

# Updated Action Plan for Ecuador Mahi-mahi Fishery Improvement Project (FIP) with Recommendations



Photo: Jesse Marsh

## UPDATE REPORT

By

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## CONTENTS

<b>INTRODUCTION .....</b>	<b>1</b>
<b>1 DEFINITION OF THE STOCK.....</b>	<b>2</b>
1.1 Genetic analysis.....	2
1.2 Parasite analysis.....	2
1.3 Otolith micro-elemental analysis.....	2
1.4 Training national technicians .....	3
1.5 National mahi workshop (genetics, stock assessment & status, biological characteristics, monitoring) .....	3
1.6 International mahi workshop (genetics, stock assessment and status, biological characteristics, monitoring) .....	4
1.7 Define Practical Stock Unit.....	4
1.8 Bilateral Technical Workshop with Peru .....	5
<b>2. STOCK STATUS AND ABUNDANCE INDICES .....</b>	<b>6</b>
2.1 VPA assessment .....	6
2.2 Develop CPUE series (index of abundance/ status of resource).....	6
2.3 Length-based assessment .....	7
2.4 Egg-size assessment .....	7
2.5 Literature review on <i>mahi mahi</i> assessment and management.....	7
2.6 Ageing.....	8
2.7 5-95 Percentile analysis.....	8
2.8 Link 5-95 percentile analysis to Bmsy .....	9
<b>3 MONITORING AND EVALUATION .....</b>	<b>9</b>
3.1 Characterization of Ecuadorian artisanal mahi mahi fishery .....	10
3.2 Development and training for observers.....	10
3.3 Design a mahi observer program .....	10
3.4 Literature review of pelagic ecosystems.....	11
3.5 Review of ecosystem/ trophic models.....	11
<b>4 TURTLE BYCATCH REDUCTION.....</b>	<b>12</b>
4.1 Determine bycatch levels for fibras fishing with nets.....	12
4.2 Implement and confirm turtle handling procedures .....	12
4.3 Conversions of longline fishery to circle hooks.....	13
4.4 Eliminate tariffs on circular hooks .....	13
4.5 Manufacture of circle hooks at national level .....	14
4.6 Project 'T' to prevent entanglement of turtles .....	14
4.7 Long-term monitoring of turtle interactions.....	15
4.8 OFCF research cruises .....	15
<b>5. EDUCATION AND OUTREACH .....</b>	<b>16</b>
5.1 Develop a communications strategy.....	16
5.2 Program to educate fishermen on resource state, changes in fishery etc. ....	16
5.3 Program to educate fishermen on bycatch reduction .....	17
5.4 Incorporate new education and outreach initiatives into existing compulsory programs.....	17
<b>6. MANAGEMENT AND GOVERNANCE .....</b>	<b>17</b>
6.1 Develop strategic research plan for mahi .....	17
6.2 Evaluate options to develop international agreement on shared stocks .....	18
6.3 Describe decision-making processes.....	18
6.4 Improve co-ordination between monitoring and enforcement .....	19
6.5 Identify new schemes for co-management .....	19
6.6 Develop and implement Code of Responsible Fishing.....	20

6.7	Revise internal and external review of the management systems.....	20
6.8	Develop timelines, budget and indicators in the mahi action plan .....	20
6.9	Incorporate an ecosystem management strategy into mahi National Plan .....	20
6.10	..... Establish National Plan of Action for mahi	
	.....	21
6.11	..... International Management Agreement	
	.....	21
<b>7.</b>	<b>NEXT STEPS .....</b>	<b>22</b>
	<b>APPENDIX 1: Original outline of proposed tasks for Ecuador <i>Mahi mahi</i> FIP Action Plan .....</b>	<b>24</b>
	<b>APPENDIX 2: Revised outline of proposed tasks for 2014 Ecuador <i>Mahi mahi</i> FIP Action Plan .....</b>	<b>25</b>

## INTRODUCTION

The purpose of this document is to provide update information on the number of ongoing and new projects/ tasks that were originally proposed during the November 2009 FIP planning workshop and revised during the 2014 FIP Review Meeting, both held in Manta, Ecuador. This includes information on the level of priority (high or medium), current status (ongoing or new) and expected timeframe to complete the initial task. The priority level for each project was assigned according to the highest level within the FIP scoping document (see Appendix 1 for further details of scoring MSC performance indicators).

It is anticipated that the Undersecretary of Fisheries Resources (SRP) will lead the FIP Action Plan and coordinate the development of each task, with assistance from the National Fisheries Institute (INP), and that both will call on World Wildlife Fund (WWF) and Conservation International (CI) to participate. It is recognized that several tasks are currently ongoing, and are therefore not described in detail here. This document serves primarily as a guide to the type of tasks required in the Action Plan to reach the Marine Stewardship Council (MSC) Standard. The Plan itself must be further developed to include timings and associated budgets in addition to developing detailed terms of reference/ memorandum of understanding for participating institutions/ stakeholders. The results generated from the Action Plan should have periodic internal and external reviews to ensure they will meet the MSC standard.

A summary of all tasks is provided in Appendix 1; the original table is followed by a revised table (Appendix 2) to allow comparison of improvements. Recommended new projects and incomplete tasks from Appendix 2 are included in Appendix 3.

## 1 DEFINITION OF THE STOCK

One of the key issues raised during the 2009 FIP workshop was the lack of information on the overall temporal/spatial distribution of the stock. This is important to help determine all sources of fishing mortality for stock assessment and management purposes. Recent genetic analysis indicates that no genetic differences have been found within the greater Pacific Ocean and that mahi mahi in the entire Pacific may constitute a single genetic population. However, if subsequent information demonstrates that stocks within the greater population are suitable for management on a smaller scale (e.g., limited exchange across subregions such that exploitation in one subregion would not adversely impact other subregions), then the unit of certification could be limited to a stock within the population. Information presented at the 2014 FIP meeting concluded that southern hemisphere mahi mahi in the eastern tropical Pacific are sufficiently separate from northern hemisphere mahi mahi to constitute a separate stock for management purposes. This conclusion lends support to the stock consensus from the 2013 FIP meeting to define the stock based on fishing patterns in the region: fishing for mahi mahi occurs primarily by Peru (>75% of the eastern Pacific catch since 2008) and Ecuador (>16%), and limited catch occurs to the north, south, or west, leading to a unit stock as that fished by Peru and Ecuador in the eastern Pacific ocean. Conducting a stock assessment on the stock unit selected with the limited information available, leading to reference points and a harvest strategy, remains as a critical need. These stock status issues were set aside into “phase 2” for the FIP, with new tasks and guidelines added during the 2013 FIP meeting.

### 1.1 Genetic analysis

The conclusion from the Concepto Azul report agreed with previous analyses that a single trans-Pacific population exists. It is unlikely that further research will identify genetic subunits, so continued genetic research will be useful for information on the species but will not likely contribute further to definition of a unit stock. Task complete for FIP purposes.

Working group	SRP
Priority	Complete
Status	Complete
Timeframe	Follow up report by end 2013
MSC Performance Indicator(s)	1.2.3 Stock status: information and monitoring

### 1.2 Parasite analysis

Low likelihood of success led to dropping this project

Working group	INP – SRP
Priority	Removed
Status	Removed
Timeframe	Removed
MSC Performance Indicator(s)	1.2.3 Stock status: information and monitoring

### 1.3 Otolith micro-elemental analysis

Information received after the 2012 FIP meeting determined that a micro element analysis could provide information on stock structure by testing a null hypothesis of a single Pacific-wide stock against an alternate hypothesis of separate stocks. A micro element analysis could be done for about \$50,000 to

test three regions of the Pacific for similarity and differences<sup>1</sup>. SRP agreed at the 2013 meeting that the methodology has merit and is worth considering further. At the 2014 meeting the participants agreed to have a proposal prepared for the International Workshop, for discussion and developing a consensus position. If scientists agree on the importance of developing this study, sharing the cost among interested agencies (Inter-American Tropical Tuna Commission- IATTC, SRP-Ecuador, IMARPE-Peru's Institute of the Sea) and stakeholders (WWF, CI, ASOEXPEBLA- the Whitefish Exporters Association) could bring down the cost per participant, and could help secure international collaboration.

Working group	INP (otolith collection) – SRP – MRAG
Priority	Medium
Status	Removed in 2102, added in 2014
Timeframe	Oct 2014
MSC Performance Indicator(s)	1.2.3 Stock status: information and monitoring

**Milestones for Activity 1.3 are shown below.**

	Commencing	Ending
Milestone 1: Proposal to present at International Workshop	Quarter 2 2014	Quarter 3 2014
Milestone 2: Decision following International Workshop	Quarter 4 2014	Quarter 4 2014

#### **1.4 Training national technicians**

SRP has undertaken a widespread program for training scientists, managers, and technicians. SRP prepared a technical report that described all the training that Ecuadorian scientists and technicians have received on a variety of issues related to biology, ecology, management, bycatch, and other topics for review within this evaluation of this FIP.

This effectively completes this subtask; training is ongoing.

Working group	INP – SRP
Priority	Complete
Status	Complete
Timeframe	Ongoing
MSC Performance Indicator(s)	1.2.3 Stock status: information and monitoring

#### **1.5 National mahi workshop (genetics, stock assessment & status, biological characteristics, monitoring)**

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<sup>1</sup> Dr. Yongwen Gao, a scientist at the Makah Tribe in Washington State, is an expert in otolith microelement analysis. He could perform an analysis to test stable isotope ratios of carbon and oxygen from mahi mahi otoliths. The design would consist of 50 otoliths from each of three regions (eastern Pacific south of the equator, eastern Pacific north of the equator, and the western Pacific) tested at the nucleus and the margin. This would determine if the fish caught in a region have consistent spawning areas (from the nucleus) and traveled together (margin), and if the spawning areas and the areas traveled differed among regions. This would include otolith preparation, microsampling, 13C/12C and 18O/16O analyses, interpretation of the isotopic data and drafting a manuscript. He worked for Bob Trumble for several years as a post-doc.

The SRP conducted a workshop in Santa Rosa de Salinas. The National mahi mahi workshop served mainly to present to the key stakeholders (but mainly to fishers), the results or progress of a series of investigations led by the SRP. SRP committed to a series of small workshops on a regular basis to update stakeholders on the status of the management and research.

These activities complete this subtask.

Working group	INP – SRP – WWF– Fishers Cooperatives
Priority	Complete
Status	Complete
Timeframe	Ongoing
MSC Performance Indicator(s)	1.1.1 Stock status; 1.1.2 Reference Points; 1.2.3 Information and monitoring; 1.2.4 Stock assessment

### **1.6 International mahi workshop (genetics, stock assessment and status, biological characteristics, monitoring)**

The SRP has discussed plans for an international workshop with IATTC science staff and some other key countries from Central America; VMAP will communicate formally with the IATTC director to announce the workshop to be held in October of 2014. Although the details of the meeting are still incomplete, planning is underway for the conference. It was recommended that specific international workshops be developed to bring together international experts on a similar number of topics. A discussion of international cooperation on data collection should occur.

Working group	IATTC – INP – SRP – WWF – CI
Priority	High
Status	New
Timeframe	Expected in Winter 2014
MSC Performance Indicator(s)	1.1.1 Stock status; 1.1.2 Reference Points; 1.2.3 Information and monitoring; 1.2.4 Stock assessment

**Milestones for Activity 1.6 are shown below.**

	Commencing	Ending
Milestone 1: Plan International Workshop	Quarter 2 2014	Quarter 3 2014
Milestone 2: Hold International Workshop	Quarter 4 2014	Quarter 4 2014

### **1.7 Define Practical Stock Unit**

The FIP participants discussed information suggesting that a southern stock exists separate from a northern stock. The INP offered to provide documents to the SRP and WWF staff collaborating with the IATTC, which could help support the notion that there is a southern stock of mahi. The better a unit stock can be defined, based on justifiable evidence such as movement of isotherms and circulation of fish, the better for stock definition and assessment. The participants recognized a fall back option of conservative harvest strategy, similar in concept to the certified Pacific Dungeness crab fishery. This

would probably involve a conservative minimum size limit, seasonal closures and CPUE monitoring from Peru and Ecuador, as they dominate landings.

Working group	INP – SRP – WWF –IATTC
Priority	High
Status	New
Timeframe	Expected in Quarter 4 2014
MSC Performance Indicator(s)	1.1.1 Stock status; 1.1.2 Reference Points; 1.2.3 Information and monitoring; 1.2.4 Stock assessment

**Milestones for Activity 1.7 are shown below.**

	Commencing	Ending
Milestone 1: Assemble and report on evidence for a southern stock	Quarter 2 2014	Quarter 3 2014
Milestone 2: Present evidence and develop consensus position at International Workshop	Quarter 4 2014	Quarter 4 2014

### **1.8 Bilateral Technical Workshop with Peru**

A cooperation agreement between the INP and IMARPE in Peru could form the basis to organize a bilateral workshop between Ecuador and Peru to demonstrate where we are with science and management of the mahi resource. The workshop could be an opportunity to show the data and management measures that each country has in place, and explore the possibility of a binational management regime, for example on the basis of CPUE. This should occur before the International Workshop. The INP offered to send a formal letter of invitation to their peers of IMARPE. It was also said that the best time for holding this Workshop would be in August 2014 (i.e., before the international workshop, in order to start creating an atmosphere of trust and cooperation between the two countries).

Working group	INP – IMARPE
Priority	High
Status	New
Timeframe	Expected by Quarter 4 2014
MSC Performance Indicator(s)	1.1.1 Stock status; 1.1.2 Reference Points; 1.2.3 Information and monitoring; 1.2.4 Stock assessment; 3.1.1 legal framework; 3.1.2 Consultation; 3.1.3 Long term objectives; 3.2.2 Decision making process; 3.2.3 Compliance; 3.2.5 Management performance evaluation

**Milestones for Activity 1.8 are shown below.**



	Commencing	Ending
Milestone 1: Plan for bilateral workshop	Quarter 2 2014	Quarter 3 2014
Milestone 2: Conduct bilateral workshop	Quarter 3 2014	Quarter 3 2014

## 2. STOCK STATUS AND ABUNDANCE INDICES

To date, limited information exists on the current status and trends of the mahi resource. Since October 2008, improvements have been made to the Ecuador national data collection program that may facilitate the development of an assessment tool and a better understanding of the status of the stock. A number of studies are currently ongoing and include development of several assessment methodologies such as Virtual Population Analysis (VPA), length-based and egg-size assessments. In addition, recent catch per unit effort (CPUE) data show clear trends of declining relative abundance throughout the fishing season that could indicate levels of both natural and fishing mortality in addition to emigration to other areas inaccessible to the fleet. Other biological metrics such as temporal/spatial changes in average length may also be considered for monitoring purposes. These issues are also expected to be addressed in the international workshops (see above).

During an MSC assessment, the stock status could be scored under the MSC risk-based framework (RBF). The RBF conducted in 2009 indicated a conditional pass for P1.1.1. Therefore, it is likely that all subsequent MSC re-certifications of the stock will require more formal assessment techniques currently being developed, as RBF cannot be used to re-certify when P1.1.1 receives a conditional pass. Due to the timescale necessary to develop robust stock assessment techniques, this research has been highlighted as high priority.

### 2.1 VPA assessment

Age-based modeling such as VPA is a good long-term objective, but given the lack of data and recognizing the log time series required, not practical in the short term.

Working group	INP – SRP
Priority	High
Status	Inactive pending suitable data
Timeframe	Very long term – likely more than 10 years
MSC Performance Indicator(s)	1.1.1 Stock status 1.1.2 Reference points 1.2.4 Assessment of stock status

### 2.2 Develop CPUE series (index of abundance/ status of resource)

SRP has maintained a consistent catch record and has begun a standardized collection of data for calculating CPUE. SRP and IATTC staff have developed a CPUE index that both parties believe will provide consistent information. The IATTC reports that the Ecuador CPUE and biological data will be sufficient for tracking the fishery, even in the absence of comparable data from Peru. SRP and IATTC expect to complete an initial report on Ecuador CPUE by November 2013, and a finalized, published report by the third quarter 2014; they expect a comparison with purse seine data to be completed by June 2014. Data collection will continue.

The progress on this subtask is sufficient to consider that a CPUE series has been developed. However, the CPUE results will not likely meet the stock assessment requirements. The CPUE series and the series from other parameters alone cannot link to Bmsy or Bmsy proxy as required by the MSC.

Working group	SRP – IATTC
Priority	Complete
Status	Completed
Timeframe	Ongoing data collection and analysis; report at end of 2014
MSC Performance Indicator(s)	1.1.1 Stock status 1.1.2 Reference points 1.2.4 Assessment of stock status

### 2.3 Length-based assessment

The length-based methods are not currently part of the stock status evaluation, removed from the action plan in favor of the work underway with IATTC. But these methods could provide a fall back analysis in case other methods do not provide sufficient robustness to meet the MSC requirements and could provide the link to Bmsy.

Working group	SRP – IATTC
Priority	Removed
Status	Removed from FIP
Timeframe	Removed
MSC Performance Indicator(s)	1.1.1 Stock status 1.1.2 Reference points 1.2.4 Assessment of stock status

### 2.4 Egg-size assessment

Information on gonad maturity continues to be useful for biological information, but egg-size data do not appear as useful as a component of the efforts to determine stock status.

Working group	INP – SRP
Priority	Removed
Status	Removed
Timeframe	Removed from stock status
MSC Performance Indicator(s)	1.1.1 Stock status 1.1.2 Reference points 1.2.4 Assessment of stock status

### 2.5 Literature review on *mahi mahi* assessment and management

SRP and IATTC recognized the value of this activity and committed to work jointly on producing a report. IATTC, as part of its help with the CPUE subtask, will work with SRP to provide a report on stock assessment and management by the end of 2014.

Working group	INP – SRP – IATTC
Priority	High
Status	Ongoing
Timeframe	Due by end of 2014

MSC Performance Indicator(s)	1.1.1 Stock status 1.1.2 Reference points 2.1.1 Harvest strategy 1.2.2 Harvest control rules and tools 1.2.3 Information and monitoring 1.2.4 Assessment of stock status
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**Milestones for Activity 2.5 are shown below.**

	Commencing	Ending
Milestone 1: Report summarizing previous actions taken by other countries to manage and evaluate mahi stocks	Quarter 2 2014	Quarter 4 2014

## 2.6 Ageing

SRP has established a collaborative project with CICIMAR of Mexico to begin continuing reading of mahi mahi scales. CICIMAR scientists help the SRP in the data analysis, and also train the national staff. After 3-4 years of age data collections, SRP and CICIMAR will evaluate the age reading program to determine the value of establishing it as a permanent program.

Working group	SRP – CICIMAR
Priority	Medium
Status	Ongoing
Timeframe	SRP and CICIMAR to discuss to discuss relevance during 2014 after several years of data collection
MSC Performance Indicator(s)	1.1.1 Stock status 1.1.2 Reference points 1.2.4 Assessment of stock status

**Milestones for Activity 2.6 are shown below.**

	Commencing	Ending
Milestone 1: Deliver final consultancy report	Quarter 2 2014	Quarter 3 2014

## 2.7 5-95 Percentile analysis

IATTC and SRP have begun application of various stock indices as indicators of stock status, looking at the trend of the indices within or outside of the 5-95 percentile range of the indices. The participants have indicated plans to complete the analysis by the fall of 2015. The project will track standardized CPUE, and estimate other possible candidate indicators like weight, length.

Working group	IATTC – SRP
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Priority	High
Status	Ongoing
Timeframe	IATTC and SRP to continue work through 2015
MSC Performance Indicator(s)	1.1.1 Stock status 1.1.2 Reference points 1.2.4 Assessment of stock status

**Milestones for Activity 2.7 are shown below.**

	Commencing	Ending
Milestone 1: Finalize indicators	Quarter 2 2014	Quarter 1 2015
Milestone 2: Deliver final report	Quarter 2 2014	Quarter 3 2015
Milestone 3: Complete southern EPO stock assessment	Quarter 2 2014	Quarter 3 2017

### **2.8 Link 5-95 percentile analysis to Bmsy**

The MSC requires a target reference point linked to Bmsy to reach the 80 level: “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.” The 5-95 percentile analysis will not meet this requirement, so some linkage to Bmsy or Bmsy proxy is needed.

Working group	IATTC – SRP
Priority	High
Status	Ongoing
Timeframe	IATTC and SRP to continue work through 2015
MSC Performance Indicator(s)	1.1.1 Stock status 1.1.2 Reference points 1.2.1 Harvest strategy 1.2.2 Harvest control rules 1.2.4 Assessment of stock status

**Milestones for Activity 2.8 are shown below.**

	Commencing	Ending
Milestone 1: Management Strategy Evaluation to establish reference points and limits	Quarter 1 2017	Quarter 2 2018

## **3 MONITORING AND EVALUATION**

The Ecuador *mahi mahi* fishery has undergone a substantial change in the level of monitoring and information available since October 2008. This includes, for example, the introduction of new biological data collection programs, increased numbers of fisheries observers, and an increased number of fisheries inspectors. This section updates ongoing work and new tasks discussed at the 2014 FIP review workshop to address various MSC Performance Indicators related to the collection of information and monitoring of the fishery (both target and non-target species).

It is recognized that that monitoring and evaluation of the ecosystem is both costly and time-consuming. Within an MSC assessment, ecosystem performance indicators could be scored using the MSC RBF. However, to support the findings of the assessment, it would be helpful to acquire a range of additional information that is relatively easy and cost-effective to obtain. These are described below.

### 3.1 Characterization of Ecuadorian artisanal mahi mahi fishery

The report and this subtask are completed.

Working group	INP – SRP
Priority	Completed
Status	Completed
Timeframe	Completed
MSC Performance Indicator(s)	1.2.3 Stock status: Information and monitoring

### 3.2 Development and training for observers

Ecuador has established a coordinated observer program where several programs previously existed. SRP has conducted a series of training to institute consistent practices for observers. The program has an observer manual with standard forms for data collection. Observer training will continue as an on-going program.

Working group	SRP – INP
Priority	Completed
Status	Completed
Timeframe	Completed but ongoing
MSC Performance Indicator(s)	1.2.3 Stock status: Information and monitoring 2.2.3 Bycatch: Information and monitoring 2.3.3 ETP: Information and monitoring

### 3.3 Design a mahi observer program

Consolidation of the several observer programs into a single program offers an opportunity for prioritizing the needs for observers by different management programs. Substantial progress has resulted in designing a comprehensive program. SRP has implemented a comprehensive observer program except that no rationale has been provided for the coverage level, and whether the coverage will permit estimates at an acceptable statistical reliability. WWF is developing terms of reference for conducting a statistical analysis of the observer program to provide background for a SRP-INP-stakeholder consultation.

To assure targeted improvements in the observer program, it is recommended that SRP and INP, in consultation with stakeholders:

- prepare overall goals for the observer program based on scientific and management requirements,
- align observer coverage, design, and strategies to achieve the goals, and
- regularly review performance of the program and adjust program design as necessary.

Key questions are: (a) what do you want to know about the fishery, and (b) what resolution do you want?

Important goals or objectives currently identified include providing adequate temporal/spatial coverage to characterize catches, discards (bycatch), Endangered, Threatened, and Protected (ETP) species interactions including incidence of sea turtle bycatch, and other biological characteristics (e.g. length, maturity etc.). Defining 'adequate' in terms of data precision and timeliness requirements would help assure that subsequent analysis would provide useful results.

Working group	SRP – INP – Stakeholders
Priority	Medium
Status	New milestones added
Timeframe	Ongoing
MSC Performance Indicator(s)	1.2.3 Stock status: Information and monitoring 2.2.3 Bycatch: Information and monitoring 2.3.3 ETP: Information and monitoring

**Milestones for Activity 3.3 are shown below.**

	Commencing	Ending
Milestone 1: Statistical robustness analysis	Quarter 1 2014	
Milestone 2: Estimate discards of mahi individuals below minimum legal size at fleet level.	Quarter 1 2014	Quarter 4 2014
Milestone 3: Estimate sea turtle catch rate/mortality at fleet level.	Quarter 1 2014	Quarter 4 2014

### 3.4 Literature review of pelagic ecosystems

It is acknowledged that understanding the structure and function of an ecosystem is both complex and expensive. While the current Action Plan proposes to put in place monitoring programs to collect quantitative information to determine the direct impact of the fishery on fish stocks, a separate literature review can be used to determine the level of risk the fishery poses on the ecosystem. The results can be used to direct future research needs, where required. SRP and IATTC have discussed preparing a joint report on ecosystem issues for the mahi mahi fishery, and a report is expected by the end of 2015.

Working group	SRP - IATTC – NGOs (CI, WWF)
Priority	Medium
Status	New
Timeframe	Before end of 2015
MSC Performance Indicator(s)	2.5.3 Ecosystem: Information and monitoring

**Milestones for Activity 3.4 are shown below.**

	Commencing	Ending
Milestone 1: Deliver literature review	Quarter 1 2014	Quarter 1 2015

### 3.5 Review of ecosystem/ trophic models

In addition to the literature review for pelagic ecosystems outlined in task 3.4 above, a separate review of current ecosystem/ ecological models was proposed to help predict the likely outcome of changes in mahi catch on the rest of the ecosystem, which in turn can be used to help design ecosystem management strategies. Due to the complexities of ecosystem models and current lack of information, this would occur over a long-term after suitable information becomes available. This Task was removed from active work but SRP will reconsider at some time in the future when data become available. Information in Task 3.4 could provide criteria for determining the value of ecosystem modeling. Actual modeling would not likely occur for a number of years if at all.

Working group	SRP –INP
Priority	Inactive
Status	Inactive
Timeframe	Very long term – likely more than 10 years
MSC Performance Indicator(s)	2.5.2 Ecosystem: Management strategy 2.5.3 Ecosystem: Information and monitoring

## 4 TURTLE BYCATCH REDUCTION

Due to the nature of the gear, longline fisheries can have a significant impact on bycatch species, including birds, turtles and marine mammals. The Ecuador mahi fishery is no exception but the government has undertaken a number of steps in order to reduce or eliminate bycatch from the fishery. One of the key bycatch species in the fishery is sea turtles. WWF, along with other key stakeholders, has already undertaken much of this work, and will help to address key MSC Performance Indicators within Principle 2 (Environmental and ecological impacts). These are described in more detail below.

### 4.1 Determine bycatch levels for fibras fishing with nets

INP has been working with Conservation International in order to know the bycatch levels of mahi and other bycatch species from the net fishery in Santa Rosa. This ongoing research will help to reduce the impact of this fishery on mahi and other bycatch species, including turtles. As the mahi mahi FIP will focus on the longline fishery, and because the project is now complete, it is removed from the action plan.

Working group	INP – CI
Priority	Removed
Status	Removed
Timeframe	Removed
MSC Performance Indicator(s)	1.2.3 Stock status: Information and monitoring 2.2.3 Bycatch: Information and monitoring 2.3.3 ETP: Information and monitoring

### 4.2 Implement and confirm turtle handling procedures

SRP has developed the tools and procedures for safe release of turtles, has set up a program to educate and fishermen on the need for turtle protection and train them in proper techniques. The program is well implemented and will proceed on an ongoing basis. While the education and training program has not reached all fishermen, it is progressing well. SRP will continue to work with additional fishing communities to implement the turtle handling requirements. The project is complete, but ongoing.

Working group	SRP –WWF – ASOEXPEBLA – EPESPO – OFCF – General Artisanal Fishery Sector
Priority	Complete
Status	Program implemented, and ongoing to extend to more communities
Timeframe	Ongoing
MSC Performance Indicator(s)	2.3.2 ETP: Management strategy

#### 4.3 Conversions of longline fishery to circle hooks

Ongoing research with multiple institutions and stakeholders has demonstrated the success of using circle hooks to reduce or eliminate the level of turtle bycatch from the mahi longline fishery using C-hook sizes 14 and 15. Outreach to fishermen is increasing acceptance, but not all fishermen are convinced. More workshops and other outreach activities continue in this regard. The SRP focused its strategy to introduce circle hooks primarily in Muisne (Esmeraldas Province) because fishermen catch bigger mahi mahi in that province, and bigger fish are more susceptible to circle hooks. Further south in Ecuador, fishers capture smaller mahi mahi (because fishing sites are different), and resistance to the circle hooks occurs because circle hooks result in lower catch rates of target species. Tests of other hooks that may increase mahi mahi catch rates while keeping sea turtle rates low could benefit conservation efforts.

Working group	SRP – OFCF – ASOEXPEBLA – General Artisanal Fishery Sector – WWF – CI – EPESPO
Priority	Medium
Status	Ongoing
Timeframe	Ongoing
MSC Performance Indicator(s)	2.3.1 ETP: Status 2.3.2 ETP: Management strategy 2.3.3 ETP: Information and monitoring

**Milestones for Activity 4.3 are shown below.**

	Commencing	Ending
Milestone 1: Develop a plan to integrate the various mechanisms for extending best fishing practices to fishing villages, including milestones, timeframes and reasonable objectives, from the VMAP.	Quarter 1 2014	Quarter 2 2014

#### 4.4 Eliminate tariffs on circular hooks

Having identified the most effective size of circle hook to be implemented within the mahi fishery, the government has proposed and implemented elimination of tariffs in circle hooks to encourage uptake of the new gear.

Working group	SRP- WWF – COMEX
Priority	Complete
Status	Complete



Timeframe	Complete
MSC Performance Indicator(s)	2.3.1 ETP: Status 2.3.2 ETP: Management strategy 2.3.3 ETP: Information and monitoring

#### 4.5 Manufacture of circle hooks at national level

This is impractical given the relatively small demand for hooks expected and the high cost of tooling up for manufacturing. Removed from list.

Working group	SRP – Metal industry
Priority	Removed
Status	Removed
Timeframe	Removed
MSC Performance Indicator(s)	2.3.1 ETP: Status 2.3.2 ETP: Management strategy 2.3.3 ETP: Information and monitoring

#### 4.6 Project 'T' to prevent entanglement of turtles

Research led by the SRP in coordination with local fishermen has recently shown that inserting slightly heavier line in the gear around the buoy float (making a 'T' shape) has significantly reduced the level of turtle interactions and entanglements. This project is now working to have the gear modification adopted fleet-wide to reduce or eliminate turtle entanglements from the mahi fishery. This task is making progress in acceptance of the gear by fishermen with a pilot program in Muisne. The development of the technique is complete, and the transfer of the technology to communities is continuing.

Working group	SRP – OFCF – WWF – ASOEXPEBLA – General Artisanal Fishery Sector
Priority	Medium
Status	Ongoing
Timeframe	Ongoing
MSC Performance Indicator(s)	2.3.1 ETP: Status 2.3.2 ETP: Management strategy 2.3.3 ETP: Information and monitoring

**Milestones for Activity 4.3 are shown below.**

	Commencing	Ending
Milestone 1: Develop a plan to integrate the various mechanisms for extending best practice fishing practices to fishing villages, including milestones, timeframes and reasonable objectives, from the VMAP, over the next month.	Quarter 1 2014	Quarter 2 2014
Milestone 2: Convert the majority of the fishery to using mainline 'T'	Quarter 1 2014	Quarter 2 2016

connectors to branch lines.		
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#### 4.7 Long-term monitoring of turtle interactions

Ongoing research has been undertaken in an attempt to reduce the level of turtle interactions with mahi longline gear. This includes the development and implementation of new gear (see tasks 4.3 and 4.6 above). While this research has shown very positive results, further monitoring is required to ensure that the benefits of research are effectively implemented across the sector and demonstrate a long-term reduction in bycatch rates. The consolidated observer program will provide ongoing coverage. Evaluation of the consolidated observer program as suggested in Task 3.3 would help assure that coverage produces the information needed for management. This task is nearing completion, and will be complete when monitoring is demonstrated as providing representative coverage of the fishery and can produce statistically reliable estimates of interactions.

Working group	WWF – EPESPO – SRP – ASOEXPEBLA – General Artisanal Fishery Sector
Priority	Medium
Status	Commitment for continuing coverage
Timeframe	Ongoing
MSC Performance Indicator(s)	2.3.1 ETP: Status 2.3.3 ETP: Information and monitoring

**Milestones for Activity 4.7 are shown below (corresponding to milestones 1 and 3 of Activity 3.3).**

	Commencing	Ending
Milestone 1: Statistical robustness analysis	Quarter 1 2014	Quarter 4 2014
Milestone 2: Estimate sea turtle catch rate/mortality at fleet level.	Quarter 1 2014	Quarter 4 2014

#### 4.8 OFCF research cruises

A series of research cruise was conducted by OFCF to i) continue to test new types of circle hooks or other (e.g., mutsubaris), ii) continue experimenting with entanglements, and iii) work on the development of educational material (especially videos related to release techniques and the appropriate use of equipment). These cruises resulted in a video that is on SRP website, and observers on nodrizas have this video to show fishermen. DVDs of the video have also been distributed by the SRP officials during the fishermen outreach meetings that have been conducted along the Ecuadorian coast.

Working group	OCFC – SRP – General Artisanal Fishery Sector – ASOEXPEBLA – EPESPO - IATTC- WWF
Priority	Complete
Status	Complete
Timeframe	Complete
MSC Performance Indicator(s)	2.3.1 ETP: Status 2.3.2 ETP: Management strategy

	2.3.3 ETP: Information and monitoring
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## 5. EDUCATION AND OUTREACH

Education and outreach was seen as an important pre-requisite to any changes made within the mahi fishery. This will provide an opportunity to gain better understanding of local concerns and could increase the level of compliance to new management measures.

### 5.1 Develop a communications strategy

The Communications Unit of the Vice Minister of Aquaculture and Fisheries has developed a communications strategy aimed to address tasks 5.2, 5.3, and 5.4. The strategy has implemented a number of specific actions that includes training and education, with more underway. Development of code of responsible fishing (6.6) was moved to this task as part of the overall communications strategy. The strategy to date will start in May 2012, with more improvements underway. The strategy will have an evaluation and feedback component to help improve the presentation of the message. This task is completed and ongoing.

Working group	SRP
Priority	Completed
Status	Completed
Timeframe	Completed but ongoing
MSC Performance Indicator(s)	1.2.3 Stock status: Information and monitoring 2.2.3 Bycatch: Information and monitoring 2.3.3 ETP: Information and monitoring 2.5.3 Ecosystem: Information and monitoring 3.2.3 Compliance and enforcement

### 5.2 Program to educate fishermen on resource state, changes in fishery etc.

A number of projects for fishermen education have been implemented, and more are in development. Participation by the fishing sector in the FIP discussions helps consolidate a diversity of information that is discussed in more detail during workshops and meetings. This program enables fishermen to learn and better understand new management measures. The education and outreach program reaches out to local fishing communities to help educate resource users and increases the level of transparency between fishermen and managers and facilitates increased levels of compliance with regulations. The task involves collaboration from multiple stakeholders including government, NGOs and the local fishing sectors. Feedback is helping scientists and managers better understand the resource and increasing the level of compliance by resource users. The program continues to develop.

Working group	SRP – INP – NGOs (WWF/CI) – General Artisanal Fishery Sector, CNP Esmeraldas – ASOEXPEBLA – EPESPO
Priority	Complete
Status	Complete
Timeframe	Complete but ongoing
MSC Performance Indicator(s)	1.2.1 Stock status: Information and monitoring 3.2.3 Compliance and enforcement

### 5.3 Program to educate fishermen on bycatch reduction

Bycatch reduction, especially of sea turtles, is one of the primary focus areas for SRP. SRP continues to conduct workshops in coastal communities to emphasize sea turtle protection and use of circle hooks and gear modifications to reduce entanglements, and to distribute the sea turtle video on turtle releases. Several projects have developed to provide information and assistance to fishermen to help reduce bycatch, with a primary focus on turtles. These include practical longline gear modifications (e.g. task 4.8), dehooking training, and shift to circle hooks. This project is complete and ongoing.

Working group	SRP – INP – NGOs (WWF, CI) – General Artisanal Fishery Sector, CNP Esmeraldas – ASOEXPEBLA – EPESPO
Priority	Complete
Status	Complete
Timeframe	Complete and ongoing
MSC Performance Indicator(s)	2.2.3 Bycatch: Information and monitoring 3.2.3 Compliance and enforcement

### 5.4 Incorporate new education and outreach initiatives into existing compulsory programs

This was not discussed at the 2014 FIP review workshop, but is an integral part of the overall strategy (5.1).

Working group	SRP – INP – General Artisanal Fishery Sector – Ecuadorian Navy – WWF – EPESPO
Priority	Complete
Status	Complete
Timeframe	Complete
MSC Performance Indicator(s)	3.1.2 Consultation, roles and responsibilities 3.2.3 Compliance and enforcement

## 6. MANAGEMENT AND GOVERNANCE

A key over-riding factor to the success of long term sustainable exploitation of the resource is good management and governance. This section of the proposed Action Plan describes a series of tasks that will encourage better compliance with management regulations as well as increased transparency of management actions between stakeholders.

### 6.1 Develop strategic research plan for mahi

While it was acknowledged that considerable research has been undertaken within the past few years, it was not clear how each component contributed towards a strategic plan for mahi. As such, it is proposed that a review of key information gaps to answer science and management questions about the fishery be undertaken and a review of all current and proposed research be undertaken to document how they address the information gaps. The action plan for mahi mahi is a good start in this. SRP has developed a strategic plan and a text description of the plan will be presented in the next update of PAN Dorado.

Working group	INP – SRP – General Artisanal Fishery Sector
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Priority	Medium
Status	New
Timeframe	Next PAN Dorado update
MSC Performance Indicator(s)	3.2.4 Research plan

**Milestones for Activity 6.1 are shown below.**

	Commencing	Ending
Milestone 1: Strategic plan developed for PAN Dorado	Quarter 1 2014	Next PAN Dorado update

## **6.2 Evaluate options to develop international agreement on shared stocks**

Ecuador has undertaken high level discussions with Peru concerning management of the mahi mahi resource. The Ecuador-Peru discussions offer an opportunity for Peru to engage in this process, and INP has a signed research agreement with the Peruvian Institute of the Sea (IMARPE). Central American countries have jointly asked IATTC scientific staff to work on a mahi mahi stock assessment; support of this request by Ecuador strengthens the request. The Ecuador National Plan of Action is a model for other countries interested in the internal management of this international resource. The IATTC has begun analysis for mahi mahi, including coordinating the work and contributions that different countries and researchers would make to this research initiative. Ecuador has completed an evaluation of the options. Until either a bilateral agreement with Peru or multilateral arrangement under IATTC is reached, the international control of the fishery is incomplete.

Working group	SRP – INP – NGOs (WWF CI) – MRAG
Priority	Complete
Status	Complete
Timeframe	Complete
MSC Performance Indicator(s)	3.1.1 Legal/ customary Framework 3.1.2 Consultation, roles and responsibilities 3.1.3 Long term objectives 3.2.1 Fishery specific objectives 3.2.2 Decision making processes 3.2.3 Compliance and enforcement 3.2.4 Research plan 3.2.5 Management performance evaluation

## **6.3 Describe decision-making processes**

The National Plan of Action and the Consejo Consultivo del Recurso Dorado provide a policy basis for consultative decision making and put the policy into place, respectively. This anticipates community involvement. The Consultative Council resulted from discussions at the FIP workshop and subsequent development of the National Plan of Action, showing responsiveness to suggestions for best practices. The Consultative Council has not met; however, consultation with stakeholders occurs as needed to support decisions by VMAP; this was demonstrated by the wide-ranging consultation that occurred prior

to the decision in 2011 to implement the current closed season for mahi mahi. completing this task requires a clear explanation of the role of the Consultative Council and meetings with individual actors in decision-making, or a documented procedure for stakeholder consultations leading to a decision (as occurred for the 2011 mahi mahi seasonal closure), is required to assure a score of 80.

Working group	SRP – INP – General Artisanal Fishery Sector
Priority	Medium
Status	Concept developed but needs demonstrated implementation
Timeframe	Ongoing; should have demonstration of Consejo meetings before next FIP meeting
MSC Performance Indicator(s)	3.2.2 Decision-making processes

**Milestones for Activity 6.3 are shown below.**

	Commencing	Ending
Milestone 1: Report on Consultative Council and Decision Making	Quarter 1 2014	Quarter 2 2014

#### **6.4 Improve co-ordination between monitoring and enforcement**

To improve the level of compliance within the mahi fishery, an increased level of co-ordination between monitoring and enforcement government agencies has begun. Veda del Dorado formalizes an arrangement for monitoring and surveillance. SRP documented mahi enforcement activities, specifically monitoring sites in fishing communities, monitoring of fishing companies, amounts of mahi mahi seized for various infractions, and inspections of mahi in cold storage prior to exportation. The report documented that the inspectors have increased to 84 distributed across the fishing landing sites, that monitoring of motherships occurs at 100% of landings and about 30-40% of fibras. Some inspectors operate primarily from main landing sites and others roam outside the primary landings sites. An emphasis on outreach and prevention has reduced the number of citations for undersized fish, emphasized the compliance with the closed season, and prevention of shark finning. Sanctions include fines up to 10-30 times average wages for infractions, and \$17,500 for illegal transshipments. VMS requirement for motherships allow continuous monitoring. The Ecuadorian Navy has an agreement with SRP for monitoring and enforcement.

Working group	SRP – INP – General Artisanal Fishery Sector – Ecuadorian Navy – EPESPO
Priority	Complete
Status	Complete for FIP purposes
Timeframe	Complete
MSC Performance Indicator(s)	3.2.3 Compliance and enforcement

#### **6.5 Identify new schemes for co-management**

Combined with 6.3

Working group	SRP – INP – General Artisanal Fishery Sector – Ecuadorian Navy
Priority	Removed
Status	Removed
Timeframe	Removed

MSC Performance Indicator(s)	3.2.3 Compliance and enforcement
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## 6.6 Develop and implement Code of Responsible Fishing

Moved to 5.1 as part of the overall communications strategy. No longer a separate task.

Working group	SRP – General Artisanal Fishery Sector
Priority	Removed
Status	Removed
Timeframe	Removed
MSC Performance Indicator(s)	3.2.3 Compliance and enforcement

## 6.7 Revise internal and external review of the management systems

Ecuador has implemented a process called Governance by Results (GBR), in which each governmental element must present the achievements expected on an annual basis, and then undergo a review of the progress against the expected results. The mahi mahi fishery will undergo this review. SRP provided a spreadsheet of GBR results that listed a series of indicators with target and achieved metrics. This is a useful first step in conducting performance reviews. PAN Dorado provides a detailed list of general objectives and responsibilities of the legal framework of fishery management of Ecuador and provides general and specific objectives for the mahi mahi fishery. Internal and external review of the overall management system and of the mahi mahi fishery as specified in these sections would substantially improve likely scores for MSC certification. SRP presented the GBR process and results at the 2014 FIP meeting, which essentially completes this task.

Working group	SRP – INP – NGOs (WWF, CI)
Priority	Complete
Status	Complete
Timeframe	Complete
MSC Performance Indicator(s)	3.2.5 Management performance evaluation

## 6.8 Develop timelines, budget and indicators in the mahi action plan

The updated Plan Dorado has presented indicators, timelines, and budgets, which completes this task.

Working group	SRP – INP – General Artisanal Fishery Sector – NGOs (WWF, CI) - ASOEXPEBLA
Priority	Complete
Status	Complete
Timeframe	Complete
MSC Performance Indicator(s)	3.1.3 Long term objectives 3.2.1 Fishery specific objectives 3.2.4 Research plan 3.2.5 Management performance evaluation

## 6.9 Incorporate an ecosystem management strategy into mahi National Plan

SRP has an ecosystem management strategy in preparation. The strategy will be developed on the basis of the on-going pelagic ecosystem literature review to determine the necessity of additional ecosystem

management. The updated PAN-Dorado will contain the strategy. This task should be completed with the publication of the next updated PAN-Dorado.

Working group	SRP – INP
Priority	Medium
Status	New
Timeframe	PAN-Dorado - next update
MSC Performance Indicator(s)	2.5.2 Ecosystem: Management strategy 3.2.4 Research plan

**Milestones for Activity 6.9 are shown below.**

	Commencing	Ending
Milestone 1: Explicit ecosystem management strategy in next PAN Dorado	Quarter 1 2014	Next PAN Dorado update

### 6.10 Establish National Plan of Action for mahi

Ecuador produced and adopted a comprehensive National Plan of Action for mahi mahi.

Working group	SRP – INP – General Artisanal Fishery Sector – ASOEXPEBLA – EPESPO - NGOs (WWF CI)
Priority	Completed
Status	Completed
Timeframe	Completed but ongoing with periodic updates (expected 2013)
MSC Performance Indicator(s)	1.2.3 Stock status: Information and monitoring 2.3.2 ETP: Management strategy 2.5.2 Ecosystem: Management strategy 3.1.1 Legal/ customary Framework 3.1.2 Consultation, roles and responsibilities 3.1.3 Long term objectives 3.2.1 Fishery specific objectives 3.2.2 Decision making processes 3.2.3 Compliance and enforcement 3.2.4 Research plan 3.2.5 Management performance evaluation

### 6.11 International Management Agreement

Ecuador has developed a strong internal management system, but cannot unilaterally control the harvest on the stock. Development of some internationally agreed control is necessary to achieve certification.

Working group	SRP – INP – NGOs (WWF CI) – MRAG
Priority	High
Status	New
Timeframe	Ongoing until complete



MSC Performance Indicator(s)	3.1.1 Legal/ customary Framework 3.1.2 Consultation, roles and responsibilities 3.1.3 Long term objectives 3.2.1 Fishery specific objectives 3.2.2 Decision making processes 3.2.3 Compliance and enforcement 3.2.4 Research plan 3.2.5 Management performance evaluation
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**Milestones for Activity 6.11 are shown below.**

	Commencing	Ending
Milestone 1: Bilateral workshop, Peru	Quarter 1 2014	Quarter 3 2014
Milestone 2: Discussion at International Workshop	Quarter 1 2014	Quarter 4 2014
Milestone 3: Evaluate level of international agreement needed (e.g., EU mackerel fishery)	Quarter 1 2014	Quarter 2 2014
Milestone 4: International agreement	Quarter 1 2014	

## 7. NEXT STEPS

To date, almost all fisheries that have received certification had conditions set for continuing certification. The client is responsible for ensuring that these conditions are met within the required timescale. The client should therefore have authority, or have secured agreement with the relevant organizations, to enact potential conditions should certification be successful. If the government (e.g., SRP) is the client, the participation comes standard.

Ecuador has achieved nearly all of the action steps over which it has control, and remaining work will have some aspect of international participation. Ongoing improvements as planned by SRP will continue to increase some scores. Several tasks would benefit from increased analysis or reporting, but the base of management and information is clearly there. The factors that prevent the mahi fishery from passing an MSC assessment fall in the stock status and international management arena. Therefore, the big tasks ahead lie beyond Ecuador's direct control. Stock status and harvest strategy were initially set aside into "Phase 2" pending development of new information. Ecuador has undertaken steps to address the stock status and harvest strategy issues that require international attention. Ecuador has also taken a positive position in dealing with Peru on a bilateral agreement, and with members of the IATTC to encourage further implementation of the Antigua Convention. Ecuador should continue an emphasis on establishing international control of the mahi mahi fishery.

### **Data collection for other countries (at least Peru)**

Under the current plans for the 5-95 percentile program, IATTC and SRP have determined that the data available from Ecuador will suffice for completing the analysis. Ecuador data would probably suffice for conducting the SPR or length-based stock assessment models. However, incorporation of data from Peru

would enhance the analysis and give it more credibility. If and when the analysis needs to expand beyond Ecuador and Peru, data for catch, effort, and biological features will be necessary. The IATTC has begun planning for expansion of data to include participation by other fishing countries.

Ecuador has achieved a major accomplishment with its PAN Dorado. Bringing other countries into comparable management planning must occur to achieve 80 scores for MSC Principle 3. As previously discussed, this could take the form of a Peru-Ecuador bilateral agreement or a comprehensive international arrangement through the IATTC, or some other multilateral agreement.

**APPENDIX 1: Original outline of proposed tasks for Ecuador *Mahi mahi* FIP Action Plan**

TASK	ROLE	TIMEFRAME	Ongoing	Additional 'NEW' work	Links to MSC Performance Indicators															
					P1. Stock Status					P2. Environmental impacts					P3. Management					
					1.1.1 Stock Status	1.1.2 Reference Points	1.2.1 Harvest Strategy	1.2.2 Harvest Control Rules and Tools	1.2.3 Information and monitoring	1.2.4 Assessment of Stock Status	2.2.3 Bycatch Information and Monitoring	2.3.1 ETP Status	2.3.2 ETP Management Strategy	2.3.3 ETP Information and Monitoring	2.5.2 Ecosystem Management Strategy	2.5.3 Ecosystem Information and Monitoring	3.1.1 Legal/Customary Framework	3.1.2 Consultation, Roles and Responsibilities	3.1.3 Long Term Objectives	3.2.1 Fishery Specific Objectives
Note: H = high priority and M = Medium priority according to scoping document																				
<b>1. Definition of the stock</b>																				
1.1 Genetic analysis	SRP	12 months +	✓																	
1.2 Parasite analysis	INP - SRP	12 months +	✓																	
1.3 Otolith micro-elemental analysis	INP (otolith collection), SRP	12 months +	✓																	
1.4 Training national technicians	INP - SRP	12 months +	✓																	
1.5 National mahi workshop (genetics, stock assessment & status, biological characteristics and monitoring)	INP - SRP - WWF	< 12 months	✓	H	H															
1.6 International mahi workshop (genetics, stock assessment & status, biological characteristics and monitoring)	INP - SRP - WWF - CPPS	12 months +	✓	H	H															
<b>2. Stock status and abundance indices</b>																				
2.1 VPA assessment	INP - SRP	12 months +	✓		H	H														
2.2 Develop CPUE series (index of abundance) / status of resource	INP - SRP	12 months +	✓		H	H														
2.3 Length-based assessment	SRP - INP	12 months +	✓		H	H														
2.4 Egg size assessment	SRP	12 months +	✓		H	H														
2.5 Literature review on mahi assessment and management	INP - SRP - Cooperatives/Asoexpebla	< 6 months	✓		H	H		Phase 2												
<b>3. Monitoring and evaluation</b>																				
3.1 Characterisation of Ecuadorian artisanal Mahi mahi fishery	SRP - INP	< 12 months	✓																	
3.2 National workshop for observer coordination	SRP - INP	< 12 months	✓																	
3.3 Design mahi observer program	INP - SRP	12 months +	✓																	
3.4 Literature review of pelagic ecosystems	INP - Universities - NGOs	< 12 months	✓																	
3.5 Review ecosystem/ trophic models	INP - SRP - Universities	12 months +	✓																	
<b>4. Turtle bycatch reduction</b>																				
4.1 Determine bycatch levels for fibras fishing with nets (Santa Rosa)	INP - CI	12 months +	✓																	
4.2 Implement and confirm turtle handling procedures	SRP - WWF - ASOEXPEBLA - EPESPO - OFCF - FENACOPEC	12 months +	✓																	
4.3 Conversion of longline fishery to circle hooks	SRP - OFCF - ASOEXPEBLA - FENACOPEC - WWF - EPESPO	12 months +	✓																	
4.4 Eliminate tariffs on circle hooks	SRP - CAE (Ecuadorian Customs)	12 months +	✓																	
4.5 Manufacture circle hooks at national level	SRP - Metal industry	12 months +	✓																	
4.6 Project 'T' to prevent entanglement of turtles	SRP - OFCF - WWF - ASOEXPEBLA - FENACOPEC	12 months +	✓																	
4.7 Long-term monitoring of turtle interactions	WWF - EPESPO - SRP - ASOEXPEBLA - FENACOPEC	12 months +	✓																	
4.8 OFCF research cruise(s)	OCFC - SRP - FENACOPEC - ASOEXPEBLA - WWF	12 months +	✓																	
<b>5. Education and outreach</b>																				
5.1 Develop a communications strategy	SRP	< 6 months	✓																	
5.2 Program to educate fishermen on resource state, changes in fishery etc	SRP - INP - NGOs (WWF) - Fishing sector (FENACOPEC) - ASOEXPEBLA	< 12 months	✓																	
5.3 Program to educate fishermen to reduce bycatch (training for fishermen)	SRP - INP - NGOs (WWF) - Fishing sector (FENACOPEC) - ASOEXPEBLA	< 12 months	✓																	
5.4 Incorporate new education and outreach initiatives into existing compulsory programs	SRP - INP - Fishing Sector - Ecuadorian Navy	< 12 months	✓																	
<b>6. Management &amp; governance</b>																				
6.1 Develop strategic research plan for mahi	INP - SRP - Universities - Fishing sector	< 6 months	✓																	
6.2 Evaluate options to develop international agreement on shared stocks	Min. RREE - SRP - INP	< 6 months	✓																	
6.3 Describe decision-making processes	SRP - INP - Fishing sector (FENACOPEC)	< 6 months	✓																	
6.4 Improve co-ordination between monitoring and enforcement	SRP - INP - Fishing sector (FENACOPEC) - Ecuadorian Navy - EPESPO	12 months +	✓																	
6.5 Identify new schemes for co-management	SRP - INP - Fishing sector (FENACOPEC) - Ecuadorian Navy	< 12 months	✓																	
6.6 Develop and implement Code of Responsible Fishing	SRP - FENACOPEC (Ecuadorian Fishers Union)	< 12 months	✓																	
6.7 Revise internal and external review of the management systems	SRP - INP - NGOs	< 12 months	✓																	
6.8 Develop timelines, budget and indicators in the mahi action plan	SRP - INP - FENACOPEC - NGOs - ASOEXPEBLA	< 12 months	✓																	
6.9 Incorporate an ecosystem mgt. strategy into mahi national plan	SRP - INP	12 months +	✓																	
6.10 Establish National Plan of Action for mahi.	SRP - INP - FENACOPEC - ASOEXPEBLA - NGOs	12 Months +	✓																	

## APPENDIX 2: Revised outline of proposed tasks for 2014 Ecuador Mahi mahi FIP Action Plan

TASK	ROLE	ORIGINAL TIMEFRAME	STATUS/ NEW TIMEFRAME	Ongoing	Additional 'NEW' work	Links to MSC Performance Indicators														
						P1. Stock Status				P2. Environmental impacts				P3. Management						
						1.1.1 Stock Status	1.1.2 Reference Points	1.2.1 Harvest Strategy	1.2.2 Harvest Control Rules and Tools	1.2.3 Information and monitoring	1.2.4 Assessment of Stock Status	2.2.3 Bycatch Information and Monitoring	2.3.1 ETP Status	2.3.2 ETP Management Strategy	2.3.3 ETP Information and Monitoring	2.5.2 Ecosystem Management Strategy	2.5.3 Ecosystem Information and Monitoring	3.1.1 Legal/Customary Framework	3.1.2 Consultation, Roles and Responsibilities	3.1.3 Long Term Objectives
Note: H = high priority, M = Med priority, & L=Low priority from scoping document																				
<b>1. Definition of the stock</b>																				
1.1 Genetic analysis	SRP	12 months +	COMPLETE	✓																
1.2 Parasite analysis (REMOVED due to low likelihood of success)	INP - SRP	12 months +	None-REMOVED																	
1.3 Otolith micro-elemental analysis	INP (otolith collection), SRP	12 months +	Reconsider Oct 14																	
1.4 Training national technicians	INP - SRP	12 months +	COMPLETE	✓																
1.5 National mahi workshop (genetics, stock assessment & status, biological characteristics and monitoring)	INP – SRP – WWF	< 12 months	COMPLETE	✓																
1.6 International mahi workshop (genetics, stock assessment & status, biological characteristics and monitoring)	INP – SRP – WWF - CPPS	12 months +	14-Oct	✓																
1.7 Define Practical stock unit	INP – SRP – WWF –IATTC	New Task	2014	✓																
1.8 Bilateral technical workshop with Peru	SRP - IATTC	New Task	14-Aug	✓																
<b>2. Stock status and abundance indices</b>																				
2.1 VPA assessment	INP - SRP	12 months +	Inactive/Long-term	✓																
2.2 Develop CPUE series (index of abundance) / status of resource	INP - SRP	12 months +	COMPLETE	✓																
2.3 Length-based assessment	SRP - INP	12 months +	Removed	✓																
2.4 Egg size assessment (REMOVED- not useful to determine stock status)	SRP	12 months +	None-REMOVED	✓																
2.5 Literature review on mahi assessment and management	INP – SRP – Cooperatives/Asoexpebla- ULEAM	< 6 months	Nov-14	✓																
2.6 Ageing	INP - SRP - CICIMAR	New Task	Jun-14	✓																
2.7 5-95 percentile	IATTC – SRP	New Task	Jul-17	✓																
2.8 Link 5-95 to Bmsy	IATTC – SRP	New Task	Jul-17	✓																
<b>3. Monitoring and evaluation</b>																				
3.1 Characterisation of Ecuadorian artisanal Mahi mahi fishery	SRP - INP	< 12 months	COMPLETE	✓																
3.2 Development and training for observers	SRP - INP	< 12 months	COMPLETE	✓																
3.3 Design mahi observer program	INP - SRP - Stakeholders	12 months +	14-Dec	✓																
3.4 Literature review of pelagic ecosystems	IATTC - SRP - NGOs	< 12 months	Nov-15	✓																
3.5 Review ecosystem/ trophic models (REMOVED but Monitored in the long-term)	INP - SRP - Universities	12 months +	Inactive/Long-term	✓																
<b>4. Turtle bycatch reduction</b>																				
4.1 Determine bycatch levels for fibras fishing with nets (Santa Rosa) (REMOVED)	INP - CI	12 months +	COMPLETE	✓																
4.2 Implement and confirm turtle handling procedures	SRP –WWF – ASOEXPEBLA – EPESPO – OFCF - Artisanal Sector	12 months +	IMPLEMENTED	✓																
4.3 Conversion of longline fishery to circle hooks	SRP – OFCF – ASOEXPEBLA – Artisanal Sector – WWF –CI – EPESPO	12 months +	Partially COMPLETE	✓																
4.4 Eliminate tariffs on circle hooks	SRP - COMEXI	12 months +	COMPLETE	✓																
4.5 Manufacture circle hooks at national level (REMOVED due to high manufacturing cost)	SRP - Metal Industry	12 months +	None-REMOVED	✓																
4.6 Project "T" to prevent entanglement of turtles	SRP – OFCF – WWF – ASOEXPEBLA - Artisanal Sector	12 months +	Jun-16	✓																
4.7 Long-term monitoring of turtle interactions	WWF - EPESPO - SRP - ASOEXPEBLA - Artisanal Sector	12 months +	14-Dec	✓																
4.8 OFCF research cruise(s)	OCFC – SRP – FENACOPEC – ASOEXPEBLA – WWF	12 months +	COMPLETE	✓																
<b>5. Education and outreach</b>																				
5.1 Develop a communications strategy	SRP	< 6 months	Complete	✓																
5.2 Program to educate fishermen on resource state, changes in fishery etc	SRP – INP – NGOs (WWF) –Artisanal Sector, CNP Esmeraldas – ASOEXPEBLA	< 12 months	Complete	✓																
5.3 Program to educate fishermen to reduce bycatch (training for fishermen)	SRP – INP – NGOs (WWF) –Artisanal Sector, CNP Esmeraldas – ASOEXPEBLA	< 12 months	Complete	✓																
5.4 Incorporate new education and outreach initiatives into existing compulsory programs	SRP - INP - Fishing Sector - Ecuadorian Navy - WWF - EPESPO	< 12 months	Complete	✓																
<b>6. Management &amp; governance</b>																				
6.1 Develop strategic research plan for mahi	INP - SRP - Artisanal Sector	< 6 months	Update in PAN-Dorado	✓																
6.2 Evaluate options to develop international agreement on shared stocks	Min. RREE - SRP - INP	12 months +	Complete	✓																
6.3 Describe decision-making processes	SRP – INP – Artisanal Sector	< 6 months	Jun-14	✓																
6.4 Improve co-ordination between monitoring and enforcement	SRP – INP – Artisanal Sector – Ecuadorian Navy - EPESPO	12 months +	Complete	✓																
6.5 Identify new schemes for co-management	SRP – INP – Artisanal Sector – Ecuadorian Navy	< 12 months	Combined with 6.3	✓																
6.6 Develop and implement Code of Responsible Fishing	SRP - Artisanal Sector	< 12 months	Complete	✓																
6.7 Revise internal and external review of the management systems	SRP - INP - NGOs (WWF, CI)	< 12 months	Complete	✓																
6.8 Develop timelines, budget and indicators in the mahi action plan	SRP – INP – FENACOPEC – NGOs - ASOEXPEBLA	< 12 months	Complete	✓																
6.9 Incorporate an ecosystem mgt. strategy into mahi national plan	SRP - INP	12 months +	Update in PAN-Dorado	✓																
6.10 Establish National Plan of Action for mahi.	SRP – INP – FENACOPEC – ASOEXPEBLA – NGOs	12 Months +	Complete	✓																
6.11 International Management Agreement	SRP – INP – NGOs (WWF CI) – MRAG	12 Months +	New	✓																

All activities for a performance indicator generally have the same priority. However, in some cases tasks received a lower priority if they are not critical to the improved score of the performance indicator.