



ECOLANGOSTA +



Regional Workshop on Harmonization and Validation of Forms and Methodologies for Caribbean Spiny Lobster Stock Assessment

Panama City, Panamá, 27 of November to December 1st 2017

FINAL REPORT

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REGIONAL WORKSHOP ON HARMONIZATION AND VALIDATION OF FORMS AND METHODOLOGIES FOR CARIBBEAN SPINY LOBSTER STOCK ASSESSMENT

Panama City, Panamá, 27 of November to 1st of December 2017

Introduction and background

The spiny lobster fishery in the Caribbean region in recent years has taken important steps towards improved, joint and regionally integrated management through ratification at the highest political level, in most of the countries, of the Strategic Action Program (PAE) of the CLME + (Caribbean Large Marine Ecosystem Project), which includes a specific strategy for the spiny lobster of the Caribbean; a Memorandum of Understanding between the Central America Fisheries and Aquaculture Organization (OSPESCA) and the Caribbean Regional Fisheries Mechanism (CRFM) and its Joint Action Plan; the Regional Management Plan (MARPLESCA) and the reactivation of the Spiny Lobster Working Group of the Western Central Atlantic Fishery Commission (WECAFC).

In this regard, the Global Environment Facility (GEF), the CLME + Project and its Caribbean spiny lobster sub-project will seek to support the countries and regional organizations objective towards the transition of a rational management of resources in an integrated way to a broader geographical context of management, beyond the SICA/ OSPESCA subregion, moving towards an Ecosystem Approach to the Caribbean spiny lobster fishery at a transboundary level. For this reason, the activities of this sub-project are based on the following premises:

- a) The concept of interactive governance (creation and implementation of improved provisions and processes for transboundary governance, beyond those currently in place).
- b) The results of the evaluations that were carried out under the CLME project. (Ensure adequate participation of interested parties).
- c) The advances and results obtained from the MARPLESCA / CLME Pilot Project (Implementation of improved measures, that are socially fair, and that improve the management of the fishery and that reduce stress on lobster populations).
- d) The progress and results of other efforts at the regional and national levels.

It is in this context that the Central America Fisheries and Aquaculture Organization (OSPESCA), through a Memorandum of Understanding (MoU) between the United Nations Office for Project Services (UNOPS) and the SICA / OSPESCA Regional Unit, will execute The Ecosystem Approach (EEP) to the Caribbean spiny lobster fishery Sub Project from August 16, 2016 to August 31, 2019, hereinafter called Ecolobster+.

Component 2 of the Ecolobster+ sub-project deals specifically with capacity development for Caribbean spiny lobster management based on data and knowledge. For this, increased capacity for the data collection, management, analysis, reporting and exchange (e.g. for stock assessment) at the (sub) regional and national level will be promoted in the countries. Likewise, improvements in stock assessment capacities would be expected. This is very important given the need to know the exploitation status of Caribbean spiny lobster in the Ecolobster+ region based on data and models that provide results that are comparable, harmonized and recognized among countries and fisheries.

The above mentioned coincides with the request expressed at the Ecolobster+ national focal points meeting held in August 2017 in Panama, where Belize, seconded by the other countries, formally requested a regional workshop to define the methodologies for data collection and Caribbean lobster stock assessment.

Although in December 2012 the MARPLESCA Regional Plan was presented, which contains data collection forms and a spiny lobster stock assessment methodology, in practice there

has not been a real consensus on its application, demonstrated by the fact that some countries continue to try to evaluate this valuable fish resource in different ways. For this reason, the Ecolobster+ subproject represents once again an opportunity to define the harmonization and adoption of a common methodology for data collection and stock assessment. The application of a common stock assessment model will allow countries to understand the type of data to collect, methodologies to be implemented, and it will expand the possibilities of having regional scientific meetings where each country presents its stock assessment, with comparable results, and fishery management recommendations of regional scope are discussed.

Workshop objectives

Present, discuss and agree on the type of data and harmonized forms to be used in the region for Caribbean spiny lobster stock assessment purposes.

Present different methodological proposals for Caribbean lobster stock assessments to be technically discussed and a common regional model with comparable results agreed and defined.

Workshop methodology

The workshop was held from November 27 to December 1, 2017 in Panama City, Panama and attended by 24 delegates from Belize, Colombia, Costa Rica, Guatemala, El Salvador, Honduras, Jamaica, Nicaragua, Panama and the Dominican Republic. The only Ecolobster+ subproject member country did not attend was The Bahamas. It was also attended by special guests from the World Wildlife Fund (WWF), The Nature Conservancy (TNC), as well as the Ambassador of the Republic of Nicaragua to Panama and online participation of the University of Miami with a presentation. The full list of attendees can be found in Annex 1.

The meeting consisted of 5 days. On the first day, presentations were made on the objectives and expected workshop outputs, on the contents of the Regional Plan for the Management of Caribbean Lobster Fisheries within OSPESCA (MARPLESCA Plan) with emphasis on the data collection forms for stock assessment purposes, and concluded with presentations of the stock assessment models of Honduras, Nicaragua and Belize. The second and third days reviewed the data collection forms, and different model runs and data exchange among Belize, Honduras, Nicaragua and Jamaica were performed. On the fourth day, updated forms and the stock assessment results were presented. A summary and workshop recommendations were also provided and discussed. On the fifth day, a delegate representing the OSPESCA pro tempore chair made a presentation on the workshop summary and recommendations to the SICA/ OSPESCA Regional Director and to the Representative of the Panama Aquatic Resources (ARAP). The closing ceremony included the delivery of participation diplomas. The agenda of the workshop is shown in Annex 2.

Workshop

Day 1 Opening

The opening ceremony and welcome were shared between Mr. Manuel Pérez, Ecolobster+ sub-project Coordinator and Mr. Ivan Flores, Deputy Administrator of the Panama Authority of Aquatic Resources. The Coordinator apologized Lic. Reinaldo Morales, SICA/ OSPESCA Regional Director absence in the opening ceremony due to previously acquired commitments. Mr. Pérez in his opening speech emphasized the importance of having harmonized Caribbean spiny lobster data to be able to make stock assessments as a whole as it is a shared and migratory resource that includes both the OSPESCA countries as well as extra-regional countries, some of which participate in the Ecolangosta + Sub-project. He also referred to previous endeavors implemented as the Subregional Management of the Caribbean Lobster Fishery project (Masplesca) and its Regional Management Plan (MARPLESCA Plan).

The Coordinator continued highlighting the participation of Jamaica and Colombia in the new sub-project Ecolangosta +, as well as The Nature Conservancy (TNC) and the World Environmental Fund (WWF) in this workshop. Mr. Pérez indicated it is expected to have similar meetings as this workshop in the future where shared outputs of national stock assessments will allow for regional stock assessments as long as a data collection system and harmonized stock assessments will be available. Finally, he invited all participants to take the challenge of agreeing on how to collect data and do stock assessments with OSPESCA's support.

Next, Mr. Ivan Flores, acting ARAP General Manager, welcomed the workshop on behalf of Ms. Zuleika Pinzon, ARAP General Manager, who was on a duty mission. Mr. Flores mentioned that institutions should be strengthened to develop knowledge on the status of fish resources to manage fisheries properly. For this reason, it is important that government officials have the necessary capacities to evaluate the status of the resource. He indicated that Panama's lobster exports have dropped by 70%, which is a source of great concern, and why the workshop is a way to build capacities to conduct Caribbean lobster stock assessments and implement corresponding management measures. He congratulated the Panama workteam for the support and work done in the framework of the Ecolobster+ subproject. Finally, he welcomed the delegates to Panama, noting that the country's independence is celebrated in November, and inaugurated the workshop.

Following, the Technical Coordinator initiated the first technical session of the workshop explaining some administrative procedures and reviewed the agenda which was not modified. He presented the workshop objectives and expected outputs and the background of the regional work carried out Central American since the 1980s. In particular, he highlighted the FIINPESCA and MASPLESCA projects that first promoted the harmonization of data collection and fishery assessments. He mentioned that the current Ecolobster+ broadens the scope of action with the inclusion of extra-regional countries that are part of this Sub-project. Next, he referred, in a general way, to the forms presented and the stock assessment model included in the Regional Plan for the Management of Caribbean Lobster Fisheries (MARPLESCA Plan) based on the Nicaraguan experience.

Regarding workshop objectives, he mentioned that data collection methodologies and stock assessment models will be harmonized based on the ones being applied in Belize, Honduras and Nicaragua. In Nicaragua, the model is the one proposed in the MARPLESCA Plan, in Belize a model from the FIINPESCA Project and in Honduras a model applied in the

framework of the fishery improvement project supported by WWF. However, all three models derive from cohort analysis and have fairly similar input data.

The Technical Coordinator made clear that although work groups are mentioned in the workshop agenda, its conformation will depend on the information and data available. He also indicated that an achievement of this workshop would be to implement a joint Nicaragua- Honduras lobster stock assessment, at least in a preliminary stage, to determine the Caribbean lobster population status.

As expected workshop outputs he mentioned:

- Caribbean spiny lobster stock assessments methodologies and data collection forms harmonized and agreed.
- Recommendations and post-workshop actions provided and agreed.

Belize stated the importance of implementing workshop outputs and agreements and that political and administrative support for decision making is needed. Decision makers should be aware and support these initiatives.

Next, a round of presentations by each of the participants took place, and a group photo was taken.

The second presentation of the day was in charge of Mr. Antonio Porras, Ecolobster+ Technical Assistant, on "The MARPLESCA Regional Plan with emphasis on data collection forms for stock assessment purposes". In the presentation, he reviewed the MARPLESCA plan and later described the forms that would be reviewed in the following workshop sessions to discuss and adopt. It was mentioned that efforts to implement a regional plan by SICA countries have not been sufficient and that lack of data is a limiting factor to conduct a regional stock assessment in the region. He stressed that traceability, in which a regional standard is being worked on, is closely linked to the use of the lobster resource and decision making. Challenges and opportunities are also similar in the region, and the regional fisheries and aquaculture policy of integration of Central America mandates good management of aquatic resources. He concluded by stating that other regional instruments, such as regional regulations, support good management of these resources.

Dr. Eloy Sosa/WWF support the Honduran delegation, and gave a presentation: Caribbean spiny lobster stock assessment model in Honduras. He provided details about the model known as catch-at-age (CSA), which is the model used in Honduras within the framework of a Fishery Improvement Project (FIP) supported by WWF. Nevertheless, he mentioned that this first presentation would only be introductory about the model, and a second presentation will deal on its practical application in the Honduran fishery in the last five fishing seasons will take place later on.

He explained that different methods require a general knowledge of the total catch (including illegal, unreported, unregulated IUU), fishing effort, abundance indexes such as catch per unit of effort (CPUE), and the life history of the fish resource: growth (sizes and age), natural mortality rate (M), size at first maturity ($L_{50\%}$), fecundity and its variation with age / size, weight-length. He added that all stock assessment models have pros and cons in their

use and that the decision on which model should be used is based on the availability of the data required by the model.

In the case of the catch-at-age model used in Honduras, it derives from cohort analysis and requires data on catch at age (or sizes that are transformed to ages) and relative abundance (catch per unit of fishing effort). This model, in general, becomes more complicated depending on fishery performance and information needed, based on the fishers and fishery manager's knowledge. He mentioned that growth equations (to transform sizes to ages) in the region are not updated, even in Cuba, with lots of experience in stock assessment and where the equations have been estimated year after year, there is always uncertainty.

Next, Mr. Renaldi Barnutti, delegate from Nicaragua, presented the lobster fishery stock assessment model in this country. The model is the same proposed in the MARPLESCA plan. He pointed out that Caribbean spiny lobster is very important in Nicaragua, and that for the fishing season from July 2016 to February 2017 lobster landings were of 1438.2 tons of lobster tails and 976.4 tons of whole lobster, with a total value of 64.4 US million dollars. They consider that the OSPESCA regional lobster closed season has allowed catches to increase. He mentioned that they are exporting lobster tails, whole lobster and recently live lobster.

Mr. Barnutti indicated that Nicaragua has fishery data and information since the 1980s on monitoring, morphometric relationships, size at first-maturity, and size-weight conversion tables, among others. The first Caribbean spiny lobster closed season in Nicaragua was for 21 days in 1992. Data collection forms in Nicaragua are those cited in the Marplesca Plan, which are for quick sampling in processing plants where data is collected. He mentioned this is an important aspect to consider in order to get companies support and collaboration for data collection.

He continued explaining that when measuring the tail length, the meat should not be included to avoid measurement errors. The fishery monitoring implemented allows to get fishery data and control regulations in place. The data is used to estimate yield trends, length frequencies, sexual maturity and by catch species caught in the lobster fishery. For stock assessments, data from lobster commercial categories converted into sizes and ages are used. The model applied in Nicaragua is the one of the MARPLESCA Plan and they have 20 years of information with data updated to 2017.

Based on the outputs of the model analysis, they provide management recommendations for the spiny lobster fishery and make projections of catch quotas called Biologically Acceptable Catch (CBA). As an example, he cited that for the biological year¹ 2016 - 2017 the results support the fact that the OSPESCA lobster regional closed season has been good for the fish resource.

Jamaica asked about how worthy was measuring frozen lobster tails. Mr. Barnutti replied it is not recommended to sample frozen lobster. Sampling of tail length measurements can be conducted in landings sites or collection centers but when sampling in processing plants, for

¹ Nicaragua lobster fishing season comprises biological years from July to February next year, not per calendar year

practical reasons, the tail weight should be measured. He concluded by mentioning that models will work well as long as sampling is done correctly and data fitted properly.

Afterwards, Dr. Elizabeth Babcock, of the University of Miami, presented via internet a stock assessment model applied in two marine protected areas of Belize (Glover's Reef and Port Honduras) based on a Bayesian depletion model considering recruitment. Results are still preliminary and cannot be used to determine the status of the fishery at the national level. Nevertheless, it was mentioned that catch rates could be close to the fishery sustainable level.

Following with the presentations, Mr. Ramón Carcamo, delegate from Belize, gave a talk on the stock assessment model applied in the country. The model also derives from cohort analysis. He indicated that in Belize there are 1700 lobster fishers, who historically have captured from 400 to 600 thousand pounds of lobster tails, with 6.5 US million dollars' worth per year. The fishery is totally artisanal and coastal. The data presented was not updated and the same analyzed in the previous FIINPESCA project. It is considered that the Belizean lobster is highly exploited, however, Mr. Carcamo mentioned that there is an unused portion of lobster population located in deeper waters where artisanal fishers do not operate. In general, he pointed out there are data quality issues related to coverage of fishing effort in time and space, so the analysis generates results with high uncertainty.

Dr. Eloy Sosa made his second presentation where he specifically addressed the stock assessments results of the lobster population of Honduras. He indicated that it should be considered partial as long as it is not including Nicaragua data even though the continental shelf and resources are shared between both countries. This marine resource supports industrial and artisanal fisheries in Nicaragua, Colombia and Jamaica.

The fishery appears to be stable in the last 10 years. He stressed that in Honduras the artisanal fishing component is very small, unlike the rest of the countries in the region where it has relevance. As in the case of Nicaragua, input data consists of lobster catches by commercial category per season, which are then converted to ages. Unlike the model of the MARPLESCA Plan applied in Nicaragua, in this model fishing effort is needed to estimate a relative abundance index (CPUE).

He indicated that they have been applying the model during 9 consecutive fishing seasons, and it is easy to use. According to its estimates, lobster recruitment occurs after two years. The model outputs indicate that the fishery could be above sustainable levels, but since few years of data were analyzed there is uncertainty about the current situation. This preliminary assessment indicates that fishing pressure on the resource should not be increased but reduced instead. He mentioned that in this regard the OSPESCA regional closed season reduces fishing effort on lobster.

To conclude, Dr. Sosa said that the assessment modeling should be adjusted as a result of variations in fishing areas and changes in fleet size, the incidence of artisanal fishing, and the effects of illegal fishing. A beneficial comparison should be made between stock assessment models, since they all have pros and cons and, at the end, models provide different but complementary perspectives.

It was commented that in Nicaragua, unlike Honduras, artisanal fishing represents 62% of Caribbean lobster landings. It was also noted that live lobster catches are increasing in this

country. This situation has resulted in a decrease of the number of divers, but at the same time the number of traps has increased.

At the end of the day, Mrs. Gabriela Pineda, on behalf of WWF, gave a talk on the Fisheries Improvement Projects (FIP) for the Caribbean Spiny Lobster fisheries in Honduras and Nicaragua. These are aimed at obtaining the certification issued by the Marine Stewardship Council (MSC) after a rigorous evaluation process. The process involves the preparation and execution of a pre-evaluation; if the fishery is considered to meet certain requirements, then it can go directly to the MSC assessment. Otherwise, a FIP that includes an action plan and its implementation must be carried out first. She mentioned that from 2011 to 2012 these processes began in both countries with FIPs currently being implemented, where Nicaragua is the country that has shown the greatest progress.

For certification-oriented assessments, fishery aspects such as stock sustainability, impact on the ecosystem, and effective management and governance are valued. In both Nicaragua and Honduras, the FIP was oriented to the trap fishery. Ms. Pineda considered that the FIP and the principles on which the MSC process is based are consistent with what is promoted in the Ecolangosta + subproject, since Principle 1 assesses the state of the stock and the exploitation strategies; Principle 2 refers to ecological and environmental impacts, and Principle 3 refers to management and governance.

At the end of the day the Ecolobster+ Regional Coordinator summarized what was discussed on the first day, indicating that different methodologies were presented and recalled that this workshop was one of the requests made by countries in the Ecolobster+ national focal points meeting. For this reason, he urged delegates to participate actively in the discussions and recommendations. He concluded by pointing out that the application of a stock assessment model to the lobster fishery should consider commonalities among countries.

Day 2 Technical Session

Mr. Antonio Porras presented the forms contained in the MARPLESCA plan and a discussion was held on the forms for Caribbean lobster data collection for stock assessment purposes. The forms allow for data collection on landings, fishing effort, onboard and landings as well as processing plants samplings. The forms presented include: 1. Production per vessel (provides information on fishing effort); 2. Fleet movement control; 3. Fishing fleet registry; 4. Lobster trap fleet fishing log; 5. Lobster dive fleet fishing log; 6. Lobster processed in plants; 7. Biological lobster sampling onboard; 8. Biological lobster tails sampling in processing plants; 9. Biological whole lobster sampling in processing plants, and 10. Exports. Subsequently, there was a discussion about sample size. It was expressed that it is better to be consistent in time, even if the sample size is low, than to have large samples for only a couple of months in a year.

In order to have more information on how data collection and stock assessments of Caribbean spiny lobster is being addressed, a round of country consultations was held and the current status and conditions in each of the respective countries was presented.

In the case of the Dominican Republic, it was pointed out there is no information or capacity to collect data due to financial and staff limitations, although there is a data collection

program for artisanal fisheries in general. Most of spiny lobster is for direct consumption in the tourism sector and not landed at collection centers.

In Panama, the fishery is artisanal with no data collection; for example, it is not known whether the lobster exported is from the Pacific Ocean or the Caribbean Sea. Main Caribbean lobster fishing sites are located close to indigenous communities difficult to access (Bocas del Toro and Guna Yala), not only because of the natural barriers but also because of the autonomy of ethnic groups and mistrust towards ARAP officials. It was also mentioned that most processing plants do not allow ARAP officials or provide information.

In Nicaragua, in addition to the information presented the previous day, it was pointed out that data collection is done through the MARPLESCA plan forms and processing plants provide the information as required by law. Likewise, fishery inspectors make monthly visits. The main difficulty for data collection comes from artisanal fisheries since landings by fishing gear and fishing effort applied are unknown. It was indicated that a census of artisanal fisheries was recently conducted but data is still being analyzed. It was also commented that there is an unknown percentage of illegal fishing although some gross estimates exist.

In the case of Jamaica, they have an active data collection program for industrial and artisanal fisheries. Although there is uncertainty of contributions that the industrial versus artisanal fisheries make towards the total, it is estimated that 60% of lobster fishing could be industrial. They collect data from the lobster industrial trap fleet and also from processing plants with lobster tails sampling. There are some new involvements with live lobster catching and monitoring. Data collection from artisanal fishing is more complicated for the numerous landing sites in the country. Information on lobster processing by commercial categories is not collected by the Fisheries Division as part of the monitoring process but is obtainable in the processing plants and possibly the Export Division. Available data however, can be assessed using the stock assessment models presented at the workshop can be applied.

Regarding Guatemala, several administrative restrictions to collection of data occur due to the distance of landing sites in the Caribbean from Guatemala City. There is very little data and information on the current Caribbean lobster status since all the activity is artisanal, although efforts have been made to collect data and generate information to establish a fishery baseline. The fishery department is currently conducting a census of fishers and boats in 4 communities where some 300 fishermen and 60 boats are expected to occur. A spiny lobster monitoring program is promoted but there is still fisher's mistrust to provide data. MARPLESCA plan forms could help to collect data.

In El Salvador, the species is from the Pacific Ocean and caught with artisanal trammel nets. There is a processing plant with lobster tails vacuum packed. There is biological monitoring and fishery statistics are received from 3 ports where lobster is landed. In general, there are deficiencies for monitoring and control due to financial and human resource limitations.

In Costa Rica there are also institutional constraints, but statistical information on total catch by area, months and years is available from 2008 to the date. No stocks assessments have been conducted.

Regarding Colombia, the most important Caribbean lobster fishery occurs close to San Andres Island with industrial and artisanal fishing fleets. Catch and fishing effort forms are

used and an annual catch quota of 50 tons has been set. There are 8 industrial boats and only traps are allowed. Another fishing area in Colombia is in La Guajira where all the fishing is artisanal and the use of traps and gillnets is common. For stock assessments, Thompson and Bell and Bayesian models are currently used but the models being reviewed in the workshop can also be used.

About Belize, a program to record fishing logs with basic catch information is in place but fishing effort data recording and monitoring is needed. Likewise, improvement of data and information quality and reliability is generating initiatives such as the development of a catch data reporting application and the establishment of catch quotas system by areas based on data collected and stock assessment models. A catch data form is being standardized, which is compatible with what is presented in the MARPLESCA Plan. As in other countries, financial and staff limitations are reported.

After the individual country presentations, the technical assistant Mr. Antonio Porras showed each data collection form in more detail. In this session, additions to some forms were suggested and two new forms (i.e. data to calculate morphometric relationships, and for sampling of size, weight and sex) were included. Annex 3 shows the ten forms finally agreed upon, with 9 and 10 as the new ones. It was agreed that digital scales, acrylic lobstermeters for lobster tails and plastic verniers for lobster cephalothorax measurements would be used.

Day 3 Technical session

The session started with the presentation by the technical coordinator, Mr. Manuel Pérez, on background information of the MARPLESCA stock assessment model. The model is a length cohort analysis calibrated from a catch curve. Input data implies the weight or the number of individuals (landings) by size in units of length, but in many countries weight by commercial categories is the data available (i.e. landings in a processing plant). For this reason, then the commercial categories must be converted into size categories in units of length (or ages).

The technical coordinator showed an example from Belize and Nicaragua, based on the previous FIINPESCA project, where commercial categories are similar (Nevertheless, in Belize lobster is reported from 4 ounces of tail weight on while in Nicaragua it starts at 5 ounces) but conversions to size are to cephalothorax length in Belize and tail length in Nicaragua. Later, he showed a frequency distribution table of Belize landings from 1998 to 2008 by size classes of cephalothorax length. This data is the input to the cohort analysis model whose outputs consist of average biomass, spawning biomass, recruitment, fishing mortality and landings estimates.

Mr. Pérez indicated that Honduras applies another model (i.e. catch-at-age) that is quite similar, but that needs to be evaluated and compared with the MARPLESCA model to define the one which best would work in the region. He mentioned that, since not all countries had enough data, delegates would not be separated into working groups and emphasis would be placed on data from Honduras, Nicaragua and Belize only. Jamaica also stated that it had data, so it was suggested that Belize could support a stock assessment with Jamaican data since both countries have data with cephalothorax length. In the case of the Honduras model, additional information is needed on fishing effort and an estimate of an abundance or catch per unit of effort (c.p.u.e) index. It was also pointed out that in the model of the

MARPLESCA plan, the use of the catch curve is very sensitive to the points chosen in the regression for the calculation of total mortality Z . For this reason, one must have a good knowledge of the fishery that is being evaluated as the results could be misleading.

It was commented the Honduran model is applicable in this country, because the fishery is industrial and generates fishing effort data that is easy to obtain, while in Nicaragua and other countries, much of the fishing effort is generated by artisanal fishers and, therefore, no data of c.p.u.e. is available. Another aspect that complicates the use of artisanal fishery effort is that different fishing gears are used, which makes it more difficult an effort standardization in a single index. Under these considerations, it was commented that it would probably be better to maintain the MARPLESCA stock assessment model for the time being and use another model as more information is obtained in the future.

Colombia commented that databases should be in a more robust software than MsExcel with backups and a programming structure generating tables directly. It was replied that MsExcel is only used for applying cohort analysis, and that databases can better be structured according to a computer programming and software that is decided convenient.

After an independent work session where different model and data trials were tested, Nicaragua presented the results of applying the MARPLESCA Plan model to Nicaragua and Honduras data for fishing seasons between 2010 to 2015. It was noted that it was the first time in history that joint data and a model is applied for both countries. Results showed that fishing mortalities were quite similar ($F = 0.4$) in both cases. Although it was a short period analysed, results indicated the lobster resource would be healthy with good recruitment and landing trends, although a fishing effort increase would not be recommended.

Day 4 Technical session

Honduras presented catch-at-age model outputs with data from the Nicaraguan fishery. Nevertheless, the results did not have the expected coherence. If more time had been available to make the analyses, then more promising results could have been expected. It was also pointed out that, except for fishing mortality, trends of other parameters in the MARPLESCA and the Honduras model are similar. Another result is that ages 2 and 3 are the main components supporting the fishery. Likewise, the determination of fishing selectivity and catch per unit of effort is influenced by several factors. For this reason, fleets and fishery performance should be well known to obtain good feedback to help improve the application of models. The general conclusion was that 5 years is not enough for the model to analyse the data satisfactorily.

Regarding the evaluation of the Belize data with the Honduran model, the results were not satisfactory as results were not coherent, in particular the observed trends in cpue. This work will continue with Belize to apply the model and results will be sent next year.

Nicaragua commended the effort made with all models and commented that a 15-year analysis would give a better result, in particular about trends of CPUE changes but, as a whole, results were acceptable. Climate impacts also have effects on the resource, but to follow fishery trends is important, and Nicaragua will continue to utilize other stock assessment models and make comparisons. It was also mentioned that an important aspect to consider is how to deal with different fishing effort indices when there are different fishing

gears, which must be complemented, and that some models have a strong dependence on fishing selectivity.

In general terms, it was concluded, for this part of the session, that the lobster fishery is currently in good condition in Nicaragua and Honduras; that the results presented fulfilled delegates expectations and are satisfactory; but that, nevertheless, artisanal fisheries data collection must be improved and the calculation of the morphometric relationships updated.

The session continued with the presentation by Belize of the Jamaican data applied in the cohort analysis model used in the FIINPESCA project. The data analysed corresponded from 1996 to 2002, but some Belizean parameters had to be assumed. The results were not conclusive, but the feasibility of using the models was demonstrated. The C.P.U.E data availability in Jamaica makes it a candidate for the application of the catch-at-age model.

Subsequently, the Ecolobster+ technical coordinator presented and discussed with the participants some actions that could be carried out post-workshop:

1. Belize update its stock assessment with data up to 2016 (FIINPESCA project model). Belize responded it could update it in January 2018 and send it for review.
2. Nicaragua has updated the MARPLESCA model, but it should explore the application of the catch-at-age model. In turn, Honduras is interested in applying the MARPLESCA model. In both cases, training in the use of both models is needed. It was commented that this could be done within OSPESCA or WWF framework.
3. There is already historical data on annual imports of lobster to the United States by Honduras (which would be equivalent to landings), and landings size structure of 5 fishing seasons. This could allow running the catch-at-age model for a longer time period and data. Likewise, the MARPLESCA model could be run with the same Honduras export data to the United States assuming the size structure of the catch-at-age model or the one of Nicaragua.
4. In the case of Jamaica, a more detailed data review is necessary, but there are options to apply the models considered in the workshop. There is a need to update the morphometric relationships and technical assistance from the sub-project is needed.
5. The use of "fishery-dependent data" has been prioritized, but independent data collection should be explored. This aspect is important to update morphometric relationships and maturity stages throughout a year.
6. Make efforts to apply the MARPLESCA model at least once a year to the extent possible.

Guatemala requested information on how countries can be supported to collect data from artisanal fisheries. It was replied that there are several ways, for example, the forms agreed for data collection are applicable to artisanal fisheries. Also, it is not necessary to be sampling vessel by vessel, and options through collection centers or processing plants should be explored. Panama also requested that specific training for artisanal fisheries data collection is necessary since they do not have any data.

Nicaragua and Honduras agreed that regional training can be technically supported, and that an artisanal fishing data diagnosis could be made to generate a roadmap that allows

countries to obtain the necessary data for the application of the MARPLESCA model. It was noted that data collection is a prime responsibility of the countries, but that the Ecolobster+ subproject would provide tools (i.e. forms, equipment, stock assessment capacity) to support countries to follow the task after the subproject is ended. This would also have to be supported by the fishing industry in the countries.

In the afternoon session, Mr. Antonio Porras presented the updated forms for stock assessment purposes with suggested changes explained in detail. The forms contain the minimum data necessary for stock assessment, but countries are free to add more information. Two forms of the MARPLESCA were eliminated and two new contributions from Nicaragua were added. The number of samples must be representative and sustained over time. A guide on how to fill out the forms will be made.

Finally, the technical coordinator presented and reviewed with the delegates the main workshop outputs to be presented next day in the closing session to the authorities by one of the delegates of Panama as Pro Tempore Chair.

Day 5 Closure

Workshop outputs and recommendations were presented by Ms. Ana Nuñez of Panama as Pro Tempore Chair representative in presence of Mr. Iván Flores, ARAP Deputy Manager and Mr. Reinaldo Morales, SICA/OSPECSA Regional Director. The presentation was followed with a brief opinions exchange on how to improve data collection, the need for regional training and the opportunity for the application of lobster stock assessment models.

The closing ceremony was then proceeded with the intervention of the SICA/OSPECSA Regional Director, Mr. Reinaldo Morales, and Mr. Ivan Flores on behalf of the ARAP. Their interventions highlighted the importance of this type of initiatives so that countries have capacities developed to evaluate their Caribbean lobster fisheries for the benefit of the resource's sustainability. Likewise, it was stressed that the integration framework of all participating countries in the subproject and synergies with other regional organizations to achieve common goals should be further strengthened. Recommendations of the workshop will be taken to the OSPECSA Executive Committee meeting to get political support and consolidate the regional cooperation and integration.

The closing of the workshop concluded with the presentation of diplomas of participation to each of the delegates. The participation of all delegates was thanked, as well as the logistical support provided by the organizers.

Conclusions and Recommendations

The following is a summary of the main workshop outputs:

Summary of Data Collection Outputs

- MARPLESCA plan forms were presented and harmonized.
- The agreed forms include minimum data to be collected. Any country may collect additional data it deems necessary.
- A review of countries status was made: disparity of capacities persists, and artisanal fisheries continues to be a priority sector to be attended to for the collection of data.
- Data collection forms, sample size, measurement units (decimal and local metric system), periodicity and measurement tools were reviewed and agreed upon.
- Two new forms were added to the MARPLESCA plan (size, weight and sex; and morphometric relationships).
- Measuring tools: verniers (calipers), acrylic lobstermeters, gloves, scales and clipboards.

Summary of Stock Assessment Outputs

- Belize, Honduras and Nicaragua presented their fishery assessments.
- A historical summary of the MARPLESCA plan stock assessment model was presented.
- Given the countries' differences in capacities for data collection and analyses, emphasis was placed on Honduras, Nicaragua, Belize and Jamaica stock assessments.
- Artisanal fisheries data collection continues to be an important limitation.
- Strengths, weaknesses and data requirements of the MARPLESCA model and the catch-at-age model were discussed.
- Actual spiny lobster data and MARPLESCA and catch-to-age model runs were carried out.
- Joint Honduras and Nicaragua data analyses and stock assessment for the first time was carried out. Preliminary results show the good condition of the fish resource and the regional closed season could have been a factor that has positively contributed to lobster recruitment.
- The MARPLESCA stock assessment model does not imply the use of fishing effort and catch per unit of effort data, but they are needed as input data in the catch-to-age model. Both models showed their usefulness and application but conditioned to the data available.
- Honduras and Nicaragua can continue to interact within the framework of the fishery improvement project supported by WWF.
- According to delegates, the workshop met the expected objectives.

Recommendations on data collection forms

- Each form should have an instructions guide.
- Stakeholders awareness and dissemination actions on data collection importance and purpose should be supported.
- Support countries with the necessary sampling equipment. Each country will make requests based on their needs and workshop outputs.

- Support on-board, processing plants and collection centers monitoring; calculate or recalculate morphometric relationships and growth parameters and update maturity indices.
- Make a diagnosis and define guidelines for artisanal fisheries data collection to generate a roadmap that allows the use of data in the application of the MARPLESCA model.

Recommendations on stock assessment models

- All Ecolobster+ countries apply the MARPLESCA plan stock assessment model so that the lobster resource status in the region can be compared.
- A regional training course on the MARPLESCA plan stock assessment model, with the technical support of Nicaragua, should be implemented.
- Likewise, intersessional meetings using electronic means of communication prior to the regional training course, to move forward with proposed tasks, should be encouraged.
- Countries with fishing effort data available can use other additional stock assessment models such as catch-at-age.
- Generate exchange and cooperation instances among countries to continue joint stock assessments.
- Procure synergies with regional organizations with similar projects promoting Caribbean lobster fisheries sustainable management.
- Transfer these recommendations to the Ecolobster+ national working groups, through the national focal point, to prepare a workplan with a time schedule and responsible for each activity, which will be sent to the Ecolobster+ regional team for compilation.

Annex 1 List of Participants

Regional Workshop on Harmonization and Validation of Forms and Methodologies for Caribbean Spiny Lobster Stock Assessment

Panama City, Panama 27 November to 1 December 2017

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Annex 2 Meeting Agenda

26th November		
	Arrival of delegates	
27th November		
Time	Theme	Responsible:
08:30 – 09:00	Registration	
09:00 – 09:30	Opening ceremony	National Authority and OSPESCA
09:30 – 10:00	Workshop introduction. Objectives and expected results	Manuel Perez
10:00 – 10:30	Break and group photo	
10:30 – 11:00	The Regional MARPLESCA Plan with emphasis in data collection formats for fisheries stock assessment	Antonio Porras
11:00 – 12:00	Stock assessment model for Caribbean lobster in Honduras	Delegate from Honduras
12:00 – 13:00	Stock assessment model for the Caribbean lobster in Nicaragua	Delegate from Nicaragua
13:00 – 14:00	Lunch	
14:00 – 15:00	Stock assessment model for the Caribbean lobster in Belize	Delegate from Belize/ University of Miami
15:00 – 16:00	Other experiences in stock assessment of lobster fisheries or initiatives	Other organizations/ countries
16:00 – 16:30	Break	
17:30 – 17:45	Plenary and conclusions for the day	ECOLANGOSTA + Team
28th November		

08:30 – 10:00	Discussion on data collection forms for Caribbean lobster stock assessment purposes	ECOLANGOSTA + Team
10:00 – 10:30	Break	
10:30 – 13:00	Discussion on different lobster fishery stock assessment models in different countries	ECOLANGOSTA + Team
13:00 – 14:00	Lunch	
14:00 - 16:00	Application exercise for the different stock assessment models and data exchange amongst countries	Working Groups
16:00 – 16:30	Break	
16:30 – 17:30	Application exercise for the different stock assessment models and data Exchange amongst countries	Working Groups
17:30 – 17:45	Plenary and conclusions for the day	ECOLANGOSTA + Team
29th November		
08:30 – 10:00	Application exercise for the different stock assessment models and data exchange amongst countries	Working Groups
10:00 – 10:30	Break	
10:30 – 13:00	Application exercise for the different stock assessment models and data exchange amongst countries	Working Groups
13:00 – 14:00	Lunch	
14:00 - 16:00	Application exercise for the different stock assessment models and data exchange amongst countries	Working Groups
16:00 – 16:30	Break	
16:30 – 17:30	Application exercise for the different stock assessment models and data exchange amongst countries	Working Groups
17:30 – 17:45	Plenary and conclusions for the day	ECOLANGOSTA + Team

30th November		
08:30 – 10:00	Presentation of stock assessment outputs	Working Groups
10:00 – 10:30	Break	
10:30 – 13:00	Presentation of stock assessment outputs	ECOLANGOSTA + Team
13:00 – 14:00	Lunch	
14: 00 - 16:00	Presentation of stock assessment outputs	Working Groups
16:00 – 16:30	Break	
16:30 – 17:30	Start of final discussions on forms and the stock assessment models	ECOLANGOSTA + Team
17:30 – 17:45	Plenary and conclusions for the day	ECOLANGOSTA + Team
1st December		
08:30 – 10:00	Final discussion on forms and stock assessment model	ECOLANGOSTA + Team
10:00 – 10:30	Break	
10:30 – 12:00	Presentation on final results and recommendations	ECOLANGOSTA + Team
12:00 – 13:00	Conclusions and adjournment	Pro Temp Chair and ECOLANGOSTA + Coordinator
13: 00 - 14:00	Lunch	
2nd December		
	Delegates return home	

Annex 3 Revised data collection forms for stock assessment purposes

FORM 1: PRODUCTION BY VESSEL/ FISHER REGISTER

This format will be used to collect Caribbean spiny lobster production or landings from industrial and / or artisanal fishing vessels. It will allow estimating fishing effort in travel days, the fishing gear utilized and lobster landed weights in different presentations, as well as bycatch species weight. This format can be filled by a collection center staff, a processing plant staff or data collectors.

- **Country:** The name of the country
- **Sheet No .:** The sheet consecutive number
- **Fleet:** the name of the fleet is written down and industrial or artisanal is selected
- **Company:** the name of the company where the product is delivered
- **Municipality, locality:** the geographical name of the place where landings are registered
- **Day, month and year:** the registration date
- **Name of the vessel:** the name of the vessel is marked down
- **Fishing trip, departure:** the date on which you went fishing is recorded; **Return:** the date is recorded when you returned from fishing
- **Fishing gear:** the name of the fishing gear
- **Lobster landed weight:** the weight of lobster landed is recorded in kilos; **tail:** lobster tail; **head meat:** head meat landed; **whole:** whole lobster landed
- **By-catch and other species landings:** the weight in kg of by-catch or other species (e.g. grouper, queen conch, crab) that have been landed and are associated with Caribbean spiny lobster
- **Mother ship name:** the name of the mother or supply ship
- **Observations:** Any comments worth to record



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COUNTRY _____ SHEET No. _____

FORM 1: PRODUCTION BY VESSEL/ FISHER REGISTER

FLEET: _____ INDUSTRIAL _____ ARTISANAL _____

COMPANY: _____

MUNICIPALITY, LOCALITY: _____

DAY/MONTH/YEAR: ___ / ___ / ___

FISHING TRIP			FISHING GEAR	LOBSTER				BY-CATCH AND OTHER SPECIES: LANDED WEIGHT				
VESSEL NAME	DEPARTURE	RETURN		MEASUREMENT UNIT (KILOGRAM)				MEASUREMENT UNIT (KILOGRAM)				
			LANDED WEIGHT	TAIL	HEAD MEAT	WHOLE	GROUPER	QUEEN CONCH	CRAB			



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MOTHER SHIP NAME (IF APPLICABLE): _____									
OBSERVATIONS:									

FORM 2 FLEET OPERATIONAL PERFORMANCE CONTROL

Format aimed at knowing the operational performance of the industrial fleet more in detail, usually filled by processing companies with their own fleet of fishing vessels.

- **Country:** The name of the country
- **Sheet No .:** The consecutive number of the sheet
- **Company/ collection center:** The name of the company or collecting center where the product is delivered and the fishing fleet operates
- **Industrial fleet:** the name of the fishing fleet
- **Month and year:** the registration date
- **Name of the vessel:** the name of the vessel(s) operating
- **Numbered columns:** Go from 1 to 31 indicating the days of the month and each cell is marked down according to the codes S: DEPARTURE TO FISHING AREA; P: FISHING; F: SHIP IS AT ANCHOR IN PORT OR FISHING BANK; E: ENTRANCE TO PORT; D = CATCH DOWNLOADING; T: TOTAL FISHING TRIP DAYS
- **Prepared by:** The name of the person who filled the form
- **Observations:** Any comments worth to record
- **Signature:** Signature of the person who filled out the form



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S: DEPARTURE TO FISHING AREA; P: FISHING; F: SHIP AT ANCHOR IN PORT OR FISHING BANK; E: ENTRANCE TO PORT; D= CATCH DOWNLOADING; T: TOTAL FISHING TRIP DAYS

FORM 3: SPINY LOBSTER TRAP FLEET LOGBOOK

This is a form to be filled out by fishing masters or fisher in charge, both for lobster trap industrial or artisanal fishing fleets. It allows to get fishing effort and lobster catch data from this type of fleets.

- **Country:** The name of the country
- **Sheet No .:** The consecutive number of the sheet
- **Name of the vessel:** the name of the vessel that is reporting the data
- **Industrial or Artisanal:** type of fleet is marked down.
- **Captain/ fisher name:** the name of the person in charge onboard the boat
- **Product:** marked down whether it is delivered in a **processing plant** or in a **collection center**.
- **Name of the company / collection center / others:** The name of the company, collection center or another place where the fish product is delivered.
- **Date:** day, month and year the fishing operation was made.
- **Start time:** The time at which traps were deployed at sea.
- **End time:** The time when traps were hauled onboard.
- **Position / fishing area:** The geographical position is recorded in degrees, minutes and seconds (industrial fishing) or by geographical name (artisanal fishing).
- **Depth (fathoms / meters or feet):** Depth at fishing station in fathoms, meters or feet.
- **Bottom type:** Bottom type found in the fishing station (e.g., sand, gravel, seagrass).
- **No. of hauled pots:** The number of pots hauled onboard in each fishing operation.
- **Catch (kilos of lobster tail or whole lobster):** Catch in kilos of lobster tails or whole lobster if landed alive.
- **Observation of the day:** Any event occurred on the fishing day worth mentioning.
- **Totals:** Catch and number of pots utilized are added up.
- **General observations:** Any event or issue during the fishing trip worth mentioning.
- **Signature of the captain / fisher:** The signature of the captain/ fishing master or the fisher in charge on board



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CAPTAIN/ FISHER SIGNATURE:

NB: Filled out by the captain or fisher and delivered to the fishery authority

FORM 4: SPINY LOBSTER DIVE-FISHING FLEET LOGBOOK

Format to be filled out by the captain or fisher in charge, both for industrial or artisanal dive-fishing. It allows to get fishing effort and lobster catch data of this type of fleets.

- **Country:** The name of the country
- **Sheet No .:** The consecutive number of the sheet
- **Name of the vessel:** the name of the vessel that is reporting the data
- **Industrial or Artisanal:** type of fleet is marked down.
- **Captain/ fisher name:** the name of the person in charge onboard the boat
- **Product:** marked down whether it is delivered in a **processing plant** or in a **collection center**.
- **Name of the company / collection center / others:** The name of the company, collection center or another place where the fish product is delivered.
- **Date:** day, month and year the fishing operation was made.
- **Start time:** The time at which traps were deployed at sea.
- **End time:** The time when traps were hauled onboard.
- **Position / fishing area:** The geographical position is recorded in degrees, minutes and seconds (industrial fishing) or by geographical name (artisanal fishing).
- **Depth (fathoms / meters or feet):** Depth at fishing station in fathoms, meters or feet.
- **Bottom type:** Bottom type found in the fishing station (e.g., sand, gravel, seagrass).
- **No. of divers:** Number of divers in each fishing operation.
- **No. of tanks:** Number of tanks utilized in each fishing operation
- **Catch (kilos of lobster tails):** Catch in kilos of lobster tails.
- **Observation of the day:** Any event occurred on the fishing day worth mentioning.
- **Totals:** Catch and number of divers and tanks utilized are added up.
- **General observations:** Any event or issue during the fishing trip worth knowing.
- **Signature of the captain / fisher:** The signature of the captain/ fishing master or the fisher responsible on board



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FORM 5: SPINY LOBSTER PROCESSED IN PROCESSING PLANTS

Format must be filled out by data collectors or processing plant staff. It is the vital data type to be collected for stock assessment purposes since they are the input data for the application of the MARPLESCA, catch-at-age or similar models. Commercial categories can be transformed to lengths or ages through equations or morphometric relationships.

- **Country:** The name of the country.
- **Sheet No.:** The consecutive number of the sheet.
- **Company name:** The name of the company.
- **Month / year:** Month and year the report was made.
- **Period:** The time processing was carried out
- **Industrial traps, industrial dive-fishing, artisanal:** The origin of the processed product is marked down in the corresponding field.
- **Lobster tail, whole lobster, precooked whole lobster, live lobster:** The processed weight is recorded in kilos or pounds for each commercial category and type of product
- **Head meat:** weight of head meat
- **Total:** the total of processed product of all commercial categories is added up by type of product
- **Observations:** Any event or issue worth mentioning.



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COUNTRY: _____

SHEET No.: _____

FORMATO 5: SPINY LOBSTER PROCESSED IN PROCESSING PLANTS

COMPANY: _____

INDUSTRIAL TRAP: _____

MONTH/ YEAR: _____

INDUSTRIAL DIVE-FISHING: _____

TIME PERIOD: _____

ARTISANAL: _____

COMMERCIAL CATEGORIES									
LOBSTER TAIL				WHOLE LOBSTER			PRECOOKED WHOLE LOBSTER		
GRAMS	OUNCES	KILOS	POUNDS	GRAMS	KILOS	POUNDS	GRAMS	KILOS	POUNDS
				400- 460			400- 460		
142	5			400- 500			460- 520		
170	6			460- 520			520- 575		
198	7			500- 600			575- 630		
227	8			520- 575			630- 690		
255	9			575- 630			690- 785		
284	10			600- 700			785- 900		
284 - 340	10-12			630- 690			900- 1200		
340-397	12-14			690- 785			1200- 1350		
397 - 454	14-16			700- 770			TOTAL		
454-567	16-20			770- 830			LIVE LOBSTER		
567-680	20-24			785- 900			GRAMS	KILOS	POUNDS
680 - UP	24 UP			830- 900					
TOTAL				900- 960					
HEAD MEAT				900- 1200					
OBSERVATIONS:				960- 1030					
				1030- 1160					



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1160- 1250					
1200-1350					
TOTAL			TOTAL		

FORM 6 SPINY LOBSTER BIOLOGICAL DATA SAMPLING ON BOARD VESSELS

Form must be filled out by biologists or data collectors who go on board industrial lobster fishing boats. Sampling must be done on deck. It is an important form to collect lobster maturity data, and with consistent sampling throughout a year, the results can provide signals of lobster maturity trends. This is important when establishing spatial and / or temporary closed seasons.

- **Country:** The name of the country.
- **Sheet no .:** The consecutive number of the sheet.
- **Day: month: year:** The date sampling was done.
- **Vessel name:** Name of the boat sampling was done.
- **Company name:** The name of the company owner of the vessel (if applicable).
- **Fishing gear:** The fishing gear used to fish.
- **Captain name:** The name of the captain of the boat.
- **Sampler Name:** The name of the person who carried out the sampling
- **No. of fishing station:** Enter the consecutive number of the haul or fishing station whose catch is being sampled
- **Position: latitude: longitude:** The geographical position in degrees, minutes and seconds of the sampling site
- **No .:** The consecutive number of the individual being sampled
- **Size (long, cef.mm.):** Length of the lobster cephalothorax in mm
- **Sex:** Male, female or juvenile
- **Reproductive status in females:** The reproductive status of the female is marked down according to the codes: **ov** (ovigerous or with eggs); **ce**: with spermatheca; **cre**: with traces of spermatheca; **cre + ov**: with traces of spermatheca and eggs; **mu**: in moulting period.
- **Observations:** Any event or issue worth mentioning.



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OBSERVATIONS:

FORM 7 SIZE AND WEIGHT VALIDATION SAMPLING PER LOBSTER TAIL COMMERCIAL CATEGORIES

To collect males/females length and weight data per commercial category of lobster processed in tails. These data allow to calibrate the conversion of the commercial categories to theoretical sizes in length with morphometric relationship equations. This conversion is of fundamental importance to prepare input data for the stock assessment model of the MARPLESCA Plan. Sampling must be done when workers manipulate and classify lobster during processing. Sampling size is estimated at 500 animals per month per commercial category. Sampling should be done every 2 years.

- **Country:** The name of the country.
- **Day:, month :, year:** Sampling date.
- **Location:** The location of the processing plant where sampling took place.
- **Observations:** Any event or issue worth mentioning.
- **Processing plant:** Name of the processing plant.
- **Fishery of origin:** Where the product comes from, whether it is industrial/ artisanal trap or dive-fishing (where applicable)
- **No .:** The consecutive number of the animal sampled
- **Size biological sampling in tail length (mm) and tail weight (gr)**
- **Commercial category:** The commercial category being sampled (e.g., 5 ounces, 10-12 ounces, etc.) for each sex **females** and **males**
- **Size (mm):** Tail length in millimetres
- **Weight (g):** Tail weight in grams

COUNTRY: _____

SHEET No.: _____

FORM 7 SIZE AND WEIGHT VALIDATION SAMPLING PER LOBSTER TAIL COMMERCIAL CATEGORIES

DAY: ____ MONTH: _____ YEAR: _____

LOCATION:					OBSERVATIONS:			
PROCESSING PLANT:								
FISHERY OF ORIGIN:								
No.	SIZE BIOLOGICAL SAMPLING IN TAIL LENGTH (mm) AND TAIL WEIGHT (g)							
	COMMERCIAL CATEGORY _____				COMMERCIAL CATEGORY _____			
	FEMALES		MALES		FEMALES		MALES	
	SIZE (mm)	WEIGHT (g)	SIZE (mm)	WEIGHT (g)	SIZE (mm)	WEIGHT (g)	SIZE (mm)	WEIGHT (g)
1								
2								
3								
4								
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FORM 8 SIZE AND WEIGHT VALIDATION SAMPLING PER WHOLE LOBSTER COMMERCIAL CATEGORIES

To collect males/females length and weight data per commercial category of lobster processed in tails. These data allow to calibrate the conversion of the commercial categories to theoretical sizes in length with morphometric relationship equations. This conversion is of fundamental importance to prepare input data for the stock assessment model of the MARPLESCA Plan. Sampling must be done when workers manipulate and classify lobster during processing. Sampling size is estimated at 500 animals per month per commercial category. Sampling should be done every 2 years.

- **Country:** The name of the country.
- **Day:, month :, year:** Sampling date.
- **Location:** The location of the processing plant where sampling took place.
- **Observations:** Any event or issue worth mentioning.
- **Processing plant:** Name of the processing plant.

- **Fishery of origin:** Where the product comes from, whether it is industrial/ artisanal trap or dive-fishing (where applicable)
- **No .:** The consecutive number of the animal sampled
- **Size biological sampling in total length (mm) and total weight (gr)**
- **Commercial category:** The commercial category being sampled (e.g., 400- 600 g) for each sex **females** and **males**
- **Size (mm):** Total length in millimetres
- **Weight (g):** Total weight in grams

COUNTRY: _____

SHEET No.: _____

FORM 8 SIZE AND WEIGHT VALIDATION SAMPLING PER WHOLE LOBSTER COMMERCIAL CATEGORIES

DAY: ____ MONTH: _____ YEAR: _____

LOCATION:		OBSERVATIONS:
PROCESSING PLANT:		
FISHERY OF ORIGIN:		
No.	SIZE BIOLOGICAL SAMPLING IN TOTAL LENGTH (mm) AND TOTAL WEIGHT (g)	

	COMMERCIAL CATEGORY _____				COMMERCIAL CATEGORY _____			
	FEMALES		MALES		FEMALES		MALES	
	SIZE (mm)	WEIGHT (g)	SIZE (mm)	WEIGHT (g)	SIZE (mm)	WEIGHT (g)	SIZE (mm)	WEIGHT (g)
1								
2								
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FORM 9 BIOLOGICAL SAMPLING OF LOBSTER TAILS IN PROCESSING PLANTS

Form utilized to collect size data from all lobster tails in a processing plant. The sample is not separated by commercial categories. The best is to carry out regular monthly samplings throughout a year. If good data collection is available, the observed size structure could replace the theoretical size structure obtained by converting industrial commercial categories into length units.

- **Country:** The name of the country
- **Date:** Day, month and year sampling was conducted
- **Location:** The location of the processing plant
- **Fishery of origin:** Where the product comes from, whether it is industrial/ artisanal trap or dive-fishing (where applicable)
- **Processing plant:** Name of the processing plant
- **Observations:** Any event or issue worth mentioning
- **No .:** The consecutive number of each animal sampled
- **Tail size biological sampling (mm)**
- **Sex:** male, female or juvenile
- **Length tail (mm):** The length of the tail measured in mm

FORM 9 BIOLOGICAL SAMPLING OF LOBSTER TAILS IN PROCESSING PLANTS

COUNTRY: _____ DATATION _____

LOCATION: _____ FISHERY OF ORIGIN: _____

PROCESSING PLANT: _____

OBSERVATIONS:

No.	TAIL SIZE BIOLOGICAL SAMPLING (mm)							
	SEX	TAIL LENGTH (mm)	SEX	TAIL LENGTH (mm)	SEX	TAIL LENGTH (mm)	SEX	TAIL LENGTH (mm)
1								
2								
3								
4								
5								
6								
7								
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FORM 10 BIOLOGICAL SAMPLING IN PROCESSING PLANTS

Form utilized to collect a number of length and weight measurements data of a whole lobster in a processing plant to calculate morphometric relationships. Sample is not separated by commercial categories. The best is to carry out regular monthly sampling throughout a year.

- **Country:** The name of the country
- **Date:** The day, month and year sampling was conducted
- **Location:** The location of the processing plant
- **Fishery of origin:** Where the product comes from, whether it is industrial/ artisanal trap or dive-fishing (where applicable)
- **Processing plant:** The name or company name of the processing plant is noted
- **Observations:** Any event or issue worth mentioning
- **No .:** The consecutive number of each animal sampled
- **Lobster size biological sampling (mm)**
- **Sex:** male, female or juvenile
- **Total length (mm):** The total length of the lobster measured in mm
- **Total weight (g):** The total weight of the lobster in grams
- **Ceph Length(mm):** Cephalotorax length in mm
- **Ceph Weight(g):** Cephalotorax weight in grams
- **Tail length (mm):** The length of the tail in mm
- **Tail weight (g):** The weight of the tail in grams

FORM 10 BIOLOGICAL SAMPLING IN PROCESSING PLANTS

COUNTRY: _____ DATE: _____

LOCATION: _____ FISHERY OF ORIGIN: _____

PROCESSING PLANT: _____

OBSERVATIONS:

No.	SEX	TOTAL LENGTH (mm)	TOTAL WEIGHT (g)	CEPH LENGTH (mm)	CEPH WEIGHT (g)	TAIL LENGTH (mm)	TAIL WEIGHT (g)
1							
2							
3							
4							
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