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WESTERN CENTRAL ATLANTIC FISHERY COMMISSION

Report of the

FISHERIES AND BIOLOGICAL DATA PREPARATION WORKSHOP ON THE SHRIMP AND GROUNDFISH FISHERIES OF THE NORTH BRAZIL SHELF LARGE MARINE ECOSYSTEM

Bridgetown, Barbados 23-25 October 2018

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PREPARATION OF THIS DOCUMENT

This is the report of the Fisheries and Biological Data Preparation Workshop on the Shrimp and Groundfish Fisheries of the North Brazil Shelf Large Marine Ecosystem (NBSLME), which was held in Bridgetown, Barbados on 23-25 October, 2018.

Representatives from the following countries and regional partner organizations participated: Brazil, France (French Guiana), Guyana, Suriname, Trinidad and Tobago, and the National Oceanic and Atmospheric Administration (NOAA) of the United States of America.

The workshop was made possible through financial support provided by the FAO-UNOPS Inter-Agency Agreement on "Catalising Implementation of the Strategic Action Programme for the Sustainable Management of Shared Living Marine Resources in the Caribbean and the North Brazil Large Marine Ecosystems" (Project UNJP/RLA/217/OPS), which is focused on the shrimp and groundfish fishery resources of the North Brazil-Guianas Shelf.

The workshop was convened by Mr Jeremy Mendoza (Project Coordinator for UNJP/RLA/217/OPS). Technical assistance to the working group and its preparation was provided by Ms Tarub Bahri (FAO FIAF), Mr Nicolas Gutierrez (FAO FIAF), Mr Yann Laurent (FAO FIAS), Mr Aureliano Gentile (FAO FIAS), Mr Marc Taconet (FAO FIAS), Ms Yvette Diei Ouadi (WECAFC Secretary) and Ms Nancie Cummings (NOAA). Administrative and logistical support was provided by Ms Safa Gritli (FAO FIAF), Ms Sonya Thompson (WECAFC Secretariat), and Ms Grace Brome, Ms Deborah Harewood and Ms Tianna Nicholls from the FAO Sub-Regional Office for the Caribbean.

This report contains a record of the meeting, including presentations and discussions.

ABSTRACT

The Fisheries and Biological Data Preparation Workshop for the Shrimp and Groundfish Fisheries of the North Brazil Shelf Large Marine Ecosystem (NBSLME) was held in Bridgetown, Barbados 23-25 October, 2018. The meeting brought together 14 participants including fisheries officers, government organizations and FAO. The main objective of the workshop was to provide training on data preparation for stock assessment purposes and fisheries status/trends monitoring, enhance capacities in fisheries data and statistics collection at the national and sub-regional levels, and review status of data collection for the shrimp and groundfish fisheries of the NBSLME.

The current state of the Fisheries and Resource Monitoring System (FIRMS) stocks and fisheries inventories for the NBSLME was reviewed and updated with inputs from participants. Ongoing work on the Data Repository and Decision Support System (DSS) for the Caribbean and North Brazil Shelf Large Marine Ecosystems (CLME+) Project and its application in the NBSLME was presented and discussed. A template for recording fisheries and biological data of key species in the NBSLME for stock assessment purposes was reviewed by participants. Furthermore, for each country and fishery, participants reviewed availability of data including, *inter alia*, time series of landings and fishing effort, length frequencies and socio-economic information. Additionally, a review was made of the biological parameters (e.g. length-weight relationship, growth, maturity) available for key shrimp and groundfish species in the NBSLME and data gaps identified. Information on genetic studies on shrimp and groundfish species in the NBSLME region served as background for discussion on the stock structure of different species. Finally, workshop participants defined a timeline for digital registration of fisheries to be disseminated within FIRMS and biological data in preparation for upcoming stock assessment training and workshop.

CONTENTS

ABBREVIATIONS AND ACRONYMS

ABNJ	Areas Beyond National Jurisdiction
AIS	Automatic Identification System
BRD	Bycatch Reduction Device
CLME+	Caribbean and North Brazil Shelf Large Marine Ecosystems Project
CRFM	Caribbean Regional Fisheries Mechanism
DCRF	Data Collection Reference Framework
DSS	Decision Support System
EAF	Ecosystem Approach to Fisheries
EEZ	Exclusive Economic Zone
FAO	United Nations Food and Agriculture Organization
FDS-WG	Fisheries Data and Statistics Working Group (WECAFC)
FIRMS	Fisheries and Resources Monitoring System
FMP	Fishery Management Plan
IFREMER	Institut Français de Recherche pour l'Exploitation de la Mer
iMarine	Data e-Infrastructure Initiative for Fisheries Management and Conservation of Marine Living Resources
IUU	Illegal, Unreported and Unregulated (Fishing)
LME	Large Marine Ecosystem
NBSLME	North Brazil Shelf Large Marine Ecosystem
NOAA	National Oceanographic and Atmospheric Administration (USA)
RFB	Regional Fisheries Body
RFMO	Regional Fisheries Management Organization
SAG	Scientific Advisory Group (WECAFC)
SAP	Strategic Action Program (CLME+)
SOMEE	State of the Marine Environment and Associated Economies (CLME+)
TED	Turtle Excluding Device
VMS	Vessel Monitoring System
VRE	Virtual Research Environment
WECAFC	Western Central Atlantic Fishery Commission

Opening of the Workshop

1. The participants to the meeting were welcomed by Mr Jeremy Mendoza (FAO). The opening address was made by Ms Lystra Fletcher-Paul, FAO Sub-Regional Coordinator for the Caribbean. Ms Fletcher-Paul welcomed the participants and began her address by highlighting how fisheries are a highly significant provider of food, livelihoods and income in the wider Caribbean area with an estimate of 900,000 people employed directly in the primary sector, with another three million jobs in ancillary activities such as processors, net makers, and boat builders.

2. Ms Fletcher-Paul recalled that the North Brazil Shelf Large Marine Ecosystem (NBSLME) extends along the northeastern coast of South America from the Parnaíba River estuary in Brazil to the boundary with the Caribbean Sea, and has a surface area of about 1.1 million km^2. The shelf topography and external sources of material, particularly the Amazon River, exert a significant influence on the productivity of the marine ecosystem, which is also enriched by the discharge from other rivers such as Tocantins, Maroni, Corentyne, Essequibo and Orinoco.

3. Ms Fletcher-Paul noted that the shrimp resources in the North Brazil Shelf LME have supported important export oriented shrimp fisheries. These resources include four species of the larger Penaeid prawns (Southern brown shrimp, pink spotted shrimp, Southern pink shrimp and Southern white shrimp) and the smaller Atlantic seabob shrimp, with their distribution and abundance differing amongst the countries in the region.

4. Ms Fletcher-Paul also noted that the groundfish resources such as snappers, weakfishes, whitemouth croaker or corvine, and sea catfishes in the NBSLME are important for commercial and social reasons, with the red snapper probably being the most important groundfish in the region, considering its wide distribution range and its high commercial value in foreign markets. These groundfish species are exploited by the industrial trawlers, that mainly target shrimp species, but also by thousands of small scale fishers whose livelihoods depend on these species. Hence, the groundfish fisheries are multi-fleet, multi-gear, multispecies and multinational, using fishing methods that can be classified as industrial or artisanal, depending, among other things, on the level of capital investment, mechanization and the organization of labor. Adequate statistical data for these species is much more difficult to obtain given the characteristics of the fisheries. Nevertheless, they represent a significant contribution to food security and poverty alleviation in the region, as well as a valuable commodity in national and international markets.

5. Ms Fletcher-Paul further emphasized that the responsible use of these resources requires an Ecosystem Approach to Fisheries (EAF) Management to deal with the complexities of heterogeneous fleets harvesting shared stocks of a diversity of species. The transition to an Ecosystem Approach to the shrimp and groundfish fisheries of the North Brazil shelf is the main objective of the FAO component of the Caribbean and North Brazil Shelf Large Marine Ecosystems (CLME+) Project.

6. Ms Fletcher-Paul ended her opening remarks by wishing a fruitful outcome from the meeting and a pleasant stay in Barbados to workshop participants.

Attendance

7. The meeting was attended by fishery officers from Guyana, Suriname and Trinidad and Tobago, as well as fishery researchers from Brazil and France (French Guiana). Technical support was provided by resource persons from FAO and the National Oceanic and Atmospheric Administration (NOAA) of the United States of America. The list of 14 participants is presented in Annex 1.

Objectives of the Workshop

8. The main objective of the workshop was to provide training on data preparation for stock assessment purposes and fisheries status/trends monitoring, and take stock of the available data on the fisheries and exploited species of the North Brazil Shelf LME. As agreed in the 2nd Meeting of the CRFM/IFREMER/WECAFC Working Group on Shrimp and Groundfish (Barbados, 17-18 May 2018), the workshop was also the first step in a process that will lead to training in fish stock assessment and a fish stock assessment workshop for the shrimp and groundfish fisheries. The workshop was an opportunity to provide inputs for updating the FAO Fisheries and Resources Monitoring System (FIRMS) for the sub-region, as well as for an operational sub-regional data and information repository on fisheries and their associated ecosystems in the North Brazil Shelf LME. Workshop activities will contribute to enhance capacities in fisheries data and statistics collection at the national and subregional levels, and contribute to FAO CLME+ project deliverables.

9. Specific objectives of the workshop included:

- Present and review existing fisheries and resources data per country in the region, including status of data digitalization, database software used and levels of spatial and temporal aggregation
- In light of the data presented, determine key species for stock assessment purposes at the national and sub-regional levels.
- Present and review the Data Repository/Decision Support System (DSS) that will be used for assessment and management of shrimp and groundfish fisheries of the NBSLME, and examine data formats required.
- Demonstrate on how to populate the Data Repository/DSS using data presented by countries at the workshop, in preparation for a stock assessment workshop to be held in early 2019.
- Examine current status of FIRMS fisheries and resource inventories in the NBSLME. Identify data gaps in FIRMS fisheries and resource inventories, and establish necessary actions to populate FIRMS inventories for the sub-region.

Adoption of the Agenda

10. The meeting adopted the Agenda presented in Annex 2.

Status of FIRMS inventories for the NBSLME

11. Mr Gentile (FAO) provided background on the FIRMS partnership, active since 2004, and he summarized the development of this initiative in the WECAFC region. He described the overall benefits of the program: dissemination of high quality information, possibility for information sharing among all partners, tracking of marine resources status and trends, keeping up to date marine resource and fishery inventories, definition of standards and guidelines, among others. Currently, the FIRMS partnership involves 14 intergovernmental organizations representing 19 regional fishery bodies (RFBs). The WECAFC-FIRMS collaboration was initiated at the WECAFC-FIRMS Workshop on Marine Resources and Fisheries Inventories- http://www.fao.org/3/a-i3661e.pdf (Corpus Christi, United States of America, 1-2 November 2013), with the identified goal "to strengthen the data collection and research process in support of fisheries management in the Caribbean". Within the WECAFC region, the FIRMS Inventories contains more than 500 stocks and fisheries records with 25 published fishery fact sheets and 50 published stock fact sheets. An output from the 2nd Meeting of the WECAFC/CRFM/IFREMER Shrimp and Groundfish Working Group on the Shrimp and Groundfish of the Brazil Guianas Shelf (UN House, Barbados, 17-18 May 2018), included drafts of additional 17 fishery fact sheets. The present Data Preparation Workshop is an opportunity to finalize the recent inventory and fact sheets drafts.

12. Ms Tagliarolo (France) enquired about the data sharing policies, as in some cases country/institutional authorization is required before data is made public. Mr Gentile (FAO) clarified that FIRMS deals with public data; countries are fully in control of the process and authorize the final approval for fishery fact sheets dissemination. However, regarding the development of a regional database, it was mentioned that confidential data may be stored, but only shared under specific data policy guidelines. Three levels of data sharing may be identified in a regional database: i) confidential data, ii) public data, and iii) intermediate level (mixture of the first two levels). The Data Collection Reference Framework (DCRF), under development by the WECAFC Regional Working Group on Fisheries Data and Statistics, was mentioned as providing for the overall policy and the operational guidelines for statistical data collection and sharing.

13. Mr Gentile (FAO) recalled that the marine resources and fisheries inventories constitute the backbone of the FIRMS knowledge base with the aim to provide a complete picture from which to assess current levels of knowledge. Marine resources and fisheries are inventoried for reporting purposes and to track status and trends. The inventory is implemented using an Excel format for initial data input, once harmonized according to FIRMS standards and validated by data owners, information is stored into the FIRMS database and published as fact sheets.

14. During the workshop work was successfully conducted in side discussions country by country to review the available data collected so far, particularly from the outputs of the WECAFC/CRFM/IFREMER Shrimp and Groundfish Working Group (Barbados, 17-18 May 2018). Inventories have been edited and enriched. A final step was required for the participants to follow-up on a few pending questions towards final approval. Once validated by data owners, the data will be published in form of fact sheets through the WECAFC-FIRMS Fishery Fact Sheets in the FIRMS website: http://firms.fao.org.

Status of Data Repository/Decision Support System (DSS) development in the NBSLME

15. Mr Laurent (FAO) presented the existing tools in FAO to build the CLME+ Decision Support System (DSS) and data repository. The DSS will be designed in order to provide information useful

to fisheries management. The DSS is considered one of the main outputs of the CLME+ project. It is envisioned to be built on the existing tools and systems storing information and statistics: FIRMS to store fisheries inventories and stock status reports, FAO Global Record of Fishing Vessels as supporting system for regional vessel registry (under the management of the Regional IUU Working Group), the WECAFC regional database (RDB) for national and regional statistics based on the Data Collection Reference Framework (DCRF) for harmonized and standardized statistics, and iMarine Virtual Research Environment (VRE) for training and computations on stock assessment and for document sharing. It will implement Regional Data Sharing and Access Policies to ensure confidentiality of data when necessary. The current main discussion is focused on the identification of the type of information and tools needed to support the DSS itself.

16. Ms Cummings (NOAA) complemented the presentation describing the iMarine VREs for document sharing and for support in Fisheries Management Plan (FMP) implementation and training on stock assessment. This collaborative environment was used in the WECAFC-FIRMS Data Workshop (UN House, Barbados, 19-21 January 2016) and since then for all meetings or workshops organized by the WECAFC-FIRMS projects. The VRE provides facilities to run specific models for stock assessments and a brief live demo was provided on the WECAFC-FIRMS tabular data manager and data viewer where specific models can be run for stock assessment compilation.

17. Mr Laurent (FAO) presented the WECAFC Data Collection Reference Framework (DCRF), a key document drafted under WECAFC-FIRMS Phase II, which lays the foundation for fisheries data and statistics collection and collation to support the needs for developing, monitoring, assessing and reviewing regional fisheries policies such as FMPs as is required by RFMOs. Although the discussion of this document was out of the scope of the current meeting, participants were invited to provide feedback. During the 1st Meeting of the Fishery Data and Statistics Working Group (UN House, Barbados, 14-16 May 2018), the DCRF was reviewed and it was agreed that the framework was conceptually and sufficiently mature and complete for data collection in the region.

18. Mr Yspol (Suriname) asked for clarifications about vessel type classification in terms of length classes. Mr Laurent (FAO) described the current proposal for vessel length classes and presented an example for Trinidad and Tobago, where local vessel classifications could be categorized into standard ones. Mr Yspol highlighted that in some cases the Length Overall (LOA) is not always a good measure of capacity of the vessels as, for example, when a vessel may happen to have a longer LOA but less gross tonnage (GT). Ms Cummings (NOAA) reminded the "living document" nature of the DCRF and the goal of the DCRF to provide the minimum content; she indicated that there was room to raise further needs as well as to refine classification proposals.

19. Mr Aragao (Brazil) offered additional input about the LOA issue, by presenting the example of the lobster fishery in Brazil for which the gross tonnage was not sufficient as a measure of capacity and not a useful indicator of fishing power, while the LOA provided a more useful indicator.

20. Mr Mendoza (FAO) stated that in any case LOA is a valid indicator considering the diversity of fleets in the region, particularly in regards to the small scale fisheries fleets, and that LOA should be considered as a minimum and relatively easy to obtain data requirement. The group agreed to define the LOA as a minimum requirement although for industrial fleets the GT is also available.

21. Mr Mendoza (FAO) highlighted the need for a sub-regional data framework for the NBSLME which should be based on the regional DCRF, and that would complement the requirements and classifications for the specificities of the sub-region. Data policies to be discussed in this workshop are for the specific needs of the NBSLME.

22. It was also noted that vessel registry is not mandatory for all countries in the sub-region and hence the need to collect this data under a common harmonized standard, already proposed by the Regional Working Group on IUU - http://www.fao.org/3/I8440B/i8440b.pdf

23. Mr Laurent (FAO) introduced the WECAFC data access and sharing policies with principles, strategies and technical implementation. Basic principles allow to establish three groups of data with decreasing levels of confidentiality. Another basic principle is that all users accessing/sharing data resources must be formally identified (e.g. fisheries officers nominated by countries).

24. In the context of the Decision Support System (DSS) as one of the key outputs of the CLME+ project, Mr Laurent (FAO) presented the WECAFC Regional Database accessible through the iMarine WECAFC-FIRMS VRE. The VRE contains also a platform for stock assessment training and computations.

25. A live demo was performed by uploading catch time series and storing in a dedicated data collection assigning specific rights to selected users. The uploaded time series can be further reviewed and validated. The data are rendered within the WECAFC-FIRMS data viewer with options to load selected data sets as well as the FIRMS inventories.

26. The WECAFC-FIRMS VRE is also offering a workspace with shared documents which have been collected so far for WECAFC - FIRMS projects. Authorized users can handle these documents (with different rights) and further share with other users. The workspace is also offering version control and download options. Ms Tagliarolo (France) asked for options in the viewer to select specific temporal extents in order to take into account the difference in time series among countries.

27. Mr Mendoza (FAO) asked for clarifications on how to use the VRE and under which procedure. Mr Laurent (FAO) explained that type of data (e.g. list of species) still needs to be agreed upon in order to configure the Excel template for data uploading by the countries. Regarding geospatial data, so far only Area 31 (Western Central Atlantic) is available as a FAO statistical area. A discussion is currently ongoing to adopt a more detailed subdivision scheme. Options include one degree squares and smaller FAO polygons within FAO Statistical Area 31. So far the geospatial reference is the EEZ at the country level plus national or shared classifications for stock assessment and reporting purposes.

Presentation on “Smartforms” application

28. Mr Gentile (FAO) presented the FAO mobile “SmartForms” application. This mobile application is designed to collect and review fishery and observer data. The development of the application is in progress under the ABNJ Deep-seas project funding. The application has been released in Google Play as a closed beta version for testing purposes. SmartForms will be eventually released as an FAO corporate application (from an IT viewpoint) as a system for the dynamic collection of fishery observers’ data on-board fishing vessels and on landing sites, and by establishing a robust infrastructure to collect, validate, amend, archive and share data. An open source version is also expected to serve a community of interest. The deliverables include data input forms suitable for use on a tablet or mobile phone that satisfies the requirements of the regional fisheries organizations and other partner organizations in the global initiative on Sustainable Fisheries Management and Biodiversity Conservation of Deep–sea Living Marine Resources and Ecosystems in the Areas Beyond National Jurisdiction (ABNJ Deep Seas Project) and similar projects. Other potential business cases have been also identified, including IUU fishing in the Bahamas, recording of

vulnerable marine ecosystem (VME) taxa in the area of the South East Atlantic Fisheries Organization (SEAFO), recording of shark species, fragile benthos in the South Indian Ocean, and the FAO Somalia - artisanal fisheries program. Mr Gentile invited participants to share their potential interest for the application for its use within their national contexts.

Presentation of fisheries and biological data templates

29. Mr Gentile (FAO) introduced the data collation template for fisheries and biological data circulated to the participants. The template was introduced sheet by sheet starting from the list of fisheries relevant to the CLME+ project. The template, built on shared data standards, integrates the section for inventorying fisheries records with sections on specific data functional for running stock assessments on selected species. Feedback was requested from participants.

30. There was a general discussion covering several aspects of the template. There was some confusion regarding the function of the "fishery description" sheet as its relation or link to other sheets was not clear, and if the sheet was more species specific than fishery specific. It was clarified that the templates should be considered on a fishery by fishery basis. Ms Cummings (NOAA) suggested that for some biological parameters (e.g, growth, and length-at-maturity) it would be useful to add columns to include uncertainty around parameter estimates.

31. There was some discussion on whether raw data versus aggregated data should be used as input for the templates. A consensus was made to review the templates fishery by fishery in order to identify what information was available and the level of aggregation required. It was noted that one goal/function of the template was to identify the minimum data needs for the fisheries resource that was to be assessed.

Review and discussion of fisheries data for industrial trawl fisheries

32. Mr Mendoza (FAO) facilitated the review of the template in relation to input of data for the industrial trawl fisheries.

33. In the sheet "biology", for each parameter, it was suggested to add a column to include the coefficient of variation to express uncertainty on estimates (e.g. growth equation parameters).

34. Ms Tagliarolo (France) noted that for some species estimates of minimum and maximum of some biological parameters (e.g. growth) existed, especially when a time series of estimates was available. The group agreed on the need to recalculate the parameter value according to an existing agreed model in cases where estimates for multiple years were available.

35. For the sheet "Catch" it was mentioned that for shrimp species this should be expressed in live weight equivalent. Ms Ferreira (Trinidad and Tobago) mentioned that in Trinidad data would sometimes be available by species and other times as species aggregates. Mr Mendoza (FAO) mentioned that the species composition in Trinidad was more diverse than in other countries and that is was not always easy to report by species. He suggested that in those cases it would be better to report as an aggregate (i.e. Penaeid shrimps) and annotation and documentation to this effect.

36. Mr Mendoza (FAO) noted that for most fisheries mainly landings would be available but not discards. On the other hand, Ms Cummings (NOAA) noted that for accurate stock assessments and for fisheries monitoring the aim would be to obtain total removals (landings + discards) in order to quantify total harvest.

37. Regarding bycatch for Guyana there is some information on finfish species caught in the shrimp fishery. However, for French Guiana and Suriname there is no information on bycatch in the shrimp fisheries. In Suriname the species composition of shrimps is obtained, but there is uncertainty regarding the quality of the species composition data. There is no legislation in place to control and enforce proper reporting. Logbook data on species composition is not considered reliable and the most reliable source is from onboard observers.

38. Mr Laurent (FAO) made some considerations on the use of common and scientific names for species and suggested to use the FAO Aquatic Sciences and Fisheries Information System (ASFIS) List of Species for Fishery Statistics Purposes - http://www.fao.org/fishery/collection/asfis/en. Mr Gentile (FAO) commented that a column could be added to include the ASFIS 3 alpha code.

39. There was also a discussion regarding codification of fishing gear. Mr Mendoza (FAO) noted that in the industrial fisheries of the NBSLME there were basically two types of vessels/gears, the stern trawlers that target finfish and the Florida type trawlers that target prawns and Atlantic seabob. Mr Laurent (FAO) mentioned that gear and vessel type should not be confused. It was also suggested that, despite its limitations for application within the region, the International Standard Statistical Classification of Fishing Gear (ISSCFG) http://www.fao.org/cwp-on-fishery-statistics/handbook/capture-fisheries-statistics/fishing-gear-classification/en/ could be used within the data template.

40. It was suggested that processing plants be added as a catch data source. For example, in French Guiana the landing declaration is cross checked with processing plant reports. Also, in Suriname landings of Atlantic seabob are obtained directly from processing plants.

41. Regarding the sheet "Abundance Index" there was a discussion on how Vessel Monitoring Systems (VMS), the Automatic Identification System (AIS) and logbooks could be used as sources of effort data.

42. The sheet on "Length composition" stimulated some discussion regarding the adequacy of the format for all countries. After reviewing the sheet content it was agreed that the template format was adequate. A question was raised on whether the data to be transcribed was the sample data or raised data. Ms Tagliarolo (France) mentioned that the length frequency data from French Guiana was raised to the monthly catches. As this was not common practice among all countries, it was agreed to include an additional column representing the sample weight or the raising factor used.

43. Especially for shrimp species it was agreed that an additional column for sex was necessary. There was also a discussion about including or not maturity stages, as this data is frequently collected for shrimp species. However, as the template required the registry of length frequency distributions, it was not clear how the maturity data could be included in the template.

44. Regarding the sheet on "Age composition" it was mentioned that it was not currently applicable for the shrimp and groundfish species of the NBSLME due to lack of data.

45. Mr Mendoza (FAO) queried the participants regarding the time period covered for the industrial trawl fishery catch and effort statistics in the different countries. In Brazil data was available since the mid-1970s until 2013 when the data collection program was halted. Since 2016 there has been some data collected through onboard observer programs. For French Guiana the series covers the period 1988-2018 and the program is ongoing. In the case of Guyana the country representatives were not able to provide an exact figure for the beginning of the series, but estimated that catch data

was available since the 1990s and effort data since the early 2000s. For Suriname data on catch and effort are available since the early 1980s and data collection is ongoing. For Trinidad and Tobago data are available since the early 1990s, however, catch and effort data have not been generated since 2016. Length frequency distributions for shrimp species were available in most countries for similar time periods as for data on catch and effort.

46. The Atlantic seabob fishery is only significant in Guyana and Suriname within the NBSLME. For Guyana monthly catch and effort statistics are available since 2001 until present, while in Suriname they are available since 1998. However, annual landing statistics cover a longer period since the 1980s.

Review and discussion of fisheries data for Southern Red Snapper fisheries

47. Regarding the sheet on "Biology" Mr Mendoza (FAO) mentioned that there was a number of studies available on-line (e.g. FishBase) regarding biological aspects (e.g. growth and maturity) of the Southern red snapper (*Lutjanus purpureus*).

48. For the "Catch" sheet, Mr Aragao (Brazil) mentioned that the period covered was 1998 to 2008, when the sampling program was stopped. Only recently, since 2016 there has been an effort to collect fishery statistics. Mr Aragao mentioned that there are 150 boats licensed with approximately 200 operating. There has been a change in the spatial distribution of the fishery as vessels operate nowadays in Northern Brazil and most are stationed at the port of Bragança in the state of Para.

49. In French Guiana the fishery for Southern red snapper is practiced by Venezuelan vessels that operate under agreement. Catch statistics have been collected since 1986. However, not all operations were covered as Venezuelan fishers are allowed to land their last trip outside of French Guiana. It is estimated that the last trip represents around 25% of total catches.

50. For Guyana there is little data available, the landing series covers the period from 2000 to present.

51. In Suriname it is also Venezuelan vessels that operate under agreement through a yearly licensing system. Landing statistics are available since the 1980s. Effort in days at sea is also estimable as vessels must use a government owned pier for operations. Fishing for Southern red snapper appears to be seasonal and vessels switch to other target species when apparent abundance is low. As in French Guiana, vessels are allowed to land their last trip outside of Suriname. Hence, landing statistics underestimate fishing pressure.

52. As foreign markets target for "plate-size" snappers mainly juveniles are being landed. It is uncertain whether larger sized individuals are being caught and sold in other markets or if transshipment of the larger individuals occurs.

53. Regarding the "Abundance index" sheet in Brazil there is information on effort and CPUE for the same period as for landings (1998-2008). Some recent information (2016-2018) has been collected through an observer program. In Guyana effort data should be available from the processing industry, but a formal request must be submitted. In Suriname effort data is available in days at sea, but monthly and yearly estimates have yet to be calculated. In French Guiana effort information is available since the mid-1980s, as for landings the data does not include fishing days related to the last trip.

54. Length frequency data for Southern red snapper are only collected in Brazil and French Guiana. Recent sampling in Brazil (2016-2018) has been through academic research projects and there is a significant gap for the period 2008-2016. In French Guiana, length frequency data have been routinely collected since 1986.

55. Ms. Tagliarolo (France) presented the data for red snapper as required by the template design. She mentioned that some of the information required by the 'Fishery description" sheet was not easy to provide. After a discussion it was suggested to follow FAO Standard symbols for statistical data (e.g. not available, zero, null, etc.) when filling the template (see Annex 4).

56. Following a suggestion by Mr Aragao (Brazil), Ms. Cummings (NOAA) proposed to create a template to summarize availability of data. The template would be populated by the countries and could be used to document sufficiency of data for the planned stock assessment work. Additionally, the template could aid in identifying research needs.

Review and discussion of fisheries data for artisanal groundfish fisheries

57. For French Guiana data are available since 2009. However, due to lack of personnel there are gaps for 2017-2018 but the program has recently restarted. Information recorded includes time at sea, landings and length-weight measurements. The target species is the Acoupa weakfish (*Cynoscion acoupa*). Only officially registered vessels are sampled, but there is a number of unregistered vessels that operate in the fishery.

58. In Guyana sampling is ongoing for the artisanal vessels. The coastal area is divided into six regions of which four are regularly sampled. A critical Issue is to obtain biological data, as most fishers are reluctant to spend time to allow fisheries officers to do the measurements during market hours, or are landing too early in the morning hours for officers to obtain samples. Hence, catch and effort data are collected from the artisanal fleet, but only a limited number of length samples have been obtained. A frame survey of the number of vessels per landing site has been conducted and is used to raise catch and effort data. The time series available starts in 2013, there is some previous data but this has not yet been digitized.

59. In Brazil the monitoring system for artisanal fisheries was stopped in 2007. A project was started in 2018 in Northern Brazil to obtain fisheries and biological data. The Ministry of the Environment is starting a program on sampling of artisanal fisheries within five Marine Protected Areas (MPAs) in Northern Brazil for defining control measures, if required. Mention was also made of the industrial Amazon catfish fishery that takes place in coastal waters with a significant bycatch of other estuarine and marine species. The fishery is currently being monitored by a research project with onboard observers, but regular monitoring is required.

60. For Trinidad and Tobago sampling for catch and effort is ongoing for the artisanal groundfish fishery (i.e. gillnets) and the artisanal shrimp trawl fishery. Data have been digitized from 1992 to present. Estimates of total landings and effort are available for the period 1994-2012 and CPUE estimates for 1992-2018.

61. In Suriname, catch and effort statistics for the coastal fisheries are available from 2000 to present. The sampling program for length frequency distributions was stopped in 2000, at present (2018) there is an ongoing project by the World Wide Fund for Nature (WWF) with several species of groundfish for estimation of length-based spawner-per-recruit (LB-SPR). Mr Yspol (Suriname) underlined that these sampling programmes were expensive, as fish, especially Acoupa weakfish,

have to be bought whole from the fishers as these can't be sold once gutted. Mr Ypsol also underlined that, given the limited human resources available, there was a need to define a minimum data required approach for fisheries management and stock assessment of these resources.

General discussion on fisheries data

62. Ms Cummings (NOAA) prepared the layout of a template for the group to summarize available data for the different fisheries including information on biology, catch, abundance, length composition, socio-economic data and environmental information. The template was discussed and the information was summarized for each country for five main fisheries: artisanal, Southern red snapper, industrial prawn, industrial Atlantic seabob and industrial finfish. The summarized data by fishery and country is presented in Annex 3.

General discussion on biological parameters

63. Mr Mendoza (FAO) facilitated the discussion on biological parameters. He gave a presentation on information available from different sources (SealifeBase, FishBase, publications, theses, technical reports, etc.), preferably from the NBSLME, for shrimp and groundfish species regarding maximum length, maximum age, growth parameters, length at maturity, length-weight relationship, trophic level and aspects of reproductive biology. Mr Mendoza indicated that the information provided was not exhaustive and that some studies, especially if not from the NBSLME, may have been overlooked. Mr Mendoza also presented estimates of natural mortality for relevant fish species obtained through the FishLife R package https://github.com/James-Thorson/FishLife. The information is summarized in Annex 3.

64. Mr Mendoza (FAO) asked participants to review the biological parameters presented by species and country. He mentioned that the reviewed parameters would constitute a regional reference for these species and were particularly relevant for the stock assessment workshop to take place in early 2019. Mr Yspol (Suriname) enquired about the priority species list for the Guianas shelf as discussed by the Fisheries Data and Statistics Working Group (FDS-WG). Ms Cummings (NOAA) and Mr Laurent (FAO) presented the list of priority species compiled for the WECAFC Data Collection Reference Framework (DCRF), which was discussed during the 1st Meeting of the FDS-WG in May 2018. Participants were briefed about the approach to categorize the species listing. Work is still in progress by the Shrimp and Groundfish Working Group to identify the priority species list for the shrimp and groundfish of the WECAFC area.

General discussion on population structure for key species

65. Mr Mendoza (FAO) presented a brief review of existing information on genetic studies on several shrimp and groundfish of the NBSLME. Most of the information related to studies in Brazil.

66. Gusmao *et al.* (2005) used allozymes to estimate variability levels and population genetic structure of *Farfantepenaeus brasiliensis*, *F. paulensis*, *Litopenaeus schmitti* and the recently detected species *Farfantepenaeus* sp. along 4,000 km of Brazilian coastline. No population heterogeneity was detected in *F. brasiliensis* or *L. schmitti* along the studied area. In contrast, values found for *Farfantepenaeus sp.* and *F. paulensis* indicated that the populations of those two species was genetically structured, comprising different fishery stocks. In *Farfantepenaeus sp.*, significant

differences were detected between the population from Recife in the northeast and those from Fortaleza and Ilhéus further south.

67. Marques (2015) used mitochondrial and nuclear markers in order to analyze aspects related to the geographic distribution and genetic relationships among the studied penaeid species (*Xiphopenaeus kroyeri, Farfantepenaeus paulensis, F. subtilis and F. brasiliensis*). The existence of a species complex was investigated for both *X. kroyeri* and *F. subtilis*. Phylogeographical signs and population structure were not observed for *F. subtilis* along the Brazilian coast. All tests performed to investigate population structuring in *F. subtilis* morphotype II point to the existence of a unique population along the Brazilian coastline. Similar results were obtained for *F. brasiliensis*. The author cautioned, however, on the low sample size for both species.

68. Ms Tagliarolo (France) mentioned that the *F. subtilis* morphotype was recently classified as a new species: *Farfantepenaeus isabelae*.

69. For the Southern red snapper, Gomes *et al.* (2008) found that morphological and mitochondrial data were not able to discriminate between the two Atlantic red snappers species (*L. campechanus and L. purpureus*), the most plausible and parsimonious hypothesis would be that the species from the North and South Atlantic Ocean represent slightly different populations of a single species with a large geographical distribution.

70. Gomes *et al.* (2012) focused on the mitochondrial control region to investigate phylogeographic patterns and population structure in *Lutjanus purpureu*s, and to evaluate the genetic similarity between *L. purpureus* and *L. campechanus.* A total of 810 base pairs sequences from control region were obtained from 239 specimens of *L. purpureus* collected from four localities off the Brazilian coast. The results revealed the presence of a single population characterized by high values of genetic diversity.

71. Da Silva et al. 2016 used a multi-locus approach (12 segments of mitochondrial and nuclear DNA) to elucidate the levels of genetic diversity and genetic connectivity of *L. purpureus* populations and their demographic history. *L. purpureus* had high levels of genetic diversity, which probably implies high effective population sizes values for the species. The data showed that this species was genetically homogeneous throughout the geographic region analyzed, most likely as a result of dispersal during the larval phase.

72. Regarding the Acoupa weakfish, Rodrigues *et al.* (2008) analyzed DNA sequences from the entire control region (D-loop) of the mitochondrial genome of 297 individuals collected during seven different months between December 2003 and August 2005 on the northern coast of Brazil (Amapá and Pará states). Samples were obtained from the fish market at Braganca. Genetic variability expressed by haplotype ($h = 0{,}892$) and nucleotide ($\pi = 0{,}003$) diversities was low compared to other heavily exploited marine fish species from the western Atlantic and eastern Asia. Results showed a lack of genetic structuring among the samples from different years, indicating the presence of a single stock of *C. acoupa* within the sampled area.

73. Santos *et al.* (2003) studied differences between King weaktfish populations using specimens caught throughout its South American range from Venezuela to Argentina. Results clearly distinguished two genetically different groups which showed nucleotide divergence and genetic structuring patterns that strongly suggested they may be different species. The data indicated the existence of two panmictic and genetically isolated *Macrodon* populations, one, the tropical group, being distributed from Venezuela to Pernambuco and the other, the subtropical group, occurring from São Paulo to Argentina.

74. Santos *et al*. (2006) studied phylogeographic patterns in *Macrodon ancylodon* sampled from 12 locations across all its range using mitochondrial DNA cytochrome b sequences, and analyzed them together with patterns of morphometric differentiation. Populations from North Brazil, with warmer waters, form a clade (tropical clade) separated by 23 fixed mutations from the populations that inhabit regions of colder waters influenced by the Brazil and Malvinas currents (subtropical clade). No gene flow existed between the tropical and subtropical clades, and most likely also between the two groups of the tropical clade. Distribution of these clades and groups was correlated with current flows and their temperatures, and was facilitated by larval retention and low adult migration. Despite differentiation at the molecular level, fishes analyzed from all these current-influenced regions were morphometrically homogeneous.

75. There was some discussion on stock structure after the presentation. For example, in Brazil shrimp stocks north and south of the Amazon are considered as separate stocks. Mr Gentile (FAO) reminded the group the notion of assessment unit vs. stock proper. The inventories and the stock assessments are carried upon assessment units which in some cases may coincide with the real populations, while in other cases the assessment units are sub-populations identified for different reasons and specific purposes. Mr Mendoza (FAO) mentioned that it is likely that several shrimp and groundfish species represent shared stocks within the NBSLME area. Mr Yspol (Suriname) enquired about the implications of considering shared stocks and expressed doubts about the existence of panmictic populations considering the geographic extent of the area. For example, he mentioned the differences in habitat characteristics for Southern red snapper between Suriname and French Guiana. On the other hand, Ms Tagliarolo (France) mentioned that juveniles were the main target of the fishery during the last ten years in French Guiana, and there were questions regarding the origin of these recruits. Mr Yspol concurred that for some sciaenid species (e.g. Acoupa weakfish) it was likely that shared populations existed among countries in the region.

76. There were additional comments on the need to standardize data and methodology in order to combine data for joint assessments, at least for length frequency data.

Defining workplan for stock assessment Workshop

77. Mr Mendoza (FAO) opened the agenda item by recalling the 2nd Meeting of the Shrimp and Groundfish Working Group and the proposed steps to further work in the NBSLME, which included:

- The present workshop on data preparation
- A 5 day training course in stock assessment methods for data-limited situations
- A stock assessment workshop for selected species of the NBSLME

78. The training course in stock assessment was discussed. It was agreed that the training will be held from the 21st to 25th of January 2019. Data will be a crucial asset to the success of this training, so the meeting agreed to share the needed data beforehand. The data will be reported according to the template discussed and amended during this workshop. The deadline for submission was agreed upon for the 21st of December 2018. For the specific case of Trinidad and Tobago, the Fisheries Division will receive support from the FAO Fisheries and Aquaculture Statistics and Information Branch (Mr Emmanuel Blondel) to prepare their catch and effort data.

79. The tentative dates for the workshop on stock assessment were discussed but will be agreed upon based on data availability. Ideally, this workshop should be organized back to back with the Third Shrimp and Groundfish Working Group meeting.

Recommendations by the Group

80. Ms Cummings (NOAA) drafted a summary for data needs and relevant recommendations considered during the meeting. For the different fisheries the current situation and the data/research requirements per country are outlined below.

81. Artisanal Fisheries:

- *Brazil*. Data collection stopped in 2008. Rescheduled for 2019 for the communities associated with the Marine Protected Areas (MPAs) in North Brazil. There is a need to implement a sampling program for the artisanal fisheries non-associated with the MPAs.
- *France (French Guiana)*. There is a program for dockside sampling of *C. acoupa*. However, it is only done on a trial basis. There is no onboard sampling regarding bycatch in this fishery. Work will be done on establishing the length-weight relation for this species, as resolution of the present estimates is considered inadequate.
- *Guyana*. Age and growth studies are needed throughout the region to update studies done in the 1990s and for those species for which studies have not been done. It is recommended to search possible sources of support for this.
- *Suriname*. It is important to begin sampling coastal fishes to record length measurements of selected species. However, there are constraints for data collectors and observers. Trials should be made to collect data using electronic means (e.g. tablets). It was mentioned that the WWF is currently conducting sampling for six species: *Cynoscion acoupa*, *C. virescens*, *Sciades parkeri* and *S. proops*, *Macrodon ancylodon* and *Nebris microps*. This data would be available once the report is finished.
- *Trinidad and Tobago*. To establish a sampling program of major commercial finfish for gillnet fisheries. There is a need to identify financial resources for developing this program. The same is valid for the artisanal multi-gear fleet.

82. Industrial shrimp fisheries

- *Brazil*. Catch and effort sampling stopped in 2013. Need to restart sampling of catch and effort. A sampling program is to begin soon. Also, biological data from processing plants has to be restarted.
- *France (French Guiana)*. Data coverage is considered good. Work is ongoing on updating length-weight relation of *F. subtilis*. Analysis of spatial data of this fishery will be done in the next months.
- *Guyana*. Coverage is good for *X. kroyeri*, however there is information lacking on the artisanal component. Stock assessment is required for the Penaeid prawn fisheries.
- *Suriname*. Good coverage of the Atlantic seabob fishery. For the prawn fishery data is obtained from processing plants for catch and effort, but there is no information on shrimp discards. No sampling is done currently for length composition.

- *Trinidad and Tobago*. Plans to implement logbooks for industrial trawlers. Through the REBYC II LAC project there are plans to sample every month from semi-industrial trawlers and every two months from industrial trawlers to estimate the amount and spatial distribution of catches and discards.

83. Southern red snapper fishery

- *Brazil*. Biological, catch and effort sampling stopped in 2008. In the port of Braganca it restarted in 2016 and there are funds until 2018. Funds must be identified for continuing this program, which is currently being implemented by the Federal University of Para.
- *France (French Guiana)*. A request has been made for age and growth studies but no funds are currently available. There is also the issue of estimating the amount of catch, effort and length composition corresponding to the last trip in each fishing season. Support is needed for obtaining and analyzing VMS data for this fishery.
- *Guyana*. Only catch data is registered from industry reports. Some effort data is collected but no biological data is collected.
- *Suriname*. Catch data is available for all Venezuelan vessels. Effort data needs to be corrected/estimated. No biological data is collected.
- *Trinidad and Tobago*. There is a need to implement species composition sampling for the pot fishery. It is necessary to establish a statistical and biological sampling program for the major commercial finfish from gillnet fisheries, as well as the artisanal and non-artisanal multi-gear fleet. Sources of funds for these sampling programs need to be identified.

84. Regarding other data needs it was mentioned that few data are collected on reproductive aspects (e.g. maturity, reproductive periodicity) of different species.

Closure of the Meeting

85. Mr Mendoza (FAO) thanked all attendants for their participation and encouraged them to continue working on data preparation for the training course and for the stock assessment workshop. The meeting was closed at 4:40 p.m.

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Annex 1. List of participants

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Annex 2. Adopted Agenda

PROVISIONAL AGENDA DATA PREPARATORY MEETING SHRIMP AND GROUNDFISH OF THE NORTH BRAZIL SHELF LARGE MARINE ECOSYSTEM		
Day 1 (October 23)		
Morning Session		
8:15-8:30	Registration of Participants	
8:30-8:45	Welcome address and presentation of participants	FAO
8:45-9:00	Presentation of Agenda and Workshop Objectives	FAO
9:00-9:45	Status of FIRMS inventories for the NBSLME	FAO
9:45-10:30	Status of Data Repository/DSS development and its applicability to document stock assessment work results in the NBSLME	FAO
10:30-10:45	Tea Break	
10:45-11:15	Presentation of fisheries and biological data templates	FAO
11:15-12:30	Review and discussion of fisheries data for industrial trawl fisheries	Countries representatives and resource persons
12:30-13:30	Lunch Break	
Afternoon Session		
13:30-15:30	Review and discussion of fisheries data for industrial trawl fisheries	Countries representatives and resource persons
15:30-15:45	Tea Break	
15:45-17:15	Review and discussion of fisheries data for artisanal groundfish fisheries	Countries representatives and resource persons
Day 2 (October 24)		
Morning Session		
8:15-9:15	Review and discussion of fisheries data for red snapper fisheries	Countries representatives and resource persons
9:15:10:30	General discussion on fisheries data (e.g. data preparation for stock assessment workshop, data gaps, recommendations)	Countries representatives and resource persons
10:30-10:45	Tea Break	
10:45-11:30	Review and discussion of available fisheries independent data (e.g. surveys)	Countries representatives and resource persons
11:30-12:30	Review and discussion of biological data on shrimp species	Countries representatives and resource persons
12:30-13:30	Lunch Break	
Afternoon Session		
13:30-14:30	Review and discussion of biological parameters and population structure of shrimp species	Countries representatives and resource persons
14:30-15:30	Review and discussion of biological data on key groundfish species	Countries representatives and resource persons
15:30-15:45	Tea Break	

PROVISIONAL AGENDA DATA PREPARATORY MEETING SHRIMP AND GROUNDFISH OF THE NORTH BRAZIL SHELF LARGE MARINE ECOSYSTEM		
15:45-17:15	Review and discussion of biological parameters and population structure of key groundfish species	Countries representatives and resource persons
Day 3 (October 25)		
Morning Session		
8:15-9:15	Review and discussion of biological data on red snapper	Countries representatives and resource persons
9:15-10:15	Review and discussion of biological parameters and population structure of red snapper	Countries representatives and resource persons
10:15-10:30	Tea Break	
10:30-11:30	General discussion on biological data and parameters (e.g. data preparation for stock assessment workshop, data gaps, recommendations)	Countries representatives and resource persons
11:30-12:30	Review and discussion on available socio-economic data on NBSLME fisheries	Countries representatives and resource persons
12:30-13:30	Lunch Break	
Afternoon Session		
13:30-14:15	Required actions and procedures to populate FIRMS inventories	FAO
14:15-15:00	Required actions and procedures to populate Repository/DSS for stock assessment of NBSLME shrimp and groundfish	FAO
15:00-15:45	Defining workplan for stock assessment workshop	Countries representatives and resource persons
15:45-16:00	Tea break	
16:00-17:00	Review of Workshop Recommendations	Countries representatives and resource persons
17:00-17:15	Meeting closure	

Annex 3. Data availability per type of fishery

Table 3.1. Data availability for Industrial trawl fishery for Penaeid prawns

Data	Availability	Time Period	Target species	Comments
Brazil				
Biology	Y		Southern brown shrimp	King weakfish main commercial bycatch
Catch	Y	1975-2013		Observer data from 2000 to 2018. Coverage variable from year to year.
Abundance index	Y	1975-2013		Observer data from 2000 to 2018. Coverage variable from year to year.
Length composition	Y	1975-2013		Observer data from 2000 to 2018. Coverage variable from year to year.
Summary length or weight	Y	1975-2013		Observer data from 2000 to 2018. Coverage variable from year to year.
Age composition	NA			
Environmental Events and Anthropogenic factors	Y			River discharge
Socio-Economic Information	Y			Ex-vessel and export prices. Operational costs of fishing
Notes: Data obtained at processing plants and from onboard observers. Surveys from 1996 to 1998 (REVIZEE). Intention to recover catch and effort data for 2013-2018 in upcoming months				
France (French Guiana)				
Biology	Y		Southern brown shrimp	Growth, weight-length, length at maturity, natural

Data	Availability	Time Period	Target species	Comments
				mortality, sex-ratio
Catch	Y	1988-2018		
Abundance index	Y	1988-2018		
Length composition	Y	1988-2018		Available data is raised to catches, per sex and maturity stage
Summary length or weight	Y	1988-2018		
Age composition	NA			
Environmental Events and Anthropogenic factors	Y			Sea surface temperature and mangrove cover
Socio-Economic Information	Y			PhD study on socio-economics of the fishery
Notes: Sampling for above information is done at processing plants				
Guyana				
Biology	NA			
Catch	Y	2013-2018	Shrimp complex	Length of series to be verified
Abundance index	Y	2013-2018		Length of series to be verified
Length composition	NA			
Summary length or weight	NA			
Age composition	NA			
Environmental Events and Anthropogenic factors	NA			
Socio-Economic Information	NA			
Notes: Missing data will be requested to the fishing companies				
Suriname				
Biology	Y	1990-2000s	Southern brown shrimp, Redspotted shrimp, Southern white shrimp,	Data collected during project in collaboration with Belgium

Data	Availability	Time Period	Target species	Comments
			Southern pink shrimp	
Catch	Y	1980s-2018	Same species as above and 2 deep water species	
Abundance index	Y	1980s-2018		
Length composition	Y	1990s-2000s		
Summary length or weight	Y	1990s-2000s		
Age composition	NA			
Environmental Events and Anthropogenic factors	NA			
Socio-Economic Information	NA			
Notes: Deep water shrimp began to be caught in mid 2000s				
Trinidad and Tobago				
Biology	NA			
Catch	Y	1992-2018	Shrimp complex for data on catch and effort. Other species include whitemouth croaker, Jamaica weakfish, snook, lane snapper and Acoupa weakfish, among others	Data digitized from 1992-2018 and some years prior to 1992. Raised total 1994-2012.
Abundance index	Y	1992-2018		
Length composition	Y	2017		There are some previous data to be located (1992-2002) referring to single species of shrimp

Data	Availability	Time Period	Target species	Comments
Summary length or weight	Y	2017		There are some previous data to be located (1992-2002) referring to single species of shrimp
Age composition	NA			
Environmental Events and Anthropogenic factors	Y			Not readily available. Meteorological Office
Socio-Economic Information	Y			Ex-vessel price, cost and earnings study for 1997 and 2010
Notes:				

Table 3.2. Data availability for Industrial Atlantic seabob fishery

Data	Availability	Time Period	Target species	Comments
Guyana				
Biology	Y	2001-2018	Atlantic seabob	Need to check length of series
Catch	Y	2001-2018		Need to check length of series
Abundance index	Y	2001-2018		Need to check length of series
Length composition	Y	Up to 2018		Need to check length of series
Summary length or weight	Y	Up to 2018		Need to check length of series
Age composition	NA			
Environmental Events and Anthropogenic factors	NA			
Socio-Economic Information	NA			
Notes: recent sampling of costal small scale fishery is underway				
Suriname				

Data	Availability	Time Period	Target species	Comments
Biology	Y		Atlantic seabob	
Catch	Y	1998-2018		
Abundance index	Y	1998-2018		
Length composition	Y	2008-2018		
Summary length or weight	Y	2008-2018		
Age composition	NA			
Environmental Events and Anthropogenic factors	NA			
Socio-Economic Information	NA			
Notes:				

Table 3.3. Data availability for industrial finfish fishery

Data	Availability	Time Period	Target species	Comments
Brazil				
Biology				
Catch	Y	2015-2018		There are 22 Florida type vessels that direct effort to finfishes mainly king weakfish
Abundance index	Y	2015-2018		
Length composition	NA			
Summary length or weight	NA			
Age composition	NA			
Environmental Events and Anthropogenic factors	NA			
Socio-Economic Information	NA			
Notes: No information available for small-scale fishery that operates mainly in state of Maranhao				
Suriname				
Biology	Y	1990s-2018	Snapper complex, sciaenids, black grunt and barracuda	
Catch	Y	1990s-2018		There are currently 28

Data	Availability	Time Period	Target species	Comments
				vessels targeting finfish
Abundance index	Y	1990s-2018		
Length composition	NA			
Summary length or weight	NA			
Age composition	NA			
Environmental Events and Anthropogenic factors	NA			
Socio-Economic Information	NA			
Notes: In recent years the fishery is mainly targeting black grunt.				

Table 3.4. Data availability for the Southern red snapper fishery

Data	Availability	Time Period	Target species	Comments
Brazil				
Biology	Y	1998-2008 and 2016-2018	Southern red snapper	Growth, reproduction, maturity, length-weight relationship
Catch	Y	1998-2008 and 2016-2018		
Abundance index	Y	1998-2008 and 2016-2018		
Length composition	Y	1998-2008 and 2016-2018		
Summary length or weight	Y	1998-2008 and 2016-2018		
Age composition	NA			
Environmental Events and Anthropogenic factors	Y			River discharge
Socio-Economic Information	Y			Number of vessels and average number of fishers per vessel. Export value and ex-vessel price
Notes: Regular data collection stopped in 2008. In recent years information has been obtained through research projects				
France (French Guiana)				
Biology	Y	1994-2013	Southern red snapper	Growth and maturity
Catch	Y	1986-2018		
Abundance index	Y	1986-2018		
Length composition	Y	1986-2018		
Summary length or weight	Y	1986-2018		

Data	Availability	Time Period	Target species	Comments
Age composition	Y	1999		One year of data based on scales and otoliths
Environmental Events and Anthropogenic factors	Y			Sea surface temperature
Socio-Economic Information	Y			Ex-vessel prices. Number of fishers based on 15 fishers per boat
Notes:				
Guyana				
Biology	NA		Southern red snapper and other lutjanids	
Catch	Y	2013-2018		Need to verify length of time series
Abundance index	Y	2013-2018		Need to verify length of time series
Length composition	NA			
Summary length or weight	NA			
Age composition	NA			
Environmental Events and Anthropogenic factors	NA			
Socio-Economic Information	Y			Estimate of number of fishers
Notes:				
Suriname				
Biology	Y	1990-2000s	Southern red snapper and lane snapper	Data collected during project in collaboration with Belgium
Catch	Y	1980s-2018		
Abundance index	Y	1980s-2018		Effort needs to be recalculated for Venezuelan fleet
Length composition	Y	1990s-2000s		Data are not currently available, but presented in WECAFC reports
Summary length or weight	Y	1990s-2000s		Data are not currently available, but presented in WECAFC reports
Age composition	NA			

Data	Availability	Time Period	Target species	Comments
Environmental Events and Anthropogenic factors	NA			
Socio-Economic Information	Y			Numbers of fishers
Notes:				
Trinidad and Tobago				
Biology	NA		Snapper complex	
Catch	Y	1959-2017		Data digitized from 1992-2018 and some years prior to 1992. Raised totals 1994-2012.
Abundance index	Y	1959-2017		
Length composition	Y	2017		Data available from discards and commercial bycatch of trawl fleet
Summary length or weight	Y	2017		
Age composition	NA			
Environmental Events and Anthropogenic factors	Y			Not readily available. Meteorological Office
Socio-Economic Information	NA			
Notes:				

Table 3.5. Data availability for small-scale fisheries

Data	Availability	Time Period	Target species	Comments
Brazil				
Biology	Y	1998-2008	King weakfish, Acoupa weakfish, Gillbacker sea catfish	Growth, reproduction, maturity, weight-length relation
Catch	Y	1998-2008		
Abundance index	Y	1998-2008		
Length composition	Y	1998-2008		
Summary length or weight	Y	1998-2008		
Age composition	NA			
Environmental Events and Anthropogenic factors	Y			River discharge
Socio-Economic Information	Y			Socioeconomic data on fisher's communities around MPAs
Notes: Data collection stopped in 2008, most of harvest is consumed locally				
France (French Guiana)				
Biology	Y		Acoupa weakfish (more than	Weight-length relation

Data	Availability	Time Period	Target species	Comments
			40 other species)	
Catch	Y	2009-2017		
Abundance index	Y	2009-2017		
Length composition	NA			
Summary length or weight	NA			
Age composition	NA			
Environmental Events and Anthropogenic factors	Y			Phd study on temperature
Socio-Economic Information	Y			average estimate price, euro value (min-max), socio economic surveys conducted every 2-3 years for coastal fisheries
Notes: Sampling intensity is variable by year. No exports except for bladders				
Guyana				
Biology	Y			Sciaenids and catfishes
Catch	Y	2016-2017		landings are estimates of samples and on dockside observers, raised by total effort, 2013-2015 not digitized
Abundance index	Y	2016-2017		
Length composition	Y	2016-2018		Gaps in series, fish gutted at sea
Summary length or weight	NA			
Age composition	NA			
Environmental Events and Anthropogenic factors	NA			
Socio-Economic Information	Y			there is a production index, contribution to the economy. Vessel count was made in 2017 for the artisanal fleet, number of fishers can be estimated on that count.
Notes:				
Suriname				
Biology	Y	1990s-2000s	Acoupa weakfish, smalleyed	Ongoing study by WWF for

Data	Availability	Time Period	Target species	Comments
			weakfish, Gillbacker sea catfish, king weakfish, Green weakfish, Crucifix sea catfish	LBSPR estimation
Catch	Y	2000-2017		
Abundance index	Y	2000-2017		
Length composition	Y			Ongoing study by WWF for LBSPR estimation
Summary length or weight	Y			Ongoing study by WWF for LBSPR estimation
Age composition	NA			
Environmental Events and Anthropogenic factors	Y			On demand (Ministry of Natural Resources)
Socio-Economic Information				On demand (Bureau of Statistics). Reliable registry of vessels and used to estimate number of fishers. Last vessel count was in 2012
Notes:				
Trinidad and Tobago				
Biology	NA		Whitemouth croaker, Jamaica weakfish, snook, Lane snapper, Acoupa weakfish	
Catch	Y	1959-2017		Data digitized from 1992-2018 and some years prior to 1992.

Data	Availability	Time Period	Target species	Comments
				Raised totals for 1994-2012.
Abundance index	Y	1959-2017		
Length composition	Y	2017		There are some previous data to be located (2003-2007) for 2 species: Whitemouth croaker and Lane snapper
Summary length or weight	Y	2017		
Age composition	NA			
Environmental Events and Anthropogenic factors	Y			Not readily available. Meteorological Office
Socio-Economic Information	Y			Price information with catch and effort data. Estimate in 2015 of number of vessels and based on 2 crew per boat estimate number of fishers
Notes:				

Annex 4. Biological parameters for crustacean and groundfish species of the NBSLME

Farfantepenaeus subtilis (southern brown shrimp, crevette café, camarao rosa)

Max. Age: NA

Max length: 20.5 cm TL (Females); 15.2 cm TL (males); 5.5 cm CL (Females); 3.6 cm CL (males)

Growth:

Female: Loo=21.64 cm TL ; K=1.10 Silva *et al*. 2015 (NE Brazil)

Male: Loo= 19.74 cm TL; K=1.06 Silva *et al*. 2015 (NE Brazil)

Female: Loo= 22.5 cm TL; K=1.0 Isaac *et al*. 1992 (North Brazil)

Male: Loo= 18.7 cm TL; K=1.08 Isaac *et al*. 1992 (North Brazil)

Female: Loo= 23.63; K= 1.0 Aragao, 2012

Male: Loo= 21.53 cm TL; K=0.94 Aragao, 2012

Length-weight relations:

Female (CL): a = 0.5273 b= 3.12 Correa & Martinelli, 2009 (North Brazil)

Female (CL): a= 0.5213 b= 3.24 Carvalho *et al*. 2015 (North Brazil)

Male (CL) same as above Carvalho *et al*. 2015 (North Brazil)

Unsexed (CL): a=0.5334 b= 3.25 Correa & Martinelli, 2009 (North Brazil)

Female (TL): 0.0000321 b=2.801 Marcano *et al*., 1997 (Eastern Venezuela)

Male (TL): 0.0000259 b=2.847 Marcano *et al*. 1997 (Eastern Venezuela)

Length at maturity:

Females: 126.5 mm TL Cintra *et al*., 2004 (North Brazil)

Females: 11.9 cm TL Silva *et al*. 2016 (Pernambuco, Brazil)

Xiphopenaeus kroyeri (Atlantic seabob, crevette seabob, camarao sete barbas, Camaron titi)

Max. Age: NA

Max length: 13.4 cm TL (males); 14.88 cm TL (females)

Growth:

Male: Loo=2.87 cm CL ; K=2.96 Da Silva *et al*. 2018 (SE Brazil)

Female: Loo= 3.08 cm CL; K=2.12 Da Silva *et al*. 2018 (SE Brazil)

Male: Loo=3.10 cm CL; K=1.7 Reis *et al*. 2017 (SE Brazil)

Female: Loo=3.30 cm CL; K=1.5 Reis *et al*. 2017 (SE Brazil)

Length-weight relations:

Female (CL): a = 0.6762 b= 2.654 Reis *et al*. 2017 (SE Brazil)

Male (CL): a= 0.6622 b= 2.821 Reis *et al*. 2017 (SE Brazil)

Length at maturity:

Females: 126,5 mm TL Cintra *et al*., 2004 (North Brazil)

Males: 1.2 cm CL Da Silva *et al*. 2018 (SE Brazil)

Females: 1.3 cm CL Da Silva *et al*. 2018 (SE Brazil)

Length-length:

Female: TL = 2.8+3.32 CL

Male: TL = 2.03+3.77 CL

Many more studies are available for the SE Brazil region, but much more south than the ones presented here.

Farfantepenaeus brasiliensis (Redspotted shrimp, crevette rose, camarao rosa, Camaron Rosado con manchas)

Max. Age: NA

Max length: 19.0 cm TL (unsexed)

Growth:

Male: Loo=17.6 cm TL ; K=1.62 Mello, 1973 (Sao Paulo, Brazil)

Female: Loo= 20.5 cm TL; K=2.52 Mello, 1973 (Sao Paulo, Brazil)

Male: Loo=21.9 cm TL; K=3.01 Arreguin-Sanchez, 1981 (Quintana Roo, Mexico)

Female: Loo=26.6 cm TL CL; K=2.05 Arreguin-Sanchez, 1981 (Quintana Roo, Mexico)

Male: Loo=23.0 cm TL ; K=0.84 Leite & Petrere, 2006 (Sao Paulo, Brazil)

Female: Loo= 28.0 cm TL; K=0.90 Leite & Petrere, 2006 (Sao Paulo, Brazil)

Length-weight relations:

Male (TL): a = 0.01 b= 2.94 Leite & Petrere, 2006 (Sao Paulo, Brazil)

Female (TL): a= 0.008 b= 3.94 Leite & Petrere, 2006 (Sao Paulo, Brazil)

Unsexed (CL): a=0.5735 b= 3.27 Perez- Castañeda & Defeo, 2002 (Yucatan, Mexico)

Length at maturity:

NA

Length-length:

NA

Cynoscion acoupa (Acoupa weakfish, curvina, Bang bang, pescada amarela, Akoupa rouj)

Max. Age: NA

Max length:

107 cm FL	De Almeida, 2008 (Maranhao state, Brazil)
110 cm TL	IGFA, 2001

Growth:

Loo = 106 cm (TL)

K= 0.27 De Espinosa, 1972 (Lake Maracaibo, Venezuela)

Length-weight relations:

a = 0.0081	b= 2.99	Giarrizzo *et al.* 2006 (North Brazil)
a= 0.0107	b= 3.03	Silva-Junior *et al*. 2007 (Maranhao state, Brazil)
a=0.00444	b=3.20	Joyeux *et al*. 2008 (Para state North Brazil)
a=0.0122124	b=2.914	Levrel, 2012 (French Guiana)
Males (SL)		
a= 0.019	b=2.935	Almeida *et al*. 2016 (Maranhao, North Brazil)
Females (SL)		
a= 0.019	b=2.924	Almeida *et al*. 2016 (Maranhao, North Brazil)

Length at maturity:

Males: 39.9 cm TL	De Almeida, 2008 (Maranhao state Brazil)
Females: 42.7 cm FL	De Almeida, 2008 (Maranhao state Brazil)
Males: 39.9 cm TL	Almeida *et al*. , 2016 (Maranhao state, Brazil)
Females: 42.1 cm FL	Almeida *et al*. 2016 (Maranhao state, Brazil)
Both sexes: 49 cm	Levrel, 2012 (French Guiana)

Trophic level: 4.05 (se 0.70)

In Lake Maracaibo in Venezuela and in Maranhao state Brazil spawning has been observed year round without major reproductive periods.

Cynoscion virescens (Green weakfish, salmon, sea trout, cambucu, Akoupa cambucu, kandratiki)

Max. Age: NA

Max length: 115 cm TL IGFA, 2001

Growth: NA

Length-weight relations:

a = 0.005	b= 3.054	Freire *et al*. 2009 (Southern Bahia, Brazil)
a= 0.00446	b= 3.1	Passos *et al*. 2012 (Parana state, Brazil)

Length at maturity: NA

Trophic level: 4.03 (se 0.70)

In French Guiana diet analysis showed that C. virescens feeds mainly on other finfish and on benthic crustaceans (shrimp and prawns)

Cynoscion jamaicensis (Jamaica weakfish, Akoupa mongolare, silver salmon, table bashaw, pescada-goete)

Max. Age: NA

Max length: 50 cm TL (Chao, 1978)

Growth:

Male: Loo= 30.3 cm TL; K= 0.342	Santos, 1963 (South Brazil)
Female: Loo= 32.1 cm TL; K=0.345	Santos, 1963 (South Brazil)
Unsexed: Loo= 39 cm TL; K= 0.40	Castro *et al*. 2005 (southeastern Brazil)
Unsexed: Loo= 40 cm TL; K= 0.41	Castro *et al*. 2005 (southeastern Brazil)

Length-weight relations:

a = 0.00517	b= 3.13	Passos *et al*. 2012 (Parana state, Brazil)
a= 0.00601	b= 3.133	Joyeux et al. 2008 (Para state North Brazil)

Length at maturity:

Male and Females: 25.1 cm TL	Marcano *et al*. 2002 (north Paria Peninsula, Venezuela)
Females: 21.6 cm TL	Manickchand-Heileman & Julien-Flus, 1990 (Trinidad & Tobago)
Males: 22.4 cm TL	Manickchand-Heileman & Julien-Flus, 1990 (Trinidad & Tobago)

Trophic level: 3.84 (se 0.66)

North of the Paria Peninsula in eastern Venezuela spawning occurred from September to February. In the same area absolute fecundity was between 46,354 and 554,400 and relative fecundity between 304 and 1042 with a mean of 583. Fecundity-length relationship parameters were a= 0.00000145 and b= 4.49 (Marcano & Alio, 2001).

Macrodon ancylodon (King weakfish, bangamary, Akoupa chasseur, pescada go, Dagoetifi, curvinata)

Max. Age: 7	Haimovici, 1988 (southern Brazil)
Max length: 45 cm TL	Cervigon, 1993

Growth:

Unsexed: Loo= 40.9 cm TL; K= 0.95	Hackett *et al*. 1997 (Guyana)
Unsexed: Loo= 48.9 cm TL; K= 0.55	Babb-Etcheld, 1997 (Suriname)
Unsexed: Loo= 40.9 cm TL; K= 0.95	Santos, 1963 (southern Brazil)
Unsexed: Loo= 39 cm TL; K= 0.40	Castro *et al*. 2005 (southeastern Brazil)
Unsexed: Loo= 40 cm TL; K= 0.41	Castro *et al*. 2005 (southeastern Brazil)
Unsexed: Loo= 47.4 cm TL; K= 0.42	Ikeda, 2003 (North Brazil)
Unsexed: Loo= 46.8 cm TL; K= 0.44	Ikeda, 2003 (North Brazil)

Several other growth curves from southern Brazil show lower K and higher Loo

Length-weight relations:

a = 0.00436	b= 3.12	Passos *et al*. 2012 (Parana state, Brazil)
a= 0.00148	b= 3.536	Joyeux *et al*. 2008 (Para state North Brazil)

Males:

a = 0.0026	b= 3.37	Cardoso *et al*., 2018 (Maranhao, North Brazil)

Females:

a = 0.0092	b= 2.98	Cardoso *et al*., 2018 (Maranhao, North Brazil)

According to Fishbase SL= 0 + 0.89*TL from photograph

Length at maturity:

Female: 18.6 cm TL	Trinidade-Santos & Freire 2015 (Para state, Brazil)
Male: 20.2 cm TL;	Trinidade-Santos & Freire 2015 (Maranhao state, Brazil)
Female: 22.2 cm TL	Trinidade-Santos & Freire 2015 (Maranhao state, Brazil)
Female: 21.5 cm TL	Trinidade-Santos & Freire 2015 (Para state, Brazil)
Female: 25.1 cm TL	Trinidade-Santos & Freire 2015 (Amapa, Para and Maranhao states, Brazil)
Unsexed: 25.4 cm TL	Alio *et al*. 1997 (Gulf of Paria, Venezuela)
Male and Females: 25.1 cm TL	Marcano *et al*. 2002 (North Paria Peninsula, Venezuela)
Male and Females: 22.1 cm TL	Camargo & Isaac, 2005 (Caete estuary, Para, Northern Brazil)
Females: 25.1 cm TL	Ikeda, 2003 (North Brazil)
Male and Females: 22.2 cm TL	Santos, 2007 (Para and Maranhao, North Brazil)
Male and Females: 20.2 cm TL	Santos, 2007 (Para and Maranhao, North Brazil)
Male and Females: 21.1 cm TL	Santos, 2007 (Para and Maranhao, North Brazil)
Males and Females: 21.13 cm TL	Cardoso *et al.*, 2018 (Maranhao, North Brazil)

Males: 20.3 cm TL Cardoso *et al*., 2018 (Maranhao, North Brazil)

Females: 22.14 cm TL Cardoso *et al*., 2018 (Maranhao, North Brazil)

Trophic level: 3.90 (se 0.65)

Absolute fecundity has been estimated in a range from 12,400 to 225,700, while relative fecundity ranged from 88 to 570, in the Rio de La Plata estuary in Argentina. Spawning has been observed year round in several studies in northern Brazil, and to a lesser extent with dominance during the second half of the year (see, Trinidade-Santos & Freire, 2015).

Nebris microps (smalleye croaker, Akoupa celeste, butterfish, botervis, Pescada banana)

Max. Age: NA

Max length: 40 cm TL Keith *et al.* 2000

Growth: NA

Length-weight relations:

a = 0.00589 b= 3.04 Passos *et al*. 2012 (Parana state, Brazil)

a= 0.00780 b= 3.200 Silva-Junior *et al*. 2007 (Maranhao state, North Brazil)

Length at maturity: NA

Trophic level: 3.60 (se 0.69)

Micropogonias furnieri (whitemouth croaker, bashaw, cro-cro, corvina, tambour raye)

Max. Age: 7 Isaac, 1988 (Other studies show max ages up to 18 y –Uruguay)

Max length: 60 cm TL (Nakamura *et al.*, 1986) there is a report of 90 cm from Lagoa dos Patos, Brazil

Growth:

Unsexed: Loo= 65.3 cm TL; K= 0.16 Manickchand-Heileman & Kenny 1990 (Trinidad and Tobago)

Female: Loo= 67.6 cm TL; K= 0.18 Rodrigues, 1968 (Ceara state, Brazil)

Male: 68.6 cm TL; K=0.18 Rodrigues, 1968 (Ceara state, Brazil)

Quite a number of studies have been done in other areas, especially in Brazil, but mainly concern sub-temperate and temperate zones.

Length-weight relations:

a = 0.03 b= 2.64 Manickchand-Heileman & Kenny 1990 (Trinidad and Tobago)

a= 0.0297 b= 2.86 Duarte *et al.* 1999 (Gulf of Salamanca, Colombia)

a= 0.0857 b=3.03 Etchevers, 1975 (Northeastern Venezuela)

a= 0.00457 b=3.18 Passos *et al*. 2012 (juveniles in Parana state, Brazil)

According to Fishbase SL= 0 + 0.868*TL from photograph

Length at maturity:

Female: 32.0 cm TL Manickchand-Heileman & Kenny 1990 (Trinidad and Tobago)

Male: 28.0 cm TL Manickchand-Heileman & Kenny 1990 (Trinidad and Tobago)

Other studies have been done in southern Brazil and Argentina

Trophic level: 3.27 (se 0.44)

In Trinidad and Tobago spawning has been observed year round, with more intensive spawning from February to August. Year round spawning has also been observed in Cuba and northern Brazil.

Lutjanus synagris (lane snapper, vivaneau raye, ariaco, pargo guanapo)

Max. Age: 10 Manooch, 1987 (southeast USA) older individuals have been reported in Bermuda (19 yrs) and Jamaica (14 yrs)

Max length: 60 cm TL IGFA, 2001

Growth:

Female: Loo= 60.3 cm TL; K= 0.20 Manickchand-Dass, 1987 (Gulf of Paria and north coast, Trinidad)

Male: 70.8 cm TL; K=0.22 Manickchand-Dass, 1987 (Gulf of Paria and north coast, Trinidad)

Unsexed: Loo= 50.5 cm TL; K=0.231 Alegria & Ferreira de Menezes, 1970 (Ceara state, Brazil)

Unsexed: Loo= 51.0 cm TL; K=0.20 Gomez *et al*. 2001 (Gulf of Paria, Venezuela)

Quite a number of studies have been done in other areas, especially in Cuba and Mexico, but also in other Caribbean countries (e.g. Jamaica, Colombia, Puerto Rico) and southern Brazil.

Length-weight relations:

a = 0.01490 b= 2.994 Joyeux *et al*. 2008 (Brazil from Equator to 25 S)

a= 0.0083 b= 3.153 Lessa *et al*. 2004 (Northeastern Brazil)

a=0.003 b=3.569 Ferreira *et al*. 1998 (Northeastern Brazil)

a= 0.0001 b=2.64 Gomez *et al*. 2001 (Gulf of Paria, Venezuela)

Length at maturity:

Male: 25.0 cm TL Manickchand-Dass, 1987 (Trinidad and Tobago)

Female: 31.0 cm TL Manickchand-Dass, 1987 (Trinidad and Tobago)

Female: 23.4 cm TL Trinidade-Santos & Freire 2015 (Ceara state, Brazil)

Unsexed: 36.8 cm TL Gomez *et al*. 2001 (Gulf of Paria, Venezuela)

Other studies have been done in Cuba, Jamaica and Bermuda

Trophic level: 3.66 (se 0.80)

In Trinidad and Tobago spawning has been observed year round (Manickchand-Dass, 1987). On the other hand, in the Gulf of Paria, Venezuela, the percentage of mature individuals was higher from July to December. Average fecundity was estimated at 928,890 with a range from 510,872 to 1,225,118 (Gomez *et al*. 2011)

Lutjanus purpureus (southern red snapper, vivaneau rouge, pargo colorado)

Max. Age: NA

Max length: 100 cm TL	Allen, 1985 (a 112 cm male was reported for Para state, Brazil, Trinidade-Santos & Freire, 2015)

Growth:

Unsexed: Loo=85.1 cm; K=0.13	Manickchand-Heileman & Phillip, 1996 (Trinidad and Tobago)
Unsexed: Loo=92.9 cm; K=0.103	Ximenes & Fonteles-Filho, 1988 (north and northeastern Brazil)
Unsexed: Loo= 100.68 cm; K=0.19	Gonzalez & Eslava, 1999 (eastern Venezuela)
Unsexed: Loo=91.9 cm; K=0.245	Gonzalez *et al*. 1998 (Guianas shelf)
Unsexed: Loo=98.0 cm; K=0.101	Lima, 1965
Unsexed: Loo=98.9 cm; K=0.09	Menezes & Gesteira, 1974

Quite a number of studies have been done in other areas, especially in Cuba and Mexico, but also in other Caribbean countries (e.g. Jamaica, Colombia, Puerto Rico) and southern Brazil.

Length-weight relations:

a = 0.0141	b= 2.99	Manickchand-Heileman & Phillip, 1996 (Trinidad and Tobago)
a= 0.0117	b= 2.99	Salles & Feitosa, 2000 (Ceara state, Brazil)

Length at maturity:

Male: 43.7 cm TL	Trinidade-Santos & Freire 2015 (Para state, Brazil)
Female: 43.0 cm TL	Trinidade-Santos & Freire 2015 (Para state, Brazil)
Male: 27.0 cm TL	Manickchand-Heileman & Phillip, 1996 (Trinidad and Tobago)
Female: 39.0 cm TL	Manickchand-Heileman & Phillip, 1996 (Trinidad and Tobago)
Male: 47.1 cm TL	Almeida, 1965 (Northeast Brazil)

Female: 46 cm TL	Almeida, 1965 (Northeast Brazil)
Male: 44.9 cm TL	Gesteira *et al*. 1972
Female: 47 cm TL	Gesteira *et al*. 1972
Female: 43 cm TL	Gesteira & Ivo, 1973 (North and Northeast Brazil)
Female: 43.7 cm TL	Souza, 2002 (North Brazil)

Trophic level: 3.85 (se 0.55)

In Trinidad and Tobago spawning has been observed between September and February (Manickchand-Heileman & Phillip, 1996). Similar patterns have been observed in North and Northeastern Brazil with some inter-annual variability with more protracted periods in more recent years.

FishLife: Thorson, J.T. *et al*. 2017. Predicting life history parameters for all fishes worldwide. *Ecological Applications*. 27 (8): 2262-2276.

-Allows predicted life history parameters for > 32,000 species included in FishBase while accounting for the similarities for fishes that are taxonomically related explicitly representing residual error including correlations among parameters, and accounting for missing data.

Benefits of new approach would include:

1. It predicts life-history variables probabilistically for species while using information about related taxa to inform predictions.
2. It predicts uncertainty for species based on the quantity of data that are available, so that species with many field-measurements of life-history variables have predictions that are more precise than species with only a few field measurements;
3. It uses the full set of life-history variables available for a given species to predict all unknown variables, e.g., rather than calculating natural mortality from a single variable (i.e., maximum age) and ignoring all others (e.g., individual growth rates).

Table 3.1. Output values of FishLife for selected groundfish species. Loo is asymptotic length and K is growth coefficient, Woo is asymptotic weight, tmax and tm are maximum age and age at maturity, respectively, M is natural mortality and lm is length at maturity.

Species/Parameter	Loo	K	Woo	tmax	tm	M	lm
Lutjanus purpureus	85.7	0.142	8 854	17.9	4.05	0.23	42.71
Lutjanus synagris	48.2	0.228	1 542	7.9	1.92	0.41	22.9
Cynoscion acoupa	93.9	0.217	7 613	12.7	3.27	0.37	46.0
Cynoscion jamaicensis	37.6	0.368	636	7.6	1.94	0.67	19.8
Cynoscion virescens	58.0	0.268	1 991	10.1	2.60	0.48	29.3
Nebris microps	50.9	0.345	1 320	9.1	2.32	0.60	27.1
Macrodon ancylodon	43.3	0.390	800	8.6	2.12	0.67	23.3
Micropogonias furnieri	61.9	0.176	2 462	10.5	3.02	0.45	27.7

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Annex 5. Standard symbols for statistical data

…	Data not available; unobtainable; data not separately available but included in another category
-	None; magnitude known to be nil or zero
0	More than zero but less than half the unit used
F	FAO estimate from available sources of information or calculation based on specific assumptions
t	tonnes (1000 kg)
kg	kilograms
no	number
nei	Not elsewhere included
…A	FAO English name of the species item is not available
…B	FAO French name of the species item is not available
…C	FAO Spanish name of the species item is not available
S	Summation of catches

The Fisheries and Biological Data Preparation Workshop on the Shrimp and Groundfish Fisheries of the North Brazil Shelf Large Marine Ecosystem (NBSLME) was held in Bridgetown, Barbados on 23–25 October, 2018. Representatives from the following countries and regional partner organizations participated: Brazil, France (French Guiana), Guyana, Suriname, Trinidad and Tobago, and the National Oceanic and Atmospheric Administration (NOAA) of the United States of America.

The main objective of the workshop was to provide training on data preparation for stock assessment purposes and fisheries status/trends monitoring, enhance capacities in fisheries data and statistics collection at the national and sub-regional levels, and review status of data collection for the shrimp and groundfish fisheries of the NBSLME.

The meeting was made possible through support provided by the FAO-UNOPS Inter-Agency Agreement on "Catalising Implementation of the Strategic Action Programme for the Sustainable Management of Shared Living Marine Resources in the Caribbean and the North Brazil Large Marine Ecosystems" (Project UNJP/RLA/217/OPS).

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