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ECO—LABEL CERTIFICATION: A CASE STUDY OF THE CAMPECHE SHRIMP FISHERY, MEXICO†

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Abstract: The Marine Stewardship Council (MSC) eco—label certifies that seafood comes from a sustainable source. The use of this eco—label lags behind in the developing world, where ecosystem approaches to fishery management have not yet been widely implemented. However, the Food and Agriculture Organization under its REBYC—II LAC project is addressing ecosystem concerns within the shrimp trawl fisheries of a number of developing countries in Latin America and the Caribbean by helping them to improve management of the negative ecosystem impacts by modifying their gear to reduce by—catch and habitat damage. This study investigates how the potential improvements identified by the REBYC—II LAC project will help in satisfying the requirements for obtaining an MSC certification in the Campeche shrimp fishery in Mexico. The feasibility and desirability of obtaining an MSC certification in this fishery was assessed by interviewing managers, fishers, processors, and other relevant stakeholders of the fishery. By comparing the MSC certification requirements with the current conditions of the Campeche shrimp fishery, this paper shows that the fishery is currently not certifiable. Although the REBYC—II LAC project could represent a significant step towards the potential certification of the fishery, further actions will need to be implemented by the Mexican management authorities and private sector, if certification is sought. This paper should help guide the Campeche shrimp industry and fishery managers towards the necessary steps for achieving sustainability.

Key words: REBYC—II LAC, Marine Stewardship Council, by—catch, eco—labelling, seafood marketing.

Introduction

Eco—labelling is a market—based incentive that can be used to support fisheries management and contribute to the promotion of sustainable fisheries worldwide (Wessels et al. 2001). Many eco—labels certify the origin and sustainability of fishery products; however, this process has generated confusion and a lack of trust among producers, retailers and consumers. The potential contribution of eco—labelling to the promotion of sustainable fisheries is constrained by a number of factors. Among these are a general lack of concern for sustainable fisheries by the market, an absence of tangible, continued financial benefits for participating fishers, and the difficulties of quality guarantee mainly related to monitoring compliance (Kaiser and Edwards—Jones 2006). However, recently the Global Sustainable Seafood Initiative (GSSI) was created to set common, consistent and internationally—agreed upon benchmarking tools on which to assess seafood eco—labelling programs (GSSI 2017a). The GSSI follows the guidelines set out by the UN Food and Agriculture Organization (FAO) Code of Conduct for Responsible Fisheries (CCRF), the FAO Guidelines for Ecolabelling of Fish and Fishery Products from Marine/Inland Capture Fisheries, and the FAO Technical Guidelines for Aquaculture Certification. As of today, 3 fisheries eco—labels are recognized by the GSSI: the Alaska Responsible Fisheries Management (RFM) Certification Program, the Iceland RFM Certification Program, and the Marine Stewardship Council (MSC; GSSI 2017b). The former 2 certification schemes operate on a local scale, and together have 11 fisheries certified, 7 from Alaska (http://www.alaskaseafood.org/rfm—certification/certified—fisheries/); and 4 from Iceland (Iceland Responsible Fisheries 2015). The MSC is the only international label certified by the GSSI, and it is the certification scheme involved in the present case study. The MSC is an independent non—profit organization that sets principles and standards for sustainable fishing practices.

As of November 2017, 208 fisheries across the world are certified to carry the MSC eco—label, 38 are under assessment, 84 have withdrawn, and 11 of them have been suspended from the program. Seventeen shrimp fisheries are certified, and a further 3 are under assessment, all of which use bottom—trawl as a fishing technique (MSC 2017).

Growing interest in sustainable fisheries products has generated a marked demand for third party sustainability certification, and eco—labels play an increasingly prominent role in shaping the seafood market (Kvalvik et al. 2014). The rapid increase in the demand for eco—labelled fishery products (Washington and Ababouch 2011) has led many fisheries worldwide to make efforts to promote sustainability, generally referred to as 'Fishery Improvement Projects' (FIPs), and to seek certification for so doing. The MSC acknowledges the important contribution that credible and reliable FIPs can offer towards promoting sustainable fisheries, and has made available a range of tools to support the development of credible FIPs worldwide. If successful, these can in turn

†This article is based on a presentation given in November 2016 at the 69th annual Gulf and Caribbean Fisheries Institute conference in Grand Cayman, Cayman Islands.

lead to the achievement of an MSC eco—label (https://www.MSC.org/about—us/credibility/all—fisheries/fisheries—improving—towards—MSC—certification/fip/s). The FIP Directory (2017) reported that 57 FIPs are being developed worldwide in 2017. Eight of these were related to shrimp fisheries and 5 of these were located in developing countries, with Mexico leading the way with 3 shrimp fisheries implementing FIPs (the Gulf of California industrial and artisanal fisheries and the Magdalena Bay fishery).

There are specific issues related to the certification of shrimp fisheries that arise mainly over concerns about habitat damage and the indiscriminate multispecies nature of the catch typically associated with benthic trawling, resulting in much higher by—catch rates than those associated with other fishing techniques. Tropical and subtropical bottom trawl shrimp fishing is characterized by by—catch levels representing up to 10—15 times the quantity of the targeted (shrimp) catch. Furthermore, the trawls often entangle juveniles of targeted and by—catch species, as well as small—sized fish species and endangered turtles and elasmobranchs (FAO 2015). This generally means that by—catch and discard rates must be significantly reduced in these fisheries for them to become sustainable.

Moreover, environmental and economic sustainability of shrimp fisheries in Latin America and Caribbean countries are hampered by overcapitalization, irresponsible fishing practices, and the real and potential adoption of non—tariff barriers and trade embargos from developed countries (Salas et al. 2011). In light of these issues, the FAO Reduction of Environmental Impact from Tropical Shrimp Trawling, through the Introduction of By—catch Reduction Technologies and Change of Management – Phase 2 of Latin America and the Caribbean (REBYC—II LAC project) seeks to improve the condition of shrimp fisheries for participating countries. Such improvements are expected to be achieved mainly through the promotion of better institutional and regulatory arrangements for by—catch management and use of by—catch discards within an ecosystem approach to fisheries (EAF) framework. If this goal were to be achieved, it is fair to assume that some of the requirements for obtaining MSC certification would be fulfilled.

From an economic perspective, shrimp fisheries are the most relevant fisheries in Mexico, and the fourth most relevant in terms of landings from fishing and aquaculture (SAGARPA 2013). Shrimp landings along the Pacific coast of Mexico are significantly higher than shrimp landings along the nation's east coast. As such, we investigate what remaining steps will need to be taken to achieve certification and what is the level of interest in meeting that goal. Thus, we evaluate the extent to which the improvements achieved under the REBYC—II LAC project (mainly in terms of by—catch reduction, sustainable fishing, and improved management) could lead to obtaining MSC certification in the Campeche shrimp fishery through a series of 4 objectives. First, we review the general environmental, economic, social and cultural issues related to shrimp fisheries along the eastern coast of Mexico to identify constraints and opportunities that may support or prevent the desirability *and* feasibility of MSC certification for the Campeche shrimp fishery. Secondly, the MSC certification process is examined to identify the main criteria that the fishery fails to meet. Thirdly, we assessed the main implications of the REBYC—II LAC project for the Campeche shrimp fishery to understand to what extent improvements can lead to obtaining MSC certification. Finally, we assessed the interest of both the private and public sectors of the Campeche shrimp fishery in pursuing MSC certification.

Materials and Methods

The relevant information used in achieving the objectives of the research was gathered using a suite of methodologies. The first objective was pursued by reviewing and synthesizing data from the literature, official documents, and annual reports from the Mexican Secretariat of Agriculture, Livestock, Rural Development, Fisheries and Food (SAGARPA). Following this preliminary phase, we obtained further information by attending the REBYC—II LAC meeting in Campeche on 27—28 September 2016. Additional data, based on a semi—structured format in which each stakeholder was asked specific questions according to the respondent's position and expertise, were collected via personal interviews with the Campeche shrimp fishery stakeholders. Overall, we interviewed 8 stakeholders in the fishery that attended the REBYC—II LAC meeting: 2 members of the Mexican National Fisheries Institute (INAPESCA), one person from the Lerma—Campeche Regional Centre of Fisheries Research (CRIP); 2 academics from the Gulf of Mexico Institute of Ecology, Fishery and Oceanography (EPOMEX); one private sector representative from the National Chamber of the Fishing Industry (CANAINPESCA); and 2 members of the REBYC—II LAC project staff.

Our second objective was accomplished by synthesizing the existing documentation about the MSC assessment process. Our third objective was achieved by examining the FAO/Global Environment Facility REBYC—II LAC project document. Relevant information was also obtained when we attended the project meeting in Campeche and by interviewing the FAO representatives in charge of the project. Finally, we obtained relevant information for addressing the last objective through personal interviews with members of CANAINPESCA during the project meeting, and these data allowed us to fill in any information gaps.

Study Area

Three main shrimp fishing grounds are located along the east coast of Mexico: the north—east Gulf of Mexico (GOM; Tamaulipas and Veracruz), the Campeche Sound (Tabasco

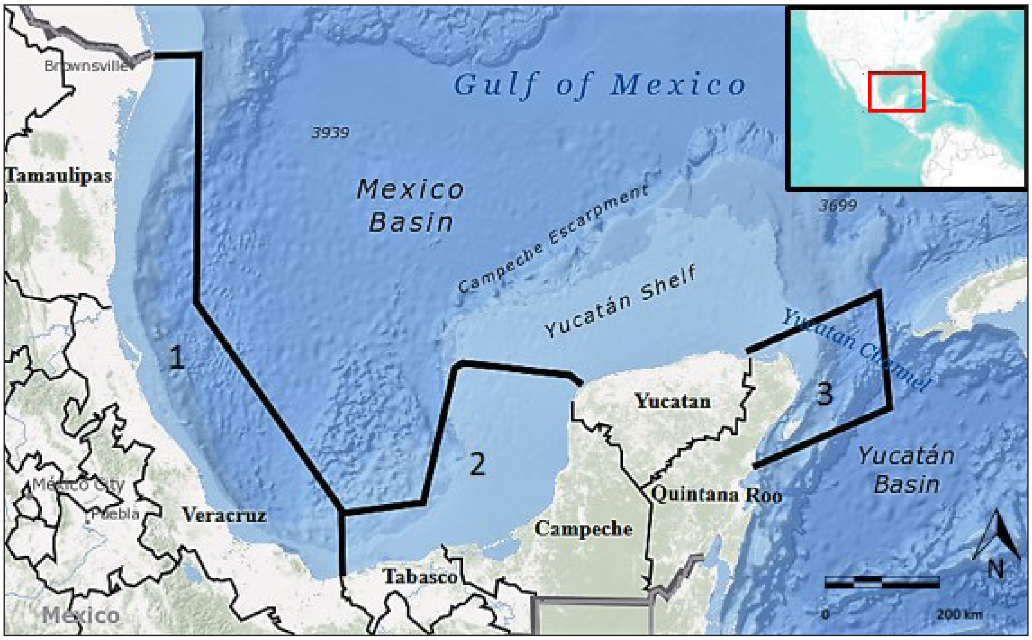

FIGURE 1. *Mexican States located along the east coast, as well as main shrimp fishing grounds in the Gulf of Mexico and Caribbean Sea: Tamaulipas and Veracruz (1), Tabasco and Campeche Sound (2), and Contoy and Quintana Roo (3). Source: Adapted from Wakida–Kusunoki et al. (2010).*

and Campeche), and the Mexican Caribbean (Quintana Roo; Figure 1). The focus of this study was on the Campeche Sound (Tabasco and Campeche) which is part of the continental shelf located west of the Yucatan peninsula, and covers about 50,000 km^2 stretching from the shore up to the edge of the continental shelf. Along its coast are several protected areas, such as the Terminos Lagoon, the Los Petenes Reserve, and the Special Reserve of the Ria Lagartos Biosphere (Ramírez–Rodríguez 2015).

Review of the Shrimp Fishery

In 2013, Campeche produced 5.9% of the Mexican Gross Domestic Product (GDP), mostly due to offshore oil production. However, the shrimp fishery is a significant economic activity in the area and is composed of 3 main fisheries: pink shrimp (*Farfantepenaeus duorarum*), Common Snook (*Centropomus undecimalis*), and octopus (*Octopus vulgaris*) (SAGARPA 2013). The principal shrimp fishing grounds are located off Ciudad del Carmen, within the Términos Lagoon, and in the area between Ciudad del Carmen, Cayo Arcas, Triángulos, and San Francisco de Campeche (Ramírez–Rodríguez 2015).

Shrimp landings in Campeche are mainly represented by wild capture; the shrimp aquaculture industry, first introduced in Campeche in 2000, has not yet reached competitive levels, representing only 17% of total shrimp production in Campeche (SAGARPA 2013, 2014b; Figure 2). In recent years, however, shrimp landings have oscillated between

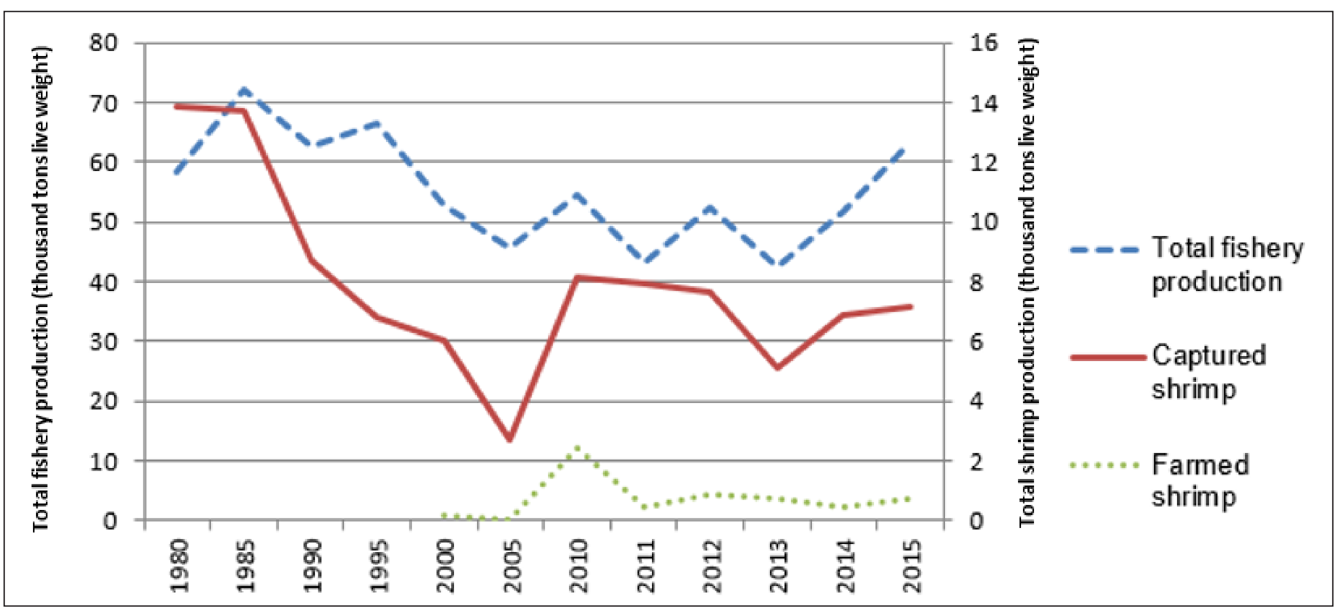

FIGURE 2. *Total fishery production (capture and farmed primary axis) and total shrimp production (capture and farmed, secondary axis) in Campeche in the years 1980-2015. Shown as thousand tons of live weight. Source: SAGARPA (1980, 1985, 1990, 1995, 2000, 2005, 2010, 2011, 2012, 2013, 2014d, 2015).*

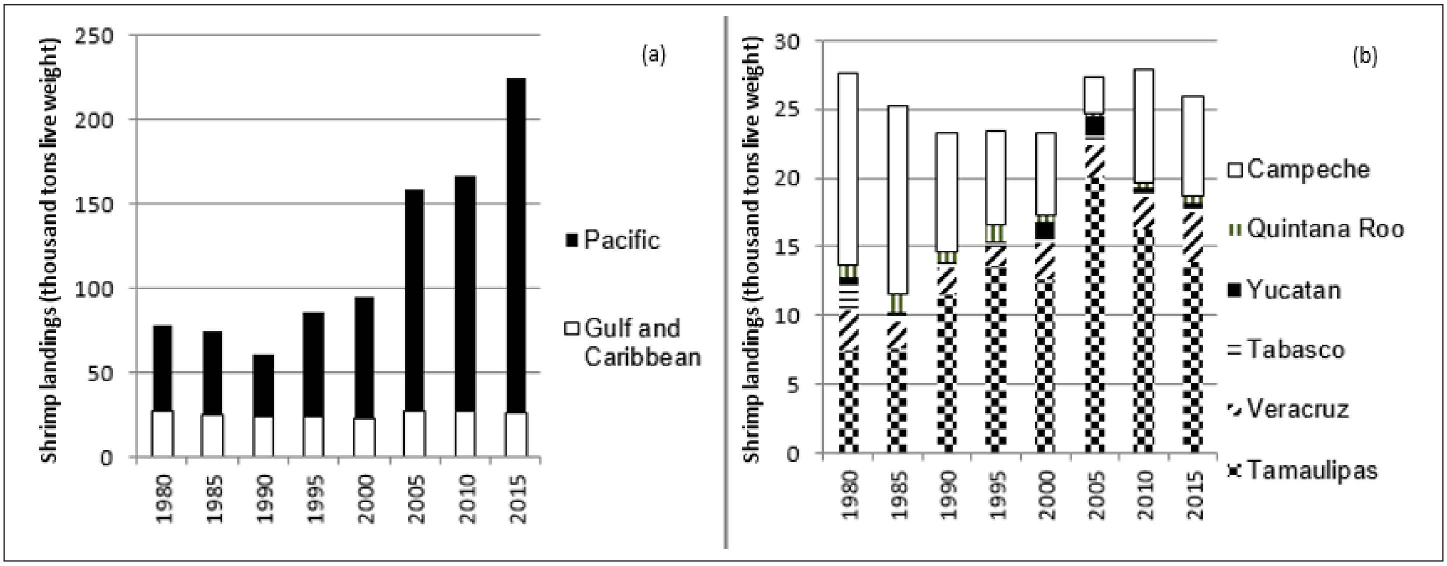

FIGURE 3. *Shrimp production in Mexico. (a). Origin by coast. (b) Origin of catches within the Gulf and Caribbean coast by state. Shown as thousand tons of live weight. Source: SAGARPA (1980, 1985, 1990, 1995, 2000, 2005, 2010, 2015).*

5,000—8,000 tons of live weight which is significantly lower than shrimp harvests in the 1970s and 1980s (around 14,000 tons); a minimum of only 2,730 tons was caught in 2005 (Ramírez—Rodríguez 2015).

The decline in shrimp landings that has occurred in Campeche has not impacted national supply, due mainly to the growth in landings in other areas, including Tamaulipas and the Pacific coast (especially since 1990; Figure 3). This pattern of higher landings contrasts with the trend observed in the Campeche shrimp fishery over the past few decades. For example, Ramírez—Rodríguez (2015) argues that from 1969 to 1979, the shrimp fishery in Campeche Sound provided considerable support towards the economic and social development for the states along the southern GOM. However, since landings of pink, white (*Litopenaeus setiferus*), and brown shrimp (*F. aztecus*) in Campeche Sound peaked in 1972 at 22,000 tons, harvests have been in decline. In the late 1970s the pink shrimp stock in the Campeche Sound had an estimated biomass of 26,000 tons, but from 2004-2011, mean biomass declined to 2,067 tons, and annual catches fell to between 770 and 1,550 tons of live weight (Rojas—González et al. 2012[1]).

Tamaulipas is the main Mexican shrimp producer in the Gulf of Mexico and the Mexican Caribbean. The shrimp fishery is the most important fishery in Tamaulipas, with harvest occurring in estuaries, lagoons and high seas (SAGARPA 2014a). Wild captures represent by far the majority of the shrimp landings across the coastal Mexican states (SAGARPA 2014a) with the contribution of the Veracruz fishery accounting for a very small part (3%) of the total shrimp landings, as compared to Campeche (12%) and Tamaulipas (30%) (Figure 3). The most important shrimp fishery species in the GOM in terms of total landings are brown shrimp, pink shrimp, and white shrimp, with other, minor species including the Atlantic seabob shrimp (*Xiphopenaeus kroyeri*), red shrimp (*F. brasiliensis*), and brown rock shrimp (*Sicyonia brevirostris*) (SAGARPA 2012). Shrimp fishing in Mexico is targeted by both artisanal and industrial fleets. Brown shrimp is mainly landed in waters outside Tamaulipas and Veracruz and currently comprises 90% of the total shrimp catch in the Gulf of Mexico, whereas pink shrimp is the main species landed off Campeche where brown and white shrimp are present in much smaller numbers (SAGARPA 2014b, c; Rojas Gonzales, Lerma—Campeche CRIP, pers. comm.). The seabob shrimp, which is fished in coastal areas by smaller boats (Ramírez—Rodríguez 2015), is another species of minor importance for Campeche.

In 2015, 338 industrial trawlers (21—25 m length) and 2,540 artisanal vessels (*charangas*) operated in the GOM and Caribbean Sea shrimp fishery (FAO 2015). The largest fleets are registered in the States of Tamaulipas and Campeche (Figure 4); however, a decline of the fleet in Campeche has been more marked than that in the rest of the GOM and Caribbean, with 725 boats operated in 1980 but only 120 boats fishing in 2013 (SAGARPA 2013).

The shrimp fishery occurs in lagoons and the high seas, with industrial high—sea fisheries captures targeting shrimp in their pre—adult and adult phases whereas artisanal fisher-

[1]Rojas-González, R., A.T. Wakida-Kusunoki, C. Monroy, and G. Galindo-Cortés. 2012. ¿Por qué no se ha recuperado la captura de camarón rosado? Análisis de la capacidad de carga. Paper Presented at the XIII Foro de Camarón del Golfo de México y Mar Caribe, San Francisco de Campeche, Campeche, Mexico.

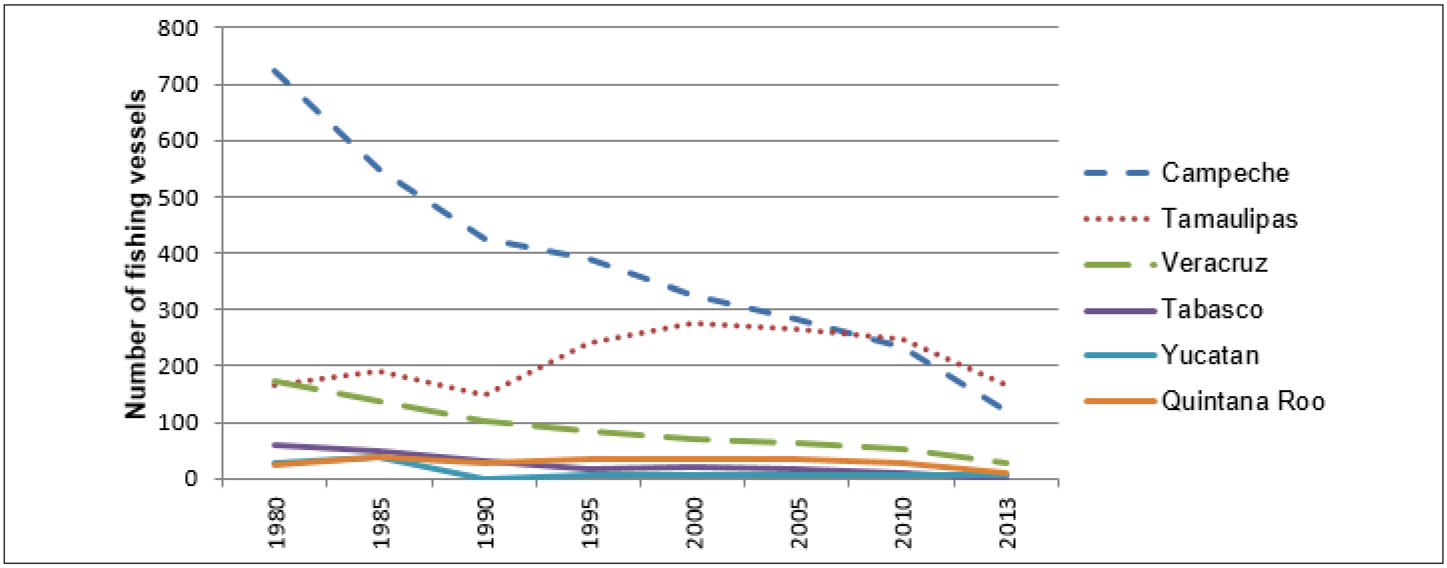

FIGURE 4. *The number of vessels in the open water shrimp fishing fleet in the Gulf of Mexico and Caribbean Sea states across years. Source: SAGARPA (1980, 1985, 1990, 1995, 2000, 2005, 2010, 2015).*

ies captures are comprised mainly of juvenile brown shrimp (Ramírez—Rodríguez 2015), particularly in Tamaulipas state. However, illegal fishing of pink shrimp juveniles occurs in the state of Campeche. Because such harvest is illegal, it is not quantifiable but it is known to occur in very significant numbers (Rojas Gonzales, Lerma—Campeche CRIP, pers. comm.). The development of an illegal artisanal fishery in Campeche has led to growth overfishing (targeting individuals from 12 to 115 mm) and has been calculated to have reduced high—sea catches by 10—20% (Gracia 1995). Furthermore, even with the differences in age classes targeted, there nevertheless exists a high level of competition between artisanal and industrial fishers in Campeche, Veracruz and Tamaulipas (SAGARPA 2014a; Ramírez—Rodríguez 2015). Artisanal fishing is legal in the latter two states, but illegal in Campeche (Rojas Gonzales, Lerma—Campeche CRIP, pers. comm.).

Although FAO (2015) recently noted a general lack of relevant information on by—catch and discards in REBYC—II LAC member countries, they reported that 19,000 metric tons of discards have been generated in the GOM, with a by—catch:shrimp ratio of between 3:1 and 19:1 (FAO 2014); fish by—catch is usually discarded (SAGARPA 2014b). However, a portion of the commercial by—catch is kept for direct consumption by fishers and boat owners (SAGARPA 2014b). In Tamaulipas and Veracruz, by—catch is composed of 80% fish and crustaceans, while the rest are mollusks, echinoderms, algae, sponges, and others (SAGARPA 2014a).

Fishery sector and sale market

With the exception of 2013, fishery exports in Mexico showed a generally increasing trend in recent years (Figure 5); however, the amount of export represented by shrimp is limited in terms of live weight, but more important in terms of export value (SAGARPA 2013). International exports are essentially oriented towards the United States with more than 99% of the shrimp being exported from Mexico as frozen product (SAGARPA 2013). Unfortunately, no exact data about export of Campeche shrimp are currently available to the Lerma—Campeche CRIP, but due to the fishery crisis, shrimp exports (mainly pink shrimp) from Campeche to the United States have significantly decreased in recent years, mostly due to the reduced size of the fished individuals (Romellón Pérez, CANAINPESCA, pers. comm). However, brown shrimp exports, while decreasing slightly, continue to remain significant (Rojas Gonzales, Lerma—Campeche CRIP, pers. comm.).

The reduction in export is also due to the loss of competitiveness on international markets, caused by the increase in shrimp from aquaculture. The problem is worsened by high fuel prices and low shrimp catches, which do not allow for benefits from economies of scale. All these factors have played a prominent role in hampering the competitiveness of the Mexican shrimp fishery (Romellón Pérez, CANAINPESCA, and Flores Hernández, EPOMEX, pers. comm.). Despite this hardship, Mexico is one of the 7 main global shrimp exporters to the United States (Figure 6) which also includes China, Ecuador, Viet Nam, Thailand, Indonesia, and India (https://www.st.nmfs.noaa.gov/apex/f?p=169:2). Together with Ecuador, Mexico represents the only non—Asian country in the group.

Status of the fishery and management measures

Ramírez—Rodríguez (2015) argues that in 2013 the shrimp fishery in Campeche was operating at bankruptcy levels due to the following factors: low catches and prices, low profitability, and an overcapitalized fleet and industrial plants. At least 4 causes explain this situation: 1) the fishery is char-

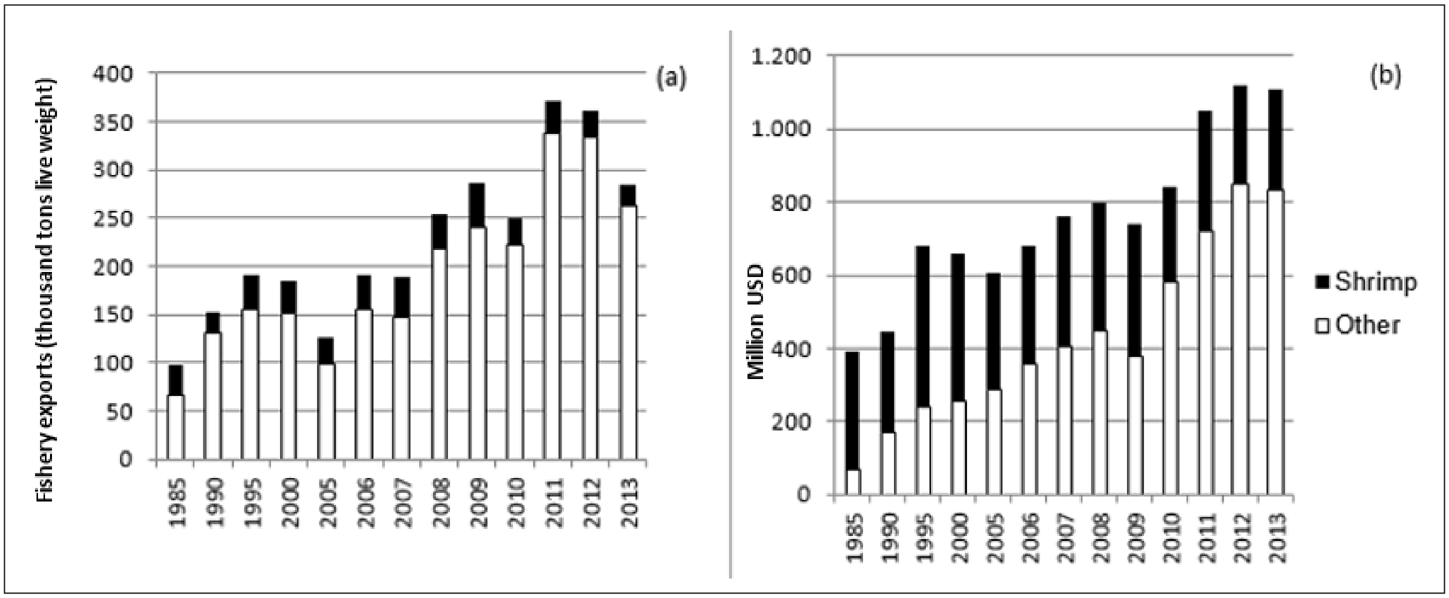

FIGURE 5. *Mexican fishery exports from 1985 – 2013. (a) Amount. (b) Value. Source: SAGARPA (1985, 1990, 1995, 2000, 2005, 2006, 2007, 2008, 2009, 2010, 2011, 2012, 2013).*

acterized by growth and recruitment overfishing, caused by illegal fishing of juveniles in coastal areas, matched with uncontrolled offshore fishing, which led to overcapitalization and decreased the profitability of the fishery (Ramírez—Rodríguez 2015); 2) a significant reduction of fishing grounds resulting from the development of security areas around oil platforms which were introduced in areas where the highest shrimp population densities were historically encountered (SAGARPA 2014b); 3) urban development and pollution modified shrimp breeding areas (Ramírez—Rodríguez 2015); and 4) a reduction in recruitment patterns around 10% of that estimated at the beginning of 1970s was experienced due to environmental changes in the waters of the Gulf of Mexico (Ramírez—Rodríguez and Arreguín Sánchez 2003). A review of relevant shrimp literature (Arreguín Sánchez et al. 1997, Gracia et al. 1997, Gracia 1997, Arreguín Sánchez 2006), SAGARPA (2014b) reported that water temperature and salinity were more responsible for the reduction of landings in the Campeche Sound than was fishing effort; the latter, the report argues, only played a marginal role in lower landings.

The most important piece of legislation for fishery and aquaculture in Mexico is the General Law on Sustainable Fishery and Aquaculture (*Ley General de Pesca y Acuacultura Sustentables*). The statute lays out 3 public policy instruments for the management of fishery resources: the framework of fishing licenses and concessions (*permisos y concesiones de pesca*); the Fisheries Management Plans (*Planes de Manejo Pesquero*, PMP); and the Fishery Code Programs (*Programas de Ordenamiento Pesquero*, POPs). The General Law acknowledges PMPs as instruments of public policy and are produced by INAPESCA, a fisheries institution without regulatory powers. The POPs are a product of the National Commission of Fishery and Aquaculture (CONAPESCA). These include compulsory regulations of fisheries management, which are based on the measures recommended in the PMPs (Quiroga Brahms, FAO, pers. comm.).

The REBYC—II LAC Project

The REBYC—II LAC project aims to reduce or eliminate negative ecosystem impacts and achieve sustainable bottom trawl shrimp fisheries in the Latin American and Caribbean region through the implementation of an EAF, as well as addressing bycatch and habitat impact management (FAO 2015). The project has four components (GEF 2013):

1. Improving collaborative institutional and regulatory arrangements for bycatch management;
2. Strengthening management and optimizing use of bycatch within an EAF framework;
3. Promoting sustainable livelihoods, diversification and alternatives; and
4. Monitoring the progress of the project and disseminating information.

The project will implement these changes by promoting institutional, technological and development solutions at the local level, encouraging the co—management of fisheries resources through the promotion of an EAF, and by fully involving the private operators in an effective public and private sector partnership (GEF 2013). Campeche fishers will play a prominent role in achieving 2 of the main objectives of the project reported under Component 2 (i.e., catch data collection and changes to fishing technology). To address catch data collection, an onboard observer program will be established during the fishing season to study harvest totals, catch com-

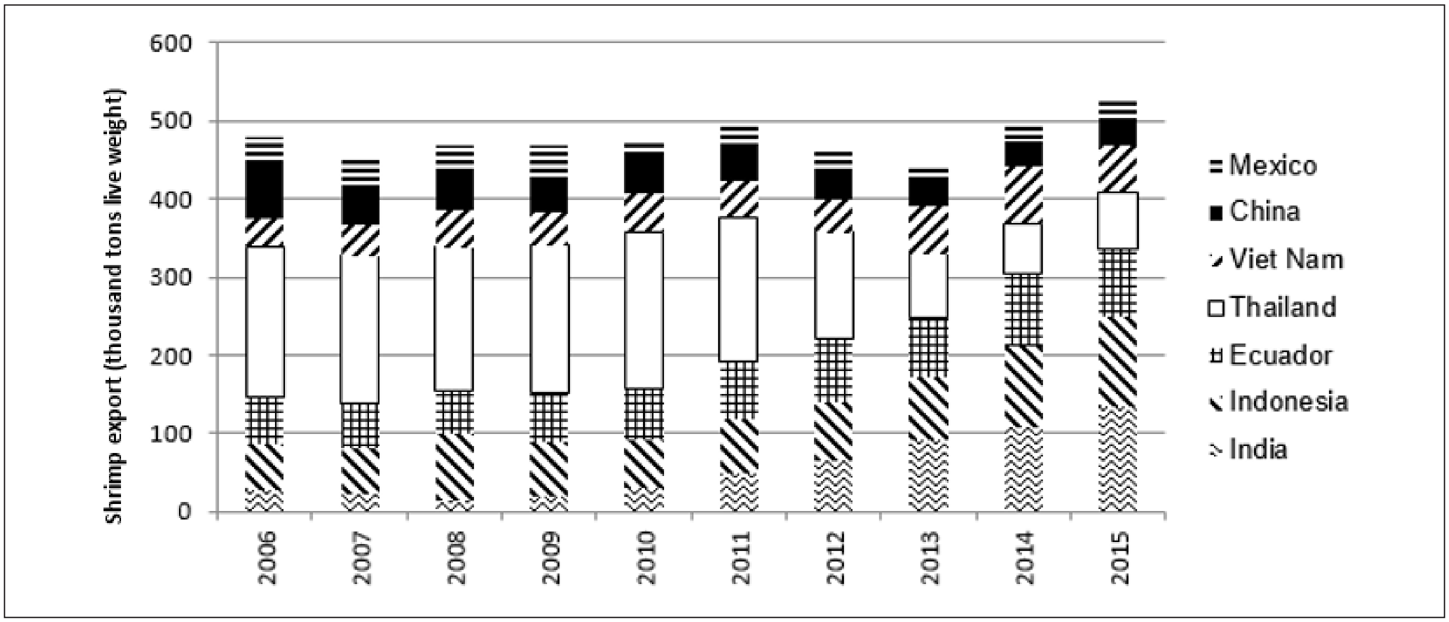

FIGURE 6. *Shrimp exports to the United States from 7 main exporters. Source: National Oceanic and Atmospheric Administration (NOAA), Office of Science and Technology, United States Government.*

position, and spatial and temporal variation in catches. For modifications to the fishing technology, changes will be proposed and tested on fishing vessels, in cooperation with fishers. These changes will mainly relate to the reduction in size and weight of nets, changes in net material, and changes in net design to increase escapement (FAO 2015).

Improvements in data collection and fishing technology will be implemented solely on industrial vessels. Experiments on nets are planned to start in October 2017 (Quiroga Brahms, FAO, pers. comm.). However, the cooperation of the shrimp—fishing private sector should not be taken for granted. During the REBYC—II LAC meeting in Campeche, representatives of the fishing industry (CANAINPESCA) expressed their concern about several of the project objectives. This is mostly due to the private sector views reducing bycatch rates only as a secondary problem when compared to the urgency of halting illegal coastal fishing.

The MSC Eco—label Assessment

The MSC has developed standards for sustainable fishing and seafood traceability which allows sustainable fisheries to be certified, recognized and rewarded in the marketplace, as well as providing consumers with guarantees that the seafood products they purchase are sourced from a well—managed and sustainable fishery (MSC 2014). Wild—capture fisheries from around the world can apply for MSC certification. If a fishery decides to undergo the MSC assessment process, it will be analyzed by an accredited, independent third party certification entity, formally known as the Conformity Assessment Body (CAB). For purposes of transparency, the report written by the CAB is subject to further scientific review by another independent group of scientists (MSC 2014). The following 3 principles of the MSC Fisheries Standards lie at the core of the assessment process:

1. Sustainable target fish stocks. Operations in a fishery must be carried out in a manner that does not lead to stock overfishing or depletion. Similarly, for depleted stocks, the fishery must be conducted in a way that demonstrably leads to their recovery.
2. Environmental impact of fishing. Fishing operations should be carried out without hampering the structure, productivity, function and diversity of the ecosystem on which the fishery depends. This also includes habitat and associated species dependent and ecologically related to the targeted stock.
3. Effective management. The fishery needs to be subject to an effective management system compatible with local, national and international laws and standards, and must include institutional and operational frameworks that require a responsible and sustainable use of the resource.

MSC Standards are composed of 28 performance indicators (PIs), against which the fishery is assessed. All the PIs and relevant criteria are shown and fully described in MSC (2014). Each PI is composed of several scoring issues against which the fishery is assessed at the 60, 80, and 100 scoring guidepost levels (SG60, SG80, SG100). The CAB assigns scores for individual PIs in increments of 5 points (MSC 2014).

The fishery is assigned a score for each PI, in which 60 is the minimum acceptable performance, 80 is global best practice, and 100 is near perfect performance. To obtain the certification, the fishery is required to score a minimum of 60 in each of the 28 PIs, and an average of 80 across all PIs composing each of the three MSC Principles (MSC 2015a). A fishery scoring very high points (e.g., 90 or beyond) in many PIs, but scoring below 60 in only one of them, would fail the assessment. The same would happen to the fishery scoring very high points in many PIs, but obtaining an overall average of less than 80 for a given principle. If the fishery obtains a score between 60 and 79 for any PI, the MSC requires the fishery to take appropriate measures to enhance the performance against the relevant indicator into account. This should lead the fishery to reach a score of 80 or above within a pre—set time interval, usually 5 years (MSC 2015a).

Before the effective assessment process starts, an optional pre—assessment phase can take place. This is a shorter and less expensive process and the pre—assessment is aimed at enabling both the certification body and client to plan for a full assessment. This pre—assessment process determines potential obstacles to certification and informs the client of the likelihood of success (MSC 2014). If the pre—assessment determines the need for additional improvements, a FIP will be launched to address the highlighted issues. Once the pre—assessment is concluded with success, the actual assessment process follows. This is based on the identification of the Unit(s) of Assessment (UoA) and Unit(s) of Certification (UoC). The UoA and UoC both include: the target stock, the fishing method or gear types, vessel types and practices, and the fishing fleets or individual fishing operators pursuing the stock, including any other eligible fishers that are outside the UoC (MSC 2014). The main difference between the UoA and the UoC is that the former summarizes all the elements that will need to be assessed whereas the UoC only includes the elements that will benefit from an MSC eco—label (MSC 2014). It follows that all the aspects included in the UoC are also part of the UoA; the opposite, however, is not true. The UoA and UoC of the Campeche shrimp fishery are reported in Tables 1 and 2, respectively.

TABLE 1. *Unit of Assessment for the MSC certification of Campeche shrimp fishery*

Unit of Assessment requirements	
Target stock	• Pink shrimp • Brown shrimp • White shrimp
Fishing method or gear type/s, vessel type/s and/or practices	High-sea bottom trawling with tween nets implemented by industrial fishing vessels of 20-25 m length Estuaries and bays trawling by artisanal boats measuring less than 10 meters
Fishing fleets or groups of vessels (or individual fishing operators) pursuing the stock[1]	Campeche industrial and artisanal fishing fleet (120 industrial and 3,776 artisanal vessels in 2013) Tamaulipas industrial fishing fleet (166 industrial and 3,029 artisanal vessels in 2013) Veracruz industrial fishing fleet (28 industrial and 11,549 artisanal vessels in 2013) Quintana Roo industrial fishing fleet (10 industrial and 773 artisanal vessels in 2013) Yucatan industrial fishing fleet (5 industrial and 2,564 artisanal vessels in 2013) Tabasco industrial fishing fleet (1industrial and 6,279 artisanal vessels in 2013)

[1]The number of industrial boats reported includes shrimp boats only. No data are available about the exact amount of artisanal shrimp boats. As such, in order to offer an approximation of the latter, the table reports the total number of artisanal boats present in each State. This is done because it is known that the same artisanal boat goes fishing for different species in different periods of the year (Flores Hernández, EPOMEX, pers. comm.).

TABLE 2. *Unit of Certification for the MSC certification of Campeche shrimp fishery*

Unit of Certification requirements	
Target stock	• Pink shrimp • Brown shrimp • White shrimp
Fishing method or gear type/s, vessel type/s and/or practices	High-sea bottom trawling with tween nets implemented by industrial fishing vessels of 20-25 m length
Fishing fleets or groups of vessels (or individual fishing operators) pursuing the stock[1]	Campeche industrial and artisanal fishing fleet (120 industrial and 3,776 artisanal vessels in 2013)

[1]The number of industrial boats reported includes shrimp boats only. No data are available about the exact amount of artisanal shrimp boats. As such, in order to offer an approximation of the latter, the table reports the total number of artisanal boats present in each State. This is done because it is known that the same artisanal boat goes fishing for different species in different periods of the year (Flores Hernández, EPOMEX, pers. comm.).

Scoring the Campeche shrimp fishery

Scoring issues and guideposts for each PI composing the MSC default assessment tree are reported in full in MSC (2014). Analyzing the scoring guideposts and issues of the Campeche shrimp fishery for each of the 28 MSC PIs is beyond the scope of this paper. Instead, what follows is a detailed analysis of some key PIs from each of the 3 MSC Principles as these relate to the Campeche shrimp fishery. These PIs were selected because they offer a snapshot of the status of and main issues affecting the fishery. Clearly, an exhaustive pre—assessment and assessment process would need to take all the PIs into account. The remainder of this section summarizes the scores that could be obtained for each of the selected PIs with and without the improvements potentially achieved under the REBYC—II LAC project as well as the rationale behind a hypothetical score achieved. The selected PIs are:

Principle 1:

- PI 1.1.1 Stock status;
- PI 1.2.2 Harvest control rules and tools;

Principle 2:

- PI 2.1.1 Primary species outcome;
- PI 2.1.3 Primary species information;
- PI 2.5.1 Ecosystem outcome;

Principle 3:

- PI 3.2.1 Fishery specific objectives;
- PI 3.2.3 Compliance and enforcement.

PI 1.1.1: Stock status

To obtain a score of 80 for PI 1.1.1, the MSC (2014) requires that stock status is above the point where recruitment would be impaired (PRI). This could also represent a stock level consistent with maximum sustainable yield (B_{MSY}). The MSC (2014) argues that a consistent downward trend over recent years to a level below B_{MSY} would not be consistent with this expectation. Unless estimates are available that suggest a trend reversal, for example, due to a significant reduction in fishing effort, a score of 80 cannot be awarded for this PI.

The current pink shrimp stock condition in Campeche does not seem to be adequate to obtain a score of 80 for PI 1.1.1. It is clear on the one hand that the decreasing capture trend experienced over the past decades has been halted, largely due to the introduction of specific harvest control rules. Landings have stabilized to around 5,000–8,000 tons/year (Quiroga Brahms, FAO, pers. comm.). In contrast, it is clear that these landings are very low when compared to the harvest levels in the fishery in the 1970s and 1980s and catches show no signs of recovery to these past levels.

While the pink shrimp stocks are in decline, brown shrimp stocks are being exploited at the maximum sustainable level (SAGARPA 2014a; FAO 2014). Indicators of fishery productivity suggest that the brown shrimp stock in northeast Mexico is stable, despite the contrasting opinion of CANAINPESCA on this issue (SAGARPA 2014b; Romellón Pérez, CANAINPESCA, pers. comm.). As such, maybe a score of 80 for PI 1.1.1 could be achieved for this stock. No exact data or scientific reports are available about the status of white shrimp stocks in the GOM. However, it is known that the stock has been severely reduced in recent years, and that it is now close to collapse (Rojas Gonzales, Lerma–Campeche CRIP, and Romellón Pérez, CANAINPESCA, pers. comm.). Similarly, the red and brown rock shrimp stocks have declined, and catches have followed a worrying declining trend in recent years (SAGARPA 2012). Based on these findings, it is clear that brown shrimp is the only shrimp species that could potentially obtain an adequate score for this PI. Unfortunately, the REBYC–II LAC project does not seem to be directly helpful, as it will only focus on bycatch stocks, and not on target species. The only exception is the proposed increase in mesh size to promote escapement of shrimp juveniles, although it is not certain whether this will be implemented given the initial resistance from the CANAINPESCA. As such, the REBYC–II LAC project will not directly address the need to reduce the fishing effort in most target species.

Two indirect contributions from the project towards the reduction of fishing effort are worth consideration. First, the REBYC–II LAC project aims at identifying alternative livelihoods for coastal fishers and in this sense, once valid alternatives are developed, fishers might also shift towards other employment sources. Furthermore, the pink, brown and white PMPs aim to restore the shrimp stocks through a series of actions and objectives. Through the practical implementation of the PMPs, the REBYC–II LAC project could potentially represent a good indirect step towards the replenishment of the shrimp stocks, thereby increasing the potential scores of the fishery under PI 1.1.1.

PI 1.2.2: Harvest control rules and tools

In order to score 80 for this PI, the MSC (2014) dictates that well–defined harvest control rules are to be in place, guaranteeing that the exploitation rate is reduced as the PRI is approached. These measures are also expected to maintain the stock biomass around a target level consistent with, or above, the MSY. Fisheries along the GOM and Caribbean coastlines are estimated to be less efficient, selective, and sustainable when compared to similar fisheries occurring along the Pacific coast (Rojas Gonzales, Lerma–Campeche CRIP, pers. comm.). Despite this, a set of well–defined harvest control rules are in force along the GOM and Caribbean coastlines.

It should also be recognized that the Mexican authorities are using an adaptive approach to management as the length of closed seasons has been modified over the years. For pink shrimp, in 1994–95, the closed season was from 15 August to 30 September. Since 2001, closed seasons have started earlier (May) and ended later (October or November, Ramírez–Rodríguez 2015). In more recent years, the closed season in Campeche has started in May/June and lasted until 1 or 15 November (Rojas Gonzales, Lerma–Campeche CRIP, pers. comm.).

For the brown shrimp, the high–sea closed season was extended to allow for juveniles to be afforded protection since 2003. In 2002, the last year in which the closure ended in July, juvenile overfishing was so prolific that an unprecedented closure in October was required. As such, high–sea closure now starting at the end of April/early May currently extends until August. In coastal lagoon fisheries, the seasonal closure starts at the end of May/early June and ends 45 days later (SAGARPA 2014a). The extension of seasonal closures has found opposition within the CANAINPESCA, which argues that the seasonal closures are too long, and that the extended closures have reduced the profitability of the industry. Flores Hernández (EPOMEX, pers. comm.) has recognized that, although the level of effort currently applied is lower compared to previous years, landings remain low. Therefore, the harvest strategies implemented and adjusted since 1993 have not prevented the stock from further consistent declines.

It is evident that the pink shrimp stock in Campeche has seen its reproductive potential severely impacted over the years, and that the PRI has likely been exceeded. As such, it is unlikely that a score of 80 for PI 1.2.2 could be achieved. However, a contribution of the REBYC—II LAC project towards the fulfilment of PI 1.2.2 would derive from the implementation of the pink shrimp PMP. Among the actions comprising the PMP are those that establish appropriate seasonal closures, determine the right level of fishing effort and adapting the fleet size accordingly, increase monitoring and control over illegal coastal fishing, and assess the feasibility of growing shrimp larvae in laboratories with the goal of promoting recruitment (SAGARPA 2014b).

During the REBYC—II LAC meeting in Campeche, the FAO representatives called for the need to increase the mesh size of shrimp fishing nets. The CANAINPESCA showed its opposition to this decision, arguing that the majority of the current catch in the GOM – especially in the Campeche Sound – is represented by small—sized shrimp (Romellón Pérez, CANAINPESCA, pers. comm.). Given that the increase of the mesh size would generate a further reduction in landings, it remains to be seen whether or not the INCOPESCA will actually implement the proposed changes in mesh size. Beyond gear modifications, the introduction of other management measures (e.g., additional spatial and temporal closures) will be considered as their need and feasibility will be examined in consultation with fishers (FAO 2015). Thus, new and more stringent harvest control rules could be produced under the co—management scheme in place, but it appears unlikely that fishers will agree to further restrict their current levels of fishing effort.

PI 2.1.1: Primary species outcome

The MSC defines "main primary species" as those species whose catch amounts to 5% or more by weight of the total catch of all species in the UoA, or to 2% or more by weight in the case of a species judged as less resilient. By contrast, "main secondary species" are classified according to the same benchmarks, but are not managed (MSC 2014). The SG 80 for the PI 2.1.1 indicates a condition in which the main primary species are highly likely to be above the PRI; or, if the species are below that point, evidence of recovery must be available. Alternatively, a demonstrably effective strategy shall be in place within all the UoAs of which the species being evaluated is considered as a main species, aimed at ensuring that all the UoAs do not impair stock recovery and rebuilding (MSC 2014). Some difficulties arise when attempting to assess the status of multi—species fisheries, especially in presence of tropical species complexes. For this reason, it is understood that the assessment of key parameters such as abundance and productivity will be implemented only for certain selected indicator species (Wessels et al. 2001). This issue is relevant here, given the large amount and high diversity of fauna comprising the catch of the Campeche shrimp fishery.

For the pink shrimp fishery, main primary species are red, white and brown rock shrimp. Red, white and brown rock shrimp captures showed a decreasing trend in the last decades, and the stock is considered to be in a deteriorated condition (SAGARPA 2012). Therefore, it seems likely that red and brown rock shrimp recruitment has been impaired; thus, obtaining a score of 80 for this PI would be difficult. Available data on catch composition estimate that the bycatch:shrimp ratio in the high—sea fishery of Campeche Sound is 12:1 and that the bycatch is mainly composed of finfish.. Given that no accurate data are available regarding the contribution of each species to the bycatch, it is not possible to assess with certainty what both the primary and secondary species are for the Campeche shrimp fishery. This implies uncertainty over the condition of the fishery under the MSC PI 2.2.1, especially the secondary species outcome. Finally, an important component of the REBYC—II LAC project will focus on the process of gathering data on landings amounts and composition. The project will improve knowledge about the stock and will contribute to a greater understanding of the primary and secondary species associated with the brown and pink shrimp fisheries.

FAO (2015) states that management plans in Mexican shrimp fisheries are not EAF based and thus bycatch is generally not managed. Despite limited knowledge on the amount of bycatch and discards, it is acknowledged that a significant amount of resources is wasted. The REBYC—II LAC project could help the Campeche shrimp fishery to increase the score achieved for PIs 2.1.1 and 2.2.1 mainly in terms of gear modification. FAO (2015) reports that the gear design currently used in the Pacific will be tested for the GOM and Caribbean Sea. The main modifications will be related to 1) the introduction of fish excluder devices (FEDs) and thus the reduction of net size and weight, 2) the change of net materials, and 3) the change in the net design aimed at increasing escapement of bycatch and shrimp.

PI 2.1.3: Primary species information

In order to reach a score of 80 for this PI adequate quantitative information needs to be available to assess the impact of the UoA on the main primary species of the fishery (MSC 2014). FAO (2015) reports that only limited and patchy data on bycatch are available in Mexico and that these are derived from earlier surveys or projects (e.g., REBYC—I) and not from systematic monitoring. Quiroga Brahms and Flores Hernández (FAO, EPOMEX, pers. comm.) also confirmed this shortcoming, reporting that data on landings composition of Campeche shrimp vessels are not currently available; the impact of fishing on bycatch stocks has not been evaluated. These conditions suggest that the fishery would not be able to achieve a score of 80 for this PI.

Similarly to PI 2.1.1, the actions promoted by the REBYC—II LAC project in terms of data gathering would also be useful for scoring the fishery under PI 2.1.3 and 2.2.3. To this extent, FAO (2015) reports that one of the goals is to improve information on bycatch (species, volumes, benthic habitat impacts) for both small and large scale fisheries. The target is to identify critical bycatch species, improve data monitoring systems, and assess the composition and spatial and temporal variation in bycatch in the GOM and Caribbean Sea through information sharing. This objective is particularly useful from the perspective of having the Campeche shrimp fishery assessed against the MSC standards as current landings and bycatch composition data (Yáñez Arancibia and Sánchez—Gil 1985) are more than 30 years old.

PI 2.5.1: Ecosystem outcome

Fisheries management plans in Mexico are not EAF based and the impacts on bycatch species stocks, seabed, and spawning areas are not well known (FAO 2015). In fact, trawling activities in Campeche are believed to be causing serious damage to animals, plants and the marine ecosystem's general structure and functioning (Flores Hernández, EPOMEX, pers. comm.). As such, a score of 80 would be hard to obtain for this fishery in this PI (and for PI 2.4.1), since the MSC (2014) requires that the UoA is highly unlikely to interrupt the key elements underlying ecosystem structure and function to the point to which these would be seriously or irreversibly damaged.

The REBYC—II LAC project will likely contribute to minimizing the Campeche shrimp fishery ecosystem impacts through a change in fishing techniques and via a modification of the existing legislation to embrace EAF principles, as was determined for the Primary species outcome PI. The REBYC—II LAC will promote the usage of turtle excluder devices (TEDs) and fish—eye fish excluder devices (FEDs). These devices will increase escapement and reduce the impact of fishing activities on the marine environment. Additionally, the introduction of a second footrope (*segunda relinga inferior*) will help to prevent the damage to marine plants and the incidental capture of benthic species (Aguilar Ramirez, FAO, pers. comm.). Furthermore, a modification to the current legislation in order to make it EAF—based will likely address the impacts that the fishery has on the marine ecosystem. The main focus will be on bycatch species, for which FAO (2015) also includes corals and other fauna and flora "taken" by trawl activities. Despite these proposed measures, it is important to note that seabed analysis and data collection do not comprise a project priority (Quiroga Brahms, FAO, pers. comm.). Thus, a substantial contribution will not arise from the REBYC—II LAC project with regard to other MSC PIs such as 2.4.3 (Habitats information) and 2.5.3 (Ecosystem information).

PI 3.2.1: Fishery—specific objectives

To achieve a score of 80 in the PI 3.2.1, the MSC (2014) dictates that short and long—term objectives shall be in place within the fishery—specific management system. These have to be consistent with realizing the goals of MSC Principles 1 and 2. The pink, brown and white shrimp PMPs have the goal of ensuring the long term well—being of the shrimp stocks, for which they also specify target reference points to be used by fishery managers. Additionally, a well—defined harvest strategy must be in place, for which harvest control rules are to be applied. Also, information should be available about stock structure and productivity as well as fleet composition (SAGARPA 2014a,b). Fishery objectives – as well as actions for achieving them – are included in the pink, brown and white shrimp PMPs. As such, the PMPs seem to deal quite fairly with the MSC Principle 1.

The situation concerning Principle 2 is different. The pink, brown and white shrimp PMPs do not adequately regulate the issue related to bycatch (primary, secondary and ETP species), habitats and ecosystems. The PMPs only mention the objective of promoting the well—being of the shrimp stocks and their habitats in the GOM (SAGARPA 2014a,b). The only exceptions are represented by Action 4.2.2 of the brown and white shrimp PMP, which aims to research new fishing technologies matching efficiency with bycatch reduction, and Actions 4.4.1 and 4.4.2 of the pink shrimp PMP. These latter activities have the objective of evaluating the effectiveness of TED usage as well as monitoring bycatch of the high—sea fishery (SAGARPA 2014a, b). These measures are more oriented towards research and data collection than towards effective management through specific objectives and these measures are not yet in place. As such, reaching a score of 80 for this PI seems rather unlikely for the pink, brown and white shrimp fisheries in Campeche.

The REBYC—II LAC project could improve this situation through the implementation of the PMPs. However, this improvement would mainly relate to the MSC Principle 1, as no explicit references are available in the PMPs about a desire of the Mexican authorities to effectively reduce the bycatch rates of their shrimp fisheries. The issue of bycatch reduction will be addressed by the REBYC—II LAC project by promoting more selective fishing techniques and by creating market options for bycatch species. These actions will represent an input to reduce unwanted catch and an incentive not to discard it at sea. These actions should provide the legal framework in the GOM with the right regulations aimed at respecting the MSC Principle 2, mainly in terms of bycatch and ecosystem considerations. As such, the REBYC—II LAC project could lead the Campeche shrimp fishery towards obtaining an adequate score for this PI.

PI 3.2.3: Compliance and enforcement

In order to score 80 for this PI, the MSC (2014) requires that a monitoring, control and surveillance system is in place, which has a proven capability to effectively enforce relevant management measures. This is an issue that requires particular attention, as fisheries authorities in the GOM suffer from a general lack of enforcement capacity (Palleiro, INAPESCA, and Flores Hernández, EPOMEX, pers. comm.). This has led to generally poor levels of compliance to existing legislation, especially with regard to artisanal fishing efforts in coastal and estuarine areas.

A vessel monitoring system (VMS) is in place for all industrial boats which generates a high level of compliance with the designated fishing zones by industrial vessels. The main problem related to industrial fishing is the tendency to misreport landings data. The situation is exacerbated by the fact that the onboard observer program has now been suspended due to a lack of funding (Flores Hernández, EPOMEX, pers. comm.). As a result, obtaining an adequate score for PI 3.2.3 seems rather difficult under current conditions for the Campeche shrimp fishery.

The REBYC—II LAC project will not aid in promoting a better level of enforcement of existing management measures as issues of illegal artisanal fishing will not be addressed. The only indirect contribution of the project towards the achievement of an acceptable score for this PI results from the generation of alternative livelihoods for artisanal fishers. This, however, by itself will not increase the level of enforcement, but it may potentially decrease the tendency towards illegal fishing. Moreover, the promotion of co—management plans through a tighter involvement of fisheries stakeholders will likely generate a higher acceptance of the suggested management measures. This in turn is expected to improve acceptance and compliance and decrease monitoring and enforcement costs, especially in light of the involvement of fishers and other stakeholders in the preparation of the PMPs of the shrimp fisheries in the GOM.

An inclusive approach was followed for the preparation of the PMPs for the pink, brown and white shrimp. In Campeche, contributions from different stakeholders directly or indirectly involved in the fishery were considered during workshops and meetings organized by the INAPESCA through the Lerma—Campeche CRIP in 2012 (Quiroga Brahms, FAO, pers. comm.). Participants and contributors included officials from the Government of Mexico and Campeche, representatives from CONAPESCA, SAGARPA, Marine Secretary (SEMAR), Mexican Oil Company (PEMEX), shrimp boat owners and captains, CANAINPESCA, as well as researchers from different institutions such as the EPOMEX (SAGARPA 2014b). For this reason, the PMPs can be seen as a good example of an effective co—management scheme (Quiroga Brahms, FAO, pers. comm.). However, it would be naïve to believe that a higher level of compliance with existing regulations will be achieved by simply having the pink, brown and white PMPs implemented. It is likely that illegal activities will continue.

Discussion

Potential contribution of the REBYC—II LAC project to certification

The analysis presented here shows that the Campeche shrimp fishery is currently not at a level where it can meet MSC standards for certification. The REBYC—II LAC project may provide some contributions in terms of increasing data availability about target and bycatch stocks, addressing high bycatch rates and damage to ecosystem structures, reducing the landings of small—size individuals that have not yet reached reproductive maturity, and modifying currently inadequate fisheries legislation. These are all aspects that need to be seriously addressed by stakeholders of the Campeche shrimp fishery and the REBYC—II LAC project could get this process started. This implies that part of the improvements needed in order to face the MSC pre—assessment process could be on the way to be solved. Therefore, an MSC certification is not only to be seen as a goal, but rather as a means through which sustainability can be achieved. This is because it makes managers work to solve the flaws associated with the fishery, which, if unaddressed, will lead to a failure of the MSC assessment process.

Our analysis has also highlighted that the REBYC—II LAC project will not address some main issues, including the presence of illegal artisanal fishing in coastal areas, the change in environmental conditions in the waters of the GOM, and the continuing overfishing from industrial vessels. The Mexican fisheries authorities and stakeholders will need to implement measures to address these issues if MSC certification is sought. However, a significant achievement towards the certification of the Campeche shrimp fishery was reached when the public and private sector (INAPESCA and CANAINPESCA) considered engaging in the MSC pre—assessment process in the near future. If realized, this pre—assessment would help the fishery stakeholders to identify the areas that will require the greatest effort to meet the MSC standards for certification.

Implications of eco—labelling and business opportunities

The REBYC—II LAC project components and the Campeche shrimp fishery legislation identified 3 main reasons to implement sustainability measures in order to obtain MSC certification for the Campeche shrimp fishery. The first reason lies in the desire expressed by the CANAINPESCA as well as Mexican authorities – through the PMPs – to obtain a certification for their main shrimp fisheries. Another is the objective (included in Output 2.2.1) of the REBYC—II LAC project to introduce certification schemes (the MSC is mentioned) and/or other incentive packages (FAO 2015). The third reason for pursuing an MSC certification is related to the importance that shrimp exports towards the United States have for Mexico. An MSC certification could represent an added value for securing and boosting exports in the near future, when validation of sustainability of seafood products (e.g., an MSC eco—label) might be required in order to access certain markets. For example, it was with the goal of preserving its exports to Europe that Suriname had its seabob shrimp fishery certified by the MSC (C. Fuentevilla and T. Willems, FAO, pers. comm.). Likewise, re—obtaining an MSC certification was vital for the South African hake (*Merluccius capensis* and *M. paradox*) fishery to preserve its value and to increase its resilience to market shocks (Lallemand et al. 2016).

There are many advantages an MSC eco—label can provide to a fishery, both in terms of market opportunities and reputation. Whether an MSC eco—label would be of any benefit to the Campeche shrimp fishery is, however, not clear. The main issue is related to whether an eco—label could increase the profitability of the fishery in Mexico. It is known that eco—labelling programs aim to promote sustainable fishing practices through the creation of a market demand for seafood products certified as sustainable. In turn, higher demand by consumers represents an incentive for producers, who will benefit from higher prices or the creation of new markets (Wessels et al. 2001). It follows that consumer awareness about the issue addressed by the eco—label is crucial for determining the success of eco—labelled fish products (Johnston et al. 2001; Blomquist et al. 2014; Kaiser and Edwards—Jones 2006).

Mexico has not yet developed a domestic market for eco—labelled products, while the United States has consistently done so in the last 15 years. The difference between the countries is clear if one considers key indicators such as the number of MSC—certified fisheries and seafood, and the amount of supply chains that respect the MSC chain of custody standards. Therefore, it is likely that the demand for certified products is higher in the United States than in Mexico. In these circumstances, for the success of the Campeche eco—labelled shrimp, it would be vital that the export flow towards the United States is restored.

Eco—labelling can offer higher margins to producers, as the final price of goods is likely to be higher than the non—labelled product (Wessel et al. 2001). While a price premium has occurred in some cases (Roheim et al. 2011, Sogn—Grundvåg et al. 2013, Blomquist et al. 2014), in others this premium has not been realized (Wakamatsu 2014, Asche et al. 2015). Proponents, however, argue that an eco—label on seafood should be considered chiefly as a "market guarantee," even in difficult times for trade, as the demand for eco—labelled fishery products is generally less volatile than demand for conventional seafood (CBI 2016).

Such a guarantee suggests that Campeche could actually benefit from an MSC certification. The low level of landings likely mean that one successful strategy could be that of creating a niche market of MSC—certified shrimp, characterized by relatively low production and high prices. Even without the use of eco—labels, restaurants and retailers are able to drive the demand for certified seafood (Gutiérrez et al. 2016). Products of the certified line could be mainly destined for restaurants, hotels, and high—end supermarkets, both in Mexico and the United States.

Mexico is among the 7 main global shrimp exporters to the United States, and it is only one of 2 non—Asian countries in the list. With the exception of India, shrimp production in these other exporting countries is achieved mostly by aquaculture. As of today, only Ecuador and Viet Nam have an adequate number of shrimp farms certified by the Aquaculture Stewardship Council (ASC), and none of these countries has an MSC certification for shrimp (ASC 2016). An MSC certification could represent a great tool to ensure exports against the adoption of non—tariff barriers and trade embargos. These two instruments have been used on several occasions by the United States, which in the past has banned shrimp imports from countries such as Trinidad and Tobago, India, Malaysia, Pakistan and Thailand because TEDs were not used during shrimp fishing operations in these countries (Gillett 2008, WTO 2016).

Another issue to consider is whether or not any of the price premiums experienced through an MSC certification would provide benefits to fishers. Kaiser and Edwards—Jones (2006) speculate that the potential contribution of eco—labelling to the promotion of sustainable fisheries is constrained, among other things, by the absence of tangible, continued financial benefits to participating fishers. Whether or not the benefits will be transferred down to the fishers will depend on the structure of the supply chain of the Campeche shrimp fishery. Vessel owners and CANAINPESCA representatives report that fishers are paid according to the amount of shrimp they land, suggesting that higher catches will result in higher revenues. Given that revenues are related to shrimp quantity, and not to its value, a higher shrimp selling price will likely not generate improvements in the remuneration of fishers.

Certification costs

Having a fishery certified is a costly procedure. The social, economic and political features of fisheries in developing countries may represent a limitation to achieving an MSC certification, especially when addressing the cost of the assessment and certification processes (Pérez—Ramírez et al. 2012). Certification costs and length of time depend on fishery size and complexity, information availability and the level of stakeholder involvement (MSC 2015a; Wessels et al. 2001). The certification process lasts on average 18 months and has a cost ranging between $15,000 and $120,000 USD. Furthermore, in the presence of multiple stakeholders, it is often complicated deciding who should pay the costs for certification, and how much, especially in light of the fact that price premiums are not always guaranteed (Washington and Ababouch 2011). All these issues can represent a serious obstacle to the certification of the Campeche shrimp fishery. However, it should be mentioned that a range of funding sources and opportunities exist to assist fisheries during certification. An example is the Global Fisheries Sustainability Fund (GSFF), a fund created by the MSC in 2015 in order to increase the accessibility of the MSC program to world fisheries (MSC 2015b).

Government financing is another possible source to cover assessment costs. For instance, the Maldivian Government decided to fund the Maldives Pole and Line tuna fishery assessment and improvements (https://www.MSC.org/about—us/credibility/working—with—developing—countries/costs—of—certification—and—funding). Similarly, the Australian Government in 2012 earmarked $14.5 million USD for the certification of fisheries in Western Australia (MSC 2012). In the case of Alaska salmon, the Alaska Department of Fish and Game offered funds for certification (Welch 2000). Other funding sources include development agencies and private sector funding such as the World Wide Fund for Nature's (WWF) Community Fisheries Grants and the Sustainable Fisheries Fund (Washington and Ababouch 2011). These and other funding alternatives should be considered by the stakeholders of the Campeche shrimp fishery. The examples sourced in the literature seem to suggest that the problem related to the cost of certification could be overcome.

Summary

Calculating the impact of fishing activities over the marine ecosystem is a challenging task. This is due to the dynamic nature of marine ecosystems, which often undergo natural changes affecting the abundance of populations. As such, it is often hard to differentiate between natural and fishing—induced ecosystem changes (Wessels et al. 2001). To this extent, Rojas Gonzales (Lerma—Campeche CRIP, pers. comm.) suggested that environmental factors rather than overfishing were more relevant in causing a decline in shrimp availability and consequent landings. This is supported by the fact that in Campeche, declines in landings were also noted in other target fisheries that use the same environment. Wakida—Kusunoki (INAPESCA, pers. comm.) further argued that the impact of environmental changes in the marine environment is so significant, that it has hampered the ability to make precise predictions about the effectiveness of fisheries management measures.

The pink shrimp fishery is an important source of employment and revenues for fishers in the State of Campeche, and its decline is a result of social and economic problems. Measures are needed to reverse this decline and the MSC eco—label could possibly represent a solution to address these issues. The similarity among the objectives of current Mexican shrimp management legislation, the REBYC—II LAC project, and the MSC certification suggests that efforts should be made to investigate the feasibility of achieving an MSC certification for the Campeche shrimp fishery.

Stakeholders should engage in an FIP to address the present flaws of the fishery: a sound FIP should be aimed at leading the fishery to a condition in which it will be able to fulfil the MSC Standards for certification. The fact that 3 Mexican shrimp fisheries have already engaged in an FIP shows that the Government and relevant stakeholders have identified this approach as a feasible strategy to address the issues of national shrimp fisheries. However, all the Mexican fisheries engaged in an FIP are located on the Pacific coast, and experts argue that the shrimp fisheries located along the Pacific coast are more sustainable than those found along the east coast due to the co—existence of healthier stocks and sound management strategies (Rojas Gonzales, Lerma—Campeche CRIP, pers. comm.). While this discrepancy in performance could impact the implementation of the FIP in Campeche, the improvement plan should nevertheless be welcomed as an opportunity to demonstrate the region's commitment to achieve sustainable shrimp fisheries in the GOM.

The fact that both the public and private sectors have considered engaging in an MSC pre—assessment process provides hope. Funds will be sourced by the MSC. This process will indicate where the most effort will need to be made to lead the fishery towards sustainability. Once the pre—assessment process is completed, a Chain of Custody analysis will have to be implemented, to ensure that the shrimp carrying the MSC eco—label is actually sourced through sustainable fishing practices.

The demand for eco—labelled fishery products is growing rapidly and many indicators suggest this will continue to increase (Washington and Ababouch 2011). As such, the advantages deriving from obtaining an MSC certification for the Campeche shrimp fishery should not be overlooked, especially in the light of the importance that this could have in terms of securing exports and inflow of foreign currency to Mexico.

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