



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

Sustainability Audit Report for sardines 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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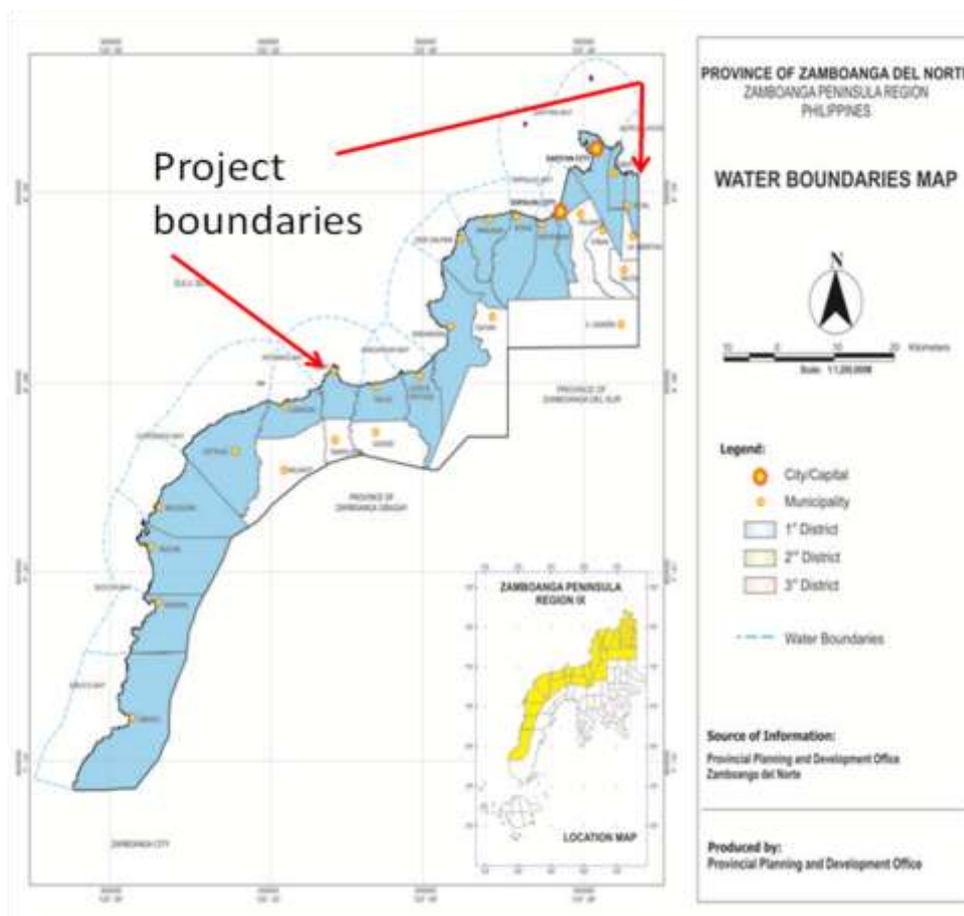
ACRONYMS

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 sardines (gillnet, ring net and bag net) 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

Species:	2 sardine species (<i>See table 3</i>)
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	Semi open access

System of Capture	Gill net, ring net and bag net
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 the Bureau of Fisheries and Aquatic Resources (BFAR), the national research body the National Fisheries Research and Development Institute (NFRDI), 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	Ateneo De Manila University

Date	Name	Organisation
	Santos	
	Ms Connie Chiang	Sulu Celebes Sea UNDP project
	Dr Demian Willette	Fisheries research scientist, Old Dominion University
2/12/10	Ms Evelyn Uy	Mayor, City of Dipolog
	Mr Francisco Loyloy	Provincial Fisheries Office of the government of Zamboanga del Norte
	Mr Mike Cases	Entrepreneur and sardine bottle plant owner
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 fishermen's association	
11/12	Mr Roseller Maniqsaca	Mayor of Rizal
		Various barangay fishermen during a full day tour of Rizal municipality with Mr Alforque and Mr Loyloy.

2.2 Other Information

Anon (2007). The Sulu Sea sardine management plan - draft for review by BFAR, Department of Agriculture, Bureau of Fisheries and Aquatic Resources, May 2007.

Aripin I.E. and Showers P.A.T. (2000) Population Parameters of Small Pelagic Fishes Caught off Tawi-Tawi, Philippines. Naga, The ICLARM Quarterly (Vol. 23, No. 4) October-December 2000

Barut N. C., Mudjekeewis D. Santos, Leony L. Mijares, Rodelio Subade, Nygiel B. Armanda and Len Garces (2010) Philippine Coastal Fisheries Situation WorldFish Center Contribution No. 1713

Cruz-Trinidad, A. (1993). Economic exploitation in the Philippine small pelagic fishery and implications for management. ICLARM Contribution No. 989.

DA-BFAR (2004) In turbulent seas: the status of Philippine marine fisheries. Coastal Resource Management Project of the Department of Environment and Natural resources, Cebu City, Philippines 378 pages.

Dalzell, P., Corpus, P., Ganaden R. And Pauly, D. (1987) Estimation of maximum sustainable yield and maximum economic rent from the Philippines small pelagic fisheries. BFAR Technical paper Series (X)3, 23 pp.

Navaluna, N.A. and Pauly, D. (1988) Seasonality in the recruitment of Philippine fishes as related to monsoon wind patterns. P167-179 in Yanez Aranciba, A. and Pauly D. Eds, Proceedings of the IREP/OSLR Workshop on the recruitment of coastal demersal communities, Campeche, Mexico, 21-25 April 1986, Supplement to IOC Workshop report No. 44.

Pauly, D. and Thia-Eng, C.(1988). The overfishing of marine resources: socio economic background in SE Asia. *Ambio* 17(3): 200-206.

Pauly, D. and Cruz-Trinidad, A (1991). Sound ecology is good economics: four vignettes from Philippine fisheries. p105-117 in the Philippine Environment: financing environmental conservation and rehabilitation projects and programs. The Philippines Futuristics Society, Makati, Metro Manila.

Sudirman and Musbir (undated) Impact of light fishing on sustainable fisheries in Indonesia. Fisheries Resources Utilization Study Program, Fisheries Department, Fac. of Marine Science and Fisheries, Hasanuddin University, Makassar 90245. Indonesia

Trinidad, A.C., Pomeroy, R.S., Corpuz, P.V. and Aguero, M (1993) Bioeconomics of the Philippine small pelagic fishery. ICLARM Technical Report No. 38.

Willette, D., Bognot, E., and Santos, M. (2010). Biology and Ecology of Sardines in the Philippines: a review. Presentation to the National Fisheries Research and Development Institute (NFRDI), Manila, Philippines, 14 December 2010.

3. FISHERIES PRODUCTION IN THE PHILIPPINES

Philippines is a regionally significant producer of marine capture fisheries products, harvesting 2.37 million tonnes in 2008, valued at US\$ 4.4 million. The main species harvested are small pelagics (roundscads {*Decapterus* spp.}, anchovies {*Stolephorus* spp.}, sardines {*Sardinella* spp.}, mackerels {*Rastrelliger* spp.}), and large pelagics (yellowfin {*Thunnus albacores*}, skipjack {*Katsuwonus pelamis*}, eastern little tuna or *kawakawa* {*Euthynnus affinis*} and frigate tuna {*Auxis thazard*}), which represent approximately 65% of production by volume. Smaller fisheries also exist for live reef food fish (LRFF) and invertebrates, most notably blue swimming crabs.

Fisheries are divided for management and administrative purposes into “municipal” fisheries – operating within 15km from the coast in vessels less than 3 GT – and “commercial” fisheries – largely operating outside 15km and in vessels larger than 3 GT. A 2002 census of fishers estimated a total of approximately 1,371,676 municipal fishers and 16,497 commercial fishers worked in the Philippines. Catches between the sectors are roughly equal: 1.15 million tonnes from the municipal fisheries and 1.22 million tonnes from the commercial fisheries in 2008¹.

4. BACKGROUND TO THE FISHERIES

Small pelagic species in general, and some species of sardines in particular, comprise a major fishery resource for the Philippines and a major source of animal protein for many residents. The total catch for the country has at times been 700 000 tonnes or more, and very little is exported. In rural areas, sardines comprise a dominant proportion of the animal protein available and prices paid to fishermen reflect the view that poor people need access to cheap protein.

There are 11 species of sardines caught in the Sulu Sea (Bureau of Fisheries and Agricultural Resources Draft Management Plan) but this may be an underestimate as full taxonomic evaluations are still under way and recent results indicate that the reclassification of the most abundant species, currently the Indian oil sardine (*Sardinella longiceps*) to the Bali sardinella (*Sardinella lemura*), will be undertaken. For this report it is assumed that this has been done and thus we will refer to *Sardinella lemuru*. The two most abundant species by catch size in the study area are *S. lemuru* and *S. fimbriata* (the fimbriated sardine) (see Bureau of Agricultural Statistics {BAS} catch data in Table 2). Other species include *S. gibbosa* (Goldstripe sardinella), *S. albella* (White sardinella, also called *Sardinella perforata*), and *Amblygaster sirm* (Spotted sardinella).

Within the study area the most common gear types observed were small pelagic gillnets operated from a large number of small (4m or less) bancas (local name for a wooden canoe with outriggers – see photo 2 below), encircling gillnets and bag nets, the latter may operate in municipal waters or may be considered commercial vessels. Small and medium scale commercial fishers may also operate between 10.1km and 15km from the coast under certain conditions, however large scale commercial fishers, (>3 GT) are restricted to operating outside 15km.

¹ BFAR (2010). BFAR Website: Fisheries Statistics. (accessed at: http://www.bfar.da.gov.ph/styles/Publications03/commer_prod_05/commercial_fisheries_08.htm and [http://www.bfar.da.gov.ph/styles/Publications03/munici_prod_05/municipal_fisheries\(08\).htm](http://www.bfar.da.gov.ph/styles/Publications03/munici_prod_05/municipal_fisheries(08).htm); viewed on 8 September, 2010)



Photo 1: Bag netters - Dapitan



Photo 2: Typical small municipal fishing bancas, Dipolog



Photo 3: Ring net vessel, Sicaya



Photo 4: Commercial purse seiner, Sindangan Bay

The number boats operating in each of the municipalities is unknown but fisheries for sardines occur along the entire study area and are distributed from the nearshore zone out to the limit of municipal waters and beyond.

Vessels generally make use of lights to attract the fish prior to deploying the gear. Gillnets (both pelagic and encircling) are required to have a minimum mesh size of 3cm. As bag nets are also used to capture anchovies, the mesh sizes are very small (2-3mm mesh size and thus far smaller than the mesh size specified for sardines and other species) (see Photo 5) and are thus capable of taking a wide variety of fish, many of juvenile sizes.



Photo 5
Fine mesh net used for targeting anchovies. Bag netter, Dapitan.

The catch for the province, as estimated by BAS has been as follows:

Table 2

Year	<i>S. longiceps</i> (Tonnes)		<i>S. fimbriata</i> (tonnes)	
	Municipal	Commercial	Municipal	Commercial
2005	11,471	5,874	5,458	3,818
2006	8,756	4,764	4,672	3,247
2007	9,646	4,222	5,543	3,826
2008	7,593	5,649	5,680	3,718
2009	7,692	5,567	4,452	2,635

It is noteworthy that it is currently not possible to provide information on catches in the study area. While data are collected, they are not made publicly available. The data have been requested from the Bureau of Agricultural Statistics.

Catches of other sardine species are not determined. The province monitors total catch by gear type but it is not possible to ascribe catches of particular species to gear types as these gears generally take a variety of small pelagic species.

There is no bycatch (discards) as such. As far as could be established, all species of all sizes are retained. Studies on catches per gear type do not appear to have been undertaken.

There was an enormous amount of diversity in the views expressed by fishermen as to whether catches were decreasing or not. The small scale fishermen interviewed claimed that incursions into municipal waters by commercial vessels were taking all the fish. This was resulting in a lack of supply to the bottling plants with negative impacts on employment.

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 10.1km offshore under agreement with the municipality.

The main management measures applied include gear restrictions (e.g. mesh sizes, a ban on the use of use of active gears – trawls, Danish seines – in municipal areas) and temporal and spatial closures. No evidence of colour coding of vessels by municipality was observed.

Catch ceilings are provided for under the Fisheries Code, but are not implemented. Estimates of MSY are only available for the Philippines EEZ as a whole, and not individually for the main stocks. Only periodic assessments have been undertaken of fishing capacity against the productive capacity of main stocks. Publicly available assessments of stocks date back to the late 1980's when there was regular collection of catch and effort data by BFAR.

The uses and pathways to markets are diverse. Based on interviews and observations the following was documented:

- Home consumption and supply to family members and members of the same village
- Limited processing at the point of landing (e.g. by salting and drying) and then use or trade
- Use as bait in other fishing activities, e.g. hook and line for snappers and groupers
- Sale to local nearby retail outlets via a middleman
- Sale to inland areas via middlemen
- Sale to local bottling plant

As far as can be established the fishery supplies domestic markets. Fish are generally landed at the beaches adjacent to fishing grounds and either transferred to or bought by buyers, the mode of transfer used is 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).

A much larger fishery for sardines and other small pelagic operates in waters adjacent to the municipal waters and is prosecuted by larger vessels under the management of the Bureau of Aquatic Resource Management (BFAR). There is some overlap in that municipalities can allow access to their waters (but only to within 10.1 km, if water depth is >7 fathoms) under agreement with the relevant municipality and stakeholders which explains why there are commercial catches (i.e. catches from vessels larger than 3GT) reported in the municipal areas.

The 3 main gear types used in commercial fishing include; purse seine, encircling gillnet and bag net. According to the draft management plan (dated May 2007) the two most abundant species are *Sardinella longiceps* (now called *S. lemuru*) and *Sardinella gibbosa*. This is obviously different from the inshore but it is unclear whether this is due to differences in distribution of *S. fimbriata* versus *S. gibbosa*, taxonomic confusion, annual variations (species mixes change over periods of years, Demian Willette pers. comm.), or is simply an artefact of the different data collection strategies of different agencies.

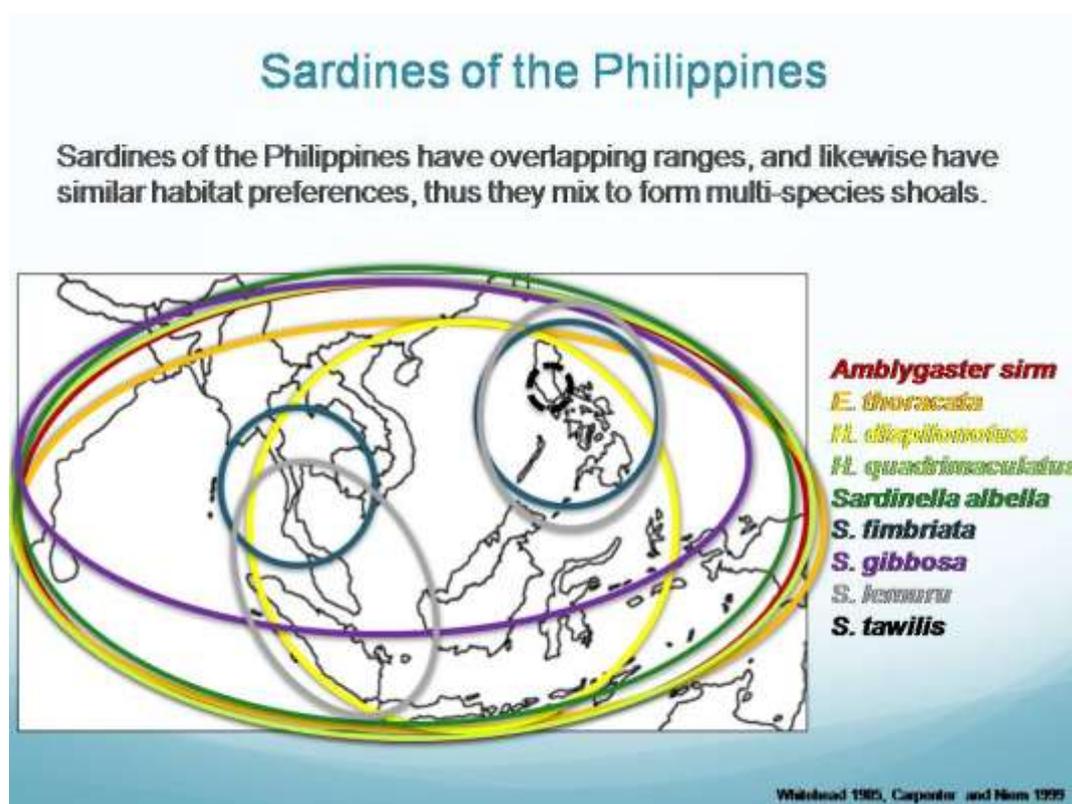
The draft plan states that there are 61 commercial purse seiners and ring netters in the Sulu Sea plus 36 large bag netters. These are able to operate for most of the year, with fishing being much reduced during the windy months of November through February.

Regulation of the fishery is via the Philippine Fisheries Code (1988). A series of general regulations apply (such as a minimum mesh size) but Fisheries Administrative Order 198 (<http://www.bfar.da.gov.ph/legislation/fao/fao198.htm>) sets out a series of requirements relating to licensing and reporting, amongst others.

5. BIOLOGY

Most of Philippines marine fisheries resources are biologically overfished, “often severely in traditional nearshore fishing areas” (Barut, 2004). Biomass levels in demersal fisheries are 10-30% of levels in the late 1940s, while in the small pelagic fishery, fishing effort in the 1980s was already twice that necessary to harvest MSY. No further information exists on the status of the sardine stock in Philippine waters.

For the purpose of this audit the target species are considered to be *S. lemuru* and *S. fimbriata*. These are both widely distributed species (see Map 2)



Map 2: Distribution of sardine species occurring in the Philippines.

Source: Willette, D (2010). Presentation to the NFRDI, 13 December, 2010, Manila, Philippines

Both are generally coastal (out to 200m water depth) species forming large schools that feed on plankton which are, in turn, driven by upwellings which are relatively common in the Philippines. These upwellings are probably driven by wind related Ekman transport linked to the seasonal monsoons. Year on year variation has also been linked to El Nino Southern Oscillation events.

Like many other sardine species they are characterised by fast growth rates, short life spans and high natural mortalities. Like many other pelagic species they are attracted to floating objects, an affinity exploited by fishermen to construct Fish Attracting Devices or FADs (known locally as payaos) to attract the fish thus making them easier to catch. In addition the fish are also attracted to lights at night-time and thus a lot of fishing is conducted at night using lights.

Table 2: Biological characteristics

Species		Average age at maturity	Average maximum age	Fecundity	Average maximum size	Average size at maturity (common)	Reproductive strategy	Trophic level (from diet composition unless otherwise stated)
<i>Sardinella fimbriata</i>	Fimbriated sardine/fringescale sardinella	1 year (estimated from data in FishBase)	3 years	Variable but in the range of tens of thousands per fish	19cm	14cm	Open water	2.7
<i>Sardinella lemuru</i>	Bali sardinella	1-2 years	7	Variable but in the range of tens of thousands per fish	23	14-15	Open water	2.5

Source: www.fishbase.org and <http://www.fao.org/fishery/species> and West Australian Fisheries Department

Table 4: Common characteristics

<i>Sardinella lemuru</i>	Bali sardinella	<p>Distribution - Eastern Indian Ocean: Phuket, Thailand; southern coasts of East Java and Bali; and Western Australia. Western Pacific: Java Sea, Philippines, Hong Kong, Taiwan Island, southern Japan. Cannot be distinguished as yet on morphological grounds from <i>Sardinella aurita</i> which occurs in the Atlantic Ocean. Forms large schools in coastal waters, particularly in the Bali Strait upwelling. Found in sheltered bays and lagoons. Feeds on phytoplankton and zooplankton, chiefly copepods. Time series analysis suggests that recruitment fluctuations are related to ENSO events.</p> <p>Resilience : High, minimum population doubling time less than 15 months (K=0.8-1.3; tmax=4.5)</p>
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		Vulnerability : Low vulnerability (18 of 100)
<i>Sardinella fimbriata</i>	Fimbriated sardine/fringescale sardinella	<p>Pelagic-neritic; brackish; marine; depth range 0 - 50 m. Forms schools in coastal waters. Fish Base describes the species as 'Low vulnerability'</p> <p>Distribution - Indo-West Pacific: southern India and Bay of Bengal to the Philippines, also eastern tip of Papua New Guinea. Often confused with <i>Sardinella gibbosa</i> in Indian waters. Forms schools in coastal waters. Mis-identifications (especially with <i>S. gibbosa</i> in Indian waters and <i>S. albella</i> in the western Indian Ocean) make published biological data potentially unreliable. Marketed fresh, dried-salted, boiled or made into fish balls.</p> <p>Resilience : High, minimum population doubling time less than 15 months (K=0.7-1.6; tmax=3)</p> <p>Vulnerability: Low vulnerability (10 of 100)</p>

Source:

Source:

www.fishbase.org

www.FishBase.org

5. STOCK ASSESSMENT

No information regarding recent stock assessments were made available to the assessors but work is currently underway as part of the National Stock Assessment Program (NSAP).

In the 1980s there was a considerable amount of effort put into documenting the status of many fish stocks in the Philippines by the International Center for Living Aquatic Resource Management (ICLARM), now called the WorldFish Centre. At the time widespread overfishing was documented, including for sardines and other small pelagics.

Because of data deficiencies regarding the health of the target stock, the Risk Based Framework² (RBF) is applied for MSC Performance Indicator 1.1.1 (Appendix 2). The main input features to the RBF are SICA (Scale, Intensity, Consequence Analysis) and PSA (Productivity, Susceptibility Analysis) 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 (200-300 days) but there is a lower level of effort during the period November to February when strong winds are common, giving a High risk 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 High Risk 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; and,
- A consequence score of 3 or greater because fishing pressure is probably high enough to affect recruitment.

The result is a SICA score of 4, equivalent to an MSC score of < 60. This equates to a **High Risk**, or in MSC assessment terms as a FAIL.

Appendix 3 assesses the PSA weighting. This produces a Productivity attribute of 1.00, and a Susceptibility attribute of 2.75. Were there lower levels of fishing effort, or were the fishery to be partially managed, the Risk would potentially be described as **Medium** (3.17). As the above analysis shows, this is not the case, requiring immediate attention to adoption of a Harvest control strategy applied throughout the stock range.

² The Risk Based Framework is an assessment tool developed by CSIRO, and adopted by the Marine Stewardship Council, to assess the status of data deficient fisheries. The analytical process includes Scale Intensity Consequence Analysis (SICA) which assesses the likely risk resulting from fishing effort to specific criteria, e.g. population size; and Productivity, Susceptibility analysis (PSA) which assesses the robustness of the stock to exploitation. The analytical process is described in Appendix 1, pp 82-106 of the Marine Stewardship Council Assessment Methodology (V 2), 2010 (http://www.msc.org/documents/scheme-documents/methodologies/Fisheries_Assessment_Methodology.pdf/view)

6. ENVIRONMENTAL INTERACTIONS

6.1 Retained species

To a greater or lesser degree all gear types will catch other species of small pelagics like other sardine, mackerel, scad and small neritic tuna species. Interviews with fishermen and others did not identify fish caught to species and in some cases the same name is used for different species or the same species is called by different names in different parts of the coast. The list below is generated from the published literature supplemented by interviews.

Common name	Scientific name	BAS data where available – municipal (tonnes), all of Zamboanga del Norte		
		2007	2008	2009
Goldstripe sardinella	<i>Sardinella gibbosa</i>	Not available	Not available	Not available
White sardinella	<i>Sardinella albella</i>	Not available	Not available	Not available
Spotted sardinella	<i>Amblygaster sirm</i>	Not available	Not available	Not available
Round scad	<i>Decapterus macrosoma</i>	4,107	3,115	1,973
Big eye scad	<i>Selar crumenophthalmus</i>	2,733	2,945	2,857
Round herring	<i>Dussumeria acuta</i>	517	196	69
Indian mackerel	<i>Rastrelliger kanagurta</i>	2,100	1,679	1,553
Indo Pacific mackerel	<i>Rastrelliger brachysoma</i>	1,234	1,011	628

Table 5 Biological attributes needed for risk assessment

Common name	Scientific name						
		Age at maturity (yr)	Maximum age (yr)	Fecundity	Max size (cm)	Reproductive strategy	Trophic level
Goldstripe sardinella	<i>Sardinella gibbosa</i>	1	7	Thousands depending on age	13	Open water	2.8
White sardinella	<i>Sardinella albella</i>	1		Thousands depending on age	9	Open water	2.7
Spotted sardinella	<i>Amblygaster sirm</i>	1	8	Thousands depending on age	15	Open water	3.3
Round scad	<i>Decapterus macrosoma</i>			Thousands depending on age	15	Open water	3.4
Big eye scad	<i>Selar crumenophthalmus</i>		3			Open water	4.1
Round herring	<i>Dussumeria acuta</i>	1			11.5	Open water	3.4
Indian mackerel	<i>Rastrelliger kanagurta</i>	1	15	Thousands depending on age	20	Open water	3.2
Indo	<i>Rastrelliger</i>		2		17	Open	2.7

Pacific mackerel	<i>brachysoma</i>					water	
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Sources: FishBase.org, peer review papers

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 is no literature available and there were no reports of interactions between any of the gears and endangered, threatened and protected (ETP) species. This is true for fisheries both outside and inside of municipal waters.

6.4 Benthic impact

The fish are largely targeted in the water column and therefore gear does not interact with the sea bed.

6.5 Trophic effects

In many parts of the world sardines form the basis for food chains that support large numbers of larger predators such as tunas, seabirds and/or marine mammals. No information is available on the predators of sardines in the study area. There was a comment from the Municipal Agriculture Office (MAO) in Dapitan that large numbers of dolphins are commonly seen offshore.

Other impacts

Ghost fishing may be an issue for lost gillnets, but the incidence is unknown and, given the replacement costs for nets, it is unlikely to be a major problem.

Both light fishing and FADs are well known to attract increased species diversity and juvenile fish. Not only were small sardines seen in the public markets but so too were small neritic tunas, mackerels and scads. Although there was nothing to link these occurrences to the use of either lights or FADs there were several comments made about FADs in particular being the source of small fish, especially when fished on by vessels targeting anchovies with fine mesh nets.

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, fishworkers, 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 main purpose of the Agriculture and Fisheries Modernization Act (AFMA) 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 outré 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 General Management Arrangements

The Philippines has operated a highly decentralised fisheries administration system since the passage of the Fisheries ordinance in 1988. The Bureau of Fisheries and Aquatic Resources (BFAR), which previously managed all fisheries, was allocated the commercial fisheries to manage. These generally operate more than 15km offshore, although they can be permitted to operate to 10.1 km under agreement from local municipalities. Administrative control of the waters inside the 15km line is the domain of the many Local Government Units operating at either a City or a Municipal level. These are usually supported by regional BFAR offices.

A large amount of material has been written about the administration system and it is not proposed to re-iterate all the details in this report.

7.3 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 (BAS) 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. For the main pelagic species this is not so much of an issue but for smaller catches (e.g. *S. gibbosa*) it may be. The BAS conducts monthly sampling of selected landing sites (see Appendix 1). 11 municipal sites and 6 commercial sites are monitored to generate information about production (wild harvest and aquaculture). All the sites are located to the north of Liloï 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. However, it is possible to request data for each individual landing site and this has been done for the Indian sardine and the fimbriated sardine 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 Sibutad (1). There is also a part time technician in Rizal. In some other cases the task of collecting data falls to agriculture staff, though in most cases no data are collected at all. 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.

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

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. Information from field enumerators is then sent to the BFAR regional office IX for compilation. Apparently catch and effort information for small pelagics is collected and this has been requested (14/12/10).

7.4 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). For 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 super-lights
- 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.

7.5 Monitoring, control and surveillance

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

In terms of surveillance there are some documented efforts but they are patchy across municipalities due to funding scarcity. 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. Other government agencies influencing fisheries management include:

- The Department of Agriculture (DA) – the DA includes an Undersecretary for Fisheries and Aquaculture responsible for attending to the needs of the fishing industry and a number of planning and policy units which support the operation of the AFMA;
- The Department of Environment and Natural Resources (DENR) – responsible for environmental management, conservation and development at a national level;
- Research institutions – the NFRDI and the Philippine Council for Aquatic and Marine Research and Development (PCAMRD); and,
- Compliance related organizations – the Philippines National Police (PNP) – Maritime Command (PNP-MC), the Philippines Navy and Philippines Coast Guard.

7.6 Long Term Policy Objectives

The Philippines overarching national fisheries policies and objectives are outlined in the Fisheries Code. .

In addition to these a number of more specific initiatives are encouraged in the Fisheries Code including:

- The promotion of offshore fishing, as a means of reducing pressure on coastal fisheries and sectoral conflict (this is supported by a number of incentives such as assistance with vessel acquisition, tax and duty rebates and exemptions);
- Incentives for municipal and small-scale fisherfolk to improve competitiveness by reducing post-harvest losses; and
- Priority for resident municipal fisherfolk to their local waters.

A draft Comprehensive National Fisheries Industry Development Plan (CNFIDP) has also been developed⁵, although it has yet to be adopted. The CNFIDP identifies a provisional vision for the fisheries sector:

“A sustainable and competitive fisheries industry that contributes to food security and provides optimal socio-economic benefits to Filipinos”

and mission:

“to build effective multi-sectoral collaboration and partnership arrangements that empower communities and other stakeholders for responsible stewardship of Philippines fisheries resources and ecosystems”.

Within these, the CNFIDP outlines nine key objectives including:

1. Rationalise utilisation of fisheries resources
2. Protect fisheries habitats
3. Reduce resource use competition
4. Maximise full potential of aquaculture and commercial fishing
5. Promote competitiveness of fisheries products
6. Minimise post harvest losses
7. Enhance capability of Local Government Units (LGUs), Non-government agencies (NGAs) and local communities
8. Promote appropriate fisheries policies
9. Strengthen institutional partnership.

7.7 Fishery specific objectives

There are no management plans for sardine fisheries. There are two draft documents that have been circulated for the commercial fisheries only (i.e. outside of the 15klm line), as follows:

1. A proposal to establish a closed season for the conservation of sardines in the East Sulu Sea for a period of two years only (version sighted dated September 2010). This would cover the period November 15 to February 15 each year and apply to commercial purse seines, bag nets and ring nets. This closure would be promulgated under Chapter 1, Sections 2(c)(f), 3(a), Chapter 11, Section 9 Article 1, Section 16 and Section 107 of the Philippine Fisheries Code. Its progress has reportedly been stalled due to industry opposition.
2. A draft management plan for the sardine fisheries of the Sulu Sea (version sighted dated May 2007). If adopted as proposed it would apply to all the waters of the Sulu Sea with the exception of Municipal waters and water managed by the Autonomous Region in Muslim Mindanao (ARMM). The plan proposes to clearly identify a maximum sustainable yield and to cap fishing effort at the level occurring in 31 December 2006. The draft also canvasses minimum legal sizes and light power limitations, a 3 month closed season (November to January inclusive) and Vessel monitoring Systems to be in place for vessels over 18 metres in length. The plan has not yet been finalised.

At the municipal level, where an ordinance has been adopted, the 3cm mesh size is the only measure that may have some impact on sardine catches. The 3 day new moon closure may have some impacts as this is a period when light fishing is most effective. There are no area closures or season closures or effort limits.

⁵ Ibid, BFAR (2005).

7.8 Information

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.

7.9 Compliance

Philippines has a number of agencies involved in fisheries monitoring, control and surveillance (MCS). At the Municipal level, the LGU'es are responsible for registration, compliance and enforcement in municipal waters. BFAR-trained "Deputised Fish Wardens" undertake local compliance and enforcement; In addition to these agencies, a bantay dagat/ Seawatch program has been established in which private fisherfolk, in collaboration with law enforcement agencies and the NGO community, are empowered under the Philippines Rules of Criminal Procedure to arrest fishers engaged in illegal activity. 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.



New but unserviceable patrol vessel
Sicaya – Bucana, near Dapitan



Patrol vessel, Sindangan



Patrol vessel, Sindangan

On a national scale compliance activities outside 15 km take the form of the following:

- BFAR – Vessel management system (VMS), observers, sea patrols, boarding and inspection, licencing, logbooks, etc;
- Coast Guard – at sea patrols, boarding and inspection in municipal waters and outside;

- Maritime Industry Authority (MARINA) – registration of vessels >3GT (e.g. can deny a vessels to fly the flag of the Philippines if it has previously been engaged in IUU);
- Philippines Fishery Development Authority (PFDA) – manages regional and municipal ports, collects data on fish landings by species and value;
- PNP - Maritime – compliance monitoring and enforcement in municipal waters;
- Navy and Air Force - compliance monitoring and enforcement outside municipal waters, and can be asked for assistance inside municipal waters;
- Philippines Department of Justice and courts – prosecutions, sanctions.

Current capacity relevant to MCS areas is discussed below:

Risk assessment and compliance planning: Risk assessment and compliance planning is largely done based on reports received from the BFAR regional offices. Efforts to encourage voluntary compliance are undertaken at the LGU level and through the involvement of FARMCs in management planning.

Licensing and registration: All vessels are registered, however some gaps exist at the LGU level. These largely relate to new entrants. The main breaches of licence conditions are non renewal of licences, commercial vessels encroaching in municipal waters, destructive fishing, the use of unlicensed workers and under-reporting. The internal perception of licensing is weak at the LGU level. The current system also lacks external cross-checks (e.g. VMS data) to verify compliance with licensing conditions.

VMS: VMS is installed on large scale tuna vessels in accordance with WCPFC requirements, but not for other sectors. A national VMS office is fully operational for tuna vessels. BFAR plans to extend the system to other sectors. VMS data is not yet provided to other agencies for compliance purposes, although the Coast Guard is seeking access.

Port inspections: Landings of tuna vessels and small pelagic vessels > 3GT are inspected by trained inspectors based in BFAR regional offices. 12 internal staff and 9 contractors are based in each region. 100% of vessels exporting to the EU are inspected for the purposes of providing an EU catch certificate. The Philippines Fisheries Development Authority (PFDA) also inspects (XXX) vessels. The internal perception of port inspection is that it is effective. The capacity to implement the Port State Measures (PSM), which would be the responsibility of the Philippines Port Authority (PPA), at present is unknown. A weakness in the current system is the absence of inspections in municipal ports, ‘free ports’ and of transshipment vessels.

Catch monitoring/traceability: Philippines is trying to implement full traceability for export products to support HACCP systems. Systems are in place for the provision of catch certificates for the purposes of the EU IUU regulation.

Prosecutions: Regular training is provided to BFAR fisheries officers on the provisions of the Fisheries Code plus basic law enforcement techniques such as case preparation. Most training is focused on enforcing municipal fisheries. Skills training is also provided in detecting destructive fishing practices. Similar training is also provided to Navy and Coast Guard officers. BFAR interviewees considered internal prosecution capacity to be “work in progress”. The current sanction regime was not considered sufficiently effective and some difficulties occurred at the diplomatic level in prosecuting illegal foreign fishing.

At sea patrols: At sea patrols are largely undertaken by the Coast Guard in collaboration with BFAR. Vessels are manned by the Coast Guard and have BFAR Fisheries Officers on board. 14 large patrol vessels are available: 10 X 30m vessels and 4 X 11m vessels. Vessels are operational approximately 10 days per month, and limited by resources. While the Navy has a mandate to enforce fisheries laws,

they are generally not active on fisheries issues. An MOU exists between BFAR and the Coast Guard to coordinate activities. Patrols in municipal waters are also undertaken by bantay dagat.

Aerial surveillance: No domestic aerial surveillance capability exists, and no surveillance coverage is provided by 3rd parties.

Information management and coordination: No electronic management system exists to collect, store, process and exchange MCS information. No automatic cross-verification of information occurs. No information sharing exists between MCS agencies. Some work has been undertaken on developing software to cross-verify data under Coordinated Resource Management and Planning (CRMP), although this was discontinued.

Institutional cooperation is occurring under the “Coastwatch South” project in the southern part of the EEZ. A National MCS Coordination and Operations Centre (MCSCOC) was reportedly set up within BFAR⁶ to provide for MCS planning, information analysis, operations, licensing and the like, though it was not mentioned during interviews. Regional MCSCOC were also reportedly set up in eight centres around the country to coordinate MCS activities at the regional level.

Despite these efforts there were regular comments from municipal fishers about incursions from commercial fishers well into municipal waters. Commercial fishers were also accused of carrying small arms (including machine guns) and were ready to intimidate those who expressed concern about their activities.

7.10 Subsidies

Occasionally the BFAR donates 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.

8. OTHER FISHERIES AFFECTING THE TARGET STOCKS

The vast majority of small pelagic are caught by the commercial fleet, especially further to the south in order to supply the canneries in Zamboanga City. According to BFAR the estimated catches are:

Table 6 Commercial and municipal catches in Zamboanga del Norte

Year	2000	2001	2002	2003	2004	2005
Total Small Pelagic Catch (MT) Industry Data ¹	318,634	317,394	305,122	364,945	247,027	291,017
Sardine Catch, all species (MT) Industry Data ¹	223,044	222,176	213,586	255,461	172,919	203,712
Estimated Municipal Sardine Catch (MT) ²	27,000	27,000	27,000	27,000	27,000	27,000
Total Estimated Sardine Catch (MT) ^{1,2}	250,044	249,176	240,586	282,461	199,919	230,712
NFRDI Estimated Catch of Sardines (MT) ²	N/A	N/A	N/A	N/A	N/A	229,477

Sources: 1: Industry Data = Southern Philippines Deep Sea Fishing Association

2: Government Data = National Stock Assessment Program /NFRDI

(extracted from draft management plan 2007)

⁶ Palma, M. (2006) *Analysis of the adequacy of the Philippines legal, policy and institutional framework to combat illegal, unreported and unregulated fishing*. University of Wollongong, PhD Thesis.

The main gear types used by the commercial fleet are purse seines, ring nets and bag nets. The size of the total commercial catch emphasises why management efforts by BFAR are focused on the commercial sector. Recently a freeze on the number of licences for commercial vessels was implemented.

9. KEY STAKEHOLDERS

The following is not an exhaustive list, but indicates the breadth of consultation that would need to 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 7: 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; and,
- 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.

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 an abundant literature describing the overfished nature of fisheries in general in the Philippines and the draft management plan suggest an exploitation ratio of 0.6 (the ratio of fishing mortality to total mortality) which is higher than desirable (0.3 to 0.5). Anecdotal information and visual observation of fish for sale in public markets suggest that catching small fish is common and fishermen claim that commercial fishing is depleting stocks.</p> <p>A formal stock assessment is currently being prepared and it is unclear when it will be finalized.</p> <p>Existing data deficiency requires the Risk Based Framework is applied. The analysis shows that the sardine fishery is High Risk, with likely prospect that the stock is heavily overfished.</p>
<p>Criterion 1.1.2:</p> <p>Reference Points</p> <p>Reference points are appropriate for the stock and can be estimated.</p>	<p>There are no formal reference points adopted. The exploitation ratio ($E=M/Z$) has been used for a number of years (at least since the ICLARM studies in the mid 1980s) to provide an estimate of stock status. Biomass at Maximum Sustainable Yield (BMSY) is adopted as a reference point in the draft management plan. This would be above the</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>	<p>point at which recruitment would be expected to be impaired.</p> <p>None of the municipalities assessed had any reference points for the sardine fisheries under their jurisdiction.</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>There is no harvest control strategy.</p> <p>.</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 reference points are approached.</p>	<p>There are no harvest control rules in place.</p> <p>The only regulations that may benefit sardines are the 3cm mesh size rule and the 3 day new moon closure. Proposals for s seasonal closure and effort controls in the commercial fisheries (outside of the study area) have not been implemented.</p>
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<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</i> 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 main species of interest.</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 points.</p> <p>The stock assessment is</p>	<p>A national stock assessment is underway and should be available in the near future. It should be updated on a regular basis, as required by law.</p>
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subject to peer review.

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

2.1 Retained Species – i.e. commercial by-catch / by-product

2.1.1 Stock Status

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.

For this assessment the two most abundant species of sardines mentioned in BAS data are considered to be the target species. Others mentioned in the BAS data are considered as retained species whilst 3 other sardine species are considered as they appear in the literature.

The status of retained species is unknown. A risk based assessment was possible for 3 of the retained species yielding one low risk (*Sardinella gibbosa*) and two medium risk species (*Rastrelliger kanagaruta* and *Amblygaster sirm*).

2.1.2 Management Strategy

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.

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.

c) There is some evidence that the partial strategy is being implemented successfully.

No associated management measures in place. No by-catch mitigation measures in place.

2.1.3 Information/

<p>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>The data reporting regime is very much production oriented and provides inadequate information for management purposes. <i>Clear attention needs to be paid to monitoring fishing effort</i> and evaluating stock densities and abundance on reef structures. Relevant information should be collected on catch, effort, fish sizes and other biological indicators.</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>As far as could be ascertained there are no discards. There is no literature on the subject and juveniles are regularly caught and utilised.</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 objective basis for confidence that the partial strategy will</p>	<p>Not relevant.</p>
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<p>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 by-catch 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 unacceptable impacts to ETP species.</p>	<p>Insufficient data made available.</p>
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<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>There is no strategy in place.</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</p>	<p>This is unlikely to be an issue as the gear does not make contact with the sea bed.</p>
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function to a point where there would be serious or irreversible harm.	
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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>	No strategy in place.
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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 changes in the outcome indicator scores or the operation of the fishery</p>	No information available.
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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.	The wider fishery needs to be evaluated from an ecosystem perspective as the small pelagic are undoubtedly part of a wider food web.
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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>	<p>There is no strategy that allows for the incorporation of an Ecosystem Approach to Fisheries but plans are in place to both incorporate Ecosim into the decision making process and to increase capacity for analyses to be undertaken.</p>
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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 information, but may not have been investigated in detail.</p>	<p>No localised information available.</p>
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<p>c) The main functions of the components (i.e. target, by-catch, 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 disputes arising within the system.</p>	<p>There is no management system in place across the whole of the study area which focuses on sardines. 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 is defined as 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>At <i>barangay</i> level, there may be an association of fishermen, but there are no signs of localised management initiatives.</p> <p>There is evidence that community customary rights form part of the national strategy, supported by the actions of the AFMA.</p>
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<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</p> <p>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>a) Long-term objectives to guide decision-making, consistent with</p>	<p>The national Fishery Code of 1988 has clear objectives to guide decision making which include statements about sustainable use. Where they exist the LGU codes have adopted these objectives. With the exception of the 3cm mesh size rule and some potential benefit from the 3 day new moon closure (where implemented) no evidence that such objectives are</p>
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MSC Principles and Criteria and the approach, are implicit within management policy.	being used to guide decision making.
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<p>3.1.4 Incentives for sustainable fishing</p> <p>a) The management system provides for incentives that are consistent with achieving the outcomes expressed by MSC Principles 1 and 2.</p>	There is no evidence of fisheries incentives (subsidies) that would encourage overfishing.
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3.2 Fishery- specific management system

<p>3.2.1 Fishery- specific objectives</p> <p>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 sardine or small pelagic management plan in place. This means that there are no fisheries specific measures.</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.</p>
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<p>3.2.2 Decision-making processes</p> <p>a) There are informal decision-making processes that result in measures and strategies to achieve the fishery-specific objectives.</p> <p>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>c) Decision-making processes use the</p>	<p>Whilst the system is highly consultative it would appear that the source of the problems is assumed to be the commercial fleet. It is thus argued by inshore stakeholders that this needs to be fixed and there is no need for restrictions within the municipalities. The Risk Assessment suggests that management is needed both inshore and offshore.</p> <p>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>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, 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 balk 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 parties.</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 sardines. Having said this, small pelagic are a high priority for national government and there will be obvious benefits for the municipalities arising from the research and management actions that are proposed. There may be opportunities to improve this at a local level via Jose Rizal University or the Dipolog school of fisheries.</p>
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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: The risk based framework suggests that the stock is over-exploited at all levels of the fishery – commercial and municipal;
- P1 1.2.1 Harvest control rules are not applied to the sardine, albeit that there appears to be some limited technical measures in place, with a modicum of support for seasonal closures; and,
- P1 1.2.3: Clear attention needs to be paid to monitoring fishing effort, CPUE and evaluating stock densities. 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 1: None of the fishing methods are selective for sardines and it could be argued that they are not designed to be. A better understanding of the species and size distributions by gear type would help understand stock status and impacts;
- P2 1.1: Stock status is uncertain, but likely to be heavily fished, as per the target species, and more information is required to better characterise the risks posed by the fisheries; and,
- P2 3.1 There is insufficient information available to allow for any interpretation on interactions with ETPs.

Based on the above, it will not be possible to assess aspects of Principle 2 without provision of data

on retained 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 the 3cm mesh size and 3 day new moon closure rules) in place specifically for sardines;
- 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 catch growth objectives outweigh sustainability;
- P3 3.2.1: There are no fishery specific management measures. The existing measures are unlikely to control fishing effort in any meaningful way;
- P3 3.2.2: There is presently no informal or formal management decision making process that is applied at the Provincial level;
- P 3 3.2.3 Compliance to the rules appears to be poor, 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 CPUE, catch by species and size distribution of species for each gear type; and,
- 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.

Appendix 1 Location of sampling sites used by the BAS

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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Noted by:

Bernardo C. Martinez
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PASO

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 gillnetters, access relatively shallow waters..</p>							

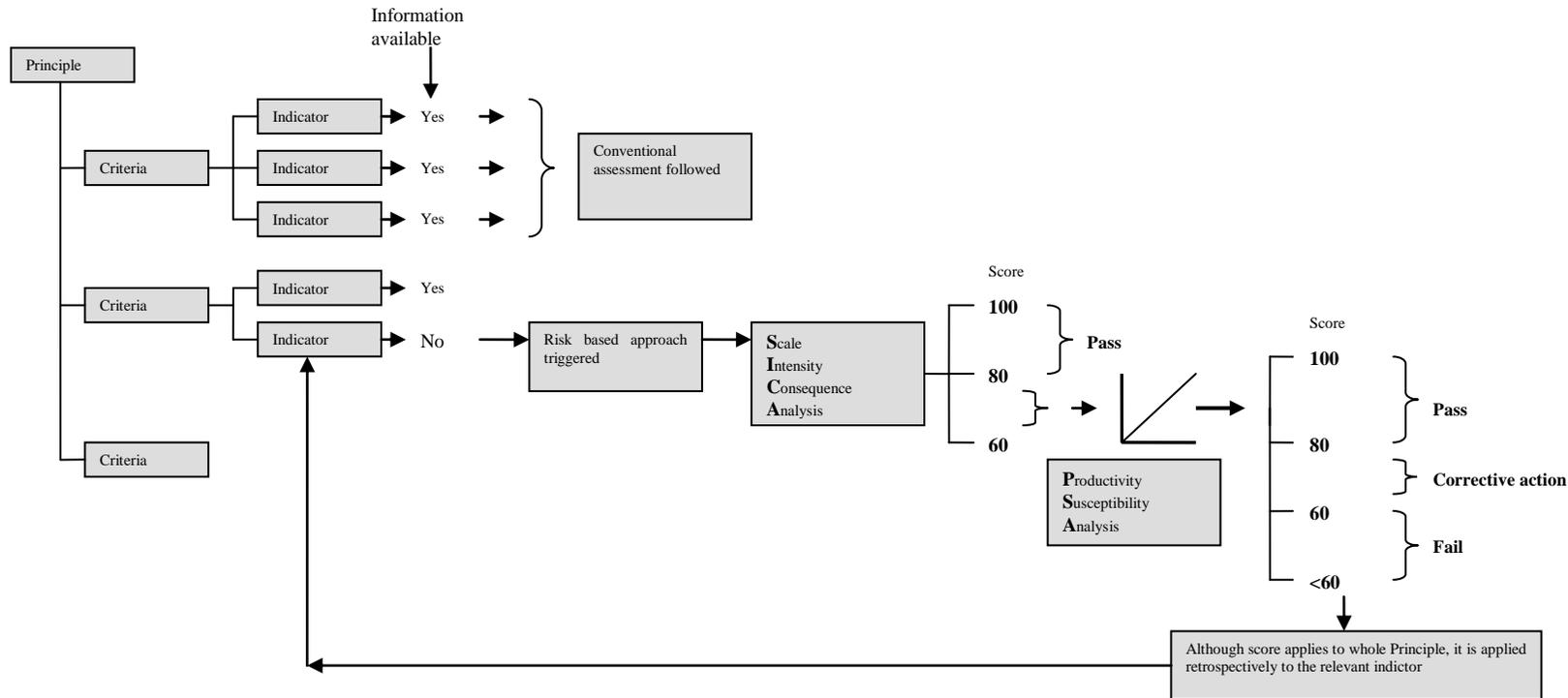
Appendix 2: PSA scores

SCIENTIFIC_NAME	COMMON_NAME	Productivity Scores [1 3]							Susceptibility Scores [1 3]					PSA scores (automatic)				
		Average age at maturity	Average max age	Fecundity	Average max size at maturity	Average size at maturity	Reproductive strategy	Tropical (fishbase)	Total Productivity (average)	Availability	Encounterability	Selectivity	Post-capture mortality	Total (multiplicative)	Color on PSA plot	PSA Score	Risk Category Name	MSC scoring guidepost
<i>Sardinella lemuru</i>	Bali sardinella	1	1	1	1	1	1	1	1.00	2	3	3	3	2.33		2.53	Low	>80
<i>Sardinella fimbriata</i>	Fringescale/fimbriated sardine	1	1	1	1	1	1	1	1.00	2	3	3	3	2.33		2.53	Low	>80
<i>Sardinella gibbosa</i>	Goldstripe sardinella	1	1	1	1	1	1	2	1.14	2	3	3	3	2.33		2.59	Low	>80
<i>Sardinella albella</i>	White sardinella	1		1	1	1	1	1	1.00	2	3	3	3	2.33		2.53	Low	>80
<i>Decapterus macrosoma</i>	Round scad			1	1	1	1	3		2	3	3	3	2.33		2.33	Low	>80
<i>Selar</i>					1											#VALUE!	#VALUE!	#VALUE!
<i>Dussumieria acuta</i>	Rainbow sardine	1			1	1	1	3	1.40	2	3	3	3	2.33		2.71	Med	60-80
<i>Rastrelliger kanagurta</i>	Indian mackerel	1	2	1	1	1	1	3	1.43	2	3	3	3	2.33		2.73	Med	60-80
<i>Rastrelliger brachysoma</i>	Indo Pacific mackerel	1	1		1	1	1	1	1.00	2	3	3	3	2.33		2.53	Low	>80
<i>Amblygaster sirm</i>	Spotted sardinella	1	1	1	1	1	1	3	1.29	2	3	3	3	2.33		2.66	Med	60-80
																#VALUE!	#VALUE!	#VALUE!
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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 Aalysis). 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 by-catch 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

		<ul style="list-style-type: none"> • 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

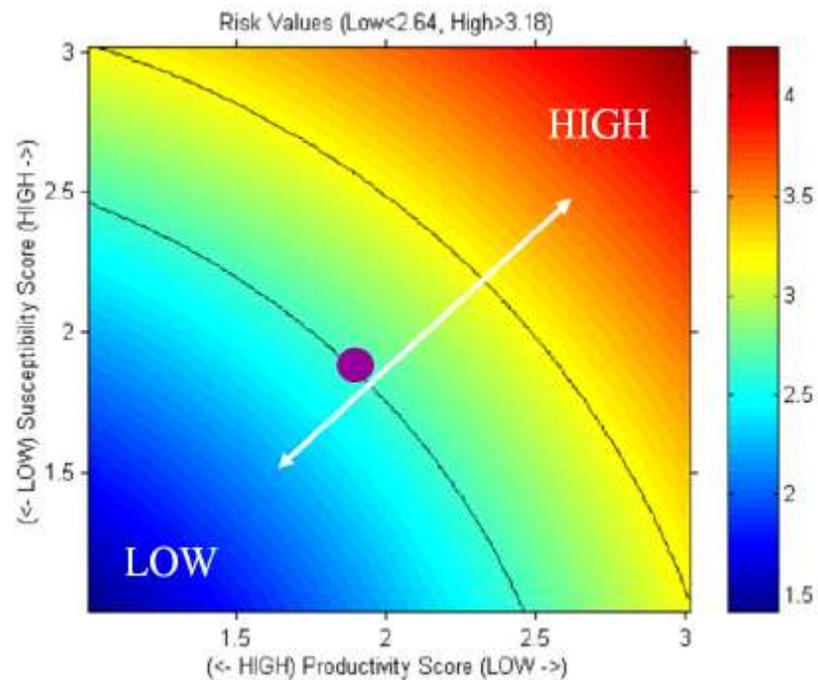
Susceptibility is scored using susceptibility attributes they are:

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.