba* (Table 3.5).

As seen in Table 3.6, the highest density of saplings and seedlings, all *Avicennia marina,*

Table 3.4. Mangrove area surveyed by SUML in the MBA.

Site	Area (ha)	Remarks
Malalag	5	Mangroves in patches, bordering fishpond dikes; a large area has been converted into fishpond
Sta. Maria	2	1.5 ha. Six species of mangroves were observed in patches at Kisulad, Sta. Maria Natural growth of 0.5 ha. Mangrove was seen in Basiawan, Sta. Maria.

Source: SUML (1997).

Table 3.5. Mangrove and associated species found in the MBA.

Species	Common name	Areas of incidence
RHIZOPHORACEAE		
Rhizopora mucronata Lamk.	*Bakhaw baye*	Malalag and Sta. Maria
Ceriops decandra Griff. Ding Hou	*Hangalay; lapis-lapis*	Malalag and Sta. Maria
Bruguiera parviflora W. and A. ex Griffith	*Pototan lalake*	Malalag
AVICENNIACEAE		
Avicennia marina (Forsk.) Vierh.	*Piape baye*	Sta. Maria
A alba Blume	*Piape laki*	Malalag and Sta. Maria
A. lanata Ridley	*Piape laki*	Malalag and Sta. Maria
SONNERATIACEAE		
Sonneratia alba J. Sm.	*Pagatpat; Pedada*	Malalag and Sta. Maria
COMBRETACEAE		
Termanalia catappa L.	*Talisay*	Malalag
PALMAE		
Nypa fruticans (Thunberg) Wumb.	*Nipa*	Sta. Maria
EUPHORBIACEAE		
Excoecaria agallocha L.	*Alipata; Buta-buta*	Malalag
ACANTHACEAE		
Acanthus ilicifolius L.		Sta. Maria
BIGBONIACEAE		
Dolichandrone spathacea (L.F.) K. Schum.	*Bito-bitoon*	Sta. Maria
MELIACEAE		
Xylocarpus granatum Koenig	*Tabigui*	Malalag
X. moluccensis (Lamk.) Roem.	*Piagau*	Malalag
FABACEAE		
Pongamia pinnata (L.) Pierre		Sta. Maria
Prosopis vidiana Naves	*Aroma*	Sta. Maria

Source: SUML (1997).

was observed in Basiawan, Sta. Maria. *A. marina* saplings reached 90,000 stems per ha and seedlings reached 3,125 stems per ha. The natural mangrove forest in the area had a mature stand area of 65.04 m^2/ha and stem density of 54 stems per ha. Diameter at breast height was in the range of >60 cm and *Rhizophora* and *Sonneratia* species attained a height of 30 cm.

In Kisulad, Sta. Maria, the most numerous saplings and seedlings were those of *R.*

Table 3.6. Mean density of mangrove seedlings and saplings in the MBA.

Place	Species	Seedlings (stems/ha)	Saplings (stems/ha)
Basiawan, Sta. Maria	*R. mucronata*	85,000	625
	A. marina	90,000	3,125
	S. alba	10,000	None
Kisulad, Sta. Maria	*S. alba*	10,000	2,500
	R. mucronata	30,000	None
	A. marina	10,000	None

Source: SUML (1997).

mucronata, attaining a density of 30,000 stems per ha for saplings and 2,550 stems per ha for seedlings. Saplings of *S. alba* and *A. marina* attained a density of 10,000 stems per ha.

Malalag had a mature basal stand area of 57.52 m^2/ha and 21 stems per ha. There were no saplings and seedlings in the area and mangroves were all secondary growth.

Mangrove loss on Malalag Bay is almost 100 percent due to fishpond conversion.

Mangrove loss on Malalag Bay is almost 100 percent due to fishpond conversion. Fishpond conversion has adversely affected the species diversity of mangroves and has resulted in the loss of associated species, not to mention the loss of secondary productivity. Addressing this problem is vital and necessary for the long-term sustainability of Malalag Bay. This could be done by massive reforestation with suitable species such as *Sonneratia* and *Avicennia*.

However, in addressing this problem, consideration should be given to the value of fishpond production in this area. In the latest economic report of Malalag, 60 percent of the annual fishery production, which ranged from 68.4 to 113.41 mt was contributed by fishponds.

2. Seagrasses and Algae

Seagrasses are essential links between the coral reefs and mangrove areas. Some of their functions include reduction of water energy and motion, regulation of the chemical composition of coastal waters and sediments, regulation of runoff and stabilization of bottom sediments, maintenance of coastal fertility, regulation of biological control mechanisms, maintenance of migration and nursery habitats, and enhancement and maintenance of coastal ecosystem and genetic diversity.

From the 1997 SUML study, about 597.5 ha of seagrass and algal beds were present from Piape, Padada to Sta. Maria. A total of 76 algal species in 51 genera and 8 species of

seagrass in 6 genera were collected from Malalag Bay. In all stations surveyed, except for Malalag, red algae dominated. In terms of seagrasses, *Enhalus acoroides, Thalassia hemprichii* and *Halophila ovalis* were common in all stations (Table 3.7).

Vegetation type is generally determined by substrate. Seagrasses favored sand and silt substrates as in Padada and Malalag while *Sargassum* were most abundant in areas with

Table 3.7. Seagrass species found in the MBA.

Cymodocea rotundata	*Syringodium isoetifolium*
Cymodocea serrulata	*Enhalus acoroides*
Halodule pinifolia	*Halophila ovalis*
Halodule uninervis	*Thalassia hemprichii*

Source: SUML (1997).

limestone or dead coral substrate which partly explains the differences in dominance patterns and species composition within an area.

3. Corals

Coral reefs serve as spawning and nursery grounds for fishes and support fisheries directly. They also contribute to sand formation and deposition and serve as natural breakwaters thereby preventing beach erosion.

Malalag Bay typifies a once-rich ecosystem now ravaged by the misuse and abuse of the people who depend on the bounty of the sea. In 1991, the Rapid Aquatic Resource Appraisal (RARA) conducted by the Philippine Council for Aquatic and Marine Research and Development (PCAMRD) revealed that only 113 ha of corals remained alive. The PCRA results of 1998 indicate that 95 ha of coral reef exist in the area.

The 1997 SUML study noted that the coral reef area, specifically in Piape Reef, located in the municipality of Padada, was approximately 5 ha. The reef flat extent of the stations in Malalag Bay, including Piape Reef, ranged from 80 to 200 m and the reef slope ranged from 30^{o} to 70^{o} (Table 3.8). Branching and massive corals were the common hard growth forms. Substrate composition was generally sand, rubble and rock, except in the Malalag Marine Sanctuary where silt comprised most of the substratum.

With regard to species composition, 90 taxa of scleractinian corals in 14 families were recorded in the MBA. Among the stations, San Agustin Point had the highest number of taxa (62) followed by Dagandang (54), Piape Reef (49), and Kulagsing (46), while

Table 3.8. Reef extent and other description of the stations in the MBA.

Stations	Reef flat extent (width)	Slope	Substrate	Remarks
Malalag Marine Reserve, Malalag	80-90 m from the shoreline to the reef crest; coral community starts at 50 m after the seagrass bed	30°-40° at 10 m deep	Mostly silt and rubble; little sand	Branching *Porites* were abundant; high cover of rubble and rocks in the shallow area
Piape Reef, Padada	100-150 m	50°-70° at 10-12 m deep	Sand, rubble, rock	Good coral cover; branching *Porites nigrescens* were dominant
Kulagsing, Sta. Maria	80-90 m from the shoreline to the reef crest; coral reef width from the reef flat down to slope area is 120 m	50° at 13 m deep	Sand, rubble, rock	Sandy area beyond 17 m deep; branching *Acropora* were abundant in the deep area; shallow area is dominated by soft corals and massive *Porites*; good coral cover; one crown-of-thorns starfish, *Acanthaster plancii,* was found
Dagandang, Sta. Maria	100-200 m from the shoreline to the reef crest	30° at 8-10 m deep	Mostly sand and rubble; rock	Massive *Porites* were dominant
San Agustin Point, Sta. Maria	200 m from the shoreline to the reef crest	50°-60° at 7 m deep	Sand, rubble, rock	Good coral cover. Massive *Porites* were dominant

Source: SUML (1997).

the lowest number was noted in the Malalag Marine Reserve (26). Four non-scleractinian coral taxa and seven soft corals were also identified (Table 3.9).

Based on the results of random quadrat sampling, the five stations surveyed in the MBA had a mean live hard coral cover of 56 percent. The highest mean live hard coral cover was obtained in Padada (78.13 percent) and Sta. Maria (70.63 percent). However, the former station also showed the highest mean dead coral cover of 10.63 percent and the lowest percentage of abiotic components at 4.38 percent. San Agustin, Sta. Maria had 53.75 percent live hard coral cover and had the highest cover of soft coral of 17.50 percent. Lowest live hard coral cover was recorded in Malalag (42.19 percent) and Dagandang (35.65 percent). Also both stations showed the highest cover of abiotic components. Malalag had 54.69 percent cover of abiotic components, 27.34 percent of which was contributed by rubble, 25.94 percent by silt, and 1.41 percent by sand. Dagandang, Sta. Maria had 52.51 percent cover of abiotic components which were composed mostly of rubble (21.25 percent), sand (23.13 percent), and rock (8.13 percent). Table 3.10 shows the mean cover of benthic categories in five stations in the MBA. Figure 3.11 shows the MBA benthic cover.

4. Fisheries

Table 3.9. Corals found in the MBA.

HARD CORALS	
ORDER SCLERACTINIA	
FAMILY ACROPORIDAE	
Acropora (branching)	*Acropora subglabra*
Acropora (digitate)	*Astreopora*
Acropora (encrusting)	*Montipora* (encrusting)
Acropora (tabulate)	*Montipora* (foliose)
Acropora echinata	*Montipora* (submassive)
Acropora microphthalma	*Montipora aequituberculata*
Acropora nobilis	*Montipora digitata*
Acropora palifera	
FAMILY AGARICIIDAE	
Coeloseris mayeri	*Pavona cactus*
Gardineroseris planulata	*Pavona decussata*
Leptoseris	*Pavona varians*
Leptoseris scabra	*Pachyseris rugosa*
Leptoseris yabei	*Pachyseris speciosa*
FAMILY CARYOPHYLLIIDAE	
Euphyllia ancora	*Physogyra lichtensteini*
Euphyllia divisa	*Physogyra sinuosa*
Euphyllia glabrescens	
FAMILY DENDROPHYLLIIDAE	
Turbinaria	*Turbinaria mesentrerina*
Turbinaria frondens	
FAMILY FAVIIDAE	
Caulastrea furcata	*Favites halicora*
Cyphastrea	*Goniastrea*
Diploastrea heliopora	*Goniastrea retiformis*
Echinopora horrida	*Leptastrea*
Echinopora lamellosa	*Leptastrea pruinosa*
Favia	*Montastrea*
Favia maxima	*Oulophyllia*
Favites	*Platygyra*
Favites abdita	*Plesiastrea*
FAMILY FUNGIIDA	
Cycloseris	*Herpolitha limax*
Fungia	*Herpolitha weberi*
Fungia concinna	*Podabacia crustacea*
Fungia scabra	*Polyphyllia talpina*
Heliofungia	*Sandalolitha robusta*
FAMILY MERULINIDAE	
Hydnophora exesa	*Hydnophora rigida*
Hydnophora microconos	*Merulina ampliata*
FAMILY MUSSIDAE	
Labophyllia hemprichii	
FAMILY OCULINIDAE	
Galaxea fascicularis	
FAMILY PECTINIIDAE	
Echinophyllia aspera	*Pectinia alcicornis*
Mycedium elephantotus	*Pectenia lactuca*
Oxypora lacera	*Pectenia paeonia*
FAMILY POCILLOPORIDAE	
Pocillopora verrucosa	*Seriatopora hystrix*
Seriatopora caliendrum	*Stylophora pistillata*

HARD CORALS	
ORDER SCLERACTINIA	
FAMILY PORITIDAE	
Goniopora	*Porites annae*
Porites (encrusting)	*Porites cylindrica*
Porites (massive)	*Porites nigrescens*
Porites (submassive)	*Porites rus*
FAMILY SIDERASTREIDAE	
Coscinaria exesa	*Psammocora profundacella*
Psammocora contigua	
ORDER COENOTHECALIA	
FAMILY HELIOPORIDAE	
Heliopora coerulea	
ORDER MILLEPORINA	
FAMILY MILLEPORIDAE	
Millepora	*Millepora exaesa*
ORDER STOLONIFERA	
FAMILY TUBIPORIDAE	
Tubipora musica	
SOFT CORAL	
ORDER ALCYONACEA	
Anthelia	*Sarcophyton crassocaule*
Lobophyton	*Sinularia*
Nephthea	*Xenia*
Sarcophyton	

Source: SUML (1997).

Table 3.10. Mean cover of benthic categories using random quadrat method (n=10) in the MBA.

Stations	Corals			Fauna	Abiotic				Total
	Live hard coral	Soft coral	Dead coral		Rubble	Sand	Silt	Rock	
Malalag Marine Reserve, Malalag	42.2	1.89		1.2	27.3	1.4	26.0		100
Piape Reef, Padada	78.1	5.6	10.6	1.3				4.4	100
Kulagsing, Sta. Maria	70.6	9.4	3.8	3.1	1.9	10.0		1.2	100
Dagandang, Sta. Maria	35.6	5.0	2.5	4.4	21.3	23.1		8.1	100
San Agustin Point, Sta. Maria	53.7	17.5	1.9	2.5	6.9	10.6		6.9	100
Mean	**56.0**	**7.9**	**3.8**	**2.5**	**11.5**	**9.0**	**5.2**	**4.1**	

Source: SUML (1997).

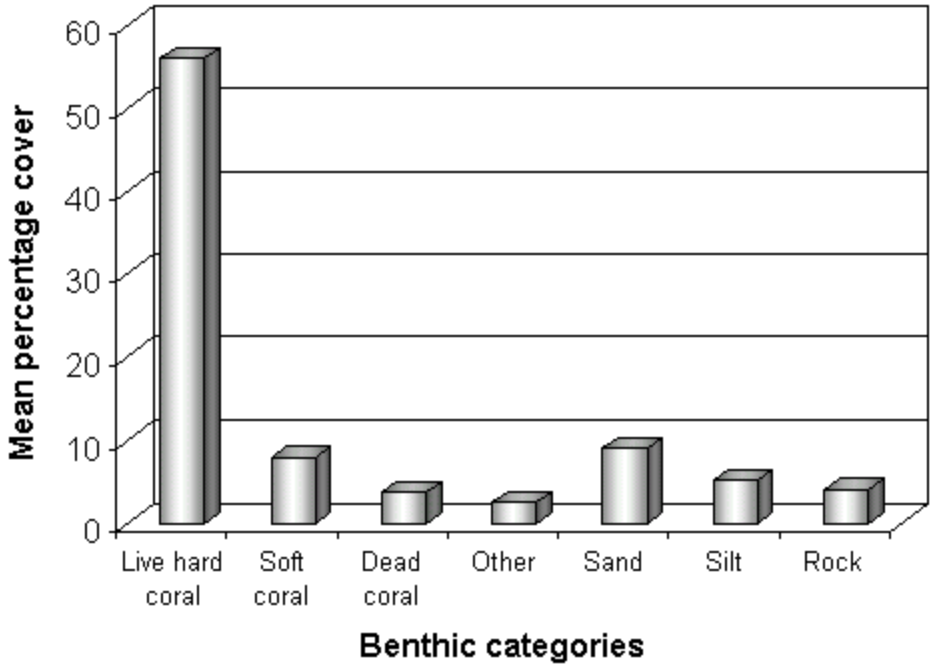


Figure 3.11. Mean benthic cover from coral reefs in five stations in the MBA.

Fishery resources in the Philippines are broadly classified into marine and inland resources. Marine resources include coastal areas and other traditional fishing grounds, while inland resources include lakes, reservoirs, rivers, brackishwater and freshwater fishponds.

For fish production purposes, fishery resources are categorized as either marine or aquaculture. Marine fishery resources consist of commercial and municipal fisheries while aquaculture comprises brackishwater fisheries, freshwater fisheries, and seafarming. Table 3.11 shows the fishery resources in the MBA.

Total marine resources production, both municipal and commercial, is 2,679.10 mt while aquaculture resources in the MBA have an aggregate fishpond area of 1,247.15 ha with a total

Table 3.11. Fishery resources in the MBA.

	Hagonoy	Padada	Sulop	Malalag	Sta. Maria	Total for MBA
Brackishwater pond						
BANGUS (MILKFISH)						
Area (ha)	384.67	167.62	352.69	189.00	153.17	1,247.15
Production (mt)	363.40	108.05	295.30	148.65	116.72	1,032.12
PRAWN						
Area (ha)	20.00	-	-	-	-	20.00
Production (mt)	89.60	-	-	-	-	89.60
Marine fish catch (Municipal)						
Production (mt)	275.00	*486*	15.0	198.50	1,549.40	2,523.9
Marine fish catch (Commercial)						
Production (mt)				35.30	120.00	155.20
SEAWEEDS						
Area (ha)	-	5.00	-	-	-	5.00
Production (mt)	-	3.25	-	-	-	3.25
OYSTER						
Area (ha)	-	-	-	1.50	1.50	3.00
Production (mt)	-	-	-	10.00	12.60	22.60

Source: PSPT (1994).

production of 1,032.12 mt. The principal aquaculture activity in the MBA was milkfish production. The largest milkfish farm (384.67 ha) is in Hagonoy, followed by Sulop (352.69 ha), Malalag (189 ha), and Padada (167.62 ha). Sta. Maria has the smallest farm with 153.17 ha. The prawn farm in Hagonoy is 20 ha with a yield of 89.60 mt. For seafarming, seaweed production has a total yield of 3.25 mt from an area of 5 ha while oyster culture with an area of 3.0 ha produces 22.60 mt.

A list of 133 finfish species belonging to 26 families were encountered in the MBA during the census conducted by SUML in 1997 (Table 3.12). The family Pomacentridae had the most

number of species, comprising 22.56 percent of the total number of species. The family Labridae was second with 19.55 percent and the family Chaetodontidae was third with 15.094 percent. Labrids and pomacentrids are two of the most abundant fishes in coral reefs (Randall et al. 1990). Pomacentrids are small fishes thus are not generally targeted for food by fishers. Labrids, on the other hand, vary in size (5-229 cm) and can grow to sizes large enough to be desirable to subsistence fishers. All of the species censused were either reef or reef-associated; no pelagic species were observed.

Sta. Maria has the most species (68) in 19 families. Malalag has the least number of species (40) in 14 families, as well as the lowest species richness and lowest average abundance.

5. Others

Endangered Species

There are no reports of sightings of endangered marine mammals such as whales, dolphins,

Table 3.12. Reef fish composition in the MBA.

Family	Common name	Species
ACANTHURIDAE	Surgeonfishes	*Acanthurus* sp. *Acanthurus bleekeri* *Acanthurus pyroferus* *Ctenochaetus binotatus* *Ctenochaetus striatus* *Naso hexacanthus* *Naso minor* *Zebrasoma scopas*
AULOSTOMIDAE	Trumpetfishes, flutemouths	*Aulostomus chinensis*
APOGONIDAE	Cardinalfishes	*Apogon bandanensis* *Apogon compressus* *Apogon* sp. *Archamia zosterophora* *Cheilodipterus macrodon* *Cheilodipterus quinquelineatus*
BALISTIDAE	Triggerfishes	*Balistapus undulatus* *Balistapus* sp. *Sufflamen bursa*
BLENIIDAE	Blennies	*Meiacanthus atrodorsalis* *Meiacanthus grammistes*
CAESIONIDAE	Fusiliers	*Caesio caerulaureus* *Caesio cuning* *Pterocaesio pisang*
CENTRISCIDAE	Razorfishes	*Aeoliscus strigatus*
CHAETODONTIDAE	Butterflyfishes	*Chaetodon baronessa* *Chaetodon bennetti* *Chaetodon kleinii* *Chaetodon lunula* *Chaetodon mertensi*

Table 3.12. (continued)

Family	Common name	Species
		Chaetodon octofasciatus *Chaetodon punctatofasciatus* *Chaetodon trifasciatus* *Chaetodon ulietensis* *Chaetodon unimaculatus* *Chaetodon vagabundus* *Chaetodon* sp. *Coradion altivelis* *Coradion chrysozonus* *Forcipiger flavissimus* *Forcipiger longirostris* *Heniochus diphreutes* *Heniochus chrysostomus* *Heniochus varius*
CIRRHITIDAE	Hawkfishes	*Cirrhitichthys falco*
FISTULARIDAE	Cornetfishes	*Fistularia commersonii*
HAEMULIDAE	Sweetlips and grunts	*Plectorhinchus chaetodontoides*
LABRIDAE	Wrasses	*Bodianus diana* *Bodianus mesothoras* *Cheilinus celebicus* *Cheilinus diagrammus* *Cheilinus fasciatus* *Cheilodipterus macrodon* *Choerodon anchorago* *Chrysiptera cyanea* *Cirrhilabrus cyanopleura* *Cirrhilabrus* sp. *Coris schroederi* *Epibulus insidiator* *Halichoeres hortulanus* *Halichoeres melapterus* *Halichoeres prosopeion* *Halichoeres scapularis* *Halichoeres* sp. *Labrichthys unilineatus* *Labroides dimidiatus* *Labropsis australis* *Pseudocheilinus octotaenia* *Stethojulis bandanensis* *Thalassoma hardwicke* *Thalassoma lunare* Unidentified labrid sp. 1 Unidentified labrid sp. 2
LUTJANIDAE	Snappers	*Macolor niger*
MONACANTHIDAE	Filefishes	Unidentified monacanthid
MULLIDAE	Goatfishes	*Parupeneus barberinus* *Parupeneus multifasciatus* *Upeneus tragulas*
NEMIPTERIDAE	Threadfin breams	*Scolopsis bilineatus* *Scolopsis ciliatus* *Pentapodus* sp.

continued

Table 3.12. (continued)

Family	Common name	Species
PINGUIPEDIDAE	Sandperches	*Parapercis cylindrica*
POMACANTHIDAE	Angelfishes	*Centropyge bicolor* *Centropyge bispinosus* *Centropyge tibicen* *Centropyge vroliki* *Chaetodontoplus mesoleucus* *Pygoplites diacanthus* Unidentified angelfish
POMACENTRIDAE	Damselfishes	*Abudefduf vaigiensis* *Amblyglyphidodon aureus* *Amblyglyphidodon curacao* *Amblyglyphidodon leucogaster* *Amphiprion clarkii* *Amphiprion percula* *Amphiprion perideraion* *Chromis analis* *Chromis atripes* *Chromis retrofasciatus* *Chromis ternatensis* *Chromis viridis* *Chrysiptera cyanea* *Chrysiptera leucopoma* *Chrysiptera rollandi* *Dascyllus aruanus* *Dascyllus reticulatus* *Dascyllus trimaculatus* *Lepidozygus* sp. *Neoglyphidodon melas* *Neopomacentrus azysron* *Pomacentrus amboinensis* *Pomacentrus brachialis* *Pomacentrus coelestis* *Pomacentrus moluccensis* *Pomacentrus nigromarginatus* *Pomacentrus reidi* *Pomacentrus* sp. *Stegastes* sp.
SCARIDAE	Parrotfishes	*Scarus dimidiatus* *Scarus lepidus* *Scarus scaber* *Scarus tricolor* *Scarus* sp.
SCORPAENIDAE	Scorpionfishes	*Pterois antennata*
SERRANIDAE	Groupers	*Cephalopholis boenak* *Cephalopholis* sp. *Plectropomus leopardus* *Pseudanthias huchtii* *Pseudanthias tuka*
SYNODONTIDAE	Lizardfishes	*Saurida gracilis*
TETRAODONTIDAE	Pufferfishes	*Canthigaster solandri*
ZANCLIDAE	Moorish idols	*Zanchus cornutus*

Source: SUML (1997).

dugongs, or marine turtles in the area. Moreover, there is no record showing the result of studies/ research in the MBA for these marine fauna.

Beaches

The MBA is endowed with several beautiful beaches where resort facilities for swimming, meetings, and other gatherings are located. One is Eagle's Eye Beach Resort in Malalag. The other two beaches are Leling and Piape resorts in Hagonoy which are ideal for swimming and scuba diving. In the nearby town in Digos, the Dawis Beach Club also offers similar facilities.

SUMMARY

In summary, the MBA is endowed with forests and coastal resources. However, these resources have long been beset with issues such as denudation of the upland areas and destruction of the coastal habitats. The abuse of the forest resources has resulted in topsoil loss, increased severity and frequency of floods, and increased siltation to downstream farms, settlements, and coastal habitats. The pressure of pollution and overexploitation on the coastal areas has resulted in declining fish catch, the near extinction of the mangrove ecosystem, and water contamination.

The Malalag Bay Area

Fishpond and mangrove remnants at Sitio Taguian, Malalag, Davao del Sur.

Mangroves at Dalamuan, Mamacao, Sta. Maria, Davao del Sur.

Fish cage and mangroves at Sitio Sulok, Tanglad, Sta. Maria, Davao del Sur.

Fish corrals at Brgy. Balasinon, Sulop, Davao del Sur.

Portion of Malalag Bay fronting Culagsing Point.

Participatory Coastal Resource Assessment, 1997 (Tanglad).

Participatory Coastal Resource Assessment, 1997 (Sta. Maria,

Participatory Coastal Resource Assessment. 1997 (Hagonoy).