Executive Report

prepared for:

PADI Foundation

2017 Grant Recipient

Program name: Searching for the king: natural history of the giant sea bass (*Stereolepis gigas*) in Mexican waters.

Coordinator: Arturo Ramírez-Valdez

Abstract

We were able to gather the most comprehensive database focused on the Gian Sea Bass (GSB) in Mexican waters, with more than 1,000 records, including data from 1990 to 2018. The database includes 103 GSB contemporary records, up to 80% come from sampling in the fish markets. Most records include the fish biometric measurements and geographic coordinates. More than 80% of the records includes otoliths samples and 90% includes tissue samples. We developed a Geographic Information System with the contemporary records from the GSB commercial and recreational fishery. We identify fishing areas that concentrate the greatest number of GSB records and identify sites to be evaluated using SCUBA dive surveys. During the expedition to assess the GSB population south of the USA-Mexico border, we were able to visit four fishing communities and 26 study sites. We carried out 62 fish surveys using SCUBA diving, in 19 of these dives the presence of GSB was recorded, with a total search time was 1,954 hrs and the density calculated globally was 0.04 GSB indiv/ minute of search. We were able to find a spawning aggregation, and we tracked their behavior for four days in a row. As part of this project and future GSB research goals, we set the foundations of a biological fishery monitoring program together with the Mexican NGO Comunidad y Biodiversidad, A.C. aimed to track the fishery landings and to work tightly with fisher to improve the management of this species. Our webpage and social networks allow us to share the objectives of the project on a larger scale, keep our followers updated with the progress of the project and even add records from fishers and collaborators. Fishermen and stakeholders have used our platforms on the internet to learn about the Proyecto Mero gigante and contact us offering information and support. The information of the natural history gathered by this project allow us to contribute to the information available for a better evaluation of this critically endangered species throughout its entire distribution.

Introduction

The Giant Sea Bass (GSB) is an endangered species with a distribution spanning California (US) and Baja California (Mexico) (1)[1]. As a result of their overfishing and the consequent decline of the population, strong conservation regulations were imposed in the US waters, whereas in Mexican territory their regulation is almost non-existent (1, 2). To date little is known about the life history of the GSB, sensitive data of its biology are unknown and there is an absence of a population status assessment (3). The scarce knowledge we have about the life history of the species comes from studies in California; research of the giant sea bass in Mexican territory is absent (2). Fishery records and anecdotal evidence show that historically populations south of the US-Mexico border were more abundant; however, there is no information about the current population size (4). Despite the growing interest in the research of this species, more literature has been published in the last 5 years than ever before, all studies point to the need to generate basic information on the species that allows for future population studies. Records of landings and biological samples from the fishing camps of Mexico present a unique opportunity to provide information on the natural history of the species. Also, including other approaches that provide information from historical records will help to have a broader perspective of these populations.

[1] References and figures included in Appendix 1.

Objectives:
The objectives of this project were:

1) Incorporate in the biological fishery monitoring program currently run by Mexican NGO's and fishermen cooperatives, a specific section for the giant sea bass.
2) Generate a Geographic Information System (GIS) that integrates all the records incorporated in the information repository and the biological fishery monitoring program. The GIS will incorporate geographic and biometric data, sex and reproductive maturity when available.
3) Evaluate the giant sea bass population size structure on sites that show the highest densities in GIS analyses using SCUBA dive surveys and dive propulsion vehicles to cover larger distances.
4) Disseminate the results of the evaluation of these fish populations in Mexican waters via a technical species fact sheet and outreach booklet. The technical species fact sheet may serve both decision makers and organizations seeking reliable information on threatened species.

Results
The first action done of this project "Searching for the king: natural history of the giant sea bass (*Stereolepis gigas*) in Mexican waters" was to establish a collaboration with a rich blend of young scientist from different backgrounds but share the passion for marine sciences and a genuine interest in the management and conservation of our natural resources. Together, we created a long-term program aims to generate baseline information of the Giant Sea Bass (GSB), the state of its population, and understand its fishery from the scientific and community standpoint. We named the program "Proyecto Mero gigante" which means Giant Sea Bass project in Spanish. Here we include evidence of the project website and the network of collaborators (Fig. 1).

The results of this project are presented below according to the numbering of each objective:

1) Generate a database that integrates records from giant sea bass caught/recorded in Mexican waters.

A database of GSB records that includes landings from the commercial and recreational fishery, records from fishery-independent surveys, scientific collections, scientific publications and gray literature, and photographs of GSB caught in Mexican waters was generated. This is the most comprehensive database focused on the GSB in Mexican waters, with more than 1,000 records, including data from 1990 to 2018. This database allows to better understand the main patterns of distribution and abundance of this species in Mexican waters. The trend of the fishing landings reported by the Mexican commercial fishery shows a significant variability in the last 15 years, with a substantial increase in 2015 (Fig. 2) (5). However, the actual landings may be even higher, if we consider that studies have reported that unofficial catches in Mexico can be close to twice the landings reported to government agencies (6). This variability in landings may generate some optimism of the population current size, although a pattern of hyperstability cannot be discarded due to the species life history (7).

Outcome 1. Database with compound records of GSB in Mexican waters.

A database with contemporary GSB records from the commercial and recreational fishery was created. The database includes 103 records, up to 80% come from sampling in the fish markets. All records include the fish biometric measurements and geographic coordinates (Fig. 3) (5). More than 80% of the records includes otoliths samples and more than 90% includes tissue samples. A few samples include gonads, stomach and scales. This is a very comprehensive database that incorporates information of the type of record, catch area, geographic coordinates, date of capture, fishing gear, morphometric measurements, and the extraction of tissue samples,

otoliths, gonads, stomachs, and scales. Spatial analyses were generated with this database, which allowed the detection of the areas with the largest number of records and the distribution of this species in Mexican waters. This database can be accessed on the following link:
Database of GSB contemporary records from the commercial and recreational fishery.
Outcome 2. Database with contemporary records of the GSB commercial and recreational fishery in Mexican waters.

2) ***Incorporate the GSB in the biological fishery monitoring program currently run by Mexican NGO's and fishermen cooperatives.***

Projecto Mero gigante established a partnership with the Mexican NGO Comunidad y Biodiversidad, A.C. (COBI) who maintain monitoring programs of several marine resources (e.g. lobster, abalone, and yellowtail) in different fishing communities in Baja California, Mexico. COBI showed interest in including the GSB in its program of sustainable fisheries in the communities where they have a presence. The first step was to prepare a data logbook form (bitacora) that request the necessary information to achieve the objectives (Fig. 4). The logbook form was presented to COBI and the fishing cooperatives to obtain their feedback and support in the implementation. The logbook form has been used to get the information of records from the fish markets, fishing communities, sports fishing tournaments, and stranded fish. The data logbook form can be accessed directly on the project webpage and Issuu platform:
Data logbook form on Proyecto Mero gigante webpage
Data logbook form on Issuu webpage
Outcome 3. Data logbook form for the GSB monitoring program.

The second step to establish a fishery biological monitoring program for the GSB was to develop and publish a technical manual describing the methodology to obtain specific biological measurements and samples for this species (Fig. 5) (5). The technical manual has been very useful to establish the most appropriate techniques for obtaining measurements and samples, as well as standardize the method. The manual is currently in press, its ISBN registration in process, and can be accessed directly on the project webpage, Researchgate and Issuu platforms.
GSB Technical manual on Proyecto Mero gigante webpage
GSB Technical manual on Researchgate webpage
GSB Technical manual on ISSUU webpage
Outcome 4. Technical manual for the biological monitoring of the GSB.

The third step was the creation of a descriptive technical sheet showing the steps and methods for obtaining data and samples as part of the GSB biological monitoring program (Fig. 6). The sheet was designed so that fishermen and collaborators can consult it when working in the field or in the laboratory. The descriptive technical sheet can be accessed directly on the project webpage and Issuu:
GSB Descriptive technical sheet on Proyecto Mero gigante webpage
GSB Descriptive technical sheet on ISSUU webpage
Outcome 5. Descriptive technical sheet for the GSB biological monitoring program.

A fourth step was to edit a video showing the procedure to obtain data and samples of the GSB. This video explains step by step the procedure and includes subtitles that describe the technique used to obtain data and extract samples. The scenes in the video were recorded in the workshops offered to fishers and collaborators. This video has allowed giving remote training fishers and collaborators, so the project can get access to more data and samples. The video was edited with the support of COBI and the collaboration with Kuali Comunicación:
Video for training fisher and collaborators of the GSB monitoring program in Vimeo
Outcome 6. Video for training fishers and collaborators of the monitoring program.

A fifth step was to train fishermen and stakeholders to collect data and samples of GSB. These training courses allowed us to obtain the support of a greater number of fishers and aspire to obtain more samples, but also to systematize and standardize the data and samples collection. A total of four training workshops were given in fishing communities of Baja California, and one more in Quintana Roo, Mexico, where COBI is looking for replicate the model of "Proyecto Mero gigante" directed to species of the Mexican Caribbean. These workshop courses included 2 hrs of theoretical class and 3 hrs of hands-on work (Figs. 7-8). Each participant to these workshops received a copy of the technical manual and the descriptive sheet. Also, an outreach video was edited showing how these workshops were conducted in fishing communities:
Outreach video showing the training during workshops.
Outcome 7. Video for outreach about the training to fishers and collaborators.

Finally, as part of the objective of establishing a permanent fishing monitoring program for the GSB, we have sought support from the Federation of fishing cooperatives of Baja California (FEDECOOP) and from state and federal government entities. Fisheries cooperatives have shown great interest in participating in the monitoring of this species and have offered their support when requested. The Secretaria de Pesca y Acuacultura del Gobierno de Baja California (SEPESCA), entity responsible of regulate fisheries and aquaculture in the state, has given its support to the activities of the project, and have expressed interest in the goals of the project.
Figure 9. Letter of support from SEPESCA.
Outcome 8. Letter of support from the state government SEPESCA to the project.

3) ***Generate a Geographic Information System that integrates all the records incorporated in the information repository and the biological fishery monitoring program.***

A Geographic Information System (GIS) was generated with the database containing the 103 GSB contemporary records from the commercial and recreational fishery. This GIS has made it possible to identify fishing areas that concentrate the greatest number of GSB records and those with sites with continuous records. Another outcome of the GIS was to identify potential sites to be evaluated using SCUBA dive surveys. This GIS is available in kml format for most part, and some sections are still under development, it is expected to be available on the project webpage very soon.
Fig. 10. Geographic distribution of our contemporary samples of GSB.
Fig. 11. Geographic distribution of otolith and tissue samples of GSB.
Fig. 12. Geographic distribution of tissue samples of GSB.
Outcome 9. Geographic Information System generated with the database containing the 103 GSB contemporary records from the commercial and recreational fishery.

4) ***Evaluate the giant sea bass population size structure on sites that show the highest densities in GIS analyses using SCUBA dive surveys and dive propulsion vehicles to cover larger distances.***

This objective included in the proposal was discarded initially when knowing that the grant was $ 6000 USD, instead of the $ 9,000 USD originally requested. Most of the money received was allocated to obtain data and samples from the commercial and recreational fishery. The field surveys through SCUBA dive is important because of the possibility of opening new research questions and obtaining data independent of the fishery. For this reason, and after success in obtaining a considerable number of records and support from COBI and the fishing communities, this objective was retaken, and an expedition was carried out to evaluate the GSB populations through visual censuses.

In a 10 days expedition (August 24 - September 3, 2018), four fishing communities and 26 study sites were visited. A total of 62 fish surveys by autonomous SCUBA diving in were carried out, in 19 of these dives the presence of GSB was recorded (Figure 5). The accumulated search time

was 1,954 hrs and the density calculated globally was 0.04 indiv/ minute of search (Figures 6-9). Most of the GSB records were adult individuals swimming alone, while in Isla Natividad it was possible to record an aggregation of six GSB. This is possibly one of the most significant findings of the expedition, during four consecutive days GSB individuals were recorded in the same site and it was even possible to observe courtship behavior between these adult individuals (Figure 10). The first product of this objective was a technical report presented to COBI, and also delivered to the state government, SEPESCA (8) (Fig. 13). This technical report can be accessed at the following link:

Technical report of the results of the expedition to search Giant Sea Bass in Mexican waters.

Outcome 10. Technical report with the results of the expedition to search Giant Sea Bass populations in Baja California presented to SEPESCA.

The second product of this objective was a brief outreach video clip sharing the work done during the expedition and the success in the fish surveys with SCUBA dive at finding GSB individuals. The video clip was shared on social networks and can be seen on the Vimeo website of the project:

Outreach video on VIMEO about the expedition searching GSB in Baja

Outcome 11. Outreach video on VIMEO webpage about the expedition to search GSB populations in Baja California.

The third product of this objective is the video footage and photographic material generated during the expedition. Part of this material includes GSB pictures and videos, another part is video and photographic evidence of the work of the fishing communities and their interest in participating in the research and conservation of their marine resources. This material is available on the project site on the Flick platform:

Flickr Albums with pictures and videos of the expedition to search GSB in Baja.

Outcome 12. Video and picture albums on Klickr webpage about the expedition to search GSB populations in Baja California.

Other products are still in process, a video showing the main findings of the expedition and a technical report with the main results of the evaluation of GSB populations.

5) ***Disseminate the results of the evaluation of these fish populations in Mexican waters via a technical species fact sheet and outreach booklet. The technical species fact sheet may serve both decision makers and organizations seeking reliable information on threatened species.***

To achieve this goal, the first step was to create and launch the website of the project: www.merogigante.org; www.giantseabass.org (Fig. 1). This site allowed to spread the objectives of the project with a larger audience and to reach fishers, scientist, stakeholders, and people in general interested in this kind of initiatives. A second step was launching the project profiles on Facebook, Twitter, and Vimeo (Fig. 14). These social networks allow us to share the objectives of the project on a larger scale, keep our followers updated with the progress of the project and even add records from fishers and collaborators. Fishermen and stakeholders have used our platforms on the internet, such as the website, Facebook and Twitter to know about the Proyecto Mero gigante and contact us offering information and support. The profiles of the project in social networks are:

Facebook @merogigante
Twitter @merogigante
Vimeo Mero gigante
Flickr Merogigante

Outcome 12. Social media profiles of the project in Facebook, Twitter, Vimeo, Klickr.

A second product was an outreach paper published in the journal Mediterranews which have significant popularity in the region and is edited by the NGO TerraPeninsular (www.terrapeninsular.org). Mediterranews magazine is published in Spanish and English and is a magazine with an electronic format. This article was intended to reach a very broad public, with the goal of highlight the importance and ecological role of the GSB, and secondly, to share the objectives of this research project (9) (Fig. 15). The article can be accessed in the following link:
Outreach paper on Mediterranews about the GSB project in Baja on ISSUU
Outreach paper on Mediterranews about the GSB project in Baja on Researchgate
Outcome 13. Outreach paper published in the journal Mediterranews to reach fishers and stakeholders about the goal of the project.

The third product of this objective is the edition of the technical manual and the descriptive technical sheet to obtain data and samples of GSB. The technical manual includes a section that explains what is known about the biology of the species, the trend of its fishery, and then explains in detail the procedures to obtain biometric measurements and the samples extraction (Fig. 5-6). These documents have been of great support to disseminate the work that this project proposes and the advances in the knowledge of this species.
GSB Technical manual on Proyecto Mero gigante webpage
GSB Technical manual on Researchgate webpage
GSB Technical manual on ISSUU webpage
GSB Descriptive technical sheet on Proyecto Mero gigante webpage
GSB Descriptive technical sheet on ISSUU webpage
Outcome 4 & 5. Technical manual and descriptive technical sheet for the biological monitoring of the GSB.

Acknowledgements
The author gratefully acknowledges financial support from PADI Foundation; nothing of this project could have been accomplished without their support.

Searching for the king: Natural history of the Giant Sea Bass (*Stereolepis gigas*) in Mexican waters

Appendix 1

A. References cited in the technical report.

1) Allen, L.G. 2017. Giants! Or… The return of the kelp forest king. Copeia, 105(1):10-13.
2) Baldwin, D. S., and A. Keiser. 2008. Giant Sea Bass, *Stereolepis gigas*. Status of the fisheries. Report California Department of Fish and Game, 8 pp. (https://nrm.dfg.ca.gov/FileHandler.ashx?DocumentID=34433&inline=true).
3) Cornish, A. 2004. *Stereolepis gigas*. The IUCN Red List of Threatened Species. Version 2014. ,www.iucnredlist.org.
4) Domeier, M. L. 2001. Giant sea bass. Pp. 209–211 in California's Marine Living Resources: A Status Report. (W.S. Leet, C.M. Dewees, R. Klingbeil, and E. Larson, eds). Oakland, CA: Agri. and Nat. Res. Comm. Serv., University of California.
5) **Ramírez-Valdez, A**.; Sgarlatta, M.P.; Villaseñor-Derbez, J.C.; Cota-Nieto, J.J.; Rowell, T.J.; Gómez-Gómez, A.; Domínguez-Guerrero, I.; Domínguez-Reza, R.; Hernández-Velasco, A.; Santana-Morales, O.; Ruiz-Campos, G.; Erisman, B. 2018. Manual para monitoreo biológico del Mero gigante (*Stereolepis gigas*) en aguas mexicanas: Proyecto Mero gigante del Pacífico mexicano. SIO-UCSD, UABC, COBI A.C., ECOCIMATI A.C., 42 pp.
6) Cisneros-Montemayor A.; M.A. Cisneros-Mata; S. Harper; D. Pauly. 2013. Extent and implications of IUU catch in Mexico's marine fisheries. Mar Policy 2013;39 (2013):283–8.
7) Erisman BE, Allen LG, Pondella DJ II, Claisse J, Miller E, and Murray J. 2011. Illusions of Plenty: hyperstability masks collapses in two recreational fisheries that target fish spawning aggregations. Canadian Journal of Fisheries and Aquatic Sciences 68:1705-1716.
8) **Ramírez-Valdez A.**; Villaseñor-Derbez J.C.; Hernández Velasco A.; Domínguez Guerrero I.; Meissner B.; Winquist T.; Blincow K.; Gomez Gomez A. 2018. Reporte técnico de la expedición en búsqueda de los meros gigantes (*Stereolepis gigas)* en aguas mexicanas. Proyecto Mero gigante, COBI, SIO-UC San Diego. SEPESCA, Ensenada, Mexico. 22 pp.
9) **Ramírez-Valdez, A.**; Sgarlata, M.P.; Villaseñor-Derbez, J.C.; Rowell, T.J.; Erisman, B.; Hérnandez-Velasco, A. 2017. Searching for the Giants of the Kelp Forest in Mexican Waters: The Giant Sea Bass (*Stereolepis gigas*). Mediterranews, Terra Peninsula A.C. Ensenada, Mexico. 19-24p.

B. Figures cited in the technical report.

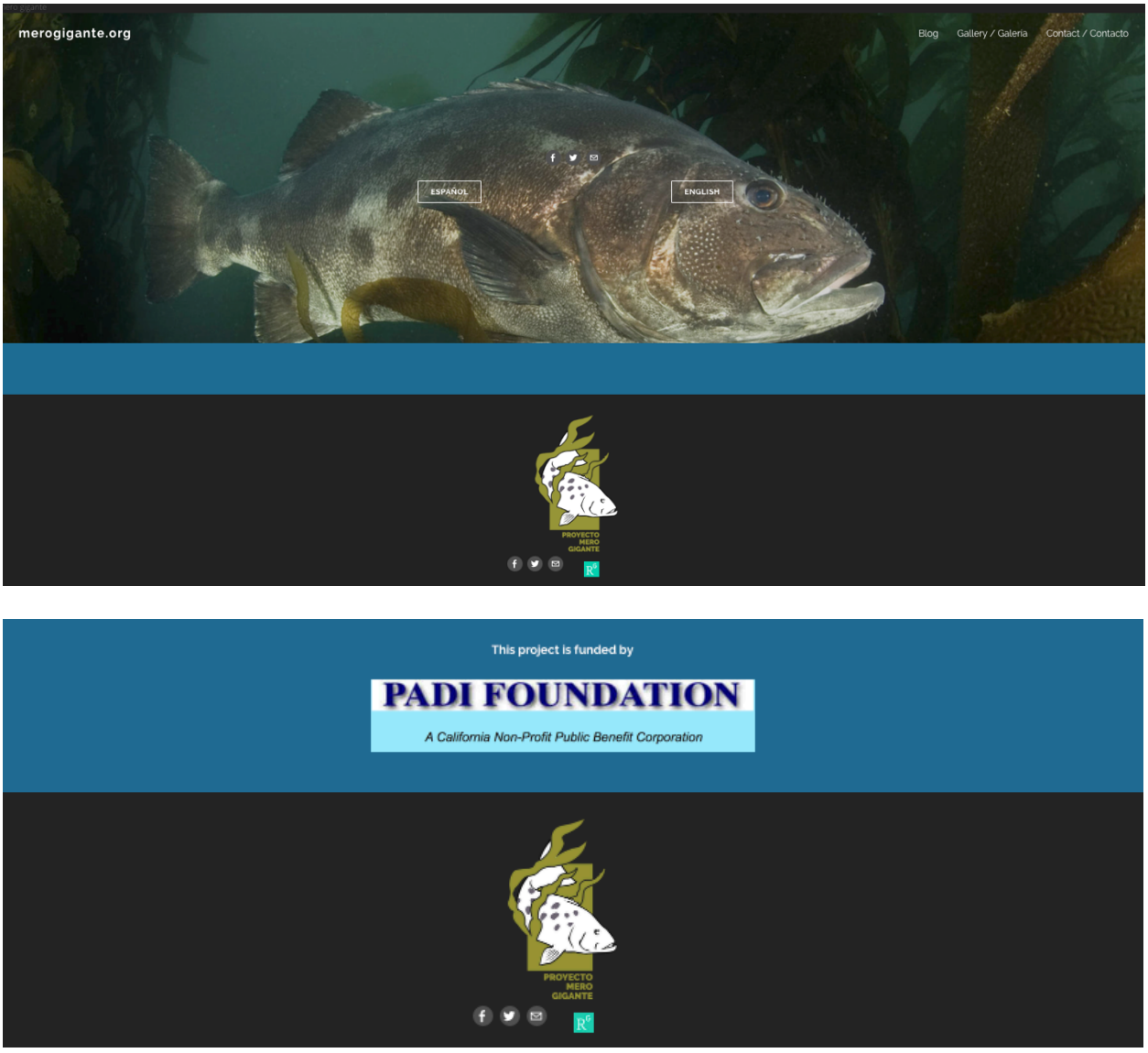


Figure 1. Screenshot of the webpage created for this project; Proyecto Mero gigante, Giant Sea Bass project in Spanish, www.merogigante.org and www.giantseabass.org. Credits for financial support given to PADI Foundation in the webpage.

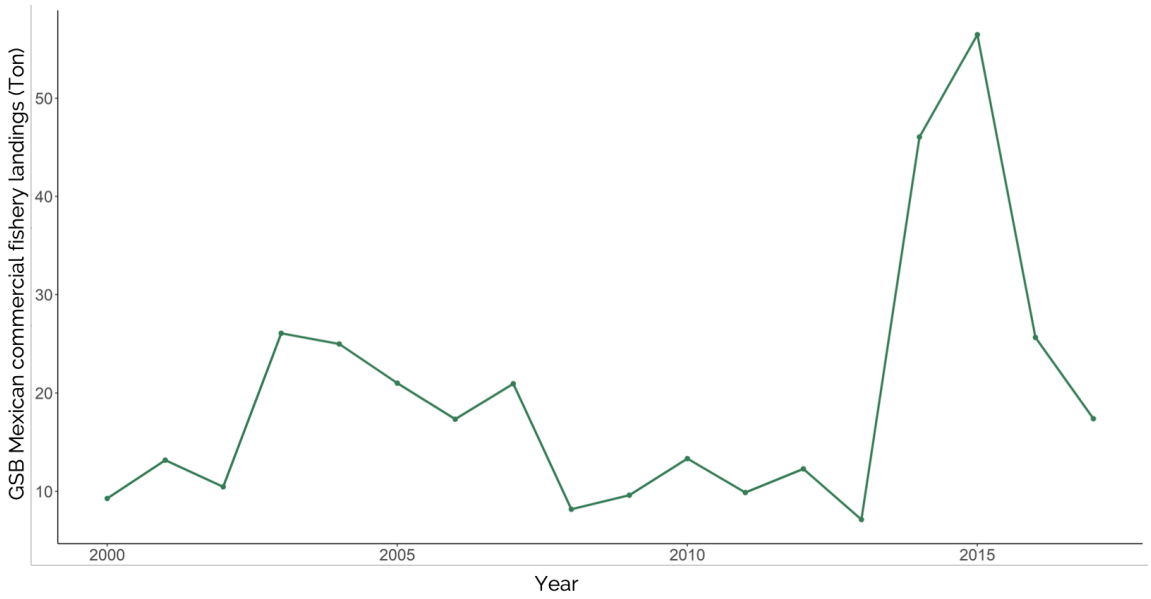
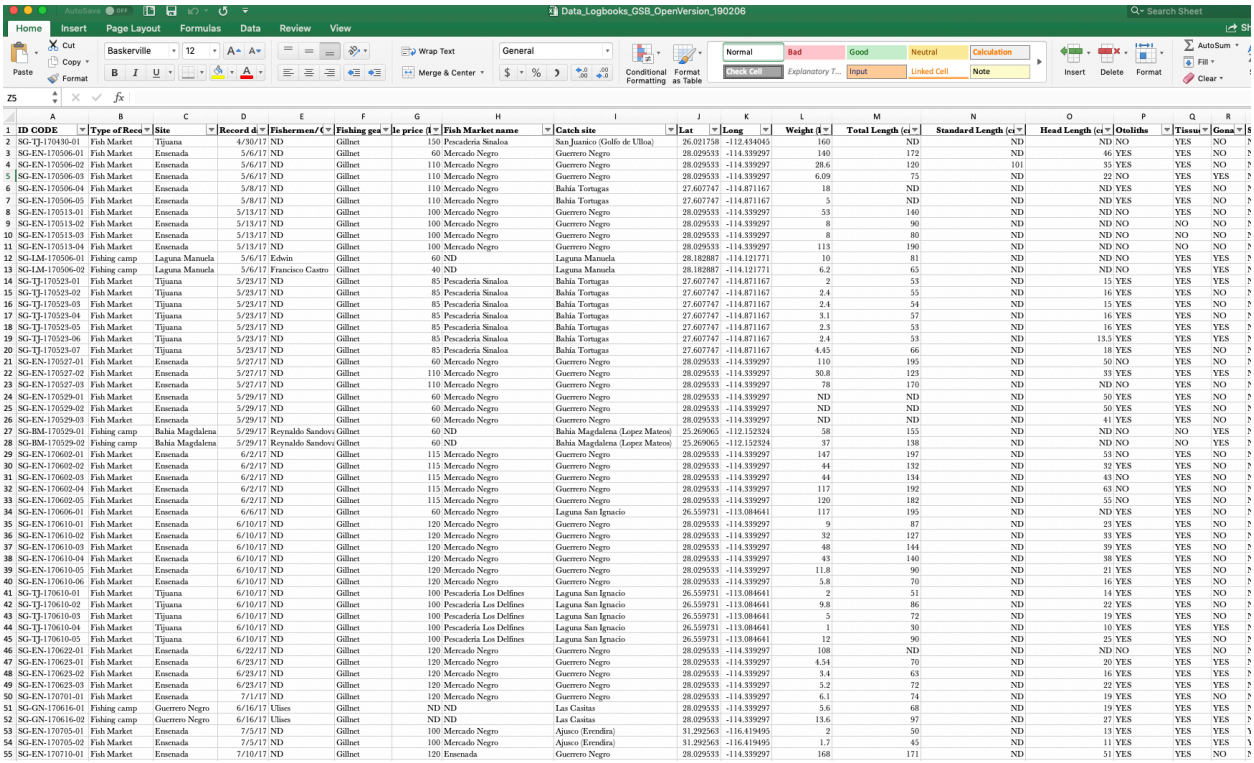
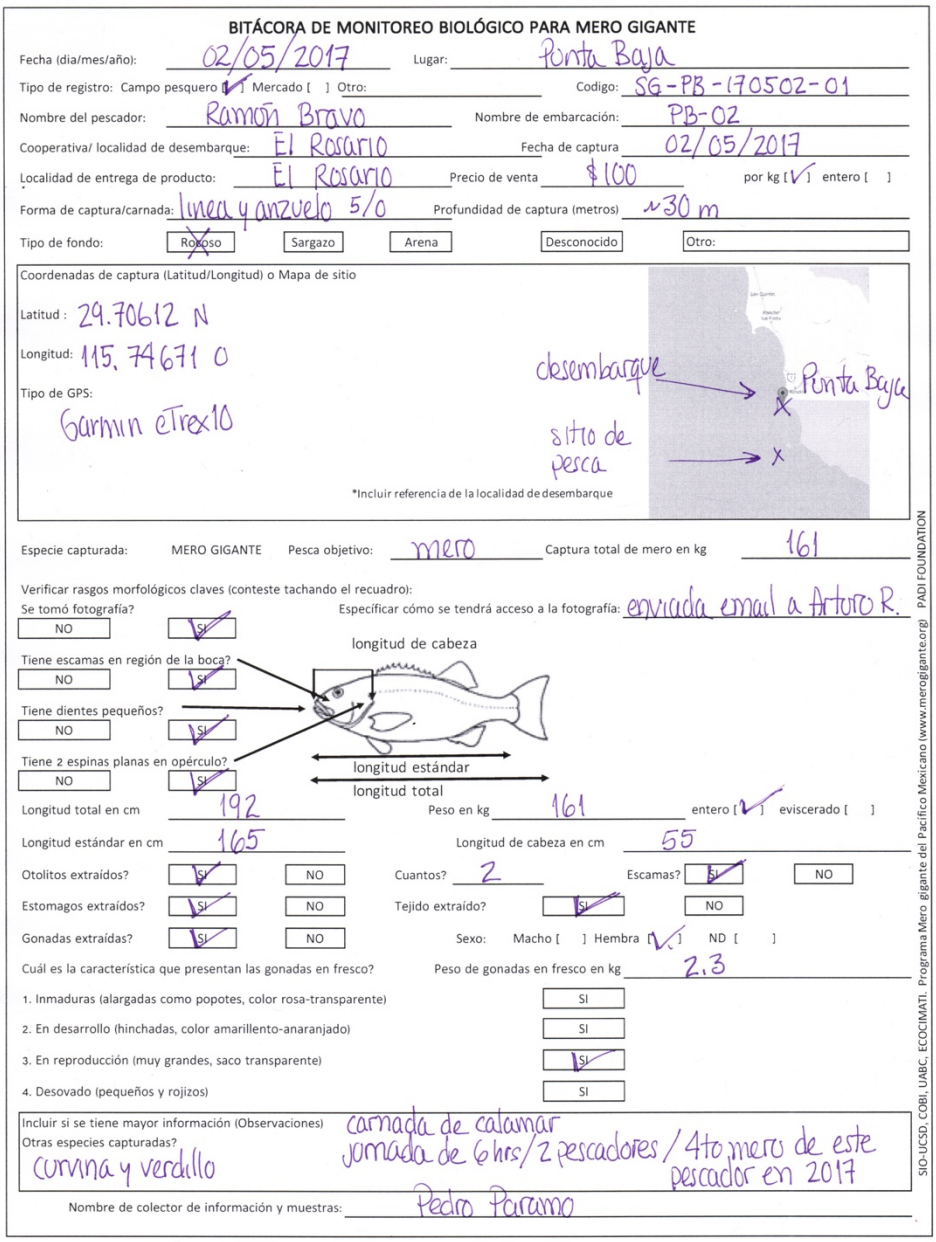


Figure 2. Landings of the Giant Sea Bass commercial and recreational fishery in Baja California, Mexico, from 2000 to 2017 (data source National commission of Aquaculture and Fishing (CONAPESCA) and Baja California State commission of Aquaculture and Fishing (SEPESCA).



ID CODE	Type of Reco	Site	Record d	Fishermen/C	Fishing gea	le price (I	Fish Market name	Catch site	Lat	Long	Weight (I	Total Length (ci	Standard Length (ci	Head Length (ci	Otoliths	Tissu	Gona
SG-TJ-170430-01	Fish Market	Tijuana	4/30/17	ND	Gillnet	150	Pescaderia Sinaloa	San Juanico (Golfo de Ulloa)	26.021758	-112.434045	160	ND	ND	ND	NO	YES	NO
SG-EN-170506-01	Fish Market	Ensenada	5/6/17	ND	Gillnet	60	Mercado Negro	Guerrero Negro	28.029533	-114.339297	140	172	ND	46	YES	YES	NO
SG-EN-170506-02	Fish Market	Ensenada	5/6/17	ND	Gillnet	110	Mercado Negro	Guerrero Negro	28.029533	-114.339297	28.6	120	101	35	YES	YES	NO
SG-EN-170506-03	Fish Market	Ensenada	5/6/17	ND	Gillnet	110	Mercado Negro	Guerrero Negro	28.029533	-114.339297	6.09	75	ND	22	NO	YES	YES
SG-EN-170506-04	Fish Market	Ensenada	5/8/17	ND	Gillnet	110	Mercado Negro	Bahia Tortugas	27.607747	-114.871167	18	ND	ND	ND	YES	YES	NO
SG-EN-170506-05	Fish Market	Ensenada	5/8/17	ND	Gillnet	110	Mercado Negro	Bahia Tortugas	27.607747	-114.871167	5	ND	ND	ND	YES	YES	NO
SG-EN-170513-01	Fish Market	Ensenada	5/13/17	ND	Gillnet	100	Mercado Negro	Guerrero Negro	28.029533	-114.339297	53	140	ND	ND	NO	YES	NO
SG-EN-170513-02	Fish Market	Ensenada	5/13/17	ND	Gillnet	100	Mercado Negro	Guerrero Negro	28.029533	-114.339297	8	90	ND	ND	NO	NO	NO
SG-EN-170513-03	Fish Market	Ensenada	5/13/17	ND	Gillnet	100	Mercado Negro	Guerrero Negro	28.029533	-114.339297	8	80	ND	ND	NO	NO	NO
SG-EN-170513-04	Fish Market	Ensenada	5/13/17	ND	Gillnet	100	Mercado Negro	Guerrero Negro	28.029533	-114.339297	113	190	ND	ND	NO	NO	NO
SG-LM-170506-01	Fishing camp	Laguna Manuela	5/6/17	Edwin	Gillnet	60	ND	Laguna Manuela	28.182887	-114.121771	10	81	ND	ND	NO	YES	YES
SG-LM-170506-02	Fishing camp	Laguna Manuela	5/6/17	Francisco Castro	Gillnet	40	ND	Laguna Manuela	28.182887	-114.121771	6.2	65	ND	ND	NO	YES	YES
SG-TJ-170523-01	Fish Market	Tijuana	5/23/17	ND	Gillnet	85	Pescaderia Sinaloa	Bahia Tortugas	27.607747	-114.871167	2	53	ND	15	YES	YES	YES
SG-TJ-170523-02	Fish Market	Tijuana	5/23/17	ND	Gillnet	85	Pescaderia Sinaloa	Bahia Tortugas	27.607747	-114.871167	2.4	55	ND	16	YES	YES	NO
SG-TJ-170523-03	Fish Market	Tijuana	5/23/17	ND	Gillnet	85	Pescaderia Sinaloa	Bahia Tortugas	27.607747	-114.871167	2.4	54	ND	15	YES	YES	NO
SG-TJ-170523-04	Fish Market	Tijuana	5/23/17	ND	Gillnet	85	Pescaderia Sinaloa	Bahia Tortugas	27.607747	-114.871167	3.1	57	ND	16	YES	YES	NO
SG-TJ-170523-05	Fish Market	Tijuana	5/23/17	ND	Gillnet	85	Pescaderia Sinaloa	Bahia Tortugas	27.607747	-114.871167	2.3	53	ND	16	YES	YES	YES
SG-TJ-170523-06	Fish Market	Tijuana	5/23/17	ND	Gillnet	85	Pescaderia Sinaloa	Bahia Tortugas	27.607747	-114.871167	2.4	53	ND	13.5	YES	YES	YES
SG-TJ-170523-07	Fish Market	Tijuana	5/23/17	ND	Gillnet	85	Pescaderia Sinaloa	Bahia Tortugas	27.607747	-114.871167	4.45	66	ND	18	YES	YES	NO
SG-EN-170527-01	Fish Market	Ensenada	5/27/17	ND	Gillnet	60	Mercado Negro	Guerrero Negro	28.029533	-114.339297	110	195	ND	50	NO	YES	NO
SG-EN-170527-02	Fish Market	Ensenada	5/27/17	ND	Gillnet	110	Mercado Negro	Guerrero Negro	28.029533	-114.339297	30.8	123	ND	33	YES	YES	YES
SG-EN-170527-03	Fish Market	Ensenada	5/27/17	ND	Gillnet	110	Mercado Negro	Guerrero Negro	28.029533	-114.339297	78	170	ND	ND	NO	YES	NO
SG-EN-170529-01	Fish Market	Ensenada	5/29/17	ND	Gillnet	60	Mercado Negro	Guerrero Negro	28.029533	-114.339297	ND	ND	ND	50	YES	YES	NO
SG-EN-170529-02	Fish Market	Ensenada	5/29/17	ND	Gillnet	60	Mercado Negro	Guerrero Negro	28.029533	-114.339297	ND	ND	ND	50	YES	YES	NO
SG-EN-170529-03	Fish Market	Ensenada	5/29/17	ND	Gillnet	60	Mercado Negro	Guerrero Negro	28.029533	-114.339297	ND	ND	ND	41	YES	YES	NO
SG-BM-170529-01	Fishing camp	Bahia Magdalena	5/29/17	Reynaldo Sandov	Gillnet	60	ND	Bahia Magdalena (Lopez Mateos)	25.269065	-112.152324	58	155	ND	ND	NO	NO	YES
SG-BM-170529-02	Fishing camp	Bahia Magdalena	5/29/17	Reynaldo Sandov	Gillnet	60	ND	Bahia Magdalena (Lopez Mateos)	25.269065	-112.152324	57	138	ND	ND	NO	NO	YES
SG-EN-170602-01	Fish Market	Ensenada	6/2/17	ND	Gillnet	115	Mercado Negro	Guerrero Negro	28.029533	-114.339297	147	197	ND	53	NO	YES	NO
SG-EN-170602-02	Fish Market	Ensenada	6/2/17	ND	Gillnet	115	Mercado Negro	Guerrero Negro	28.029533	-114.339297	44	132	ND	32	YES	YES	NO
SG-EN-170602-03	Fish Market	Ensenada	6/2/17	ND	Gillnet	115	Mercado Negro	Guerrero Negro	28.029533	-114.339297	44	134	ND	43	NO	YES	NO
SG-EN-170602-04	Fish Market	Ensenada	6/2/17	ND	Gillnet	115	Mercado Negro	Guerrero Negro	28.029533	-114.339297	117	192	ND	63	NO	YES	NO
SG-EN-170602-05	Fish Market	Ensenada	6/2/17	ND	Gillnet	115	Mercado Negro	Guerrero Negro	28.029533	-114.339297	120	182	ND	55	NO	YES	NO
SG-EN-170606-01	Fish Market	Ensenada	6/6/17	ND	Gillnet	60	Mercado Negro	Laguna San Ignacio	26.559731	-113.084641	117	195	ND	ND	YES	YES	NO
SG-EN-170610-01	Fish Market	Ensenada	6/10/17	ND	Gillnet	120	Mercado Negro	Guerrero Negro	28.029533	-114.339297	9	87	ND	23	YES	YES	NO
SG-EN-170610-02	Fish Market	Ensenada	6/10/17	ND	Gillnet	120	Mercado Negro	Guerrero Negro	28.029533	-114.339297	32	127	ND	33	YES	YES	NO
SG-EN-170610-03	Fish Market	Ensenada	6/10/17	ND	Gillnet	120	Mercado Negro	Guerrero Negro	28.029533	-114.339297	48	144	ND	39	YES	YES	NO
SG-EN-170610-04	Fish Market	Ensenada	6/10/17	ND	Gillnet	120	Mercado Negro	Guerrero Negro	28.029533	-114.339297	43	140	ND	38	YES	YES	NO
SG-EN-170610-05	Fish Market	Ensenada	6/10/17	ND	Gillnet	120	Mercado Negro	Guerrero Negro	28.029533	-114.339297	11.8	90	ND	21	YES	YES	NO
SG-EN-170610-06	Fish Market	Ensenada	6/10/17	ND	Gillnet	120	Mercado Negro	Guerrero Negro	28.029533	-114.339297	5.8	70	ND	16	YES	YES	NO
SG-TJ-170610-01	Fish Market	Tijuana	6/10/17	ND	Gillnet	100	Pescaderia Los Delfines	Laguna San Ignacio	26.559731	-113.084641	2	51	ND	14	YES	YES	NO
SG-TJ-170610-02	Fish Market	Tijuana	6/10/17	ND	Gillnet	100	Pescaderia Los Delfines	Laguna San Ignacio	26.559731	-113.084641	9.8	86	ND	22	YES	YES	NO
SG-TJ-170610-03	Fish Market	Tijuana	6/10/17	ND	Gillnet	100	Pescaderia Los Delfines	Laguna San Ignacio	26.559731	-113.084641	5	72	ND	19	YES	YES	NO
SG-TJ-170610-04	Fish Market	Tijuana	6/10/17	ND	Gillnet	100	Pescaderia Los Delfines	Laguna San Ignacio	26.559731	-113.084641	1	30	ND	10	YES	YES	YES
SG-TJ-170610-05	Fish Market	Tijuana	6/10/17	ND	Gillnet	100	Pescaderia Los Delfines	Laguna San Ignacio	26.559731	-113.084641	12	90	ND	25	YES	YES	NO
SG-EN-170622-01	Fish Market	Ensenada	6/22/17	ND	Gillnet	120	Mercado Negro	Guerrero Negro	28.029533	-114.339297	108	ND	ND	ND	NO	YES	NO
SG-EN-170623-01	Fish Market	Ensenada	6/23/17	ND	Gillnet	120	Mercado Negro	Guerrero Negro	28.029533	-114.339297	4.54	70	ND	20	YES	YES	YES
SG-EN-170623-02	Fish Market	Ensenada	6/23/17	ND	Gillnet	120	Mercado Negro	Guerrero Negro	28.029533	-114.339297	3.4	63	ND	16	YES	YES	YES
SG-EN-170623-03	Fish Market	Ensenada	6/23/17	ND	Gillnet	120	Mercado Negro	Guerrero Negro	28.029533	-114.339297	5.2	72	ND	22	YES	YES	YES
SG-EN-170701-01	Fish Market	Ensenada	7/1/17	ND	Gillnet	120	Mercado Negro	Guerrero Negro	28.029533	-114.339297	6.1	74	ND	19	YES	YES	NO
SG-GN-170616-01	Fishing camp	Guerrero Negro	6/16/17	Ulises	Gillnet	ND	ND	Las Casitas	28.029533	-114.339297	5.6	68	ND	19	YES	YES	NO
SG-GN-170616-02	Fishing camp	Guerrero Negro	6/16/17	Ulises	Gillnet	ND	ND	Las Casitas	28.029533	-114.339297	13.6	97	ND	27	YES	YES	YES
SG-EN-170705-01	Fish Market	Ensenada	7/5/17	ND	Gillnet	100	Mercado Negro	Ajusco (Erendira)	31.292563	-116.419495	2	50	ND	13	YES	YES	NO
SG-EN-170705-02	Fish Market	Ensenada	7/5/17	ND	Gillnet	100	Mercado Negro	Ajusco (Erendira)	31.292563	-116.419495	1.7	45	ND	11	YES	YES	YES
SG-EN-170710-01	Fish Market	Ensenada	7/10/17	ND	Gillnet	120	Ensenada	Guerrero Negro	28.029533	-114.339297	168	171	ND	51	YES	YES	NO

Figure 3. Screenshot of the database in Excel format file containing 103 Giant Sea Bass records from the commercial and recreational fishery in Mexican waters.



BITÁCORA DE MONITOREO BIOLÓGICO PARA MERO GIGANTE

Fecha (dia/mes/año): 02/05/2017 Lugar: Punta Baja

Tipo de registro: Campo pesquero [✓] Mercado [ ] Otro: Codigo: SG-PB-170502-01

Nombre del pescador: Ramón Bravo Nombre de embarcación: PB-02

Cooperativa/ localidad de desembarque: El Rosario Fecha de captura 02/05/2017

Localidad de entrega de producto: El Rosario Precio de venta $100 por kg [✓] entero [ ]

Forma de captura/carnada: linea y anzuelo 5/0 Profundidad de captura (metros) ~30 m

Tipo de fondo: [X] Rocoso [ ] Sargazo [ ] Arena [ ] Desconocido [ ] Otro:

Coordenadas de captura (Latitud/Longitud) o Mapa de sitio

Latitud : 29.70612 N

Longitud: 115. 74671 O

Tipo de GPS: Garmin eTrex10

*Incluir referencia de la localidad de desembarque

Especie capturada: MERO GIGANTE Pesca objetivo: mero Captura total de mero en kg 161

Verificar rasgos morfológicos claves (conteste tachando el recuadro):

Se tomó fotografía? NO [ ] SI [✓] Especificar cómo se tendrá acceso a la fotografía: enviada email a Arturo R.

Tiene escamas en región de la boca? NO [ ] SI [✓]

Tiene dientes pequeños? NO [ ] SI [✓]

Tiene 2 espinas planas en opérculo? NO [ ] SI [✓]

Longitud total en cm 192 Peso en kg 161 entero [✓] eviscerado [ ]

Longitud estándar en cm 165 Longitud de cabeza en cm 55

Otolitos extraídos? SI [✓] NO [ ] Cuantos? 2 Escamas? SI [✓] NO [ ]

Estomagos extraídos? SI [✓] NO [ ] Tejido extraído? SI [✓] NO [ ]

Gonadas extraídas? SI [✓] NO [ ] Sexo: Macho [ ] Hembra [✓] ND [ ]

Cuál es la característica que presentan las gonadas en fresco? Peso de gonadas en fresco en kg 2.3

1. Inmaduras (alargadas como popotes, color rosa-transparente) SI [ ]
2. En desarrollo (hinchadas, color amarillento-anaranjado) SI [ ]
3. En reproducción (muy grandes, saco transparente) SI [✓]
4. Desovado (pequeños y rojizos) SI [ ]

Incluir si se tiene mayor información (Observaciones)

Otras especies capturadas? corvina y verdillo

carnada de calamar
jornada de 6 hrs / 2 pescadores / 4to mero de este pescador en 2017

Nombre de colector de información y muestras: Pedro Paramo

SIO-UCSD, COBI, UABC, ECOCIMATI. Programa Mero gigante del Pacífico Mexicano (www.merogigante.org) PADI FOUNDATION

Figure 4. Data logbook form created for the Biological Monitoring Program for the Giant Sea Bass in Mexican waters (Credits given to PADI Foundation for financial support in right border).

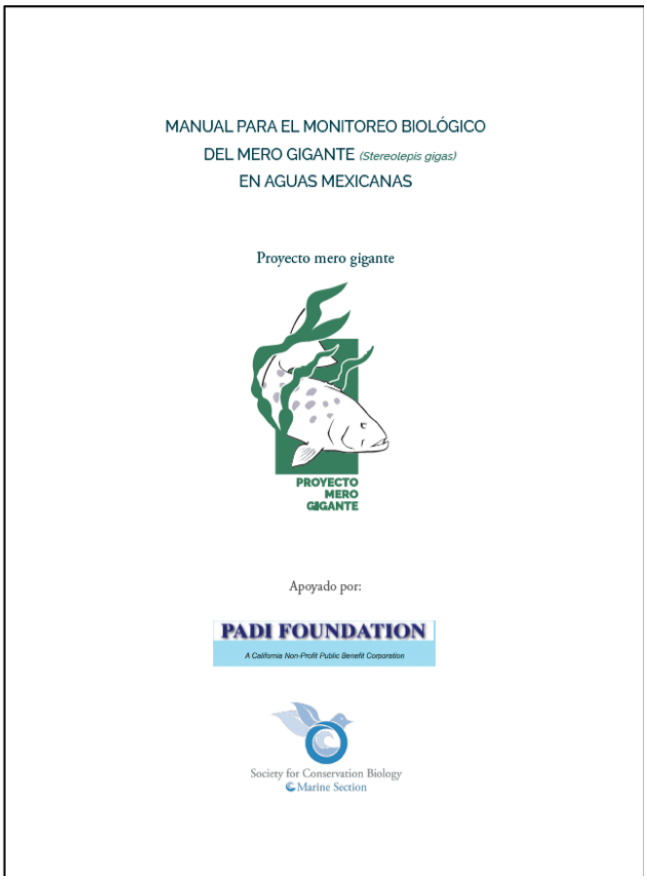


Figure 5. Technical manual for the Biological Monitoring Program for the Giant Sea Bass in Mexican waters (Credits given to PADI Foundation for financial support).

Figure 6. Descriptive technical sheet for the Biological Monitoring Program for the Giant Sea Bass in Mexican waters (Credits given to PADI Foundation for financial support).

Figure 7. Screenshot of the outreach video created showing the training to fishers and collaborators in the techniques to obtain measurements and extract samples.

Figure 8. Participation of fishers and members of the fishing cooperative S.C.P.P. Ensenada S.C.L., in the workshop to train in the collection of data and biological samples (Photo: Isaí Domínguez / Proyecto Mero gigante -COBI).

GOBIERNO DEL ESTADO
LIBRE Y SOBERANO DE
BAJA CALIFORNIA

DEPENDENCIA: SECRETARIA DE PESCA Y ACUACULTURA
SECCION:
NUMERO DEL OFICIO: DIRECCION DE PESCA 1106
EXPEDIENTE: PESCA/521/08/2018

ASUNTO: Apoyo

Ensenada, B.C. a 23 de agosto del 2018

AUTORIDADES MILITARES, CIVILES, PERMISIONARIOS PESQUEROS Y ACUICOLAS.
P R E S E N T E.-

En alcance del seguimiento al proyecto Mero Gigante, en el que de acuerdo al memorándum de entendimiento con la Universidad de San Diego, California USA en nombre de la Instituto de Oceanografía Scripps, Universidad de California en San Diego, La Jolla, California y el Gobierno del Estado de Baja California, México, con la comparecencia de la Secretaría de Pesca y Acuacultura a coadyuvar en proyectos en materia y con interés en las áreas de pesca y acuacultura, de intercambio tecnológico, científico, capacitación, ordenamiento ecológico, sanidad e inocuidad, establecimiento de programas académicos, conjuntar esfuerzos y recursos, fortalecer las capacidades afines y complementarias, monitores biológicos, prospecciones de recursos pesqueros, desarrollo biotecnológicos, estudios de mercado, esquemas de pesca sustentable, entre otros.

Se solicita su atenta disponibilidad y colaboración, para facilitar respetando sus diferentes procedimientos y disposiciones, todas las facilidades para el apoyo de este grupo interdisciplinario en la gira de trabajo técnico científico que busca documentar agregaciones reproductivas de la especie Mero Gigante (*Stereolepis gigas*) en cinco localidades de la Península en el Pacífico de la Baja California, iniciando en El Rosario, después isla Natividad, isla Cedros, La Bocana y terminando en Punta Abreojos.

Sin más por el momento, agradezco la atención otorgada a la presente.

GOBIERNO DEL ESTADO DE BAJA CALIFORNIA
DESPACHADO
23 AGO 2018
DESPACHADO
SECRETARÍA DE PESCA Y ACUACULTURA

ATENTAMENTE

LIC. VICTOR A. IBAÑEZ ESQUER
DIRECTOR DE PESCA
SECRETARÍA DE PESCA Y ACUACULTURA DE BAJA CALIFORNIA

SECRETARIA DE PESCA Y ACUACULTURA

C.c.p.
LIC. MATIAS ARJONA RIDALCH.- Secretario de Pesca y Acuacultura del Estado de Baja California, SEPESCA B. C.
C.P. JOSÉ WALLE GALVEZ.- Director Administrativo, SEPESCA B. C.
L.B.A. ERICK PETERSON CHINOLLA.- Director de Acuacultura, SEPESCA B. C.
PHD. OCTAVIO ABURTO.- Scripps Institution of Oceanography, UC San Diego
PHD CATALINA LOPEZ SAGASTEGUI.- UC San Diego University of California, Riverside
M.C. ARTURO RAMIREZ-VALDEZ.- Scripps Institution of Oceanography, UC San Diego
OCEAN. ROGELIO CANO CETINA.- Fomento y Ordenamiento Pesquero, SEPESCA, B.C.
ARCHIVO Expediente/VAIE *RCC

Figure 9. Letter from the Baja California State commission of Aquaculture and Fishing (SEPESCA) in support of the activities of this research project.

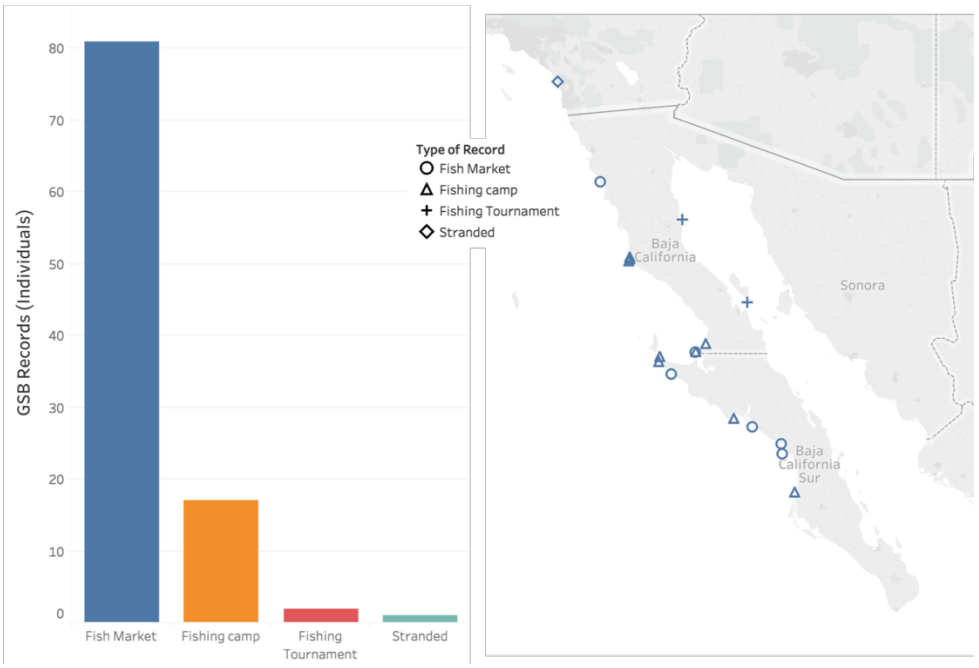


Figure 10. Geographic distribution of the 103 contemporary samples of Giant Sea Bass, showing the origin of the sample (Fish markets, Fishing camps, Fishing tournaments or Stranded).

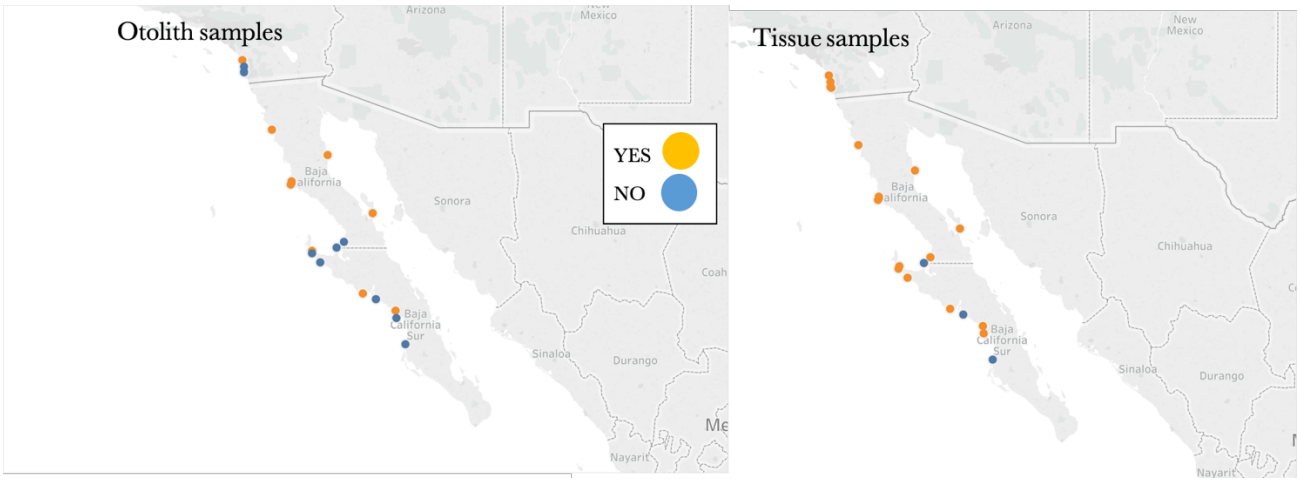


Figure 11. Geographic distribution of the otolith and tissue samples of Giant Sea Bass obtained from the commercial and recreational fishery on Mexican waters.

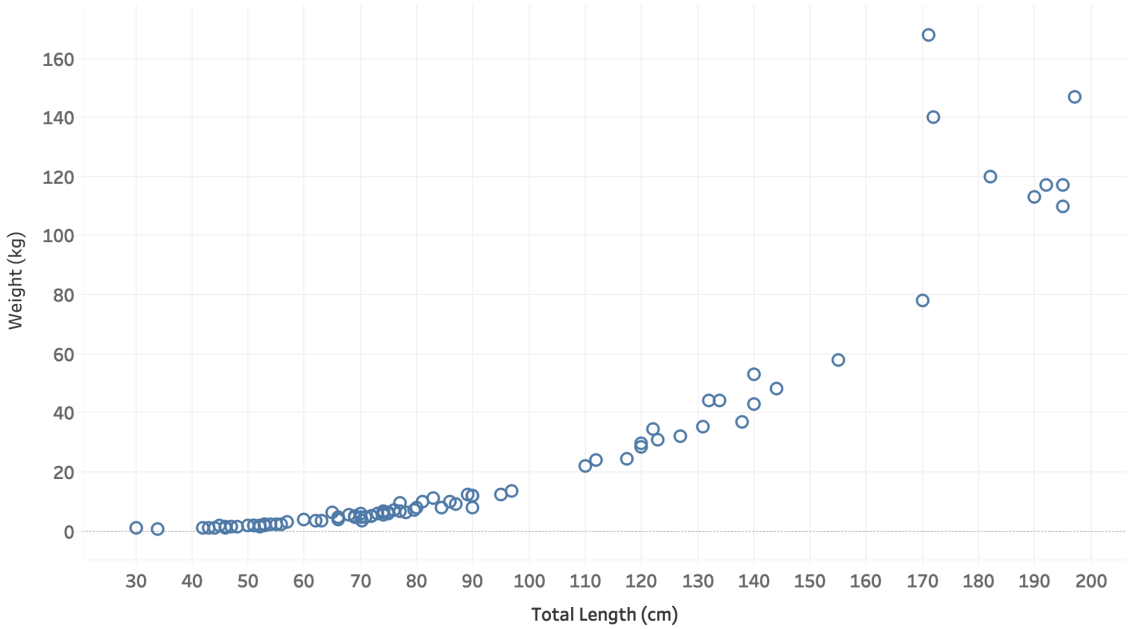


Figure 12. Length-Weight relationship of Gian Sea Bass samples obtained from the commercial and recreational fishery on Mexican waters.

Figure 13. Technical report submitted to Baja California State commission of Aquaculture and Fishing (SEPESCA) as result of the expedition to search Giant Sea Bass populations in Baja California (Credits given to PADI Foundation for financial support).

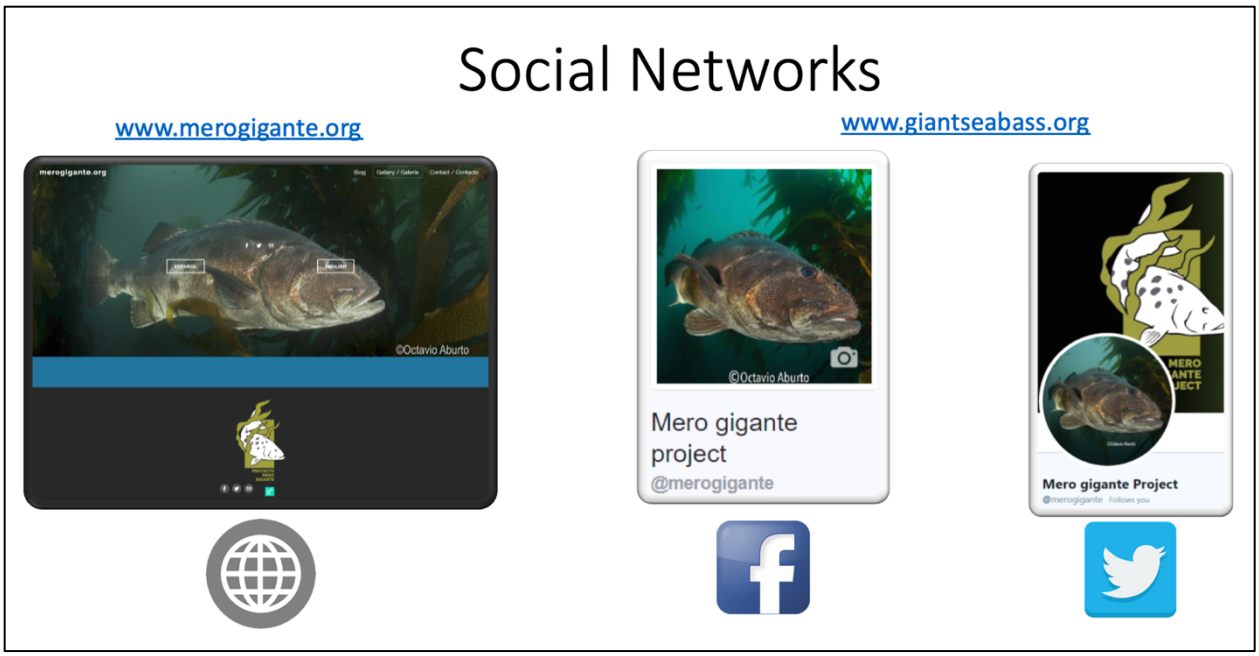


Figure 14. Social network profiles of the project; Proyecto Mero gigante, @merogigante.

Figure 14. Outreach paper published in the journal Mediterranews to reach fishers and stakeholders about the goal of the project (Credits given to PADI Foundation for financial support).