



REGIONAL FISHERIES LIVELIHOODS PROGRAMME FOR SOUTH AND SOUTHEAST ASIA (RFLP)

Sustainability Audit Report for

Groupers and snappers taken in selected municipal and city waters of Zamboanga del Norte province, Republic of the Philippines

For the Regional Fisheries Livelihoods Programme for South and Southeast Asia

Prepared by

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Poseidon Aquatic Resource Management



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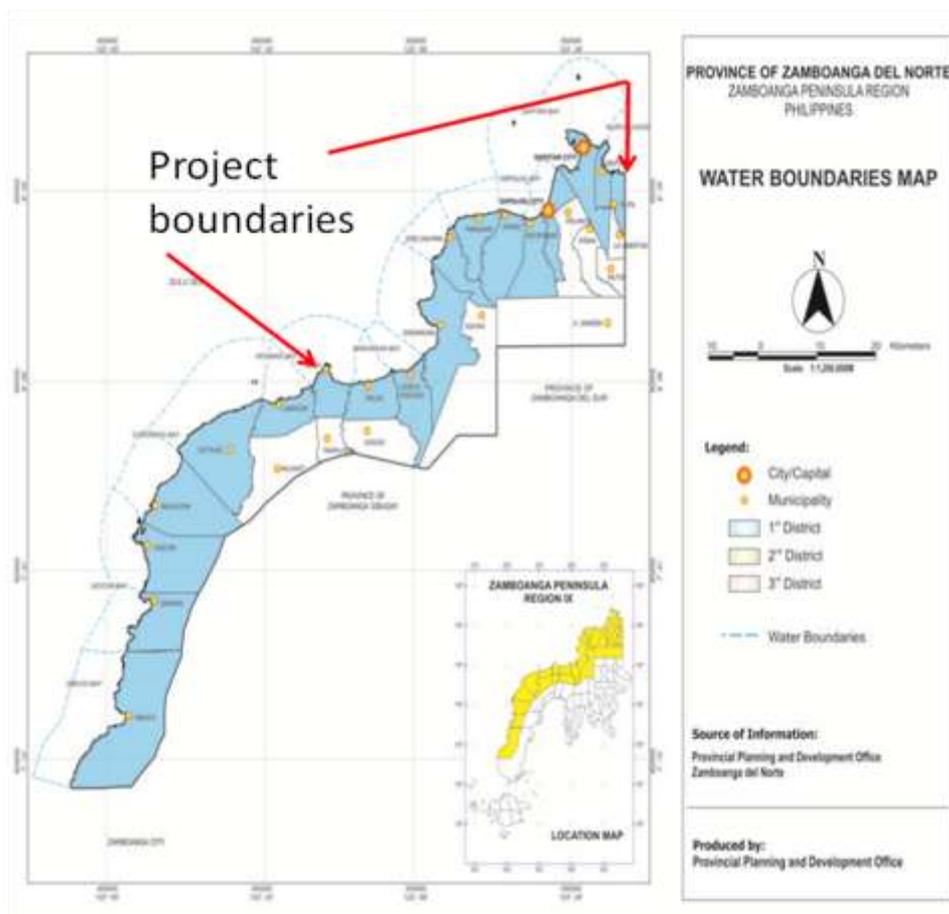
ACRONYMS

CB	Certification Body
BAS	Bureau of Agricultural Statistics
BFAR	Bureau of Fisheries and Aquatic Resources
CPUE	Catch Per Unit Effort
EAF	Ecosystem Approach to Fisheries
EEZ	Exclusive Economic Zone
ESD	Ecologically Sustainable Development
HS	Harvest Strategy
MAO	Municipal Agriculture Office
MCS	Monitoring, Control and Surveillance
MPA	Marine Protected Area
MEY	Maximum Economic Yield
MSY	Maximum Sustainable Yield
NFRDI	National Fisheries Research and Development Institute
PI	Performance Indicator
PSA	Productivity Susceptibility Analysis
RF	Risk Based Framework
SICA	Scale Intensity Consequence Analysis
TAC	Total Allowable Catch
TEP	Threatened, Endangered or Protected
TURFS	Territorial User Rights in Fisheries

1. INTRODUCTION

This report sets out the results of a sustainability audit of the small scale fisheries for groupers and snappers (hand line, trap and spear) based in near coastal waters from the Municipality of Liloy north to the Municipality of Rizal, in the Province of Zamboanga del Norte (see Map 1).

Map 1 – project areas as defined by RFLP



1.1 Methodology

This audit is based on the Fisheries Assessment Methodology (FAM) developed by the Marine Stewardship Council as a mechanism for conducting audits of the sustainability of fisheries with reference to selected components of the FAO’s Code of Conduct for Responsible Fisheries. Whilst the FAM does not cover socio-economic aspects, unlike some other fishery evaluation systems, it does have clear performance thresholds which provide workable goals for fishery management planners.

1.2 Scope and aims

The scope of this audit is defined as follows

Table 1

Species:	6 grouper and 3 snapper species (<i>See table 3</i>) ¹
Geographical Area:	Western Pacific: Coastal waters (within 15 km from shore as defined by national law) from the Municipality of Liloy north to the

	Municipality of Rizal, in the Province of Zamboanga del Norte (see Maps 1 and 2)
Method Management	Open access supported by Marine Protected Areas
System of Capture	Hand line, trap and spear
Management Authority	Local Government Units under national legislation
Client Group:	FAO RFLP

Audit aims

The principal aims of the audit are to determine, on the basis of information made available by the client, the position of the fishery in relation to the Marine Stewardship Council (MSC) Fisheries Assessment Methodology. In particular, the audit will:

- Outline the key attributes of the fishery that are relevant to management based on an Ecosystem Approach to Fisheries (EAF)
- Identify those attributes that require management intervention to facilitate a level of performance that could ensure long term sustainability.

In preparing this audit the assessor has undertaken the following:

- Documentation of available written information,
- Sought out anecdotal information via stakeholder interviews
- Conducted an evaluation of risks to the species of interest using the Risk Based Framework set out in the Fisheries Assessment Methodology.

This involved meetings with fishers and their representative bodies, the national fisheries management agency (BFAR), national research body (NFRDI), a number of municipal/city fishery managers and elected local government representatives, an officer from the provincial fishery management unit, a university and FAO staff and consultants.

This report sets out:

- The information on which the audit report is based
- The background of the fishery/fisheries
- The location and scale of the fishery/fisheries
- Fishery management arrangements
- Other relevant fisheries
- Key stakeholders in the fishery
- Preliminary evaluation of the fishery against the FAM
- Limit of identification of landings from the fishery
- Issues requiring management intervention

2. INFORMATION SOURCES USED

This audit is based upon the following information sources:

2.1 Meetings

Table 1: List of persons met

Date	Name	Organisation
1/12/10	Ms Jessica Munoz	BFAR

	Dr Noel Barut	NFRDI
	Dr Mudjekeewis Santos	Ateneo De Manila University
	Ms Connie Chiang	Sulu Celebes Sea UNDP project
2/12/10	Ms Evelyn Uy	Mayor, City of Dipolog
	Mr Francisco Loyloy	Provincial Fisheries Office of the government of Zamboanga del Norte
3/12/10	Dr Maria Rio Abdon	Dean, Education Department, Jose Rizal University
	Mr Angelo Macario	Graduate student, Jose Rizal University
3/12/10		Director, MAO, Dapitan City
6/12/10	Ms Therese Culanculan	Director, MAO, Sindangan
	Mr Juliot Buot	Fisheries Technician, MAO Sindangan
	Mr Virgilio Alforque	Retired Regional Director for BFAR
	Mr Nilo Florentino	Mayor of Sindangan
	Russel H. Adaza	Mayor of Jose Dalman
7/12/10	Mr Foatorato Agperas	President, Olingan Fishermens Livelihood Association
8/12/10	RFLP workshop, Sindangan municipality	
9/12/10	RFLP workshop, Jose Dalman municipality	
10/12/10	Mr Bernardo C. Martinez	Bureau of Agricultural Statistics
	Mr Loyloy and local farmer	Farmer of groupers and snappers
	Mike Cases and members of his fishermens association	
11/12	Mr Roseller Maniqsaca	Mayor of Rizal
		Various baranguay fishermen during a full day tour of Rizal municipality with Mr Alforque and Mr Loyloy.
14/12	Dr Noel Barut and Dr	NFRDI
	Ms Jessica Munoz	BFAR

2.2 Other Information

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Sadovy Y., Domeier M. (2005) Are aggregation fisheries sustainable Reef fish fisheries as a case study, *Coral Reefs* 24: 254–262

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Note, there is abundant literature on MPAs in the Philippines and it is not intended to create a full listing here.

See also

www.fishbase.org for general biological information

www.iucnredlist.org for conservation status

www.sprfa.org for information on aggregating species

3. BACKGROUND TO THE FISHERY

Handline fishermen operate out of small (3-4m) vessels (bancas - local name for a wooden canoe with outriggers – see Photo 1 below) using single hooks and small pelagics for bait (probably sardines but also round scad). The exact number of vessels fishing for snappers/groupers is unknown.



Photo 1: Typical small municipal fishing bancas, Dipolog

The trap operation visited uses no bait at all. The traps have one entrance and the fish simply find a way in to find sanctuary (Photo 3). The soak time is up to 3 weeks. The association visited has about 50 traps and can examine about 9 per day. Catches can be quite significant at times and the number of snappers caught generally outnumber the groupers by 50 to 1. However, most are small (0.5kg) whilst the groupers are commonly about 10kg. Mr Cases claimed that larger fish live in deeper waters. However, these require a long time to bring to the surface if they are to be kept alive for breeding purposes.

Some traps are made solely from bamboo (Photo 2) whilst others are made from a mix of bamboo and plastic mesh (Photo 3). No escape gaps were observed.



Photo 2 - Traps (bobo) seen on a beach north of Dipolog



Photo 3 - Traps used for catching broodstock and other fish



Photo 4 - Small (10cm) groupers at Dipolog public market



Photo 5 - 6kg green grouper (*Epinephelus coioides*) caught by the broodstock trap.

No spearfishermen were encountered or observed.

All sizes of fish appear to be targeted:

- Larger fish are sought as a source of eggs for fish farming (Photo 5) and generally kept alive
- Medium size fish for food
- Small fish for farm grow out if kept alive or for food if dead (Photo 4)

In terms of access to municipal waters the following arrangements apply:

- Municipal fisherfolk must register with the local the Local Government Unit (LGU) to fish within its waters.
- Residents from other municipalities are not permitted access.
- In some cases, limited entry of municipal fisherfolk is required where evidence exists that a municipality's waters are overfished, however access is otherwise open to all registered fisherfolk.
- Commercial vessels are only permitted access to a distance of 10.1klm offshore under agreement with the municipality.

The number boats operating in each of the municipalities is unknown and from comments made during site visits it would appear that municipal fishermen registration systems are not always implemented.

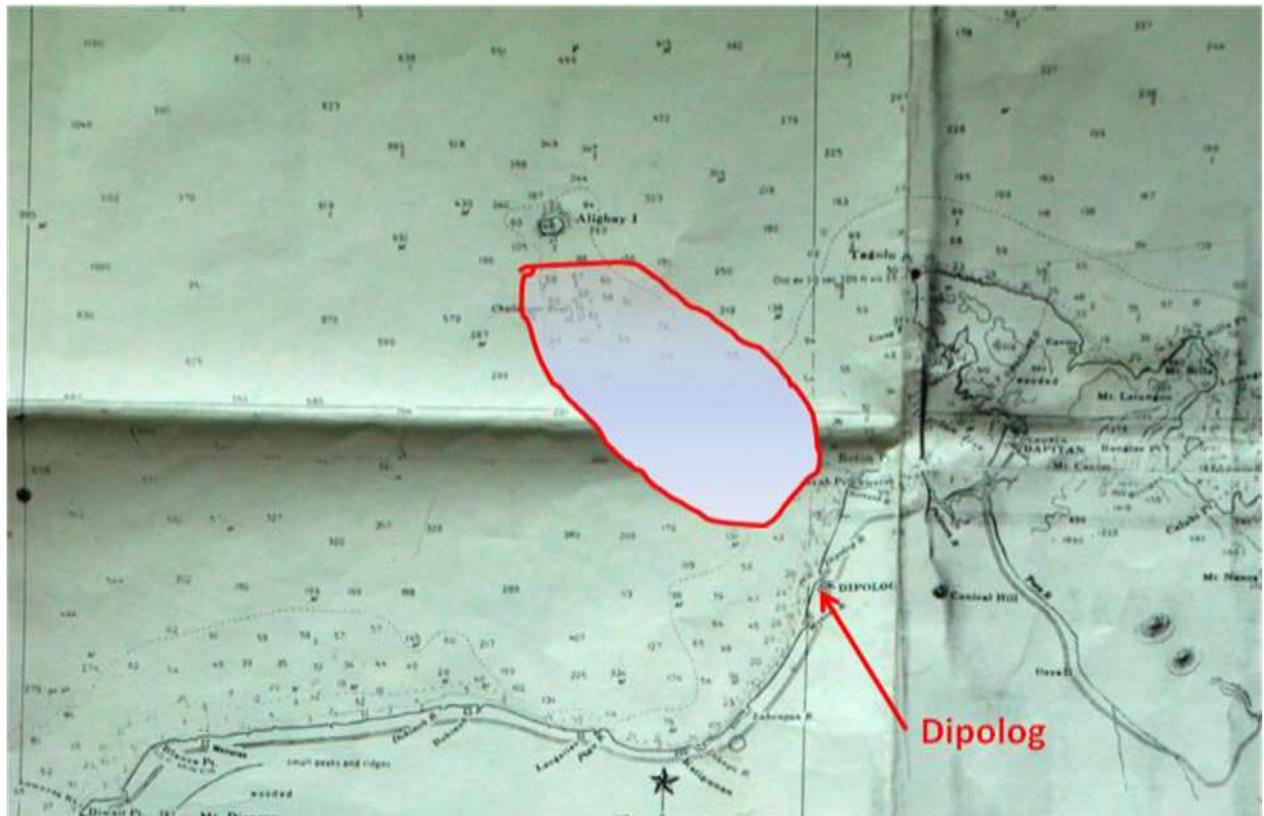
As far as can be established the fishery supplies domestic markets although there was one report about live fish being shipped to Hong Kong. Fish are generally landed at the beaches adjacent to fishing grounds and either transferred to or bought by buyers, the mode transfer being based upon relations between the catcher and the buyer (i.e. if the next handler is a family member then the fish may not be sold as such). From here the fish are transferred to a broker at a local market from where they are sold to retail stalls or sent to other centres such as restaurants in Cebu.

The location and scale of the fisheries

Fisheries for groupers and snapper occur along the entire study area on coral reefs extending down to about 200m in depth. Adequate maps were not a available but Map 3 below shows areas identified by a merchant involved in the taking of groupers as brood stock for generating fingerlings for the growing number of grouper farms in the northern part of the study area. This map shows the general distribution of fishable grounds close to Dipolog and neighbouring baranguays. Deeper sites along the

edge of the drop off to deep water were also identified to the south of Dipolog. It was claimed that these sites are only fished by the one group seeking large breeders.

Map 2 – location of fishing grounds for demersal species close to Dipolog



There is no bycatch (discards) as such. All species of all sizes are retained. Small groupers are sold to fish farms for growout.

The amount of bait used by the handline fishery is minimal, being only a kilo or two per trip. Most trips are short (less than a day) The main bait species are the Bali sardinella (*Sardinella lemuru*) Round herring (*Dussumieria acuta*). It is likely that other species of sardines, mackerels and scads are also used but these two appear to be the most mentioned.

According to the fisheries technician in Sindangan, Mr Juliot Buot, most species weigh 2-3 kg. There are about 100 fishermen fishing for groupers in Sindangan municipality and they catch about 20kg per night. Information for other areas has not been forthcoming. It is difficult to understand this estimate when the BAS data for the entire province show very low catches. The catch for the province, as estimated by BAS has been as follows:

Table 2 : estimated catches of groupers for Zamboanga del Norte (from Bureau of Agricultural Statistics)

Year	Groupers (tonnes)		Snappers (tonnes)	
	Commercial	Municipal	Commercial	Municipal
2005	0	234	1	411
2006	0	177	0	172

2007	0	83	0	138
2008	0	51	0	131
2009	1.85	39	3.5	574

The low commercial catches are due to the fact that commercial fishing has to be at least 10.1 klm offshore (and usually 15klm offshore) in very deep water.

Even if the BAS data is a major underestimate of the catch (which is highly likely) there has been a notable decline in catches in the past 5 years alone.

An observation though, is since grouper and snapper populations are reported as local to specific reefs, it is very difficult to gauge whether there are reef specific changes in the catch composition and whether the sustainability of local populations are threatened or not. There was an enormous amount of diversity in the views expressed by fishermen as to whether catches were decreasing or not.

There are also no records to illustrate the species sex. The mix of species would depend very much on whether the fishery targets spawning aggregations or not. Catches focussing on aggregations would catch a larger number of females. Grouper species are also known to change sex, and mature at earlier stages in the event of reductions in population sizes.

Illegal operations

Anecdotal reports of continued use of dynamite and poisons persist although there is considerable pressure from other fishers to see these practices discontinued.

4. BIOLOGY

Groupers

Groupers are bottom-associated fishes found in the tropical and subtropical waters of all oceans. Most species occur on coral reefs, but some live in estuaries or on rocky reefs. Groupers are generally associated with hard (rocky) bottoms, although juveniles are found in seagrass beds, and adults of a few species prefer sandy or silty areas. Most groupers live above 100 m depth, with a higher number found between 10 and 30 m. Most groupers feed on a variety of fishes, larger crustaceans, and cephalopods.

Except for occasional spawning aggregations typified of some species, most grouper species are solitary fishes and tagging studies have shown that groupers are generally resident on a particular reef for long periods of time (often years). Records of aggregations of the grouper species listed in Table 3 are identified. Groupers have a slow growth rate which makes them particularly vulnerable to over-fishing. In addition, some groupers use localized spawning sites to which they migrate from distances of several kilometres and these sites are often exploited by local fishermen who catch large numbers of fishes during the brief spawning period of 1 or 2 weeks. This removal of a considerable number of reproductively active fish from the population may be detrimental to sustained yields of the fishery.

Although an individual male may spawn several times during the breeding period, there is no evidence to suggest that females spawn more than once a year. Based on the few species that have been studied, groupers are protogynous hermaphrodites. An exogenous (behavioural) inducement of sexual transformation, as opposed to an endogenous (size) threshold, is indicated by 1) the sexual transition occurring over a broad range of size (age), and 2) the presence of females older than the age at which transition is completed for the population.

Other relevant characteristics² are:

- Average age at maturity is perceived to be around 5 years
- Average maximum age: 19 to 49 years
- Fecundity: 900,000-1 million eggs
- Average size at maturity of most groupers is between 35 cm and 75 cm. However, change in maturity is behavioral and cannot be taken as definitive. One species, Malabar grouper (*Epinephelus malabaricus*) matures at 100 cm
- Reproductive strategy: Batch spawners and demersal egg layers, with grouper spawn tending to stay in the water column for longer periods
- Trophic level: High (3.2 to 4.15)
- Vulnerability: Camouflage grouper (*Epinephelus polyphekadion*) and Leopard Coral grouper (*Plectropomus leopardus*) are classified in FishBase as high to very high vulnerability. Malabar grouper (*Epinephelus malabaricus*), Orange spotted grouper (*Epinephelus coioides*), and Highfin coral grouper (*Plectropomus oligacanthus*) are classified as very highly vulnerable.

Snappers

Some snappers are known to aggregate which makes them vulnerable to overfishing in most fisheries. Spawning periods are between spring and summer, but may extend to up to 8 months (Red snapper or *Lutjanus sebae*) (McPherson *et al*). Spawning takes place over spring and neap tides, and between dusk and midnight.

Snappers are active predators feeding mainly at night on a variety of items, although fishes are dominant in the diet of most species. Other common foods include crabs, shrimps, various other crustaceans, gastropods, cephalopods, and planktonic organisms, particularly urochordates. Generally, the larger, deep-bodied snappers feed on fishes and large invertebrates on or near the surface of the reef. They are usually equipped with large canine teeth, adapted for seizing and holding their prey.

Specific characteristics of snapper are:

- Average age at maturity is perceived to be around 8-10 years
- Average maximum age: 27 (Spangled emperor (*Lethrinus nebulosus*)) to 35 years (Emperor red snapper (*Lutjanus sebae*))
- Fecundity: 900,000-1 million eggs
- Average size at maturity of most snapper is between 60 cm and 100 cm.
- Reproductive strategy: Demersal egg layer
- Trophic level: High (3.3 to 4.3)
- Vulnerability: Emperor red snapper (*Lutjanus sebae*), are classified as highly vulnerable. Others are moderate to high.

Table 2: Biological characteristics

Species		Average age at maturity	Av maximum age	Fecundity	Average maximum size	Average size at maturity (common)	Reproductive strategy	Trophic level (from diet composition unless otherwise stated)
Camouflage grouper	<i>Epinephelus polyphkadion</i>				90 cm	30cm	nonguarders open water/substratum egg scatterers spawning aggregations recorded	3.94
Malabar grouper	<i>Epinephelus malabaricus</i>				234 cm	70-80 cm	nonguarders open water/substratum egg scatterers	3.75
Giant grouper	<i>Epinephelus lanceolatus</i> ,				270	105-129	-protogyny -nonguarders, open water/substratum egg scatterers	4.0
Orange spotted grouper	<i>Epinephelus coioides</i>	2-3	22		120	25-30	Spawning aggregations recorded	3.9
Leopard Coral grouper/ coral trouts	<i>Plectropomus leopardus</i>	2-4	26		120	21-60	protogyny -nonguarders, open water egg scatterers Spawning aggregations recorded	4.49 (based on diet composition)
Highfin coral grouper	<i>Plectropomus oligacanthus</i>				75	42	Spawning aggregations recorded	4
Red snapper/ Emperor	<i>Lutjanus sebae</i>	49	35 years	5 millions ?	116 cm	60 cm	nonguarders open water/substratum egg scatterers batch spawners	4.27
Spangled emperor	<i>Lethrinus nebulosus</i>	45.3	27		87		Spawning aggregations recorded	3.32

Russell's snapper	<i>Lutjanus russelli</i>	29			50 cm		4.31

Source: www.fishbase.org and www.iucnredlist.org and www.scrfa.org

Common characteristics

<i>Epinephelus polyphekadion</i>	Camouflage grouper	Reef-associated; oceanodromous; marine; depth range 1 – 46 m. Usually found in coral-rich areas of lagoon and outer reefs; in caves and large crevices to swim through. Most abundant around islands, particularly atolls. Usually found in small schools. Feeds mainly on crustaceans (portunid crabs) and fishes, sometimes on cephalopods and gastropods. The species may be sold in the Hong Kong live fish markets, but there is no evidence of sales beyond domestic markets.. IUCN Red List Status: Near threatened (NT). Resilience: Very Low, minimum population doubling time more than 14 years. High to very high vulnerability (66 of 100). Price category: very high. Fisheries: commercial; aquaculture: experimental
<i>Epinephelus malabaricus</i>	Malabar grouper	Common species that is found in a variety of habitats: coral and rocky reefs, tidepools, estuaries, mangrove swamps and sandy/mud bottom from shore to depths of 150 m. Juveniles found near shore and in estuaries; sex reversal probable; catch statistics poor being previously confused with <i>E. andersoni</i> . It feeds equally on fishes and crustaceans and occasionally on octopuses. No information is available on age and growth of this species. Frequently sold in the Hong Kong live fish markets, but there is no evidence of sales destined beyond domestic markets. Widely used in mariculture mainly in the Far East. Resilience: Very low, minimum population doubling time more than 14 years. Vulnerability: Very high (85 of 100). Price category: very high. Fisheries: highly commercial; aquaculture: commercial; gamefish: yes Size: Tan et al. (1982) illustrated a 97.4 cm standard length specimen (= 115 cm total length). Attains at least 25 kg. The maximum size is uncertain because of confusion with other species of large groupers. Adult 500 mm total length, juvenile 23 mm standard length
<i>Epinephelus lanceolatus</i> ,	Giant grouper	The largest bony fish found in coral reefs. Common in shallow waters. Found in caves or wrecks; also in estuaries. Individuals more than a meter long have been caught from shore and in harbours. Juveniles secretive in reefs and rarely seen. Benthopelagic and benthic. Feed on spiny lobsters, fishes, including small sharks and batoids, and juvenile sea turtles and crustaceans. The main prey item is the mud crab, <i>Scylla serrata</i> . /Nearly wiped out in heavily fished areas. Frequently sold in the Hong Kong live fish markets, but there is no evidence of sales destined beyond domestic

		markets.. Large individuals may be ciguatoxic. Resilience: Very Low, minimum population doubling time more than 14 years (Preliminary K or Fecundity). Very high vulnerability (85 of 100). Price category: very high. IUCN Red List Status: (VU) vulnerable; IUCN Grouper and Wrasse Specialist Group. Threat to humans: traumatogenic. Maximum published weight 400kg.
<i>Epinephelus coioides</i>	Orange spotted grouper	Reef-associated; brackish; marine; depth range ? - 100 m. Inhabit turbid coastal and are often found in brackish water over mud and rubble. Juveniles are common in shallow waters of estuaries over sand, mud and gravel and among mangroves. Feed on small fishes, shrimps, and crabs. Probably spawn during restricted periods and form aggregations when doing so. Eggs and early larvae are probably pelagic. Has been tested in several countries as a potential species for mariculture. High vulnerability (58 of 100)
<i>Plectropomus leopardus</i>	Leopard Coral grouper	<p>A monandric species. Sex change occurs at 32.1 cm TL and 16 years of age. Courtship behavior: a male approaches 1 or more females from behind, changing colour from dark brown to brownish white while the edges of median fins remained dark. As the male gets near, it flicks its dorsal and pelvic fins eliciting a mild lateral display from the female. The male rolls onto its side and shakes from side to side as its abdomen passes the female. Takes 15 seconds.</p> <p>Inhabit coral-rich areas of lagoon reefs and mid-shelf reefs. Inactive at night, hiding under ledges. Juveniles have a demersal existence in shallow water in reef habitats, especially around coral rubble. Adults feed mainly on fish. Juveniles feed on small fish and invertebrates such as crustaceans and squid. A protogynous hermaphrodite. Form several spawning aggregations on a reef occurring around the new moon. Eggs float just below the surface. Larvae are pelagic. On the Great Barrier Reef, its maximum lifespan is 14 years. IUCN Red List Status: Near Threatened (NT); IUCN Grouper and Wrasse Specialist Group. Threat to humans: reports of ciguatera poisoning. Human uses: fisheries – commercial; aquaculture – commercial; gamefish; aquarium- commercial. Resilience: Medium, minimum population doubling time 1.4 - 4.4 years (tm=2-4; tmax=26; Fec=457,900). Vulnerability: moderate to high (46 of 100). Price category: very high.</p>
<i>Plectropomus oligacanthus</i>	Highfin coral grouper	Reef-associated; non-migratory; marine; depth range 3 - 30 m. Inhabits drop-offs and steep channel slopes. Very little has been published on its biology. Reported to forage in groups of two or three for rock- and sand living crustaceans and fishes. Rare in most areas. In the Hong Kong live fish markets. High vulnerability (56 of 100)
<i>Lutjanus sebae</i>	Emperor red snapper	Occur in the vicinity of coral or rocky reefs, often over adjacent sand flats and gravel patches. Also trawled in deeper water on relatively flat bottoms. Juveniles are frequently commensal with sea urchins. Juveniles less than 20 cm long are common in near shore, turbid waters, in mangrove areas, or among both coastal and deeper water offshore reefs. Juveniles can also be found swimming amongst the spines of urchins in shallow coastal bays. They move to deeper waters as they grow larger, with large fish often moving into shallower water during the winter months. They form schools of similar-sized individuals or are solitary. Feed on fishes, crabs, stomatopods, other benthic crustaceans and cephalopods. May be marketed fresh, dried-salted and frozen. Commercially important but in certain regions of the Indian Ocean, large individuals are known to cause ciguatera poisoning. Resilience: Medium, minimum population doubling time 1.4 – 4.4 years. Vulnerability: high (62 of 100). Price category: high. Fisheries: commercial; aquaculture:

		commercial; aquarium: commercial.
<i>Lethrinus nebulosus</i>	Spangled emperor	Reef-associated; non-migratory; brackish; marine; depth range 10 - 75 m. habit coral reefs, coralline lagoons, seagrass beds, mangrove swamps and coastal sand and rock areas. Adults solitary or in small schools; juveniles form large schools in shallow, sheltered sandy areas, also harbours where in seagrasses, algae or sponge habitats at various depths. Feed on echinoderms, molluscs and crustaceans, and to some extent on polychaetes and fish. A protogynous hermaphrodite. May have a coppery or iodine taste or smell in the Indian Ocean. It has been shown that this species can survive for long periods in salinities as low as 10 parts per thousand and therefore it is a potential estuarine aquaculture species. Utilized as a food fish. Moderate to high vulnerability (46 of 100)
<i>Lutjanus russelli</i>	Russell's snapper	Reef-associated; brackish; marine; depth range 10 - 80 m, usually 20 - 50 m. Inhabit offshore coral reefs and also inshore rocky and coral reefs. Juveniles frequent mangrove estuaries and lower reaches of freshwater streams. Adults on clear outer reefs at moderate depths, usually over 20 m, and is more common in about 50 m depth. Feed on benthic invertebrates and fish. In Hong Kong live fish markets. Moderate vulnerability (36 of 100)

Source: www.FishBase.org

5. STOCK ASSESSMENT

No information regarding stock assessments were made available to the assessors.

Because of data deficiencies regarding the health of the target stock, the Risk Based Framework is applied for Performance Indicator 1.1.1 (Appendix 2). The main input features to the RBF are SICA and PSA scores, which provide a risk-based evaluation of effort and stock recruitment components.

The following assumptions are made³:

- Most fishing takes place on a daily basis but is probably more intensive in the period December to February when seas are calmer. The traps observed fish all the time when deployed (200-300 days), giving a score of 5;
- Spatial scale represents the range of the stock that overlaps with the fishing activity. Stock boundaries have not been determined but given that fishing occurs almost everywhere, including in adjacent areas outside the study area a score of 6 was allocated (>60%)
- The scale intensity is allocated as Major, which reflects ‘detectable evidence of activity occurring reasonably often over a broad spatial scale. It is unclear though whether fishing in deeper water is common and thus there may be a reservoir of larger fish at depth.
- A consequence score of 3 or greater because fishing pressure is probably high enough to affect recruitment.

The result is a SICA score of 3, equivalent to a MSC score of > 60.

In terms of the Productivity Susceptibility Analysis (PSA) enough information for only two species (*E. malabaricus* and *P. leopardus*) could be found. The results were as follows:

Species	Productivity	Susceptibility	PSA composite score
<i>E. malabaricus</i>	1.71	2.33	2.89
<i>P. leopardus</i>	1.86	2.33	2.98

This put these species into the MSC 60-80 scoring range which represents, in the absence of sufficient information for the other species, a medium risk fishery, with a requirement for at least precautionary harvest control tools to be introduced. However, it is also noted that some of the groupers listed are in the ‘Very vulnerable category’, emphasizing the need for caution.

The susceptibility of many grouper species to uncontrolled fishing pressure is well known and many are at risk as document by the International Union for the Conservation of Nature. The status of the species covered in this study is as follows:

		IUCN status
<i>Epinephelus polyphekadion</i>	Camouflage grouper	Near threatened
<i>Epinephelus malabaricus</i>	Malabar grouper	Near threatened
<i>Epinephelus lanceolatus</i>	Giant grouper	Vulnerable
<i>Epinephelus coioides</i>	Orange spotted	Near threatened
<i>Plectropomus leopardus</i>	Leopard Coralgrouper	Near threatened
<i>Plectropomus oligacanthus</i>	Highfin coralgrouper	Near threatened

6. ENVIRONMENTAL INTERACTIONS

6.1 Retained species

As far as can be established any fish that are caught, including juveniles of the target species are retained. Indeed the distinction between target species and retained species is difficult to document due to the lack of landings data and the nature of the fishery (i.e. whatever is caught is of value). For the purpose of this audit it has been assumed that any of the snapper and grouper species identified as being caught are target species. It was also mentioned that a species of stingray is occasionally caught but its identity is unknown.

In terms of the evaluation system used i.e. based in the MSC's FAM, the baitfish used are required to be treated as retained species and these are described as follows. Two species were identified as being used for bait; the Bali sardinella (*Sardinella lemuru*) and the round scad (*Decapterus macrosoma*). More than likely other species are used but were not identified.

Year	<i>S. longiceps</i> (Tonnes)		<i>D. macrosoma</i> (tonnes)	
	Municipal	Commercial	Municipal	Commercial
2005	11471	5874	3472	3830
2006	8756	4764	3462	3548
2007	9646	4222	4107	4879
2008	7593	5649	3115	3448
2009	7692	5567	1973	2877

6.2 Bycatch species

Data are non existent but, anecdotally, bycatch does not occur as no fish are discarded.

6.3 Endangered, threatened and protected

There are no reports of ETP interactions.

6.4 Benthic impact

Lines are frequently snagged in coral, but coral is rarely damaged (Personal observation). Lines accumulate organisms, and often stimulate further growth.

Boats anchor on the reef when not operating on the daylight and looking for protection from bad weather. Anchor damage, especially to corals may be significant.

The main habitat threat related to fishing is from the ongoing but occasional illegal use of dynamite.

6.5 Trophic effects

Groupers and snappers are high up in the food chain. They act as the source of feed for sharks and dolphins, but feed on a variety of fishes, larger crustaceans, and cephalopods (groupers and snappers) as well as planktonic organisms (snapper). There is no fishery independent information to verify the health of specific reefs under evaluation. Table 3 shows the trophic index for both species to be 3.5 or higher. This suggests that if high numbers of fish are taken from the reef, it will affect the reef ecosystem balance.

Other impacts

Ghost fishing may be an issue for the traps. The traps observed are single parlour which means that fish at least have an opportunity to leave the trap. There are no escape panels as such although the bamboo will break down over time, a period of 6 months was mentioned in response to an inquiry on this subject.

7. FISHERY MANAGEMENT

7.1 Overall Governance

The Philippines is a democratic republican state whose system of government is the presidential form patterned after the American model. There are 21 departments in the executive branch, more than 200 congressmen and 24 senators in the bicameral legislative branch, and 15 justices in the Supreme Court (judicial branch). At the sub-national level, the Philippines is divided into a hierarchy of local government units (LGUs) in which the province is the primary unit. There are currently 81 provinces in the Philippines. Provinces are further subdivided into cities and municipalities. For administrative purposes, all provinces are grouped into 17 regions, of which one (Muslim Mindanao) is autonomous. The main laws providing the governing and policy framework for the management of fisheries include:

- The Philippine Fisheries Code of 1998 (Republic Act No. 8550) (“the Fisheries Code”);
- The Agriculture and Fisheries Modernization Act of 1998 (RA 8435) (“the AFMA”);
- The Local Government Code of 1991 (RA 7160); and
- The National Integrated Protected Areas System Act of 1992 (RA 7586).

These are also supported by Executive Orders (e.g. EO 240 establishing Fisheries Aquatic Resource Management Councils - FARMCs) and Memorandum Orders (e.g. No. 357 to establish an inter-agency committee to resolve disputes with foreign fishing vessels in the South China Sea) on specific issues.

The Fisheries Code is the primary legislation empowering the management of fisheries. The Fisheries Code sets out the overarching policies and objectives to be pursued in the management of fisheries, as well as powers to regulate municipal and commercial fisheries, aquaculture and post-harvest activity, create fisheries reserves, protect fisheries habitats and to impose sanctions. The Fisheries Code also sets out the institutional and consultative structure for the implementation of the Act. This includes the creation of a Bureau of Fisheries and Aquatic Resources (BFAR), which has overall responsibility for fisheries management at the national level, and Fisheries and Aquatic Resources Management Councils (FARMCs), whose function is to assist in the formulation of policies and plans for the management and development of fisheries and in the enforcement of fisheries laws. FARMCs are established at two levels – national and municipal – and comprise government, fisherfolk, fishworker, NGO and academic representatives. “Integrated” FARMC are also established in bays and other systems that span two or more municipalities to ensure consistency in management approaches. The Fisheries Code also establishes a National Fisheries Research and Development Institute (NFRDI) to undertake research and, in particular, deliver training in fisheries technology.

The Fisheries Code provides for a mandatory five yearly review of the legislation, however there is reluctance from Congress to undertake the review. All legislative changes or new proposals for management are subjected to an extensive public and stakeholder review process involving all levels of government (national, provinces and LGUs, the BFAR regional offices, and the FARMCs. This process encourages input and expressions from all interest groups, but is a time consuming and costly exercise

The AFMA’s main purpose is to “provide appropriate and budgetary logistical requirements for

modernization of the country's agricultural and fisheries base"⁴. Its objectives include poverty alleviation, social equity, food security, rational use of resources, people empowerment and sustainable development.

Institutionally, marine capture fisheries management is demarcated at national and municipal levels. BFAR have management responsibility for waters outside 15km, and may formulate policies and plans for the conservation and management of fisheries resources in this outé jurisdiction. Municipal LGUs, operating under the Local Government Code of 1991, have management responsibility for fisheries inside 15km and may issue Municipal Fisheries Ordinances (MFOs) to govern fisheries within their jurisdiction. Although provinces have no formal management power, they may assist in implementation by coordinating municipalities within their area.

7.2 Data collection and information flows

One of the consequences of the decentralisation program was the transfer of fishery information collection to the Bureau of Agricultural Statistics and the LGUs. Both appear to have mandates focused on production oriented rather than management oriented statistics. In the case of the BAS, this has resulted in the lack of data at the species level in many cases, especially for snappers and groupers, the latter all aggregated as *lapu-lapu*. The BAS conducts monthly sampling of selected landing sites (see Appendix 1). There are 11 municipal sites and 6 commercial sites monitored to generate information about production (wild harvest and aquaculture). All the sites are located to the north of Liloí due to funding, safety (pirates are common in the southern part of the province) and travel time restrictions. Data are obtained via interviews with fishermen and then scaled up according to a formula. Samplers also interview other knowledgeable persons at the landing site such as buyers. The data are compiled into 3 month blocks and aggregated for the province as a whole prior to release. However, it is possible to request data for each individual landing site and this has been done for snappers and groupers for each month for 2009. The information is expected to be supplied in early January 2011.

However, at least these data are collected which is not the case for any of the LGUs consulted during this study. Data collection, where it occurs, at the LGU level is administered by the Municipal Agricultural Office (MAO) which provides information and advisory services to the main farming systems in the region (mainly rice and corn but also aquaculture). Due to funding constraints, the priorities for service delivery appear to be land based farming, then aquaculture and then wild harvest fisheries. Dedicated fishery technicians can be found in Dapitan (3), Dipolog (2), Sindangan (1) and Sibutang? (1). There is also a part time technician in Rizal. In some other cases the task of collecting data falls to agriculture staff but in most cases no data are collected at all. For those cases where data are collected the focus is on production by gear type and is simply recorded, based on field enumerator visits, as total tonnage (or boxes of fish) of all species gathered at selected landing sites. In one case (Sindangan) an attempt had been made to estimate the annual catches of various species, including the collective category of *lapu-lapu* (groupers).

Data from the LGUs are submitted to the provincial government which maintains 5 fishery technicians who compile the data and submit it to the Bureau of Agricultural Statistics. How the gear based data is integrated with the species data is unknown. Thus, catch per unit effort data (e.g. species catch by gear type by day, or similar), of major importance in fisheries management, does not seem to be collected.

The BFAR also has enumerators in the field and collects data in two barangays in Dipolog City (Sicaya and Olingan) and also in Sindangan. However, in the case of groupers in the Dipolog area the data are supplied by a businessman, Mr Mike Cassis who operates about 50 traps (bobos) for the

⁴ BFAR (2005). *Comprehensive National Fisheries Industry Development Plan – Draft, October 2005*. 238pp.

taking of grouper broodstock for hatchery purposes. It is unclear whether only one species is caught but the ones observed at the landing area were *Epinephelus coioides* (green grouper). There is thus no species level data collected. Information from field enumerators is then sent to the BFAR regional office for compilation.

The primary focus of the data collection system is not fisheries management but production maximisation and seems to be ill suited to the need to manage the fisheries. The state of the resources and the need for active management has been a recurring theme since the 1980's when early assessment work by ICLARM and others noted that overfishing was already widespread in the pelagic fisheries, at least.

7.3 Overall strategies

Fisheries management objectives, as set out in the Fisheries Code of 1988, are as follows:

Sec. 2. Declaration of Policy. - it is hereby declared the policy of the State:

a. to achieve food security as the overriding consideration in the utilization, management, development conservation and protection of fishery resources in order to provide the food needs of the population. A flexible policy towards the attainment of food security shall be adopted in response to changes in demographic trends for fish, emerging trends in the trade of fish and other aquatic products in domestic and international markets, and the law of supply and demand;

b. to limit access to the fishery and aquatic resources of the Philippines for the exclusive use and enjoyment of Filipino citizens;

c. to ensure the rational and sustainable development, management and conservation of the fishery and aquatic resources in Philippine water including the Exclusive Economic Zone (EEZ) and in the adjacent high seas, consistent with the primordial objective of maintaining a sound ecological balance, protecting and enhancing the quality of the environment;

d. to protect the rights of fisherfolk, especially of the local communities with priority to municipal fisherfolk, in the preferential use of the municipal waters. Such preferential use, shall be based on, but not limited to, Maximum Sustainable Yield (MSY) or Total Allowable Catch (TAC) on the basis of resources and ecological conditions, and shall be consistent with our commitments under international treaties and agreement;

e. to provide support to the fishery sector, primarily to the municipal fisherfolk, including women and youth sectors, through appropriate technology and research, adequate financial, production, construction of post-harvest facilities, marketing assistance, and other services. The protection of municipal fisherfolk against foreign intrusion shall extend to offshore fishing grounds. Fishworkers shall receive a just share for their labor in the utilization of marine and fishery resources;

f. to manage fishery and aquatic resources, in a manner consistent with the concept of an integrated coastal area management in specific natural fishery management areas, appropriately supported by research, technical services and guidance provided by the State; and

g. to grant the private sector the privilege to utilize fishery resources under the basic concept that the grantee, licensee or permittee thereof shall not only be a privileged beneficiary of the State but also an active participant and partner of the Government in the sustainable development, management, conservation and protection of the fishery and aquatic resources of the country.

In support of Fishery Management policies, the Minister is responsible for establishing regulations that provide for

- Access to fishery resources – at the LGU level, a registry of fisherfolk should be developed and made publicly available within the barangays
- Catch ceilings
- Establishment of closed seasons
- Protection of Rare, Threatened and Endangered Species
- Environmental Impact Statement (EIS)
- Monitoring Control and Surveillance of the Philippine Waters

Fishery reserves and fish refuges and sanctuaries (at least 25% and not more than 40%).
Municipalities should aim for 15% set aside.

LGU's are expected to put in place ordinances to give effect to the national laws and add any local requirements. The Municipality of Sindangan, for example, has promulgated via its Committee on Agriculture, Municipal Ordinance No. 2003-045 (Title: An Ordinance Enacting the Basic Municipal Fisheries Ordinance of Sindangan, Zamboanga del Norte and Providing Rules and Regulations of Licensing and Permits and other Fishery Activities in Conformity With the Philippine Fishery Code of 1988, R.A. 8550). In regards to wild harvest fisheries the Ordinance sets out the following:

- Declaration of policy objectives
- Definitions – including a clear separation of commercial from artisanal fishing
- Establishes a limited access regime in that only residents of the municipality can receive a licence to fish in municipal waters.
- A licensing system for fishing gears and fishing vessels
- A system of fees for licenses
- Grounds for cancellation of licenses and a system of fines for breaches
- A catch monitoring program at landing sites and markets
- A program for monitoring effort and other aspects of the fishery
- The creation of a consultative body, the Municipal Fisheries and Aquatic Resources Management Council
- Provisions for fish sanctuaries, reserves and refuges including one of 30 hectares
- A prohibition on all fishing one day before to two days after the new moon
- Bans on fine mesh (less than 3cm) nets except for specific purposes (e.g. catching anchovies)
- Bans in explosives, chemicals and electricity, and the use of superlights
- A ban on drift gillnets from February to July each year
- Provision for minimum safety standards for fishing vessels

In Rizal Municipality it was found that this municipality collaborated with others surrounding Murcielagos Bay to ensure that there are common fishery control regulations, including a 3 day closure during the time of the new moon, to help protect those species that spawn at this time. The mayor also stated that there was also collaboration with a municipality from the neighbouring province and that there was a management plan in place. He undertook to provide copies of the fishery ordinance and the plan.



New moon closure advisory in a fisherman's shed, Rizal Municipality.

Monitoring, control and surveillance

As has already been mentioned there is very little monitoring undertaken. The BAS data are the best available but totally inadequate for management purposes.

In terms of surveillance there are some efforts documented but they are patchy across municipalities due to funding issues. In some cases patrol vessels have been made available but maintenance and fuel hamper regular efforts. Shore based policing also takes place and there are occasional prosecutions, as documented in the monthly report of the provincial fisheries officer visited (Mr Fancisco Loyloy).

At the community level there are Sea Watch teams established in some cases. These are organised by BFAR and members have the power to detain those that break the law. Generally this is not done due to well founded fears about the violence that may ensue and so these groups more commonly conduct surveillance and reporting. The government can (and does) make firearms available (as seen in Rizal municipality) but this is uncommon and not encouraged.



Photo 6 - New but unserviceable patrol Vessel Sicaya – Bucana, near Dapitan



Photo 7 Patrol vessel, Sindangan



Photo 8 – Patrol vessel, Sindangan

7.3 Fishery specific objectives

There are no management plans for the fisheries.

Management measures that may be considered relevant to these fisheries include Marine Protected Areas and time based closures. An open access system prevails and there are no restrictions on fleet activity. Licencing may or may not be implemented and enforced, depending on the municipality.

The system of protected areas is said to support fish populations within primary areas of abundance and will protect potential sources of larval exchanges amongst adjacent regions. Spawning aggregations are useful focal points for protected area management.

The most feasible management measures that could be applied in this fishery are either spatial closures or restrictions on fishing effort. The first would not appear to be being applied sufficiently, and the second, not at all. Given the latter, there would at least need to be some precautionary management system in place.

7.4 Subsidies

Occasionally the BFAR provides a vessel to a small group of fishermen but this does not appear to be common and contributes a negligible number of boats in overall terms.

It was also reported that, for the grouper broodstock catching operation the traps were also supplied free of charge by BFAR as the enterprise was originally established as a research program. However, it appears to have outgrown this and few if any data were supplied to the BFAR.

8. OTHER FISHERIES AFFECTING THE TARGET STOCKS

Illegal fishing is mentioned above in terms of habitat but other illegal fishing in terms of the use of compressed air for spearfishing and incursions from unlicensed (i.e. from other municipalities) and commercial fishermen were mentioned at workshops during December 2010.

There was one report in sindangan of demersal longlining starting up but the number of participants is unknown.

There was one claim that purse seines are catching large numbers of juvenile groupers as they go close to the surface at night to feed. The veracity of this needs to be tested as green groupers go to the estuary mouths to spawn and the juveniles are found in the estuaries.

9. KEY STAKEHOLDERS

The following is not an exhaustive list but indicates the breadth of consultation that would be carried

out. This list would be completed in consultation with the stakeholders identified below and additional stakeholders may be identified during the assessment. However, 'stakeholders' for consultation must have a valid and established interest in the fisheries under assessment.

Table 3: Key stakeholders

Persons name	Position	Organisation		
Regional staff		BFAR, Zamboanga		
Ms Jessica Munoz		BFAR, Manila		
Mr Virgilo Alforque		RFLP Dipolog		
Mr Benjamin Francisco		RFLP		
Mr Francisco Loyloy	Fisheries technician	Government of Zamboanga del Norte		
Municipal Agriculture Office employees		All municipalities in the study area		
Municipal and city mayors		All cities and municipalities in the study area		

10. PRELIMINARY EVALUATION AGAINST MSC PRINCIPLES & CRITERIA

This sustainability audit measures compliance with the MSC Principles and Criteria as expressed in the Fisheries Assessment methodology. A series of questions have therefore been developed to determine:

- the availability of sufficient information to measure the fishery against the requirements of the Principles and Criteria
- the implementation of management measures to ensure that the fishery is both well managed and sustainably managed

During the audit, compliance with the Principles and Criteria will be determined by applying a scoring system to these questions (or ‘performance indicators’).

For this audit, the information available has been used to determine the general position of the fishery in relation to a series of generic performance indicators. This will also aid the evaluation team in modifying the performance indicators to best suit the fishery in question during the assessment.

The position of the fishery in relation to the generic performance indicators is presented in the following table, and provides an indication of the availability of information in relation to the various requirements of the MSC Principles and Criteria for Sustainable Fishing. It also indicates, on the basis of available evidence, the extent to which the fishery meets these requirements. Where potential issues are identified, these are highlighted in *bold italics*.

Principle 1	A fishery must be conducted in a manner that does not lead to over-fishing or depletion of the exploited populations and, for those populations that are depleted, the fishery must be conducted in a manner that demonstrably leads to their recovery.
<p>Criterion 1.1.1:</p> <p>It is highly likely that the stock is above the point where recruitment would be impaired.</p> <p>The stock (or fishing mortality) is at or fluctuating around its target reference point.</p>	<p>There is no verifiable information available to determine the true status of any of the stocks of snappers and groupers in the study area. There is an abundant literature describing the overfished nature of fisheries in general in the Philippines and, in the absence of management the likelihood that the species covered in this assessment are not overfished as well is very low.</p> <p>Existing data deficiency requires the Risk Based Framework is applied. The analysis shows that the sardine fishery is Medium, and possibly High Risk for certain species, with likely prospect that some is not all stocks, are heavily overfished.</p> <p>This assessment is confirmed by anecdotal information and visual observation of the few fish for sale in public markets suggest that the species are not abundant and generally of a small to very small size. There are occasional reports of large fish.</p>
Criterion 1.1.2: Reference Points	No reference points are provided. RBF is applied.

<p>Reference points are appropriate for the stock and can be estimated.</p> <p>The limit reference point is set above the level at which there is an appreciable risk of impairing reproductive capacity</p> <p>The target reference point is such that the stock is maintained at a level consistent with BMSY (or some measure or surrogate with similar intent or outcome)</p>	
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<p>Criterion 1.2.1: Harvest Strategy</p> <p>The harvest strategy is responsive to the state of the stock and the elements of the harvest strategy work together towards achieving management objectives reflected in the target and limit reference points.</p> <p>The harvest strategy may not have been fully tested but monitoring is in place and evidence exists that it is achieving its objectives.</p>	<p><i>There is no harvest control strategy, nor harvest control rules.</i> The only management measure applicable is MPAs and the overall size and location of many of these is unknown.</p> <p>Not all municipalities have fishery ordinances and non have fishery specific measures. There may be some minor protection afforded by the 3 day, new moon, fishing closure that operates in some municipalities.</p> <p>Other measures such as minimum sizes, closures of spawning grounds, closures during spawning seasons and effort limitations are not applied.</p>
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<p>Criterion 1.2.2: Harvest Control -Rules and Tools</p> <p>Well defined harvest control rules are in place that are consistent with the harvest strategy and at a minimum ensure that the exploitation rate is reduced as limit</p>	<p><i>There are no harvest control rules in place.</i> There are generic rules in place but these are not specific to the species of interest.</p>
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<p>reference points are approached.</p> <p>The selection of the harvest control rules take into account a limited range of uncertainties.</p> <p>Available evidence indicates that the tools in use are appropriate and effective in achieving the exploitation levels required under the harvest control rules.</p>	
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<p>Criterion 1.2.3: Information / Monitoring</p> <p>Sufficient relevant information related to stock structure, stock productivity, fleet composition and other data is available to support the harvest strategy.</p> <p>Stock abundance and fishery removals are regularly monitored at a level of accuracy and coverage consistent with the harvest control rule, and one or more indicators are available and monitored with sufficient frequency to support the harvest control rule.</p>	<p>There is no reporting of CPUE, nor regular monitoring of effort and there is mixed information from fishers as to whether the number of boats is increasing or decreasing</p> <p><i>Clear attention needs to be paid to monitoring fishing effort and evaluating stock densities and abundance on reef structures. Relevant information should be collected on catch, effort, fish sizes and other biological indicators for the various reef systems that exist.</i></p>
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<p>Criterion 1.2.4: Assessment of Stock Status</p> <p>The assessment is appropriate for the stock and for the harvest control rule, and is evaluating stock status relative to reference</p>	<p>Stock assessment processes need to be introduced. This will require strengthening of data collection and analysis.</p>
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points. The stock assessment is subject to peer review.	
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Principle 2	Fishing operations should allow for the maintenance of the structure, productivity, function and diversity of the ecosystem (including habitat and associated dependent and ecologically related species) on which the fishery depends
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2.1 Retained Species – i.e. commercial by-catch / by-product

<p>2.1.1 Stock Status</p> <p>a) Main retained species are highly likely to be within biologically based limits, or if outside the limits there is a partial strategy of demonstrably effective management measures in place such that the fishery does not hinder recovery and rebuilding.</p>	<p>For this assessment all the species taken are considered to be target species.</p> <p>Retained species (those comprising less than 5% of the catch) are unknown and a program to better document catches is required.</p> <p>Bait fishing (Small pelagic) is likely to be low risk</p>
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<p>2.1.2 Management Strategy</p> <p>a) There is a partial strategy in place that is expected to achieve the outcome 80 level of performance or above for the main retained species.</p> <p>b) There is some objective basis for confidence that the partial strategy will work, based on some information directly about the fishery and/or species involved.</p> <p>c) There is some evidence that the partial strategy is being implemented successfully.</p>	<p><i>No associated management measures in place.</i> No bycatch mitigation measures in place.</p>
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<p>2.1.3 Information/monitoring</p> <p>a) Information is sufficient to qualitatively (if risk is shown to be low as defined in the SG80 outcome indicator) or quantitatively estimate outcome status with respect to biologically based limits.</p> <p>b) Information is adequate to support a partial strategy to manage main retained species.</p> <p>c) Sufficient data continue to be collected to detect any increase in risk level (e.g. due to changes in the outcome indicator scores or the operation of the fishery or the effectiveness of the strategy).</p>	<p>There is no reporting of CPUE, nor regular monitoring of effort and there is mixed information from fishers on whether boat numbers are increasing or decreasing.</p> <p><i>Clear attention needs to be paid to monitoring fishing effort and evaluating stock densities and abundance on reef structures. Relevant information should be collected on catch, effort, fish sizes and other biological indicators for the various reef systems that exist.</i></p>
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2.2 By-catch Species – i.e. non-commercial species/discards

<p>a) Main by-catch species are highly likely to be within biologically based limits or if outside such limits there is a partial strategy of demonstrably effective mitigation measures in place such that the fishery does not hinder recovery and rebuilding.</p>	<p>Because of the selectivity of gear there are no non commercial by-catches. Fishing takes place over reefs and the bait largely determines that marketable fish are caught.</p>
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<p>a) There is a partial strategy in place for managing by-catch that is expected to achieve the by-catch outcome 80 level of performance or above.</p> <p>b) There is some</p>	<p>Not relevant</p>
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<p>objective basis for confidence that the partial strategy will work, based on some information directly about the fishery and/or the species involved.</p> <p>c) There is some evidence that the partial strategy is being implemented successfully.</p>	
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<p>a) Information is sufficient to qualitatively (if risk is shown to be medium as defined in the SG80 outcome indicator) or quantitatively estimate outcome status with respect to biologically based limits.</p> <p>b) Information is adequate to support a partial strategy to manage main affected species.</p> <p>c) Sufficient data continue to be collected to detect any increase in risk level (e.g. due to changes in the outcome indicator scores or the operation of the fishery or the effectiveness of the strategy).</p>	<p>There are no discarded bycatch species.</p>
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2.3 Endangered, Threatened and Protected Species

<p>a) The effects of the fishery are known and are highly likely to be within limits of national and international requirements for protection of ETP species.</p> <p>b) Direct effects are highly unlikely to create</p>	<p>Insufficient data made available</p>
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<p>unacceptable impacts to ETP species.</p> <p>c) Indirect effects have been considered and are thought to be unlikely to create unacceptable impacts.</p>	
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<p>a) There is a strategy in place for managing the fishery's impact on ETP species, including measures to minimise mortality and injury that is designed to achieve the ETP outcome 80 level of performance or above.</p> <p>b) There is an objective basis for confidence that the strategy will work, based on some information directly about the fishery and/or the species involved.</p> <p>c) There is evidence that the strategy is being implemented successfully.</p>	<p>MPAs represent a partial strategy, but these are not sufficiently numerous, allow moderate access to these fishing methods and there is a large degree of non compliance.</p>
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<p>a) Information is sufficient to determine whether the fishery may be a threat to recovery of the ETP species, and if so, to measure trends and support a full strategy to manage impacts.</p> <p>b) Sufficient data are available to allow mortality and the impact of fishing to be quantitatively estimated for ETP species.</p>	<p>There is insufficient information available</p>
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2.4 Habitat

<p>a) The fishery is highly unlikely to reduce habitat structure and function to a point where there would be serious or irreversible harm.</p>	<p>Anchoring on reefs may pose a problem. The sheer number of vessels active on these sites (possibly several thousand) may suggest that this is quite a serious issue.</p>
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<p>a) There is a partial strategy in place that is expected to achieve the habitat outcome 80 level of performance or above.</p> <p>b) There is some objective basis for confidence that the partial strategy will work, based on some information directly about the fishery and/or habitats involved.</p> <p>c) There is some evidence that the partial strategy is being implemented successfully.</p>	<p>No strategy in place</p>
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<p>a) The nature, distribution and vulnerability of all main habitat types in the fishery area are known at a level of detail relevant to the scale and intensity of the fishery.</p> <p>b) Sufficient data are available to allow the nature of the impacts of the fishery on habitat types to be identified and there is reliable information on the spatial extent, timing and location of use of the fishing gear.</p> <p>c) Sufficient data continue to be collected to detect any increase in risk level (e.g. due to</p>	<p>No information available.</p>
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changes in the outcome indicator scores or the operation of the fishery or the effectiveness of the measures).	
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2.5 Ecosystem (Communities, trophic impacts etc)

a) The fishery is highly unlikely to disrupt the key elements underlying ecosystem structure and function to a point where there would be a serious or irreversible harm.	RBF results show medium risk, with some possible wider ecosystem impacts likely. Experience in other parts of the Philippines and in the wider region suggest the need for caution.
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<p>a) There is a partial strategy in place that takes into account available information and is expected to restrain impacts of the fishery on the ecosystem so as to achieve the outcome 80 level of performance.</p> <p>b) The partial strategy is considered likely to work, based on plausible argument (e.g. general experience, theory or comparison with similar fisheries/ecosystems).</p> <p>c) There is some evidence that the measures comprising the partial strategy are being implemented successfully.</p>	There is no strategy in place to record changes to benthic assemblages.
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<p>a) Information is adequate to broadly understand the functions of the key elements of the ecosystem.</p> <p>b) Main impacts of the fishery on these key ecosystem elements can be inferred from existing</p>	No localised information available.
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<p>information, but may not have been investigated in detail.</p> <p>c) The main functions of the components (i.e. target, bycatch, retained and ETP species and habitats) in the ecosystem are known.</p> <p>d) Sufficient information is available on the impacts of the fishery on these components to allow some of the main consequences for the ecosystem to be inferred.</p> <p>e) Sufficient data continue to be collected to detect any increase in risk level (e.g. due to changes in the outcome indicator scores or the operation of the fishery or the effectiveness of the measures).</p>	
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Principle 3	The fishery is subject to an effective management system that respects local, national and international laws and standards and incorporates institutional and operational frameworks that require use of the resource to be responsible and sustainable.
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3.1 Governance and policy

<p>3.1.1 Legal and/or customary framework</p> <p>a) The management system is generally consistent with local, national or international laws or standards that are aimed at achieving sustainable fisheries in accordance with MSC Principles 1 and 2.</p> <p>b) The management system incorporates or is subject by law to a mechanism for the resolution of legal</p>	<p>There is no management system in place across the whole of the study area which focuses on snappers and groupers. There is management hierarchy in place with the Fisheries Code 1988 responsible for overall policy. Responsibility for vessels operating within the 15 km zone that defines LGUA waters, falls to Municipal and City governments. Some of these (e.g. Sindangan) have promulgated fishery codes to give effect to national law at the local level but there is no evidence of any measures in place that are specific to the fisheries of interest.</p> <p><i>At barangway level, there may be an association of fishermen but there are no signs of localised management initiatives.</i></p> <p>There is evidence that community customary rights form part if the national strategy, supported by the actions of AFMA.</p>
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<p>disputes arising within the system.</p> <p>c) Although the management authority or fishery may be subject to continuing court challenges, it is not indicating a disrespect or defiance of the law by repeatedly violating the same law or regulation necessary for the sustainability for the fishery.</p> <p>d) The management system generally recognises and respects the legal rights created explicitly or by custom of people dependent on fishing for food and livelihood in a manner consistent with the objectives of MSC Principles 1 and 2.</p>	
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<p>3.1.2 Consultation, roles and responsibilities a) Organisations and individuals involved in the management process have been identified. Functions, roles and responsibilities are generally understood.</p> <p>b) The management system includes consultation processes that obtain relevant information from the main affected parties, including local knowledge, to inform the management system.</p>	<p>The Philippines has a very consultative and democratic approach to fisheries with consultative bodies and their membership inscribed in law both at the national level and, where ordinances exist, at the local level.</p>
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<p>3.1.3 Long term objectives</p>	<p>The national Fishery Code of 1988 has clear objectives to guide decision making which include statements about sustainable use. Where they</p>
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<p>a) Long-term objectives to guide decision-making, consistent with MSC Principles and Criteria and the approach, are implicit within management policy.</p>	<p>exist the LGU codes have adopted these objectives. With the exception of an unknown number of MPAs (or refuges/sanctuaries) there are no management arrangements specific to the fisheries for snappers and groupers and no evidence that such objectives are being used to guide decision making.</p>
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<p>3.1.4 Incentives for sustainable fishing a) The management system provides for incentives that are consistent with achieving the outcomes expressed by MSC Principles 1 and 2.</p>	<p>The access regime is two tier in that access is restricted to residents of the LGU but within the LGU there is an open access regime in place. This is generally not conducive to sustainability. The data reporting regime is very much production oriented and provides inadequate information for management purposes.</p>
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3.2 Fishery- specific management system

<p>3.2.1 Fishery- specific objectives a) Objectives, which are broadly consistent with achieving the outcomes expressed by MSC's Principles 1 and 2, are explicit within the fishery's management system.</p>	<p>There is no reef fish management plan in place. This means that there are no fisheries specific measures.</p>
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<p>3.2.2 Decision-making processes a) There are informal decision-making processes that result in measures and strategies to achieve the fishery-specific objectives. b) Decision-making processes respond to serious issues identified in relevant research, monitoring, evaluation and consultation, in a transparent, timely and adaptive manner and take some account of the wider implications of decisions.</p>	<p>Whilst the system is highly consultative there appears to be no real concern, resulting in management action. The primary direction for solving the perceived overfishing problem is to seek alternative livelihoods. The consultations provide forums for receiving grievances (e.g. lack of enforcement, piracy etc). Lack of resources is often cited as the reasons for lack of action but it also seems to be true that fisheries remain a low priority for many municipalities when budgets are allocated.</p>
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<p>c) Decision-making processes use the precautionary approach and are based on best available information.</p> <p>d) Explanations are provided for any actions or lack of action associated with findings and relevant recommendations emerging from research, monitoring, evaluation and review activity</p>	
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<p>3.2.3 Compliance & enforcement</p> <p>a) Monitoring, control and surveillance mechanisms exist and are implemented in the fishery under assessment.</p> <p>b) Sanctions to deal with non-compliance exist and there is some evidence that they are applied.</p> <p>c) Fishers are generally thought to comply with the management system for the fishery under assessment, including, when required, providing information of importance to the effective management of the fishery.</p>	<p>There are no management measures in place with the exception of MPAs. Compliance issues include illegal fishing in the MPAs, incursions of fishermen from outside municipal boundaries and non compliance with licensing requirements. The level of non compliance is unknown but is obviously high enough for officials to baulk at cracking down due to fears of retribution at the ballot box.</p>
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<p>3.2.4 Research plan</p> <p>a) Research is undertaken, as required, to achieve the objectives consistent with MSC's Principles 1 and 2.</p> <p>b) Research results are available to interested</p>	<p>There are processes in place to identify research priorities at a national level (via NFRDI) but nothing in place at either the provincial level or within the fisheries for snappers and groupers. There may be opportunities to improve this via Jose Rizal University or the Dipolog school of fisheries.</p>
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parties.	
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<p>3.2.5 Management performance evaluation</p> <p>a) The fishery has in place mechanisms to evaluate some components of the management system and is subject to occasional internal review.</p>	<p>There is no mechanism for peer review of management decision making within the Philippines</p>
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11.ISSUES REQUIRING MANAGEMENT ACTION

The MSC Standard is based upon three principles, Principle 1 relating to the status of the target stock, Principle 2 relating to the condition of the ecosystem upon which that stock depends, and Principle 3 relating to the management system. This provides a structured framework that can help identify issues which require attention.

Based on the information discussed above, there are a number of areas where performance may fall below that required by the MSC standard. These will provide the basis for a series of management improvement recommendations that will be prepared in a subsequent document. An overview of the issues identified is provided below.

Principle 1: A fishery must be conducted in a manner that does not lead to over-fishing or depletion of the exploited populations and, for those populations that are depleted, the fishery must be conducted in a manner that demonstrably leads to their recovery. The following observations are made:

- P1.1.1: It is impossible, from information provided, to gauge the level of exploitation and whether these fall within acceptable limits. **The RBF is applied indicating high risk and thus continuing to fish in the absence of any form of dedicated management regime, supported by data is a serious cause for concern;**
- P1 1.2.1 **Harvest control rules are not applied to the reef fish fishery;**
- P1 1.2.3: Clear attention needs to be paid to **monitoring fishing effort, CPUE and evaluating stock densities, and vulnerabilities of specific species and spawning aggregations to over exploitation.** Relevant information should be collected on effort in the zones taking account of each reef system;

Principle 2: Fishing operations should allow for the maintenance of the structure, productivity, function and diversity of the ecosystem (including habitat and associated dependent and ecologically related species) on which the fishery depends.

- P2 2.1.1: The fishing method is selective.
- P2.3.1 There is insufficient information available to allow for any interpretation on interactions with ETPs.
- P 2.4.1 There is high likelihood of damage to corals as a result of boat anchoring.

Based on the above, it will not be possible to assess aspects of P 2 without provision of data on ETP interactions or an assessment of benthic interactions, or some management measures applied to P 2 species.

Principle 3: The fishery is subject to an effective management system that respects local, national and international laws and standards and incorporates institutional and operational frameworks that require use of the resource to be responsible and sustainable.

- P3 3.1.1: The basic law (Fishery Code 1988) is in place but it not always applied at the LGU level and there are no management measures (except for some MPAs) in place specifically for snappers and groupers
- P3 3.1.2: Formal consultative processes exist but are untested since there are no management measures applied to this fishery of any significance.
- P3 3.1.3/3.1.4: There would appear to be a conflict in overall policy objectives. Evidence suggests that growth objectives outweigh sustainability.
- P3 3.2.1: There are no fishery specific management measures. The existing network of MPAs is probably not sufficient to ensure the sustainability of the reef systems.
- P3 3.2.2: There is presently no informal or formal management decision making process that applied at Provincial level.
- P 3 3.2.3 Compliance to the MPA system is weak, and initiatives to develop community management have only begun.
- P 3 3.2.4: A clear research plan, harvest control rules and a management structure needs to be developed to allow for monitoring of SSB, age structures, sex ratios, CPUE and habitat interactions for each LGU.
- P3. 3.2.5 A formal Management Plan peer review structure needs to be implemented, assuming that Management plans will become a feature in the future.

Performance Indicator Category		Priority	Timeframe	Linkages
Principle 1				
1.1.1	Stock status	H		
1.1.2	Reference points	M		1.2.1, 1.2.2, 3.1.3, 3.2.1
1.1.3	Rebuilding	NA		-
1.2.1	Performance of the harvest strategy	M		1.1.2, 1.2.2, 3.1.3, 3.2.1
1.2.2	Harvest control rules and tools	H		1.1.2, 1.2.1, 3.1.3, 3.2.1
1.2.3	Information/ monitoring	H		
1.2.4	Assessment	H		
Principle 2				
2.1.1	Retained spp: Status	N/A		
2.1.2	Retained spp: Management	N/A		
2.1.3	Retained spp: Information/ monitoring	M		2.2.3, 2.3.3
2.2.1	Discarded spp: Status	N/A		
2.2.2	Discarded spp: Management	N/A		
2.2.3	Bycatch spp: Information/ monitoring	N/A		2.1.3, 2.3.3
2.3.1	ETP spp: Status	M		
2.3.2	ETP spp: Management	M		
2.3.3	ETP spp: Information/ monitoring	M		2.1.3, 2.2.3.
2.4.1	Habitat: status	M		
2.4.2	Habitat: management strategy	M		
2.4.3	Habitat: Information/ monitoring	M		
2.5.1	Ecosystem: status	L		
2.5.2	Ecosystem: management strategy	L		
2.5.3	Ecosystem: Information/ monitoring	L		
Principle 3				
3.1.1	Governance and policy: legal framework	H		
3.1.2	Governance and policy: consultation, roles and responsibilities	M		3.2.2
3.1.3	Governance and policy: long term objectives	M		1.1.2, 1.2.1, 1.2.2, 3.2.1, 3.2.5
3.1.4	Governance and policy: incentives for sustainable fishing	M		
3.2.1	Fishery specific management system: fishery-specific objectives	H		1.1.2, 1.2.1, 1.2.2, 3.1.3, 3.2.5
3.2.2	Fishery specific management system: decision-making processes	H		3.1.2
3.2.3	Fishery specific management system: compliance & enforcement	H		
3.2.4	Fishery specific management system: research plan	H		1.1.1, 1.1.2, 2.1.3, 2.2.3, 2.3.3, 3.2.5
3.2.5	Fishery specific management system: monitoring and evaluation	M		3.1.3, 3.2.1, 3.2.4

Appendix 1 – BAS sampling sites in Zamboanga del Norte

LIST OF SAMPLES FOR TRADITIONAL FISH LANDING CENTERS
(Quarterly)

Region: **ZAMBOANGA PENINSULA**
Province: **ZAMBOANGA DEL NORTE**

COMMERCIAL

NO.	MUNICIPALITY	BARANGAY	NAME OF LANDING CENTER
1	DIPOLOG CITY	CENTRAL	PUNTA CORRO, CENTRAL, DIPOLOG CITY
2	DIPOLOG CITY	OLINGAN	FISHERMEN'S VILLAGE, LAOY, OLINGAN
3	SALUG	POBLACION	POBLACION, SALUG
4	LEON B. POSTIGO	PALANDOC	PALANDOC, LEON B. POSTIGO
5	LILOY	BAYBAY	LAWIS, BAYBAY, LILOY
6	SINDANGAN	GAMPIS	GAMPIS, SINDANGAN

MUNICIPAL

NO.	MUNICIPALITY	BARANGAY	NAME OF LANDING CENTER
1	ROXAS	IRASAN	PASIL, IRASAN, ROXAS
2	ROXAS	POBLACION	PUROK 3, POBLACION, ROXAS
3	DAPITAN CITY	TALISAY	TALISAY CENTRO, DAPITAN CITY
4	KATIPUNAN	SAN ANTONIO	LAOY, SAN ANTONIO, KATIPUNAN
5	MANUKAN	DON JOSE AGUIRRE	SAN JUAN, DON JOSE AGUIRRE, MANUKAN
6	DIPOLOG CITY	OLINGAN	PUROK OFISCO, OLINGAN, DIPOLOG CITY
7	MANUKAN	SAN ANTONIO	SAKAYANON, SAN ANTONIO, MANUKAN
8	KATIPUNAN	TUBURAN	TUBURAN, KATIPUNAN
9	MANUKAN	POBLACION	BAYBAY, LOKILOS, POBLACION, MANUKAN
10	MANUKAN	LINAY	BAYBAY, LINAY, MANUKAN
11	DIPOLOG CITY	SICAYAB	BUCANA, SICAYAB, DIPOLOG CITY

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Appendix 1: SICA table. P1 worst case is the direct capture impacting on population size.

Performance Indicator	Risk-causing activities	Spatial scale of activity	Temporal scale of activity	Intensity of activity	Relevant subcomponents	Consequence score	MSC Score
Target species outcome	Fishing activities from all fisheries including: <ul style="list-style-type: none"> Population size 	6	5	4	Population size	>3	>60
<p>Rationale: <u>Risk-causing:</u> The total numbers of fishermen is unknown but likely to number in the thousands. In some municipalities there is a temporal closure for 3 days each month during the new moon. Other than for religious holidays there are no other times when, weather permitting, fishing is not permitted. Vessels are small and the coastline is generally quite exposed and during the windy season (northern autumn and summer) fishermen may not be able to put to sea as often. <u>Spatial scale of activity:</u> there are very few areas off limits to fishing and fishing occurs in the main habitats frequented by adults and juveniles although the amount of fishing that occurs in deep (>50m) of water is not known. Most fishermen, being handliners, access relatively shallow waters. Fishing is intense in the estuarine nursery grounds of some of the species and on shallow water reefs.</p>							

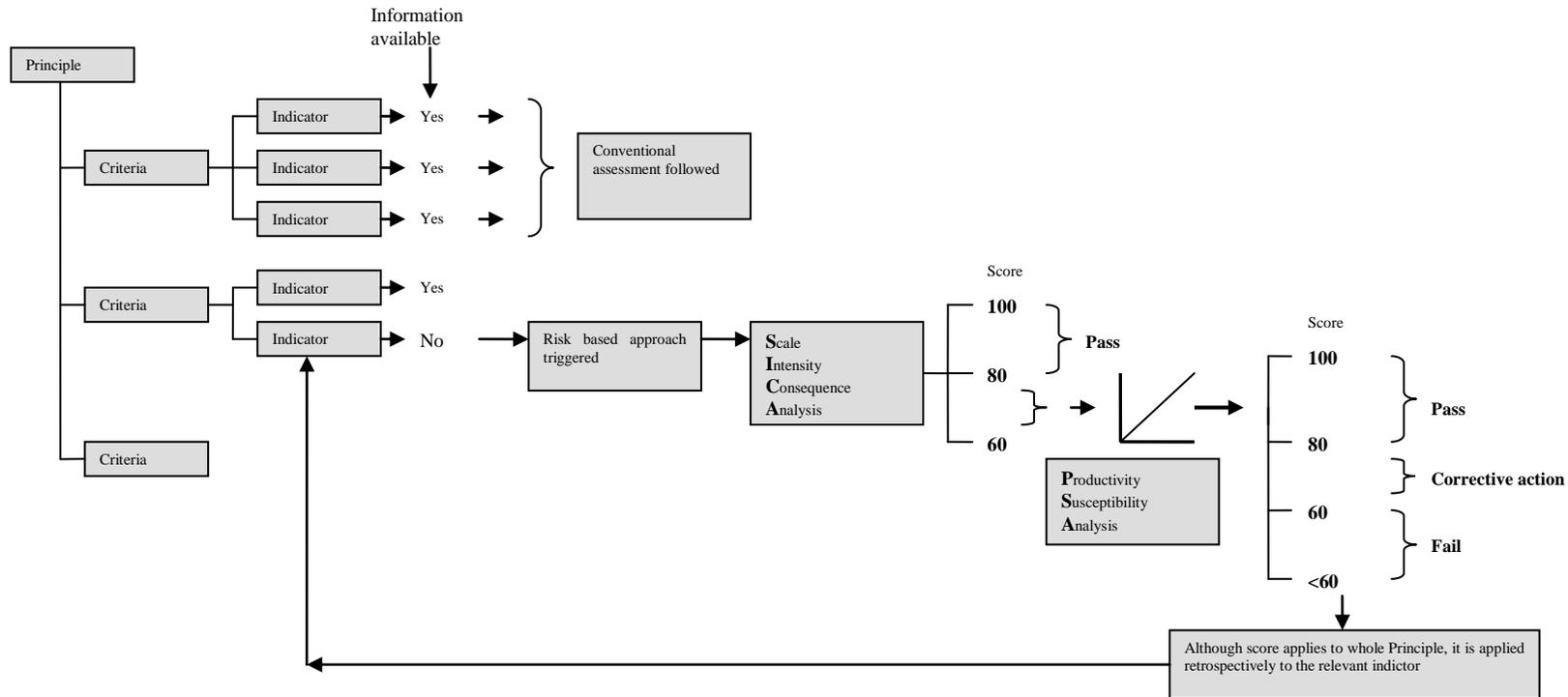
Appendix 2: PSA scores

		Productivity Scores [1 3]							Susceptibility Scores [1 3]					PSA scores (automatic)				
SCIENTIFIC_NAME	COMMON_NAME	Average age at maturity	Average max age	Fecundity	Average max size	Average size at Maturity	Reproductive strategy	Trophic level (fishbase)	Total Productivity (average)	Availability	Encounterability	Selectivity	Post-capture mortality	Total (multiplicative)	Color on PSA plot	PSA Score	Risk Category Name	MSC scoring guidepost
Epinephelus lanceolatus	Giant grouper															#VALUE!	#VALUE!	#VALUE!
E. coioides	Orange spot grouper															#VALUE!	#VALUE!	#VALUE!
E. malabaricus	Green grouper?	1	2	1	2	1	2	3	1.71	2	3	3	3	2.33		2.89	Med	60-80
E. polyphekadion	Camouflage grouper															#VALUE!	#VALUE!	#VALUE!
Plectropomus leopardus	leopard coral grouper	1	3	1	2	1	2	3	1.86	2	3	3	3	2.33		2.98	Med	60-80
P. Oligacanthus	High fin coral grouper															#VALUE!	#VALUE!	#VALUE!
Lutjanus russelli	Russells snapper															#VALUE!	#VALUE!	#VALUE!
Lutjanus seabae	Red emperor															#VALUE!	#VALUE!	#VALUE!
Lethrinus nebulosus	Spangled emperor															#VALUE!	#VALUE!	#VALUE!

Appendix 3: Scale Intensity Consequence Analysis (SICA) and Productivity and Susceptibility Analysis (PSA)

1. Introduction

The risk-based approach to MSC fishery assessment introduces two new elements (and acronyms) to the conventional MSC fishery certification process: **Scale Intensity Consequence Analysis (SICA)** and **Productivity and Susceptibility Attributes (PSA)**. An overview of the proposed incorporation of the risk based-approach is shown in figure 1. As illustrated, if sufficient information to allow a performance indicator to be scored in the conventional way does not exist then the risk-based assessment is triggered using the SICA and PSA approach.



2. Scale Intensity Consequence Analysis (SICA)

If a conventional Performance Indicator (PI) cannot be assessed in the conventional way, a risk based PI is used instead. In a similar way to the normal stakeholder interview the assessment team will ask questions that allow them to qualitatively evaluate the risk posed by the fishery, i.e. decide on whether the risk is “moderate”, “minor” or “negligible”. In order to make such a judgment questions need to be asked that help to describe the scale, intensity and the likely consequence of the activity (i.e. Scale Intensity Consequence Analysis). The SICA is used to screen out low risk activities by identifying the significance of their impact on any species, habitat or community.

There are 6 steps to be carried out at part of the SICA process for each relevant Performance Indicator (PI). These steps are:

SICA Step	Action
1	Score spatial scale of the activity relevant to the PI.
2	Score temporal scale of the activity relevant to the PI
3	Choose the most vulnerable attribute relevant to the PI
4	Score the intensity of the activity for that attribute
5	Score the consequence resulting from the intensity of the activity for that attribute (i.e. Negligible / Minor / Moderate risk consequences equivalent to conventional MSC scores of 100 / 80 / 60),
6	Document the rationale for each of these steps and the confidence (Low or High) in the consequence against the PI.

The following sections describe how these steps are completed.

2.1 Score the spatial scale of the activity

<1 nm	1-10 nm	10-100 nm	100-500 nm	500-1000 nm	>1000 nm
1	2	3	4	5	6

The largest spatial area (relative to the distribution of the stock) is used to determine a score for the spatial scale of the activity. For example, if the relevant activity was longlining and it takes place within an area of 200 nm by 300 nm, then the spatial scale is scored as 4.

2.2 Score temporal scale of the activity

Decadel (1 day every 10 years or so)	Every several years (1 day every several years)	Annual (1-100 days per year)	Quarterly (100-200 days per year)	Weekly (200-300 days per year)	Daily (300-365 days a year)
1	2	3	4	5	6

The highest frequency is used to determine the temporal scale score for the relevant Performance Indicator activity. The number of days that an activity occurs can be combined, e.g. if the activity “fishing” was undertaken by 10 boats during the same 150 days of the year, the score is 3. If the same 10 boats each spend 30 non-overlapping days fishing, the temporal scale of the activity is a sum of 300 days, indicating that a score of 6 is appropriate. In the case where the activity occurs over many days, but only every 10 years, the number of days divided by the number of years in the cycle is used to determine the score. For example, 100 days of an activity every 10 years averages to 10 days every year, so that a score of 3 is appropriate.

2.3 Choose the most vulnerable species, habitat or community likely to be affected by the activity associated with the PI.

The most vulnerable species, habitats, or communities are selected. With Principle 1 PIs there is likely to be only the one target species to consider. With Principle 2 PI’s, a number of bycatch species may be assessed, for example.

2.4 Score the intensity of the relevant activity

The intensity of the activity is based on the scale, nature and extent of the activity.

Negligible	Minor	Moderate	Major	Severe	Catastrophic
1	2	3	4	5	6

Negligible = remote likelihood of detection at any spatial or temporal scale

Minor = activity occurs rarely or in few locations and evidence of activity even at these scales is rare

Moderate = detection of activity at broader spatial scale or obvious but local detecting

Major = detectable evidence of activity occurs reasonably often at broad spatial scale

Severe = easily detectable localized evidence of activity or widespread and frequent evidence of activity

Catastrophic = local to regional evidence of activity or continual and widespread evidence

2.5 Score the consequence of intensity for that activity

The consequence for the activity is scored using the above factors. Where information is not available or agreement is not possible the most plausible score is applied to the activity.

2.6 Provide a reason for the scoring of each of the above steps and a confidence rating

The scores and reasons for the PI’s overall consequence score is recorded. A confidence rating is provided, i.e.:

Confidence	Score	Rationale for the Confidence Score
Low	1	<ul style="list-style-type: none"> • Data exists but is considered to be poor or conflicting • No data exists • There is no agreement between experts
High	2	<ul style="list-style-type: none"> • Data exists and is considered sound • There is consensus between experts • The consequence is constrained by logical consideration

2.7 If the score from the SICA produces a score of less than 80, the assessment team proceeds to a further step, the Productivity and Susceptibility Analysis (PSA).

3. Productivity and Susceptibility Analysis (PSA)

The PSA approach is based on the assumption that the potential risk to a species, habitat or community will depend on:

1. The **productivity** of the species, habitat or community, which will determine the rate at which recovery can occur after the fishing related activity; and,
2. The extent of the impact due to the fishing related activity, which will be determined by the **susceptibility** to the fishing activities.

3.1 Scoring a species for productivity

The productivity of a species can be scored using *productivity attributes*. Seven productivity attributes for over 400 habitats and species have been developed to support the Australian risk based assessment approach, they are:

Productivity Attribute
Average age at maturity
Average maximum age
Fecundity
Average maximum size
Average size at maturity
Reproductive strategy
Trophic level
Total
Average

These are presented on excel spreadsheets and have been made available to use in the MSC risk based approach. (For ease, hereafter these will be referred to as the “PSA worksheets”). Each productivity attribute is scored as either, 3 = “low”, 2 = “medium”, or 1 = “high”. By taking the average score of all seven attributes it is possible to provide an overall productivity score for a species.

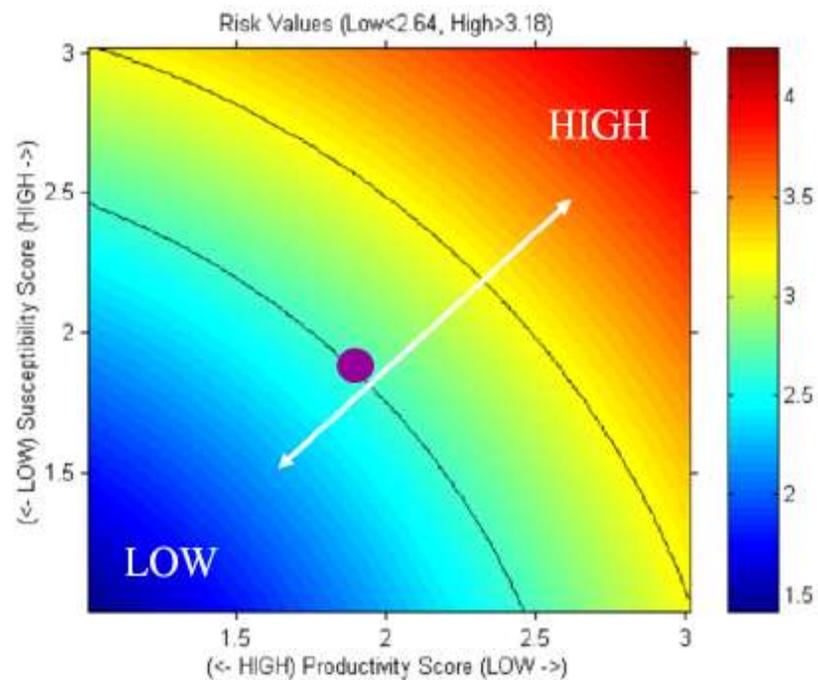
3.2 Scoring a species for susceptibility

Susceptibility is scored using susceptibility attributes they are:

Susceptibility Attribute	Description
Availability	Considers overlap of the fishing effort with a species distribution. Where a fishery overlaps a large proportion of a species range the risk is high because the species has no refuge, and the potential for impact is high.
Encounterability	Considers the likelihood that a species will encounter fishing gear that is deployed within its geographic range.
Selectivity	Considers the potential of gear to capture or retain the species.
Post-capture mortality	Post-capture mortality (PCM) evaluates the survival of a species if released after capture. The PCM of a species is affected by its biology and fishing practices.

All of the susceptibility attributes are supported and calculated using the PSA worksheets.

They are scored as: 1 = “low”, 2 = “medium” or 3 = “high” and rescaled such that they can be plotted along with the productivity scores on a 2D diagnostic chart. This can be undertaken using the PSA excel worksheets. The relative position of the species on the plot will determine relative risk. The following figure shows how the diagnostic chart displays PSA values for each species. Low risk species have high productivity and low susceptibility, while high risk species have low productivity and high susceptibility. The curved lines divide the potential risk scores into thirds on the basis of the distance from the origin (0,0).

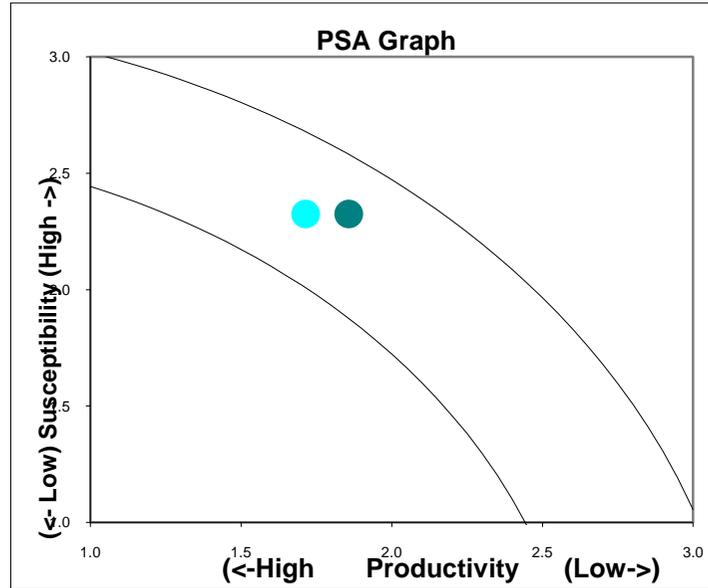


The possible PSA scores lie between 1.41 and 4.24 and can be interpreted as follows:

PSA Risk Category	PSA Score	Scoring Guidepost
High	>3.18	<60
Medium	3.18 – 2.64	60-80
Low	<2.64	>80

Where any score is >80, the indicator is passed for that species, habitat type or community assemblage. Where any of the species, habitat types or community assemblages scores 60-80 a condition is set on that PI. This is similar to the setting of conditions in the conventional assessment process. Any score <60 will result in failure for the PI.

Table X – PSA for species for which sufficient information be found to satisfy data requirements.



The two species plotted on to a graph. The lower line defines MSC scores of 60 or below. The second line defines scores of 80 or above. Both the species tested are locate din the 60-80 score band.