
IFFO FISHERY IMPROVERS PROGRAMME

**Fishery Feasibility Trial for developing the IFFO
Fishery Improvers Component for:**

**IFFO GLOBAL STANDARD FOR RESPONSIBLE SUPPLY OF
FISHMEAL AND FISH OIL**

**TEST FISHERY 1: KIEN GIANG PROVINCE TRAWL FISHERY,
VIETNAM**



DATE OF REPORT:	July 14th 2014
EVALUATION TEAM:	Ivan Mateo/Dave Garforth

Introduction

SAI Global Assurances were contracted to undertake a test assessment of two Vietnamese bottom trawl fisheries (Kien Giang and Ben Tre Provinces) to the IFFO Responsible Supply (RS) Standard as part of an overall project to develop an improvement programme for fisheries that which to pursue approval for their catches for IFFO RS eligibility.

Overall Objectives

This project has two overall objectives:

- **To assess the feasibility of the current IFFO RS Programme Fishery Approval Assessment approach for use on data poor, multi-species fisheries.**
- **To provide a framework for the recognition and progression of fishery improvement activities that lead to fisheries meeting the IFFO RS Standard for approval purposes.**

Two candidate fisheries were chosen for their interest in the project and because of existing improvement ambitions and support from the Sustainable Fisheries Partnership:

1. Vietnamese Ben Tre Province multi-species trawl fishery

2. Vietnamese Kien Giang multi-species trawl fishery (this report)

This report documents the outcome of the trial assessment for Kien Giang with respect to the main challenges for this fishery to gain approval to IFFO RS and also first considerations of applicability of the IFFO RS fishery assessment criteria for these more complex and data poor fisheries.

Objectives and Activities for Stage 1

- **Provide a first stage report, identifying key features; areas that are compliant or provide good basis for compliancy with IFFO Fishery Approval Criteria and provisional considerations for criteria that will be required to assess data poor, multi-species fisheries**

This report identifies the current broad conformity of the Kien Giang bottom trawl fishery to the IFFO RS Criteria and identifies the gaps when assessed against the current IFFO RS criteria.

Scope Details	
1. Scope of Assessment	Feasibility Trial
2. Fishery	Multi-species Trawl Fishery
3. Fishery Location	Vietnam Kien Giang Province
4. Fishery Method	Trawl (single/pair)
Outcome of Assessment	
5. Overall Fishery Compliance Rating	Low
6. Sub Components of Low Compliance	All but A1, E1, E2
7. Information deficiency	High levels of information deficiency
8. Peer Review Evaluation	N/A
9. Recommendation	N/A Trial assessment.

1. QUALITY OF INFORMATION

There was reasonable, general information on the overall fishery management system framework but less information on how this applies to the fishery under review. There was insufficient, consistent biological data on the state of the fishery resources that confirms the suitability of the management measures currently in place and less so on the responsiveness of the management system to the state of the fishery resources. Much of the report is based on discussion and question/answer sessions, kindly provided by the stakeholders involved in the assessment feasibility.

2. COMPLIANCE LEVEL ACHIEVED

LOW COMPLIANCE

Recommendation For Approval

NOT APPLICABLE

3. GUIDANCE FOR ONSITE ASSESSMENT

NOT APPLICABLE

4. OVERALL ASSESSMENT OUTCOME

This feasibility review of the multispecies trawl survey of Kien Giang province in Vietnam identifies considerable gaps in the current fishery management system. The fishery resources have been described as severely depleted as a consequence of over-fishing and there have been related but unknown ecological impacts on the habitat and other marine species. There is an identifiable fishery management system with divisions of responsibility at National and Provincial level, covering administrative, operational, enforcement and scientific functions although it's functionality and application at the fishery level has considerable weaknesses. Consequently, there are considerable challenges with respect to fulfilling the requirements of the IFFO RS criteria.

Key challenges for fisheries managements include:

The fishery has an open access situation despite some attempts to limit capacity making it very difficult to implement biologically based and conservative management rules to reduce exploitation rate. Previous TAC's which were used in the offshore fishery are no longer implemented. Rules that limit larger vessels from fishing inshore waters appear largely ineffective. There appears to be evolving attempts at 'improving' the control on effort within certain provinces in the inshore but this could be at the consequence of further displaced impact on the offshore.

There is limited consistent data that are collected on catch, biological data and bycatch in the fishery. There is scarce information on the fishery statistics and biological data to conduct stock assessment and lack of a data collection framework at portside, at sea and independent sources. However, there have been some strategic research studies and assessments undertaken using fishery-dependent and independent data that indicate that fishery resources are severely depleted. The management system has struggled to implement measures that can respond to this effectively.

The overall available evidence suggests that the fishery is not well monitored and management actions are not based on best available scientific advice. For example, anecdotal evidence suggests that the current management measures, which may have some conservation benefit, are nullified by lack of enforcement resources.

There are a number of projects identified in the report which may provide the basis of reform within the management system, fleet restructuring and implementation of more effective controls on fishing that allow for recovery of the fisheries within the region. These do appear to be focused on the main challenges and the reviewers recommend that the initial approach to fishery improvement should ensure that these projects are further investigated and where relevant supported. It would be beneficial for any improvement activity to capture the research effort, activities etc. undertaken, on-going and proposed presently in order to maximize the

opportunity of successful reform and improvement of the fishery management system.

Key Challenges:

The following considerations are based on the limited available information and evidence provided by the stakeholders that supported the review.

- The Management System in Kien Giang consists of an over-arching central system with devolved powers to Provinces. The information currently available is insufficient to clearly understand the operational norms, governance and capabilities of the management system. Evidence suggests that Provincial Governments lack sufficient resources and powers to allow for effective reform and control on their fisheries.
- Over-capacity and restructuring within the fishery remains the most pressing challenge.
- There is a NPOA for capacity under development with support from FAO. This had not been approved by government although a government plan has been approved.
- The overall plan for the fisheries sector to 2020 officially approved by government is for a 15% reduction in fleet capacity (from 126,400 to 110,000) and further reductions to 2030. The plan also targets a 6.5% per annum reduction in trawlers from 2010-2020. Current number is 22,500 which would result in 12,500 by 2020 if successful. Reducing capacity should be a high priority for improvement the overall sustainability of the fishery. There is a Decision (N0.18/2011)QD-UBND) that has frozen the number of vessels ,90CV in Kien Giang.
- Evidence suggests that lack of enforcement ability is also a key challenge. Reform within the enforcement sections of the management system should be a priority in order to implement the existing regulations on vessel CV, mesh size and closed areas and future regulations. Current enforcement may result in displacement rather than reduction in capacity and effort. Management resource availability may have been a key obstacle to this reform to date. There is evidence that projects to implement VMS are to be established and these should be further understood as part of any coordinated improvement plan for the fishery.
- All fishing vessels of above 90CV have to record fishing logbook and all fishing vessels which were issued fishing licenses have to provide a monthly fishing report. However, there appears to be an absence of a structured, independent data collection system for portside or vessel catch verification and biological sampling.
- There is evidence of projects that are aimed at implementation of such data collection systems, sample data sets that contribute to both Provincial and National data bases although these are not maintained up-to-date.
- There is an absence of a structured fishery independent data collection and survey, although there is evidence that intermittent surveys have been undertaken in the past.
- There is evidence that benthic impact studies are to commence and the research approach and scope should be fully understood as part of a coordinated improvement plan for the fishery.
- There have been studies already undertaken to investigate gear technical conservation

measures such as TED's. The extent that these are necessary remains unknown, although there is evidence that turtles and other mammals (Dugong's) are encountered although data was not available on frequency.

- More recently, a new project called Strategies for Trawl Fisheries Bycatch Management (REBYC-II CTI) which will implement the FAO Code of Conduct for Responsible Fisheries has been described. This effort will provide guidance to different nations in the Coral triangle including Vietnam in reducing bycatch and to reduce the impacts of fishing on bottom habitats in order to promote long-term sustainability of fish resources. This program is to be implemented in Kien Giang fishing areas.

SUMMARY OF LEVEL OF COMPLIANCE					
	The Management Framework and Procedures	Stock assessment procedures and management advice	Precautionary approach	Management measures	Implementation
legal and administrative basis	A1				
Fisheries management should be concerned with the whole stock unit	A2				
Management actions should be scientifically based	A3				
Research in support of fisheries conservation and management should exist		B1			
Best scientific evidence available should be taken into account when designing conservation and management measures		B2			
The precautionary approach is applied in the formulation of management plans			C1		
The level of fishing permitted should be set according to management advice given by research organisations				D1	
Where excess fishing capacity exist, mechanisms should be in established to reduced capacity				D2	
Management measures should ensure that fishing gear and fishing practices do not have a significant impact on non-target species and the physical environment				D3	
A framework for sanctions of violation of laws and regulations should be efficiently exists					E1
A management system for fisheries control and enforcement should be established					E2

KEY:

Low Compliance:



Medium Compliance:



High Compliance:



Global Trust Certification Ltd, Part of SAI Global Assurances; 3rd Floor, Block 3, Quayside Business Park, Mill Street, Dundalk, Co. Louth, Ireland Tel: 042 932 0912 Fax 042 938 6864

Form No: 9

Report Ref: IFFO Feasibility

Page 7 of 46

CCM Code: NA

1. EVIDENCE REVIEW AGAINST EACH CRITERIA**A. THE MANAGEMENT FRAMEWORK AND PROCEDURE****LEVEL OF COMPLIANCE**

A1. The management of the fishery must include a legal and administrative basis for the implementation of measures and controls to support the conservation of the fishery.

LOW	An administrative framework that ensures an efficient management of the fishery for its conservation is not established.
MEDIUM ✓	An administrative framework that ensures an efficient management of the fishery for its conservation is somehow established, but there is evidence of not being efficient to ensure the conservation of the stock.
HIGH	A legal and administrative framework that ensures an efficient management of the fishery for its conservation is established and works efficiently toward the conservation of the stock.

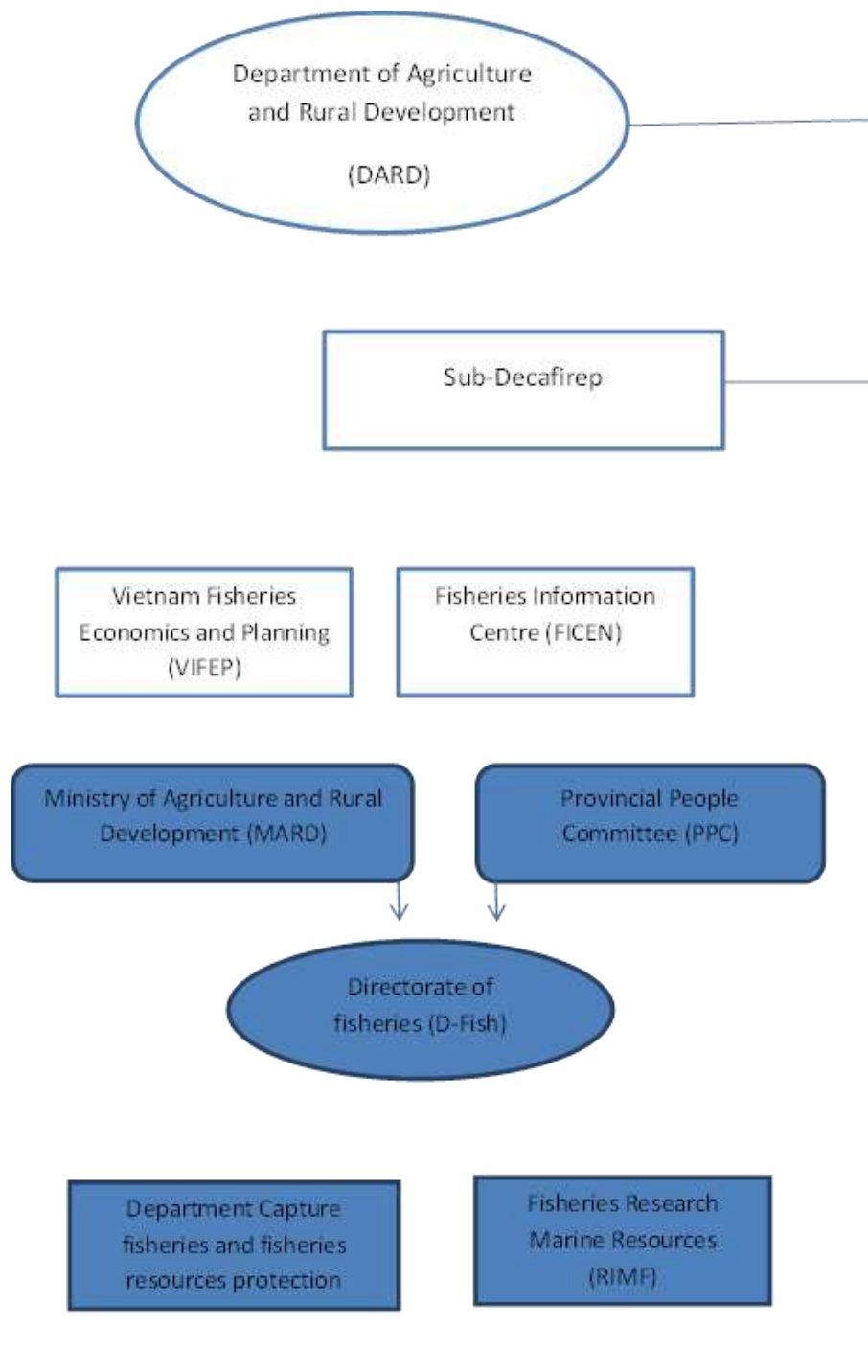
Information Review:

Fisheries management of marine resources in Vietnam is divided in two levels: at national level and provincial level. At national level the Directorate of Fisheries (D-FISH) under the Ministry of Agriculture and Rural Development (MARD) Department of Capture Fisheries and Resources Protection (DECAFIREP) is the agency responsible for management of marine species including oceanic pelagic species and demersal species and regulation of fishing activities and vessel entry regulation.

The Vietnam fisheries law came into effect on 2004 and is the main instrument for national living aquatic resources management. There is evidence of modification to the fishing law (creation of new rules/measures) including many aspects of the fisheries management, including minimum limits of concentrations of toxic substances in waters inhabited by aquatic organisms, minimum permitted mesh sizes by gear type, prohibited species, area closures during spawning seasons and minimum size regulation. However the legal framework governing fisheries is not fully developed and implemented when considering effectiveness and enforcement. Compliance, in the various sectors is variable and questionable e.g. shrimp trawl fishery. There are efforts to regulate the entry of vessels in the trawl fishery. However, to date, it appears that the regulation has been applied ineffectively as fishing licenses which may be imposed are ignored by fishermen. Licenses are granted on the basis of submitting a number of supporting documents such as vessel inspection and registration papers. A small license fee, proportional to engine size is used. The process appears to be ineffective at limiting entry in that it appears that license is refused and in fact, the fishery operates in an open access situation (FAO, 2005). A minimum legal mesh regulation is imposed for different bottom gears but likely not implemented effectively in the shrimp trawl fishery. In other provinces, the Tonkin Gulf (not Kien Giang) a recent study showed that shrimp trawlers had been heavily violating the minimum mesh size relegation. Almost all trawler groups were described as using smaller mesh size than the legal minimum. It appears that the minimum mesh size at present seems to be an ineffective regulation in the shrimp trawl fishery.

The diagram shows the institutions involved and some background on their role and function).

Overall Structure of Vietnamese Fishery Management System



At national level

MARD holds overall state management of agriculture and rural development responsibility, including capture fisheries management.

MARD set the fisheries rules and submit the fisheries Law to the National Assembly for approval.

D-Fish work under MARD and provide the functional arm of the overarching Ministry.

DECAFIREFP is the key organization on capture fisheries management. DECAFIREFP is the operational arm of fisheries management implementation and provides advices to D-Fish who in turn advise MARD on rules/regulation; planning, and policy for official state-management of fishery resources.

There are other agencies involved also who provide research and advisory functions to D-Fish.

The Vietnam Institute of Fisheries Economics and Planning (VIFEP): This agency is responsible for establishment of a strategies and plans of fisheries development in Vietnam including marine capture fisheries and provide research and advice to D-Fish on fisheries planning and policy (academia).

The Research Institute for Marine Fisheries (RIMF): This institute is responsible for carrying out surveys and stock assessment to provide information related to fishing ground prediction for fishing boats provide research and advice to MARD and D-Fish on fisheries stock assessment (academia).

FICEN: provide information and statistics of fisheries, advice to D-Fish and MARD

At Provincial level:

DARD: Hold overall state management of agriculture and rural development in the Province, including capture fisheries management, DARD set the fisheries rules, and submit the provincial regulation to the Provincial Council for approval.

Sub-DECAFIREFP: the key organization on capture fisheries management; sub-DECAFIREFP advices to DARD and then DARD advices to PPC on rules/regulation; planning, and policy (official state-management)

Collaboration

DARD and MARD are closely linked; for example, MARD provide guidelines for DARD in 63 Provinces. The sub-units of MARD e.g. DECAFIREFP, VIFEP or RIMF also work directly to DARD or sub-DECAFIREFP.

The Directorate of Fisheries main missions are as follows :

- Responsible for management and development of marine capture fisheries including prediction of fishing ground, fisheries logistics and services, establishment of proper forms of production at sea, proposal of policies on professional structure of fisheries and other solutions to improve fishing efficiency, development of offshore fishing and promotion of international co-operation with other countries in the region and international and regional organizations in the field of marine capture fisheries.
- Propose policies on protection and development of fisheries resources and improve effective measures of protecting marine resources and environment.
- Responsible for management of fishing boats, fishing ports and other fisheries services, proposal of policies on encouragement to invest money in fishing boats, fish markets in accordance with a strategy of the sector and a program of offshore fishing.

- Propose programs and planning of scientific research, application of advanced technology in the field of marine capture fisheries.
- Establish and implement programs of international cooperation's on marine fishing and protection of marine fisheries resources.
- Instruct and facilitate associations and NGOs taking part in the activities in the field of marine fisheries and fisheries resources protection.
- Instruct and inspect enforcement of the laws and implementation of policies in the scope of DECAFIREP's management according to the laws in force".

There are other relevant agencies under MARD which are also responsible in development of marine fisheries conservation plans:

The previous Ministry of Fisheries that existed before MARD (Ministry of Agriculture and Rural Development) had issued many fisheries regulations such as mesh size, fishing gear, minimum length of fish, allowable catch.

However, it is apparent from discussions with SFP representatives that these agencies have lacked the resources necessary in terms of staff and budget to provide the required management, monitoring, surveillance or enforcement of Vietnam's inshore and offshore waters.

Of note is the increasing population pressure and the development of more effective fishing gears on inshore resources which has led to environmental degradation.

The main legislation in Vietnam regarding fisheries is the Fisheries Law. The Fisheries Law states that "fisheries activities should be done in accordance with the development master plan", also referred to as the Fishery development strategy in Vietnam to 2020 issued on 16 September 2010, by the Prime Minister approval Decision 742/QĐ-TTg.

The 2020 strategy sets targets for the growth of the fisheries sector, and includes environmental and eco-labeling considerations. Central to this strategy is the notion that both quality and quantity of fisheries output and export should be augmented.

Regulations for Trawl Fisheries:

There are current regulations of the trawl fishery by vessel size. For example, in Kien Giang, Decision No 18/2011/QĐ-UBND issued by Kien Giang PPC dated 7 April 2011, on capture fisheries and resources protection management in Kien Giang waters.

The law states that trawls must be fished in the designated areas. It also delineates fishing areas by size of engine power. For example on the demarcation for fishing vessels:

- The vessels of > 90CV are not allowed to fish in coastal and near shore waters
- Vessels with engine power of 20-89CV can legally fish in areas of nearshore and offshore waters
- Vessels < 20 CV boats can legally fish in coastal waters.

In Kien Giang, vessels of <90 CV have gear restrictions.

Outcome of Assessment: Medium Rating

There is an administrative framework but a lack of key evidence that demonstrates that it ensures an efficient management of the fishery for its conservation. There is evidence of depleted resources, overfishing and lack of a effective rules and measures.

There is evidence that describes the administrative framework, although aspects will require further clarification to confirm responsibility of certain items relating to National and Provincial responsibilities. However, the main gaps relate to an absence of how the framework applies to the specifics of Kien Giang Province fisheries management that demonstrates if it is responsive for the conservation of the fishery stocks. There is evidence that suggests that it is not effective at ensuring fishery conservation and prevent environmental degradation. Further criteria elaborate on the specifics of this outcome.

References

<http://www.fistenet.gov.vn/marine-capture-fisheries/overview-of-viet-nam2019s-marine-fisheries/>

http://www.vietlinh.com.vn/library/law_standard_quality_safety/luatthuysan_en.htm

<http://munin.uit.no/bitstream/handle/10037/4771/thesis.pdf?sequence=2>

LEVEL OF COMPLIANCE	
<i>A2. Fisheries management should be concerned with the whole stock unit over its entire area of distribution and take into account fishery removals and the biology of the species.</i>	
LOW	Fisheries management is not concerned with the whole stock unit over its entire area of distribution and do not take into account any of the matters listed in 'A1'.
MEDIUM	Fisheries management is concerned with matters listed in 'A1' but not entirely. Fisheries, in relation to 'A1' statement, should improve to ensure the long term conservation of the marine resource.
HIGH	Fisheries management should be concerned with the whole stock unit over its entire area of distribution and take into account: • All fishery removals • The biology of the species

Information Review:

Management by stock unit for all species from Kien Giang trawl fishery have been hampered since there is very little scientific information available to define biological population units.

Some studies have been done in fish stock assessment carried out by RIMF, especially under the ALMRV project supported by DANIDA (1996 – 2005). Annually 2 surveys were conducted and total biomass of the demersal fish and some economically important species were estimated. Abundance of the fish stocks were estimated by depth strata and fishing grounds, defined as 'the Southeast' and the 'Southwest', 'central' and the Gulf of Tonkin, but not by provinces.

From a most recent report (2014), total stock biomass was estimated at 4.25 mill MT in which, small pelagic fish accounted for 2,65 mill. MT, demersal fish accounted for 0.487 mill. MT, crustacean accounted 79,000 MT, reef associated fish accounted for 2600 MT, and big pelagic fish accounted for 1.03 mill. MT.

Fish stock in the southwest was 0.61 mill. MT which accounts for 14% of the total fishery production in Vietnam.

More formal stock assessments are not available for any species at the regional level. However, there is a considerable number of species targeted by the fishery making individual stock assessment an unlikely approach.

Historical information on species composition and volume of by-catch is also not available for management purposes and there is a no discard policy in place for Vietnam trawl fisheries. However, all fish caught which have any form of commercial value either for direct human consumption or for fishmeal production are retained and landed.

There is scarce to no existing information available on the geographic extent of the species in the fishery although there is considerable cross over with species composition from each of the Provinces under review.

There is little other biological data (early Life history, sexual maturation, growth, mortality recruitment).

Outcome of Assessment: Low Rating

There is insufficient evidence to establish a rating beyond the low rating criteria 'Fisheries management is not concerned with the whole stock unit over its entire area of distribution and do not take into account any of the matters listed in 'A1. Evidence of stock unit distribution for the Province of all or main species is not available.

LEVEL OF COMPLIANCE	
<i>A3. Management actions should be based on long-term conservation objectives</i>	
LOW	Management actions are not based on long term management objectives.
MEDIUM	Management actions are based on long term management objectives. However the actions are not scientifically formulated.
HIGH	Management actions are based on long term management objectives, and actions are science based.

Information Review:

In reviewing available documents and in discussion with SFP representatives, there are number of initiatives that are underway or commencing which describe developing fishery management plan, objectives and measures that will allow for more effective control for conservation of the fishery. These include:

- A national initiative programme on the re-organization of the fisheries management structure.
- A proposal to establishing a monitoring program of fishing vessels including trawlers and establishment of Stock Assessment Centre and Fishing Ground Forecast under RIMF.
- There is a proposal for a fishery capacity reduction program.

However, currently, there appears to be insufficient knowledge of compliance from fishers and poor investment in data collection. FICEN (fisheries information center under the Directorate of Fisheries) and DECAFIREP do not appear to have an identifiable and functional system of data collection. There is an absence of a network of enumerators existing in the country at both central and local levels.

However, in some provinces, a number of part-time enumerators exist and who collect some monthly landing data.

Vietnam fishery agencies previously have used regulations for management of their trawl fisheries such as seasonal closures, no take areas, limited entry (licenses, vessel registration), and prohibition of destructive fishing methods mesh size regulations). Evidence of these existing regulations is compiled in Decree No. 33 33/2010/NĐ---CP and Circular No 02/2006/TT---BTS.

Outcome Rating: Low Rating

The overarching fishery management system is based on a set of top level fishery acts and regulations. These also establish policy and set out objectives or missions for the management of Vietnamese fisheries. The mission statements do include references to conservation and good treatment of resources. At the regional or provincial level however, it is difficult to ascertain how these have been applied specifically to the Kien Giang Province trawl fishery and therefore, it is not possible to establish if management actions are based on long term objectives for this fishery. Scientific data is scarce and routine data collection is not very well established.

However, the review did highlight a number of proposed initiatives and plans that if implemented would help to demonstrate that management actions were focusing on conservation objectives for the fishery. These are noted below:

- Government has recently approved a long term fishery strategy to significantly reduce the number of trawl fishery boats by year 2020. Evidence of how this will be established was not available during the review but appears to be either within the 2013 Decision for Fishing Strategy 2020 (with targets for 2030) or within a Vietnam (D-FISH) National Plan of Action on fishing capacity and implemented with collaboration from FAO. This Master Plan for reduction of capacity (Decision no 1445/QĐ-TT (16th Aug

Global Trust Certification Ltd, Part of SAI Global Assurances; 3rd Floor, Block 3, Quayside Business Park, Mill Street, Dundalk, Co. Louth, Ireland Tel: 042 932 0912 Fax 042 938 6864

Form No: 9	Report Ref: IFFO Feasibility	Page 14 of 46	CCM Code: NA
------------	------------------------------	---------------	--------------

2013) indicates that the total no. of vessels will be reduced from 126,400 units to 110,000 by 2020 and further reductions to 95,000 by 2030 (also refer to section D2). There is a NPOA for capacity supported by FAO under review by central government. Clarification of the plan and its implementation would be an important development for this fishery as part of an overall Fisheries Improvement Project.

- There is an ODA project funded by the French Government for establishing a Vessel Monitoring system (VMS) in fisheries activities and establishment of a monitoring/observer program of Fishing vessels under DECAFIREP. This development would be a positive step, particularly for the larger fishery in gaining an understanding of effort distribution and at sea monitoring and enforcement needs.
- D-FISH is also developing a proposal for Fisheries statistics, where data collection is required for every fishery under the legal framework. There was no information available at the time of review of how this will be developed and implemented for this fishery.
- D-FISH has scheduled to develop a trawl fisheries management plan under the REBYC 2- CTI project which is an effort by countries of the Coral Triangle to manage trawl fisheries according to the FAO Code of Conduct for Responsible Fisheries and using FAO guidance on the ecosystem based management approach.

References

<http://www.apfic.org/attachments/article/92/BRIEF%20INTRODUCTION%20TO%20VIETNAM%20TRAWL%20FISHERY.pdf>

B. STOCK ASSESSMENT PROCEDURES AND MANAGEMENT ADVICE	
LEVEL OF COMPLIANCE	
<i>B1. Research in support of fisheries conservation and management should exist.</i>	
LOW	Research to support the conservation and management of the stock, non-target species and physical environment does not exist
MEDIUM	Research to support the conservation and the management of the stock, non-target species and physical environment exists, however research programmes could be significantly improved to decrease scientific advice uncertainty.
HIGH	Research to support the conservation and the management of the stock, non-target species and physical environment exist, and existent research is considered most adequate for the long term conservation of the target, non-target and physical environment

Information Review:

Fishery and biological data availability is intermittent for this fishery and consisting of mainly sample data sets conducted by RIMF. More detailed survey and fishery research is normally, only conducted under strategic efforts with supporting mechanisms, often from external entities. These have value but their application is limited for use by the fishery scientists and managers for on-going advice and management. It would appear that a more long-term, nationally developed, structured and managed data acquisition, biological survey and resource assessment is required.

Since 1996 there have been some efforts to collect landing data although landings are recorded by species groups or families rather than by species. Port sampling is on-going but represents a sub-set of actual and therefore may represent high statistical uncertainty for the fishery scientists who are tasked with providing analyses and interpretation.

No information exists of size structure or growth mortality parameters of local species for population dynamics modelling. There have been a few scientific surveys conducted around 1996 and 2005. However, the interpretation of these survey results is unclear and it has been reported that there is a lack of consistency in some of the parameters of the actual survey design such as numbers of vessels that participated in the survey, sampling dates and season and timing and survey areas. There have been continuing scientific surveys since 2005 but these surveys appear to have insufficient coverage since they are conducted at a smaller scale and with irregular frequency in both spatial and temporal scales. Further information is required to better understand the extent of these data sets.

Reports or on-going studies by local institutions (government academic) describing ongoing fishery independent data collection such as trawl surveys (abundance, biomass, length frequency, effort – e.g. hours fished/no of trawl shots, tow times, or other standard method of describing effort) are not routinely available at the provincial level. There have been some works from researchers published – e.g. Chu Tien Vinh, Dao Manh Son, Nguyen Long, Dang Van Thi, Pham Thuoc and recently RIMF, Nha Trang University, Can Tho University, and HCMC University conducted a 1-2 study on benthic resources survey. Reports or ongoing studies by local institutions (government academic) describing studies of size at maturity, growth, mortality, recruitment for any of the important species in the trawl fishery have been few (Please refer to appendix I).

Reports or ongoing studies by local institutions (government academic) describing historical landings and effort, length frequency or weight data by species or groups of the trawl fisheries by province or by region are incomplete. For example, there is historical landings and effort only but data on length frequency or weight

data by species or groups of the trawl fisheries is scarce to non-existent. Evidence from independent surveys (2008, 2013) around the Southwest region (area that encompasses Kien Giang) shows that local resources are depleted. The 2008 report by Nguyen found that economically important species in the Southwest region have declined considerably. The study found that highly commercially important species such as grouper, snapper, croakers, lizard fish, Carangids, and Scombrids have decreased dramatically while less important species by value such as Ponyfish (*Leiognathidae*), Japanese leather jacket fish, cardinalfish (*Apogonidae*), and Pufferfish increased in abundance and became a dominant component of the benthic fish community in the region during a survey from 2000 to 2005 (Table 5, Table 6).

Table 5: Catch composition (%) of the most abundance fish families monitored by bottom trawl surveys in the Southwest area, the southwest monsoon, 2000 – 2005.

Importance	Family name	2000	2002	2004	2005	Note
Low commercially important species	Apogonidae	2.3	2.9	1.1	1.9	#
	Tetraodontidae	3.7	4.9	13.9	9.2	**
	Leiognathidae	6.7	5.4	12.5	6.2	**
	Mullidae	1.0	5.3	1.9	2.2	*
High commercially important species	Carangidae	11.7	8.0	3.9	4.5	##
	Clupeidae	2.5	0.2	0.2	0.0	##
	Dasyatidae	1.1	4.1	1.4	2.3	#
	Loliginidae	14.1	11.4	10.9	13.7	#
	Lurjanidae	0.4	0.7	1.2	0.5	*
	Nemipteridae	6.5	7.3	4.2	4.6	#
	Portunidae	0.8	4.7	1.9	0.8	#
	Priacanthidae	3.2	4.7	1.8	4.0	#
	Sciaenidae	8.2	2.9	9.6	9.8	*
	Scombridae	3.8	1.8	1.6	3.0	#
	Sepiidae	5.7	8.4	4.3	6.7	#
	Serranidae	0.8	0.5	0.7	0.8	-
	Synodontidae	5.5	3.5	4.5	2.7	##
	Trichiuridae	3.9	2.4	3.9	3.8	#

Table 6: Catch composition (%) of the most abundance fish families monitored by bottom trawl surveys in the Southwest area, the northeast monsoon, 2000 – 2003.

Importance	Family name	2000	2002	2003	Note
Low commercially important species	Apogonidae	2.2	4.7	2.9	**
	Tetraodontidae	2.8	7.0	3.7	**
	Leiognathidae	17.5	23.1	13.3	#
	Mullidae	2.9	0.9	1.4	#
High commercially important species	Carangidae	7.8	3.2	8.2	*
	Clupeidae	0.9	0.6	0.6	#
	Dasyatidae	3.1	2.4	3.4	#
	Loliginidae	9.4	8.9	6.4	##
	Lurjanidae	1.0	1.2	2.5	*
	Nemipteridae	8.0	3.1	3.1	##
	Portunidae	2.8	3.7	4.0	*
	Priacanthidae	2.0	1.4	6.7	**
	Sciaenidae	4.4	9.1	5.8	*
	Scombridae	2.0	1.6	2.4	*
	Sepiidae	7.2	3.6	3.9	##
	Serranidae	0.9	0.6	0.7	#
	Synodontidae	5.1	4.5	6.9	*
	Trichiuridae	4.5	3.1	4.2	#

Note: * denotes the increasing, ** significant increasing, # decreasing and ## denotes the considerable decreasing.

A more recent study in 2012 found that for the Southwest waters, the proportion of highly economic important

fish species is low. For example Chinese squid accounted for (4.6%) of the species composition followed by slender lizard fish (2.8%), brushtooth lizardfish (2.4%) and greater lizardfish (2.1%). Economically unimportant species such as puffer 11% dominated the species composition. According to the latest stock abundance assessment of RIMF, demersal fishery resources in Vietnam have been seriously decreased in Southwest waters.

There have been few studies documenting the multispecies trawl fishery in Vietnam at provincial level. A study conducted in 2010 in Kien Giang showed that for the 90< shrimp trawlers fishery, shrimp and prawn accounted for about 40 % total catch and corresponded to about 70 % total catch value while trash fish accounted for 37% catch volume but only about 8% catch value. Trash fish are comprised of many different fish species belonging to 40 families identified. It is important to say that the <90V shrimp trawlers fleet accounts for almost 8 % of the total number of vessels of 3273 in 2013. In another study analyzing the catch of >90 trawlers for year 2007, trash fish composed 97% and 51 % of the catches in commercial groups for pair trawls and otter trawls. Trash fish composition in pair trawl was dominated by forage species such as anchovies while in otter trawls species composition were dominated by flatfishes and file fishes.

Trawl fisheries # vessels in Kien Giang.

	<90 HP		90-150 HP		150-250		250-400		>400	
Kien Giang	# fishing vessels	Total engine power	# fishing vessels	Total engine power	# fishing vessels	Total engine power	# fishing vessels	Total engine power	# fishing vessels	Total engine power
Single trawl	286	12387	67	8001	230	39158	142	46490	75	34965
Paired trawl	6	269	25	3266	118	19885	534	186145	1790	893013

(Source: Kien Giang DECAFIREP, 2013)

Table of Catch Composition

Catch composition in "trash fish" group			
Rank	Family name	Sampled catch (kg)	Proportion (%)
1	Apogonidae	24.7	5.2
2	Atherinidae	2.9	0.6
3	Bothidae	31.9	6.7
4	Callionymidae	40.9	8.6
5	Cynoglossidae	32.0	6.7
6	Engraulidae	2.5	0.5
7	Engyprosopon	3.2	0.7
8	Ephippidae	0.2	0.0
9	Gastropoda	2.8	0.6
10	Gobiidae	152.4	32.1
11	Hemirhamphus	0.4	0.1
12	Hoplichthyidae	1.5	0.3
13	Leognathidae	13.4	2.8
14	Loliginidae	0.0	0.0
15	Lutjanidae	1.6	0.3
Rank	Family name	Sampled catch (kg)	Proportion (%)
16	Monacanthidae	11.4	2.4
17	Mullidae	26.7	5.6
18	Nemipteridae	17.5	3.7
19	Penaeidae	4.9	1.0
20	Pinguipedidae	9.7	2.0
21	Platycephalidae	19.8	4.2
22	Plotosidae	2.6	0.6
23	Portunidae	0.6	0.1
24	Sepiidae	3.3	0.7
25	Sepiolidae	27.1	5.7
26	Siganidae	24.0	5.1
27	Soleidae	0.7	0.1
28	Squillidae	1.7	0.3
29	Synodontidae	3.8	0.8
30	Tetraodontidae	8.7	1.8
31	Aploactinidae	2.0	0.4
	Total	475	100

Table of Catch Revenue Composition

Catch revenue composition					
• Revenue					
Commercial groups	Catch (kg)	Price (1000d/kg)	Revenue (1000 d)	Catch prop. (%)	Revenue prop. (%)
Trash fish	3,493	3	11,283	36.6	8.4
Mixed fish	978	5	5,183	10.3	3.9
Crabs	8	21	154	0.1	0.1
Swimming crab	17	100	1,720	0.2	1.3
Squid, cuttlefish	902	28	25,312	9.5	18.9
Peeling shrimp	3,804	16	60,761	39.9	45.5
Shrimp	331	88	29,225	3.5	21.9
Total	9,532		133,638	100	100

Table 3. Overall Catch composition

Catch composition			
Rank	Commercial groups	Sampled Catch (kg)	Proportion (%)
1	Trash fish	572	37
2	Mixed fish	155	10
3	Crab	36	2
4	Squid and cuttlefish	81	5
5	Shrimp used for peeling	573	37
6	Other shrimp	35	2
7	Others	100	6
	Total:	1.551	100

1. Commercial groups (catch composition) of above 90CV pairtrawl fishery in Kien Giang, based on landing survey conducted in 2007.

Rank	Commercial group (VNM)	Commercial group (EL)	Percentage (%)
1	Bạch tuộc	Octopus	0.01
2	Cá ba thú	Short mackerel	1.07
3	Cá chợ	Marketed fish	1.91
4	Cá cơm	Anchovy	7.85
5	Cá đù+cá sóc	Croakers	0.53
6	Cá nóc	Pufferfish	0.47
7	Cá phân	Trashfish	86.07
8	Cá thu	King mackerel	0.02
9	Cá xô	Mixed fish	0.67
10	Mực	Squid	0.33
11	Mực lá I	Bigfin reef squid type I	0.00
12	Mực lá II	Bigfin reef squid type II	0.00
13	Mực lớn	Squid type I (first class)	0.03
14	Mực lộn xộn	Mixed squid	0.14
15	Mực nang	Cuttlefish	0.22
16	Mực nang I	Cuttlefish type I	0.01
17	Mực nang II	Cuttlefish type II	0.09
18	Mực nang lớn	Large cuttlefish	0.08
19	Mực nang nhỏ	Small cuttlefish	0.07
20	Mực nhỏ	Small squid	0.05
21	Mực ống I	Squid type I (first class)	0.00
22	Mực ống II	Squid type II	0.00
23	Mực xô	Mixed squid	0.29
24	Tôm	Shrimp	0.06
25	Tôm thẻ		0.01
26	Tôm thẻ I	Shrimp type I	0.00
27	Tôm thẻ II	Shrimp type II	0.00
28	Tôm thẻ+chì	Mixed shrimp	0.01
	Total		100

2. Commercial groups (catch composition) of above 90CV otter trawl fishery in Kien Giang, based on landing survey conducted in 2007.

Rank	Commercial group	Commercial group (EL)	Percentage (%)
1	Cá chai		0.26
2	Cá chợ	Market fish	0.43
3	Cá phân	trashfish	51.12
4	Cá tạp	Mixed fish	1.72
5	Ghẹ	Crab	2.58
6	Mực	Squid	1.37
7	Mực nang	Cuttlefish	0.86
8	Mực xô	Mixed squid	0.86
9	Tép	Small shrimp	5.50
10	Tôm bộp	Jinga shrimp	0.43
11	Tôm gậy	Small spear shrimp	29.21
12	Tôm lớn	Large shrimp	1.12
13	Tôm sắt	Spear shrimp	0.86
14	Tôm sắt rắn	Large spear shrimp	1.12
15	Tôm thẻ	Shrimp	2.58
	Total		100.00

3. Species composition of group of “trash fish” in >90 CV pair-trawlers in Kien Giang, 2007.

Rank	Scientific name	Percentage (%)
1	<i>Acetes sp.</i>	0.2
2	<i>Alepes kleinii</i>	1.1
3	<i>Alpheus sp.</i>	0.0
4	<i>Ambassis commersoni</i>	0.5
5	<i>Anodontostoma chacunda</i>	5.1
6	<i>Apogon frenatus</i>	0.0
7	<i>Apogon kiensis</i>	0.0
8	<i>Apogon quadrilineatus</i>	0.1
9	<i>Atherinomorus lacunosus</i>	4.5
10	<i>Atule mate</i>	0.7
11	<i>Bregmaceros maclellandii</i>	0.1
12	Broken shrimps	0.1

13	<i>Callionymus richardsoni</i>	0.0
14	<i>Charybdis nanator</i>	0.1
15	<i>Chirocentrus dorab</i>	0.6
16	<i>Dussumieria elopsoidea</i>	0.2
17	<i>Elagastis bipinnulata</i>	0.1
18	<i>Encrasicholina heteroloba</i>	17.1
19	<i>Encrasicholina sp.</i>	2.1
20	<i>Engraulidae</i>	0.0
21	<i>Escualosa thoracata</i>	7.1
22	<i>Gerres erythroureus</i>	0.1
23	<i>Gobiidae</i>	0.1
24	<i>Hemirhamphus intermedius</i>	0.1
25	<i>Hemirhamphus sp.</i>	0.2
26	<i>Hippocampus sp.</i>	0.0
27	<i>Johnius belangeri</i>	0.1
28	<i>Lagocephalus lunaris</i>	0.4
29	<i>Leiognathus abbrevirostris</i>	1.2
30	<i>Leiognathus bindus</i>	0.0
31	<i>Leiognathus blochii</i>	0.7
32	<i>Leiognathus equulus</i>	0.0
33	<i>Leiognathus lineolatus</i>	2.0
34	<i>Leiognathus sp.</i>	0.4
35	<i>Leiognathus stercorarius</i>	2.0
36	<i>Loligo beka</i>	0.4
37	<i>Loligo chinensis</i>	0.1
38	<i>Loligo duvauceli</i>	0.1
39	<i>Loligo sp.</i>	0.1
40	<i>Metapenaeopsis lamellata</i>	0.0
41	<i>Metapenaeopsis stridulans</i>	0.1
42	<i>Metapenaeus affinis</i>	0.0
43	<i>Mugil affinis</i>	0.1
44	<i>Other Biomass</i>	8.2
45	<i>Paramonacanthus nipponensis</i>	0.0
46	<i>Paramonacanthus sp.</i>	0.1
47	<i>Parapenaeopsis cornuta</i>	0.0
48	<i>Parapenaeopsis sp.</i>	0.0
49	<i>Pellona ditchela</i>	0.2
50	<i>Penaeidae</i>	0.0

51	<i>Penaeus semisulcatus</i>	0.0
52	<i>Pennahia anea</i>	1.1
53	<i>pennahia argentata</i>	0.1
54	<i>Pennahia pawak</i>	0.0
55	<i>Pennahia sp.</i>	0.2
56	<i>Pentapodus setosus</i>	0.1
57	<i>Pisodonophis zophistius</i>	0.1
58	<i>Rastrelliger brachysoma</i>	8.8
59	<i>Sardinella gibbosa</i>	6.6
60	<i>Scomberomorus commersonii</i>	0.2
61	<i>Scombridae</i>	0.0
62	<i>Secutor insidiator</i>	0.0
63	<i>Secutor ruconius</i>	3.0
64	<i>Selaroides leptolepis</i>	0.1
65	<i>Sepiella inermis</i>	0.2
66	<i>Sepiella sp.</i>	0.0
67	<i>Sepiolidae</i>	0.1
68	<i>Sphyraena obtusata</i>	0.1
69	<i>Sphyraena sp.</i>	0.1
70	<i>Stolephorus commersonii</i>	19.8
71	<i>Stolephorus indicus</i>	0.1
72	<i>Stolephorus sp.</i>	0.1
73	<i>Terapon jabua</i>	0.0
74	<i>Terapon theraps</i>	0.1
75	<i>Thryssa dussumieri</i>	0.3
76	<i>Trachypenaeus curvirostris</i>	0.1
77	<i>Trachypenaeus malaiana</i>	0.0
78	<i>Trachypenaeus sp.</i>	0.0
79	<i>Trichiurus lepturus</i>	1.3
80	<i>Upeneus japonicus</i>	0.1
81	<i>Upeneus sp.</i>	0.0
82	<i>Upeneus sulphureus</i>	0.6
	Total:	100.0

4. Species composition of the group of “trash fish” in >90 CV otter trawlers in Kien Giang, 2007.

Rank	Scientific name	Percentage (%)
1	<i>Acentrogobius carninus</i>	3.8
2	<i>Apogon kiensis</i>	0.5
3	<i>Apogon poecilopterus</i>	1.5
4	<i>Callionymus richardsoni</i>	4.4
5	<i>Cociella crocodila</i>	2.7
6	<i>Crossorhombus sp.</i>	0.8
7	<i>Cynoglossus sp.</i>	13.2
8	<i>Hoplichthys langsdorfii</i>	0.7
9	<i>Leiognathus berbis</i>	0.5
10	<i>Leiognathus stercorarius</i>	1.2
11	<i>Minous monodactylus</i>	0.8
12	<i>Ophichthus urolophus</i>	4.7
13	<i>Oratosquilla gonypetes</i>	1.0
14	<i>Oratosquilla oratoria</i>	3.3
15	<i>Oratosquilla sp.</i>	1.2
16	<i>Paramonacanthus sp.</i>	16.8
17	<i>Parapercis filamentosus</i>	6.1
18	<i>Portunus sp.</i>	1.4
19	<i>Pseudorhombus oligodon</i>	18.8
20	<i>Rogadius asper</i>	5.0
21	<i>Saurida elongata</i>	2.3
22	<i>Scolopsis taenioptera</i>	2.9
23	<i>Sepiolidae</i>	3.6
24	<i>Trachypenaeus curvirostris</i>	0.1
25	<i>Trachyrhamphus longirostris</i>	0.3
26	<i>Upeneus japonicus</i>	2.5
	Total	100.0

Outcome Rating: Low Rating

Research on the evaluation of the state of the resources is intermittent. There are some noticeable works undertaken but these are infrequent. Fishery dependent data is not collected routinely and is incomplete and independent trawl surveys are intermittent, most likely variable depending on resource availability and may not always result in published, usable research for management purposes. The studies that have been

undertaken in the Southwest Region describe the fishery resources as depleted.

References

FAO. 2010 Report of the first Workshop on the Assessment of Fishery Stocks Status in South and Southeast Asia. Bangkok, 16–19 June 2009. *FAO Fisheries and Aquaculture Report*. No. 913. Rome, FAO. 2010. 30p.

[Online] <http://www.fao.org/docrep/012/i1555e/i1555e00.pdf>

<http://www.fao.org/fileadmin/templates/rap/files/meetings/2013/130930-11-catch.pdf>

<http://www.unuftp.is/static/fellows/document/thong08-prf.pdf>

<http://www.fistenet.gov.vn/marine-capture-fisheries/workshop-on-reviewing-aquaculture-performance-in-the-northern-provinces-30-07-2013/>

LEVEL OF COMPLIANCE	
<i>B2. Best scientific evidence available should be taken into account when designing conservation and management measures.</i>	
LOW	Scientific advice is not taken into account when designing conservation and management measures.
MEDIUM	Scientific advice is taken into account, when designing conservation and management measures. However some areas of discrepancy are identified that could have a significant impact in the long term conservation of the marine environment.
HIGH	Scientific advice is taken into account, when designing conservation and management measures, in a comprehensively manner.

Information Review:

Reports or ongoing studies by local institutions (government academic) describing any results of stock assessment studies done for the most important species in the multispecies trawl fishery by province or by region have been scarce. Reports or ongoing studies by local institutions (government academic) describing results of abundance surveys done for the most important species in the multispecies trawl fishery by province or by region are scarce. The most common method of stock assessment for demersal fishery resources in Vietnam is the so called "swept area" method. However, these survey assessments lack studies on "catchability", the so-called q constant or escape rate from gear of the bottom trawl by single species. Therefore, there is a need to conduct more studies to improve this method of fish stock assessment.

There are few studies mostly by RIMF on fish stock abundance, biology and ecology for some economically important species caught by trawlers, not by province but by depth strata and regional level, such as southwest (Gulf of Thailand), southeast, gulf of Tonkin. Some single species were studied by resource (biomass) and biological characteristics such as goatfish, red big eye, lizard fish etc but by region not by province.

There are no historical fisheries statistics at species levels. The available data are grouped in to commercial groups. Based on this information this data is not suitable for conducting a defensible stock assessment at this point. There have been recent efforts to obtain better fishery data collection in Vietnam. There are intermittent scientific surveys and a lack biological data collection to characterize Vietnam Trawl fishery stocks status. The studies that are available do provide evidence of depleted fishery resources and changes in the biodiversity of the more economically more important species. There is evidence that management acknowledges the need to undertake measures to reduce fishing, most particularly, within the inshore regions and a number of reform programs are either in discussion or planned. There is a range of existing management measures using input controls (engine power restrictions in inshore waters, mesh sizes for different target species, closed areas) although it is highly questionable if the system can effectively implement these measures. Pomperoy *et al.*, 2009 summarized the key challenges for reform in the inshore fisheries of Vietnam as:

1. Serial depletion of near-shore fisheries.
2. Overcapacity of fleet and competition from higher-equipped boats designed for offshore.
3. Lack of management controls and sustainability triggers (e.g. protective catch limits, precautionary management).
4. Continuation and proliferation of illegal fishing activities.
5. Lack of administrative capacity and human resources within fisheries authorities to address

sustainability issues.

Outcome Rating: Low Rating

There is evidence that scientific advice from RIMF and other agencies is made available within the management framework although, at the provincial level there does not appear to be sufficient resources to implement existing conservation and management measures. The key challenge appears to be over-capacity and lack of resources to enforce the regulations to limit larger vessels from fishing inshore waters. Additionally, there were concerns that obtaining better control within the inshore fishery may come at the expense of displacing effort elsewhere and hence may have consequential negative effects.

References

Pomeroy, Nguyen & Thong, 2009. Small-scale marine fisheries policy in Vietnam. *Marine Policy* 33 (2009) 419-428.

FAO. 2010 Report of the first Workshop on the Assessment of Fishery Stocks Status in South and Southeast Asia. Bangkok, 16–19 June 2009. *FAO Fisheries and Aquaculture Report*. No. 913. Rome, FAO. 2010. 30p. [Online] <http://www.fao.org/docrep/012/i1555e/i1555e00.pdf>

C. THE PRECAUTIONARY APPROACH	
LEVEL OF COMPLIANCE	
<i>C1. The precautionary approach is applied in the formulation of management plans.</i>	
LOW	The precautionary approach is not applied in the formulation of management plans.
MEDIUM	The precautionary approach is applied, however not all uncertainties are taken into account.
HIGH	The precautionary approach is applied, taking into account uncertainties relating to the dynamic of fish population (recruitment, mortality, growth and fecundity), and the impact of the fishing activities, such as discards and by-catch of non-target species as well as on the physical environment (Habitats).

Information Review:

Adoption of the precautionary approach (FAO, 1995) requires formal consideration of uncertainty in data quality and stock status. It also states that the level of precaution applied to extraction of fishery resource should increase with level of uncertainty with stock status. Based on the current situation the precautionary principle is not applied in Vietnam trawl fishery in Kien Giang for several reasons:

Data to perform robust stock assessment that allows for the promulgation of biologically based reference points is not available and the reviewers did not find evidence of attempts to perform other risk based approaches that would allow for proxies or triggers to be identified.

Currently, there are no existing reports or ongoing studies by local institutions (government academic) that describe biologically based reference points MSY , B_{MSY} , F_{msy} , F_{lim} or other proxies that describe limits to fishing done for the most important species in the multispecies trawl fishery by province or by region. There are no reports or ongoing studies by local institutions (government academic) describing the benefits of marine protected areas to mitigate effects of trawl fishing activities in the multispecies trawl fishery by province or by region.

However, there were results of an assessment of marine fisheries resources in Vietnam (Nyugen 2002) that showed the MSY yield in the area of 50m depth is about 582,212 tons, whereas the catch in practice has exceeded this level since 1986. The basis of the report would require more detailed review but for instance, in 1998, the catch was 928,272 tons or 1.6 times higher than the MSY identified here. The marine catch in Vietnam has increased 4.5 times during the period 1980 to 2007, from 400,000 to 1,800,000 tons, a yield much higher than the MSY identified in that study (FAO, 2008).

The coastal catch has continued to be higher than the maximum sustainable yield and has continued to show growth. This indicates a situation of over-fishing in sea waters of less than 50m depth.

Moreover, it is uncertain whether fishing pressure is yet decreasing because of the annual increase of small fishing boats. This strongly affects the sustainable development of the sector, and there is a great need for proper policies aimed at reducing fishing pressures in coastal waters.

The reviewers are aware of work undertaken by SFP which considers the implementation of a risk based framework for identifying and evaluating the higher risk fishing practices. This may allow for the identification of triggers which could act as thresholds to exploitation limits.

In the absence of formal stock assessment, a more precautionary approach would be the most advisable and acceptable route. As this is an open fishery, implementation of conservation measures can be highly

Global Trust Certification Ltd, Part of SAI Global Assurances; 3rd Floor, Block 3, Quayside Business Park, Mill Street, Dundalk, Co. Louth, Ireland Tel: 042 932 0912 Fax 042 938 6864

problematic. Measures would be implemented to reduce exploitation to highly conservative levels. There are regulations that limit mesh size, closed areas, fishing vessel engine capacity etc. but to what extent they are effective and if they are implemented effectively, is questionable.

Evidence suggests that mesh sizes of nets are often smaller than the mesh sizes allowed by national regulation. As a consequence the ratio of juvenile and trash fish in the catches is high. There is a high level of by-catch and incidental catch of small-size/juvenile fish. There is evidence that trawls have caused damage to ecosystems such as seabeds and a number of species that are caught are listed under IUCN and it is uncertain if these catches are retained or returned and if there is any supportive national regulations that identify and provide legal recognition.

There are specific regulations that ban destructive fishing techniques, such as explosives, electricity and poison and confirmation that these are now completely phased out would be beneficial for the review.

The government has subsidised the offshore fishing fleet (engine>90 HP). As a result, fishing effort has been increasing and heavily overexploiting coastal areas (due to scarce fish resources offshore).

Efforts to reduce bycatch on trawls impacting other species such as turtles are minimal. There are no Turtle or bird exclusion devices operating.

There is a marine protected area in Kien Giang area but there is no enforcement.

Outcome Rating: Low Rating

The overarching legislation (2004 Fishery Act) does not make reference to the precautionary approach but does set wide objectives for the protection of resources. This is not currently implemented for Kien Giang and the precautionary approach is not applied in the formulation of management plans.

References:

A brief introduction to trawl fishery and management issues in Vietnam (Nguyen Ba Thong) presented at the APFIC Regional Expert Workshop on Tropical Trawl Fishery Management, 30th September - 4th October 2013, Phuket, Thailand

FAO 1995. Code of conduct for responsible fisheries, Rome, 41p

FAO. Fishery and aquaculture country profile. Vietnam. Rome: UN Food and Agriculture Organization; 2008 / http://www.fao.org/fishery/countrysector/FI-CP_VN/en S.

Nguyen Long. Small-scale fisheries management in Vietnam. In: Asia-Pacific Fishery Commission. Interactive mechanisms for small-scale fisheries management report of the regional consultation. RAP Publication 2002/10. Bangkok: FAO Regional Office for Asia and the Pacific; 2002.

D. MANAGEMENT MEASURES**LEVEL OF COMPLIANCE**

D1. The level of fishing permitted should be set according to management advice given by research organisations.

LOW

The level of fishing permitted is not set according to management advice given by research organisations.

MEDIUM

The level of fishing permitted is higher than management advice given by research organisations. However, the difference is not considered to have a significant impact of the sustainability of the stock

HIGH

The level of fishing permitted is set according to management advice given by research organisations.

Information Review:

Currently all the fisheries in Vietnam including trawl fisheries are open access. The problem is closely associated with overcapacity and overfishing and lack of management. From 1990 to 2004, the number of fishermen in the country has almost doubled, rising from 270,600 to 550,000 in 2004. Also over the past two decades, the country's fleet of fishing vessels has increased dramatically both in number and fishing capacity. In the last decade the numbers of trawl vessels increased from 6,850 to approximately 12,000 in Kien Giang.

There are few existing reports or ongoing studies by local institutions (government academic) documenting efforts to minimize over fishing by population dynamics modelling for the most important species of the trawl fishery survey by province and by region. Of all those few reports there is no actual direct applicability for the management of the trawls fishery. DECAFIREF is the government appointed body that advises the management of the fishery and RIMF focus on research for management goals.

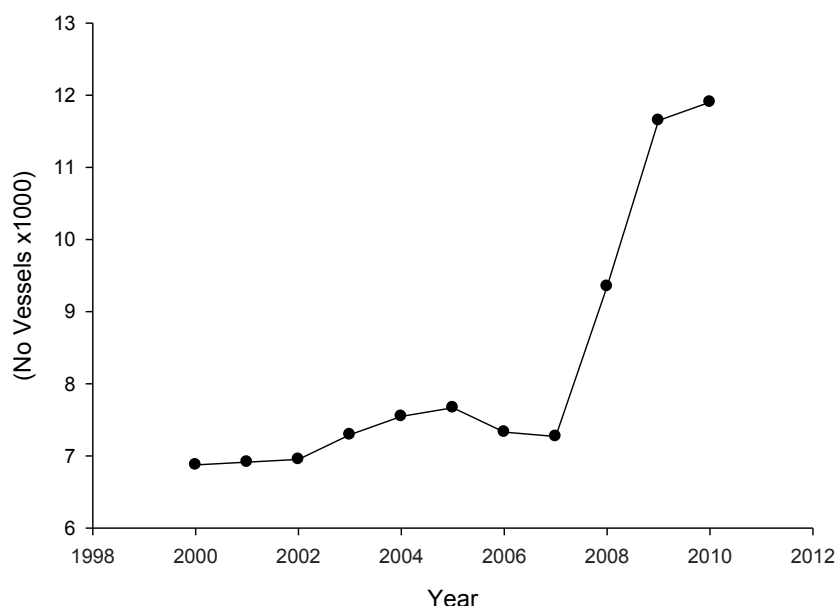


Figure 1. Number of trawl vessels in Kien Giang from 2000 to 2010.

Outcome Rating: Low Rating

The level of fishing permitted is not set according to management advice given by research organisations. There is only sporadic advice available, due to a lack of a concerted data collection system for both fishery dependent and independent sources and fishing level is not controlled or set according to any management objectives. It is noted though that the number of trawlers below 90CV is froze in Kien Giang (Decision No 18/2011/QD-UBND).

References

Thanh, N. V. 2006. Bioeconomic Analysis of the Shrimp Trawl Fishery in the Tonkin Gulf, Vietnam. Master of Science Thesis in Economics and Management, University of Tromso.

Thi, D. V., V. V. Ha, and L. T. Kien. 2004. "Status of the marine resource based on the trawl and gill net surveys in 2003." Technical Report no. 27. Research Institute for Marine Fisheries, Hai Phong, Vietnam.

<http://www.ciem.org.vn/Portals/1/CIEM/Publications/2010/FishReportUoCCiem.pdf>

Pomeroy, Nguyen & Thong, 2009. Small-scale marine fisheries policy in Vietnam. Marine Policy 33 (2009) 419-428.

LEVEL OF COMPLIANCE	
<i>D2. Where excess fishing capacity exist, mechanisms should be in established to reduced capacity to allow for the recovery of the stock to sustainable levels.</i>	
LOW	Mechanisms to allow for recovery of the stock to sustainable levels are not established.
MEDIUM	Mechanisms to allow for recovery of the stock to sustainable levels are somehow established. However there is no evidence of the efficiency of the methods used.
HIGH	Mechanisms are established to reduce capacity to allow for the recovery of the stock to sustainable levels and there are evidences of recovery.

Information Review:

Vietnam fishery agencies previously adopted policies and commonly used management measures such as restriction of access to fishing grounds and Total Allowable Catch (TAC) in an effort to limit the growth of fishing capacity. However management measures aimed at reducing overfishing by reducing fishing capacity in coastal waters have not been successful, and vessel numbers and aggregate capacity in Vietnam have increased at a rapid pace. In Vietnam the problem of reducing capacity is more difficult in coastal small scale fisheries where levels of fishing pressure are severe. It has been documented that highest density of concentration of fishing vessels occur in near shore and coastal areas (86% of vessels operate in coastal areas).

There are existing documents that describe efforts to minimize over fishing either by means of moratorium on new entry of number of vessels, gear restrictions and mesh size. There are efforts by agencies to minimize over fishing: by moratorium on new entry of number of vessels, gear restrictions (mesh size), and a regulation banning the construction of new vessels less than 20HP (Decree 59/2005-ND CP) on conditions for business of fisheries sub-sectors Circular 48/2010/TT-BNNPTNT dated 11 August 2010. There are regulations for mesh size by vessel/type of fishing activity – for example Directive No 02/2006/TT-BTS dated 20 March 2006 documents regulations on bans of fish species, closed season and closed areas, minimum mesh sizes, trawlers and pure seine with light are illegal in coastal waters. For trawlers: below 90 CV, minimum mesh size of the codend is 28 mm, 90—150 CV (34mm), above 150 CV (40mm). For shrimp trawlers: below 45 CV, minimum mesh size of the codend is 20 mm and above 45 CV is 30 mm. There are also regulations on input control measures such as closed season, effort reduction or closed areas to fishing; for example Fisheries law 2003, Decree No 33/2010/ND-CP Circular No 89/2011/TT-BNNPTNT dated 29 Dec 2011, on promulgating the list of closed areas and closed season for capture fishery Directive No 02/2006/TT-BTS.

More recently a government plan to reduce capacity has been conceived for Vietnam. Decision no 1445/QĐ-TT (Aug 2013) indicates that the total number of fishing vessels in Vietnam will be reduced to 110,000 units by 2020 and 95,000 units by 2030 from the current capacity of 126,400. Greater than 90CV Trawlers represent circa 18% of the total. The plan also aims to reduce trawlers by 6.5% per year to 2020 (currently circa 22,500). Therefore, the target is to reduce this to 18,000 by 2015, 12,500 by 2020 and to 8000 by 2030. There is also the NPOA supported by FAO currently awaiting approval by central government.

Outcome Rating: Low Rating

Whilst there are measures in the form of regulations that do have conservation and reduction of effort or capacity in mind, there are no mechanisms that are sufficient for their implementation and evidence does not

indicate that they are sufficient to allow for recovery of the stock to sustainable levels.

References

Thanh, N. V. 2006. Bioeconomic Analysis of the Shrimp Trawl Fishery in the Tonkin Gulf, Vietnam. Master of Science Thesis in Economics and Management, University of Tromsø.

Thi, D. V., V. V. Ha, and L. T. Kien. 2004. "Status of the marine resource based on the trawl and gill net surveys in 2003." Technical Report no. 27. Research Institute for Marine Fisheries, Hai Phong, Vietnam.

<http://www.ciem.org.vn/Portals/1/CIEM/Publications/2010/FishReportUoCCiem.pdf>

Pomeroy, Nguyen & Thong, 2009. Small-scale marine fisheries policy in Vietnam. Marine Policy 33 (2009) 419-428.

LEVEL OF COMPLIANCE	
<i>D3. Management measures should ensure that fishing gear and fishing practices do not have a significant impact on non-target species and the physical environment.</i>	
LOW	There are no management measures to prevent the impact of the fishing methods and fishing practices on non-target species and the physical environment.
MEDIUM	There are management measures to prevent the impact of the fishing methods and fishing practices on non-target species and the physical environment. However it is not science based.
HIGH	There are management measures to prevent the impact of the fishing methods and fishing practices on non-target species and the physical environment. Measures are based on scientific information.

Information Review:

As described, there are management measures for the trawl fishery according to decree 33/2010/nd-cp.

- No trawlers fishing in coastal areas (6nm from shore).
- Trawl fishing vessels with above 90 cv should operate in offshore waters
- Moratorium of newly small shrimp trawlers (below 30CV) and fish trawler (below 90CV)
- Gear restrictions ("2a" meshsize – codend; meshsize of fish trawlers (28 – 40 mm) and , shrimp trawlers (20-30 mm))

Decree 48CP of August 1996 and 91CP of August 1997 also banned illegal fishing methods and promoted resource protection. Directive no. 1/1998/CT-TTG, issued in February 1998, strictly banned the use of explosives, electric impulses and toxic substances to exploit aquatic resources. However, the impact these measures have had on the conservation of the resources, and how they are kept under evaluation based on available science, are unknown.

There is an ongoing project with a focus on the impacts of trawl fisheries on ecosystems called Project REBYC 2-CTI undertaken by D-FISH in Kien Giang. Further clarity on the establishment of this programme and how the results will be incorporated into reform within the management system and measures is not currently known.

A significant component of the catch is made up of the so-called 'trash fish' which consists of low-value small or juvenile fish. Trash fish has been previously described as the most economically important marine fish product based on volume and value in Vietnam (Edwards et al, 2004). Trash fish is caught mainly from trawling activities for higher value species. Trash fish is made up of smaller, most often juvenile species which does not have a higher, human economic value. Previously trash fish accounted for about one third of the catch from trawling in Vietnam (RIMF, 2001). However, this proportion has risen to an estimated 50 percent and even up to 80 percent in some regions such as Kien Giang.

Information on critical habitat protection within trawl fisheries is limited in Vietnam. Historically, although managers established no-trawl areas and mesh size regulations, the restrictions are not enforced and the result is indiscriminate trawling in nearshore habitats throughout the year with no size selectivity leading to the depletion of resources and non-targeted species such as turtles (FAO 1997). According to historical reports, there has been a serious lack of information on the effect of trawling on living marine resources including Vietnam (FAO 2001; FAO 1997). Basic information on potential damaging effects trawling activities in benthic

organisms in many regions was deemed scarce some 15 years ago (FAO 1997). There does not appear to be more recent reports that have provided more analyses of these impacts. FAO reported that heavy chains may be added in the trawls that may impact bottom-dwelling organisms such as shellfish, sponges, sea urchins (FAO 1997) and again, uncertainty of how gear is configured remains.

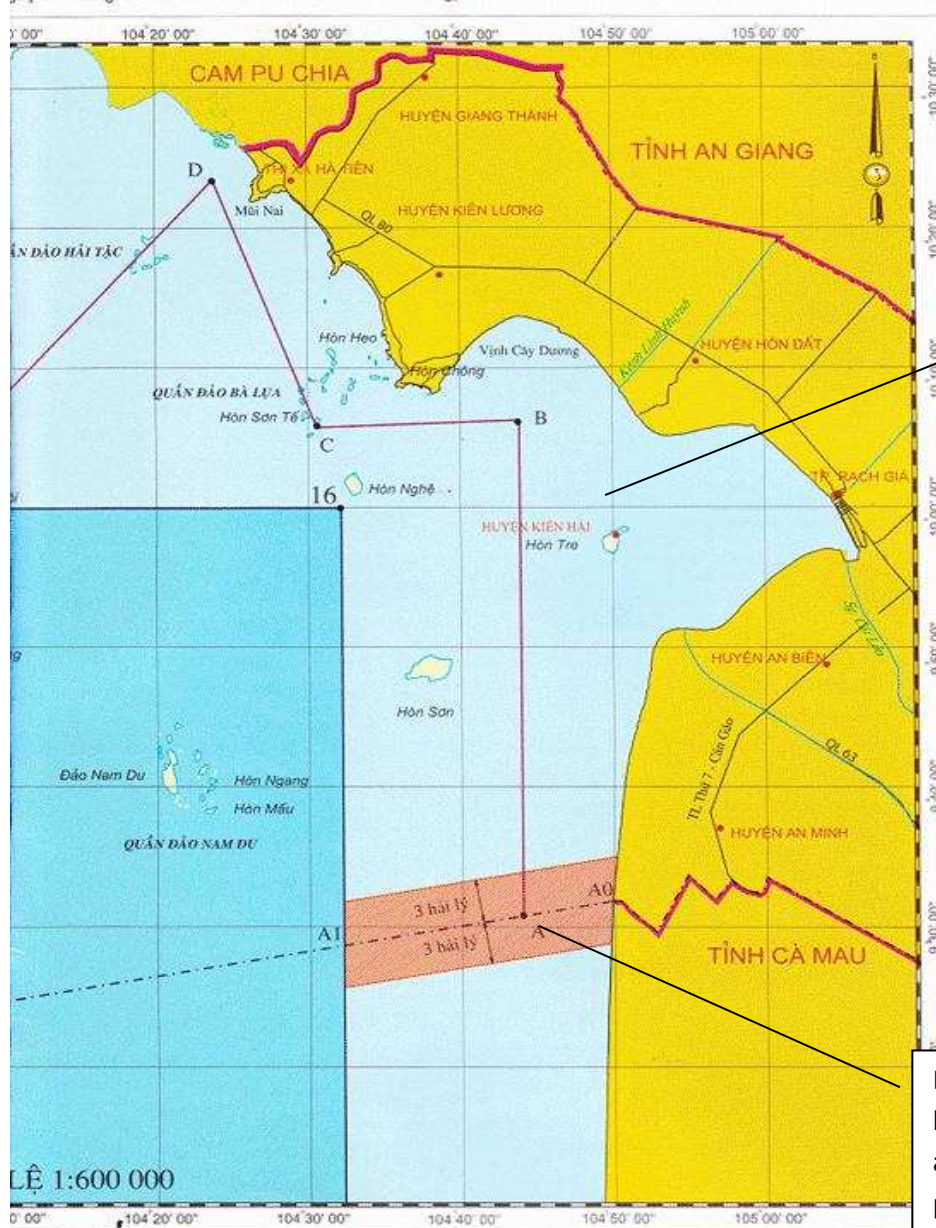
Currently, detailed studies on the effects of trawl fishing on associated important and sensitive habitats such as seagrass or mangroves as well as studies describing any fishery interactions like bycatch of marine mammals, turtles and birds were not available at the provincial level.

However, RIMF in collaboration with SEAFDEC have conducted 3 small projects on experiments of use of JTED, TTED in the Gulf of Tonkin for reduction of juvenile fish and sea turtle since 2001. These studies did identify possible BRD that can be applied in Vietnam trawl fishery. Currently, there are no mitigation efforts the trawl fishery utilizes such as Turtles exclusion devices (TED) or bird exclusion devices (BRD).

REBYC 2- CTI proposes some studies under the pilot project in Kien Giang. There is occurrence of illegal activities that it is contravening the international plan of FAO such as illegal fishing of shark, sea turtle bycatch, and IUCN redlist fishing e.g Dugong. Even though there are no trawl fishing areas in the provinces, it appears that trawlers continue fishing around these near shore habitats There is also existing information that trawlers operating in Kien Giang are capturing species listed in IUCN with protected, vulnerable and endangered status.

HUY SẴN TRÊN BIỂN KIEN GIANG

(gày 07 tháng 04 năm 2011 của UBND tỉnh Kiên Giang)



Close season applied in this area (ABCDE)

Buffer zone between Ca Mau and Kien Giang province

Zonation of Fishing Areas for trawl boats in Kien Giang

A summary of zonation requirements as follows:

- <20 CV- fishing in Coastal water
- 20-90 CV - fishing in nearshore and offshore waters
- 90 CV fishing in offshore waters only;

Additionally,

- Vessels > 90CV have to record fishing logbook

- Kien Giang has identified the spawning areas/nursery areas to protect, total area of these critical habitat of 23,351 ha (Decision No 2601/QĐ-UBND).
- Kien Giang operates a close season from April to June.
- Fishing vessels are obligated to display their horse power group (fleet).
- All licensed vessels must produce a monthly fishing report
- Regulations for min. fish sizes, mesh sizes and legal gears.

List of species listed in IUCN with current status commonly found on the Multispecies trawl

Fishery species in Kien Giang.

Vietnamese Name	English Name	Scientific Name	Classification	Species Present in Kiên Giang
Cá Cháo lớn	Indo-Pacific tarpon	<i>Megalops cyprinoides</i> (Broussonet, 1782)	VU	X
Cá cháo biển	Ladyfish	<i>Slops saurus</i> Linnaeus, 1766	VU	X
Cá Mòi đường	Bonefish	<i>Albula vulpes</i> (Linnaeus, 1758)	VU	X
Cá mòi không răng chacun	Chacunda gizzard shad	<i>Anodontostoma chacunda</i> (Hamilton, 1822)	VU	X
Cá Mòi mõm tròn	Bloch's gizzard shad	<i>Nematalosa nasus</i>	VU	X
Cá Mòi đường	Bonefish	<i>Albula vulpes</i> (Linnaeus, 1758)	VU	X
Cá Mòi không răng chacun	Chacunda gizzard shad	<i>Anodontostoma chacunda</i> (Hamilton, 1822)	VU	X
Cá Ngựa gai	Thorny seahorse	<i>Hippocampus histrix</i> Kaup, 1856	VU	X
Cá Chìa vôi mõm răng cưa		<i>Trachyrhamphus serratus</i> (Temminck & Schlegel, 1850)	VU	X
Cá Mú sọc trắng	Slender grouper	<i>Anyperodon leucogrammicus</i> (Valenciennes, 1828)		X
Cá Song mỡ (cá Mú ruồi)	Greasy grouper	<i>Epinephelus tauvina</i> (Forsskal, 1775)	VU	X

Global Trust Certification Ltd, Part of SAI Global Assurances; 3rd Floor, Block 3, Quayside Business Park, Mill Street, Dundalk, Co. Louth, Ireland Tel: 042 932 0912 Fax 042 938 6864

Cá Bàng chải đầu đen	Moon wrasse	<i>Thalassoma lunare</i> (Linnaeus, 1758)	VU	X
Ốc đụn cái		<i>Trochus niloticus</i> Linnaeus, 1767	CR	X
Ốc Kim khôi	Horned Helmet	<i>Cassis cornuta</i> (Linnaeus, 1758)	VU	X
Tôm vồ dẹp trắng (Tôm vồ biển cạn)		<i>Thenus orientalis</i> (Lund, 1793)	VU	X
Quản đồng (Đú)	Loggerhead	<i>Cretta caretta</i> Linnaeus, 1909	CR	X
Đồi mồi	Hawksbill	<i>Eretmochelys imbricata</i> (Linnaeus, 1766)	EN	X
Cá Ngựa đen (cá Ngựa lớn)	Spotted seahorse	<i>Hippocampus kuda</i> B leeker, 1852	EN	X
Cá Bò râu	Bearded leatherjacket	<i>Anacanthus barbatus</i> (Gray, 1830)	EN	X
Ốc đụn đực		<i>Tectus pyramis</i> (Born, 1778)	EN	X
Bào ngư bầu dục		<i>Halotis ovina</i> Gmelin, 1791	VU	X
Trai ngọc môi đen		<i>Pinctada margaritifera</i> (Linnaeus, 1758)	VU	X
Trai Ngọc môi vàng	Yellow Lip Pearl Shell	<i>Pinctada maxima</i> (Jameson, 1901)	VU	X
Trai Ngọc nữ		<i>Pteria penguin</i> (Roding, 1798)	VU	X
Trai tai tượng nhỏ	Fluted Giant Clam	<i>Tridacna squamosa</i> Lamarch, 1819	VU	X
Hải sâm mít (Đồn đột mít)		<i>Actinopyga echinites</i> (Jaeger, 1833)	VU	X
Hải sâm dừa (Đồn đột dừa)		<i>Actinopyga mauritiana</i> (Quoy & Gaimard, 1833)	VU	X
Bò biển (cá Cúí, Heo biển, Nàng tiên cá)		<i>Dugong dugon</i> (Muller, 1776)	CR	X

Cá Bống bớp (cá Bớp, cá Bống dứa)	Four-eyed sleeper	<i>Bostrichthys sinensis</i> Lacepède, 1801	CR	X
Cá Đường (Cá sủi giầy)	Bronze croaker	<i>Otolithoides biauritus</i> (Cantor, 1849)	VU	X

Outcome Rating: Low Rating

Whilst there are some management measures that are designed to limit impact of the fishing methods and practices on the physical environment and to a lesser extent, non target species, they are unproven with respect to both their implementation and ineffective. The outcome rating has been left low for these reasons. Further evidence to substantiate the degree of implementation through effective enforcement is required to improve the score to Medium.

References

Edwards P, Thuan LA, Allan GL. A survey of marine trash fish and fish meal as aquaculture feed ingredients in Vietnam. Canberra: Australian Centre for International Agricultural Research (2004).

<http://aci-ar.gov.au/files/node/554/wp57.pdf>

A brief introduction to trawl fishery and management issues in Vietnam (Nguyen Ba Thong) presented at the APFIC Regional Expert Workshop on Tropical Trawl Fishery Management, 30th September - 4th October 2013, Phuket, Thailand.

E. IMPLEMENTATION	
LEVEL OF COMPLIANCE	
<i>E1. There should be a framework for sanctions of violation of Laws and regulations.</i>	
LOW	A framework for sanctions of violation of Laws and regulations do not efficiently exist.
MEDIUM ✓	A framework for sanctions of violation of Laws and regulations do exist but do not work efficiently.
HIGH	A framework for sanctions of violation of Laws and regulations exists and is proven to be efficient.

Information Review:

Marine capture Fisheries inspection lies under the Agriculture inspection arm of DARD who have the responsibility for enforcement and sanctions of violation. Sub-DECAFIREFP provides and renews fishing licenses and fishing vessel registration.

There is a system of fines and sanctions for violations of the fishing law created in 2004: Under Decree No 31/2010/ND-CP, PROVIDING FOR SANCTIONING OF ADMINISTRATIVE VIOLATIONS IN THE FISHERIES DOMAIN. An excerpt is included:

“The fine levels for acts of exploiting aquatic resources with a weight of caught aquatic species of sizes smaller than the sizes permitted for mixed exploitation shall be as follows:

- a) A fine of between VND 500,000 and VND 1,500,000 if the weight exceeds the permitted level of mixed exploitation from 20 kg to under 100kg;*
- b) A fine of between VND 1,500,000 and VND 3,000,000 if the weight exceeds the permitted level of mixed exploitation from 100 kg to under 500kg*
- c) A fine of between VND 3,000,000 and VND 5,000,000 if the weight exceeds the permitted level of mixed exploitation from 500 kg to under 1,000kg ;*
- d) A fine of between VND 5,000,000 and VND 10,000,000 if the weight exceeds the permitted level of mixed exploitation over 1,000 kg.”*

However, evidence and communications suggest that implementation of sanctions for violations have been quite unsuccessful. Over the last decade it has been widely recognised that Vietnam’s fisheries, in particular the near-shore fisheries are being exploited unsustainably. For the off-shore fishery, TACs are no longer widely used because of problems with data accuracy and comprehensiveness which is required to calculate reliable maximum sustainable yields. As a result, production targets are usually set out in provincial development plans that place a heavy emphasis on economic growth.

Marine fisheries in Vietnam are managed according to engine size of the fishing vessel the size of the boat engine and the location of fishing operations (Decree 123/2006/ND-CP, Article 5).

- Vessels without an engine or with engines less than 20hp should operate between 1-6nm from the shore
- Vessels with engines between 21–90hp should operate in areas 7-24 nm from the shore,
- Vessels with engines over 90hp should operate in areas 25-350nm from the shore.

Moreover, vessel operators should obtain marine fishing licenses depending on where they wish to fish (near-to-shore vs offshore), the size of the boat engine, and gear type.

Outcome Rating: Medium Rating:

A framework for sanctions of violation of Laws and regulations do exist but do not work efficiently.

References

<http://www.ecolex.org/ecolex/ledge/view/SearchResults;DIDPFDSIjsessionid=62DDE97E07DFDA800931741F03E88682?action=table.SetPage&includeFields=all&page=1&query=fisheries+and+vietnam&sortField=score&tableId=1>

LEVEL OF COMPLIANCE	
<i>E2. A management system for fisheries control and enforcement should be established.</i>	
LOW	A management system for fisheries control and enforcement is not established.
MEDIUM	A management system for fisheries control and enforcement is established but do not work efficiently.
HIGH	A management system for fisheries control and enforcement is established and work efficiently.

Information Review:

There are two specific enforcement agencies responsible for enforcement of the fisheries law: Fisheries Surveillance and Fisheries Inspection. Furthermore The police and Coast Guard also have a minor role in enforcing the fisheries regulations. However enforcement is limited because limited budget for fuel to patrol. Information on the resources available for enforcement by each province was not available at the time of review. However, there are about 7 vessels operating in Kien Giang and about 40 patrol vessels nationwide, but some are very old and out of order due to limited financial sources for operating and most of the assets are not operational due to the limitations mentioned above. For Kieng Giang however, enforcement is described as 'one of the better' regions.

There exists a decree of fines for violations on regulations of the trawl fishery under Decree-31/ND-CP2013.

There is an existing fishing vessel registry under Decree-59/2005-ND-CP. There is a logbook program where fishermen report catch species fishing area and size. Under the regulations on marine capture fishery, fishers/vessel owners have obligation to provide data as follows:

- Log book data for all types of fishing vessels from 20 CV
- Catch/landing reports for fishing vessels which were issued fishing licenses;
- Port data sampling conducted by local fisheries agencies such as Sub-DECAFIREP
- Data collected including categorized as:
 - Vessel information: registry No, fishing gear, vessels owner's or skipper's name
 - Fishing operational: fishing ground, fishing gear, number of crew, trip duration, operation costs...
 - Catch information: name of main species/commercial groups, their corresponding weight, prices at landing sites/

Each province has its own database for management of landing data samples, fishing vessel registry/registration. There is a Fishbase website for Vietnam marine resources but it is not updated regularly. There are existing reports of recent enforcement activities but it is not clear if it is at a provincial scale. There is a booklet on fisheries regulations and guidance for fishermen to report their catch.

Demonstration the level of compliance and reports on illegal activities are documented on provincial reports where they compile the number of conflicts/violations happened annually, produced and reported by provincial agencies, e.g. Sub-DECAFIREP, normally annual reports. Further evidence and clarification of the content of these reports would be beneficial to the review.

References:

Thanh, N. V. 2006. Bioeconomic Analysis of the Shrimp Trawl Fishery in the Tonkin Gulf, Vietnam. Master of

Science Thesis in Economics and Management, University of Tromsø.

<http://munin.uit.no/bitstream/handle/10037/334/thesis.pdf?sequence=1>

KEY STAKEHOLDERS

The review team is extremely grateful for the assistance, commentary and documentation provided by SFP and MARD staff.

Tuong Phi Lai, SFP Vietnam.

Nguyen Ba Thong, Fisheries Management Expert

Vietnam Fund for Aquatic Resources Reproduction (VIFARR) Ministry of Agriculture and Rural Development (MARD), Vietnam.

REFERENCES

Edwards P, Thuan LA, Allan GL. A survey of marine trash fish and fish meal aquaculture feed ingredients in Vietnam. Canberra: Australian Centre for International Agricultural Research (2004). <http://aci-ar.gov.au/files/node/554/wp57.pdf>

<http://www.apfic.org/attachments/article/92/BRIEF%20INTRODUCTION%20TO%20VIETNAM%20TRAWL%20FISHERY.pdf>

Thanh, N. V. 2006. Bioeconomic Analysis of the Shrimp Trawl Fishery in the Tonkin Gulf, Vietnam. Master of Science Thesis in Economics and Management, University of Tromsø.

Thi, D. V., V. V. Ha, and L. T. Kien. 2004. "Status of the marine resource based on the trawl and gill net surveys in 2003." Technical Report no. 27. Research Institute for Marine Fisheries, Hai Phong, Vietnam.

<http://www.ciem.org.vn/Portals/1/CIEM/Publications/2010/FishReportUoCCiem.pdf>

FAO 1995. Code of conduct for responsible fisheries, Rome, 41p

Pomeroy, Nguyen & Thong, 2009. Small-scale marine fisheries policy in Vietnam. Marine Policy 33 (2009) 419-428.

FAO. 2010 Report of the first Workshop on the Assessment of Fishery Stocks Status in South and Southeast Asia. Bangkok, 16–19 June 2009. FAO Fisheries and Aquaculture Report. No. 913. Rome, FAO. 2010. 30p. [Online]

A brief introduction to trawl fishery and management issues in Vietnam" (Nguyen Ba Thong) presented at the APFIC Regional Expert Workshop on Tropical Trawl Fishery Management, 30th September --- 4th October 2013, Phuket, Thailand.

<http://www.fao.org/fileadmin/templates/rap/files/meetings/2013/130930-11-catch.pdf>

<http://www.unuftp.is/static/fellows/document/thong08-prf.pdf>

Appendix 1

Population parameters of species from the Multispecies Trawl fishery from Kien Giang.