



Encontrando soluciones que funcionan



Workshops to update scientific knowledge on the geoduck clam (*Panopea globosa*) and definition of research priorities

General objective



CeDePesca



Encontrando soluciones que funcionan

- ▶ Promote the dissemination, discussion and updating of scientific research
- ▶ Through a process of collaboration between researchers, permit holders and authorities, define the research priorities for its management
- ▶ Generate synergies for cooperation in the development of the established priorities.

Workshop 1

(May 3th, 4th & 5th, 2021)

Objetivo: Understand and update advances and research needs, seek synergies

Target Audience: researchers

► Participants from

- Inapesca, Baja California State University (UABC), Intercultural Center for the Study of Deserts and Oceans (CEDO), National Fisheries Institute (INAPESCA), Centro de Investigación Científica y de Educación Superior de Ensenada (CICESE), National Protected Areas Commission (CONANP), Biological Research Center from northwest (CIBNOR), Interdisciplinary center of Marine Sciences (CICIMAR)



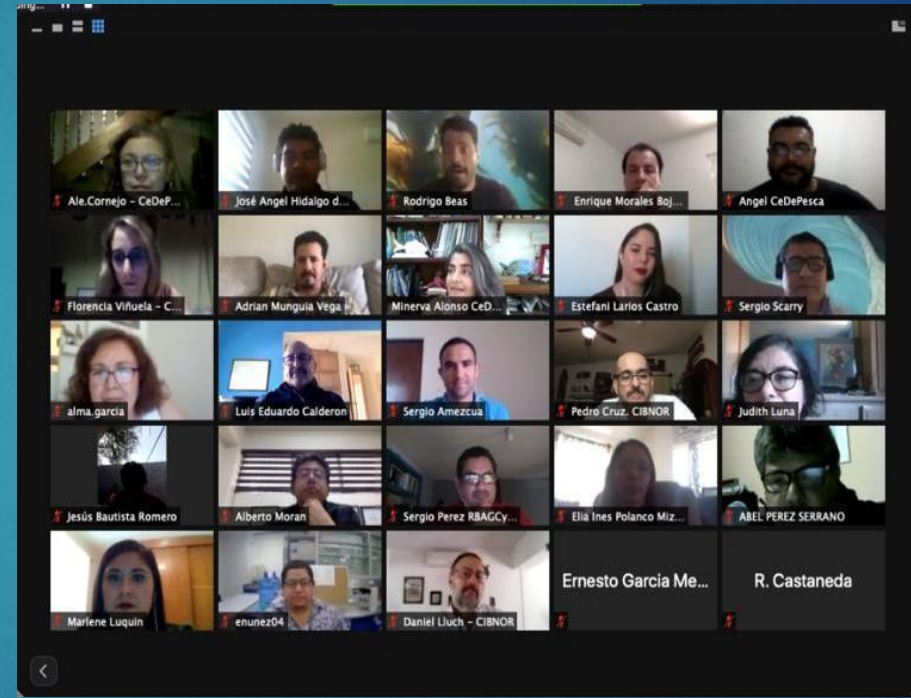
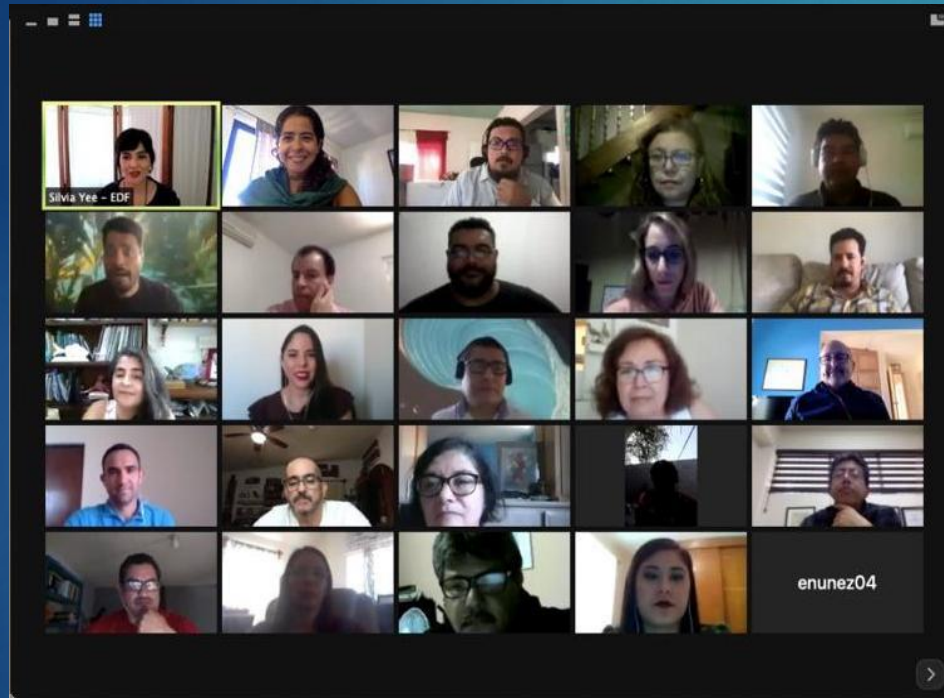
Workshop 2 (May 19th, 20th y 21st, 2021)

Objetivo: Validate the results, generate synergies to cover the research needs aimed at strengthening the management of the fishery

- ▶ Target audience are
 - ▶ Permit holders
 - ▶ Researchers
 - ▶ Federal and State Authorities



Results

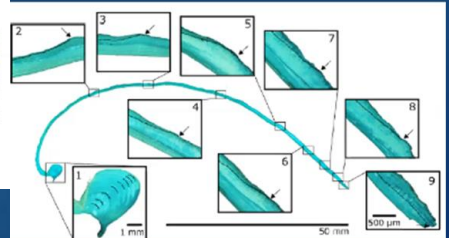
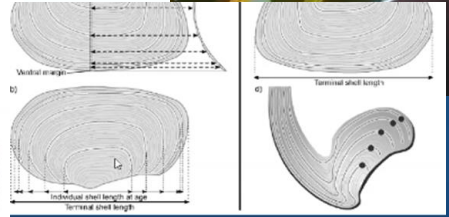





Day 1

- ▶ Definition of specific biological reference points for the fishery for *Panopea globosa*.
- ▶ Factors and metabolites involved in successful recruitment and reproduction in each distribution area, including environmental parameters.
- ▶ Reproductive information, description of the populations and estimation of biomass of all zones.
- ▶ Determination of molecular markers that help sexual identification when sexual differentiation has not occurred.
- ▶ Evaluation of the proportions of maturity for incorporated into the estimation of spawning biomass.
- ▶ Evaluate negative senescence in the different catch areas to determine the maximum catch size.

Información

Se analizaron 360 organismos de almeja, llevando a cabo un mapeo de toda la masa visceral, de tal forma que permitiera la identificación y localización anatómica de la gónada, analizando 1440 laminillas seriadas.



Individual growth profiling improves growth modelling in the geoduck clam *Panopea generosa*

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Hidalgo-de-la-Toba JA, Vadopalá I, Urch-Cora D, Bernado-Urch-Cora D, Morales-Baquero E, Bautista-Ramero J, and González-Pérez SS. Individual growth profiling improves growth modelling in the geoduck clam *Panopea generosa*. *ICES Journal of Marine Science*. doi:10.1093/icesjms/fsz011

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Comprehensive modelling of growth based on shell length to terminal age (SLTA) to long-lived clams is seldom incorporated as a more precise of how representative of early age classes in population sampling. To increase early age representation and improve growth modelling, we implemented an approach that used individual growth profiles (IGPs) also measured in shells of the Pacific geoduck *Panopea generosa*. We compared IGP against SLTA and a combination of both IGP + SLTA using a multi-model approach for the southernmost bay of greater population. The most parsimonious model for both IGP and SLTA data sets was the logistic model with L_{∞} at 11.03 and 12.03 mm, respectively, with the asymptote phase attained at ~15 years. The SLTA data alone, the new parameterisation was the logistic model with L_{∞} at 10.03 mm, matching the asymptote phase at ~10 years. In terms of performance, the IGP and IGP + SLTA data sets of individual growth models with superior robustness ($R^2 > 0.91$) and higher modelling efficiency (ME = 0.92) than those based on SLTA alone ($R^2 = 0.81$ and 0.87). The results demonstrate that IGP yields reliable information from relatively few specimens, improve the biological knowledge of the population, and increase the accuracy of parameter estimates for better fishery management.

Keywords: geoduck, growth modelling, individual growth profiles, *Panopea generosa*

Introduction

Individual growth in bivalves is typically characterised via measurement of the shell length (SL) and estimation of age as the maximum of capture (i.e. SL at terminal age (SLTA)), which, in some cases, can be done through the counting of growth marks periodically deposited in the shell (Cortés et al., 1986; Cortés, 2004). As such, the method derived from this information requires only the terminal length and age or measure of the inter-shell capture during sampling. Due to the scarcity of the living gear used, there exists a considerable pressure to harvest certain lengths (Stallard and Coullter, 1982; Ellis et al., 2017a; Kikita, 2018). This has been frequently observed in

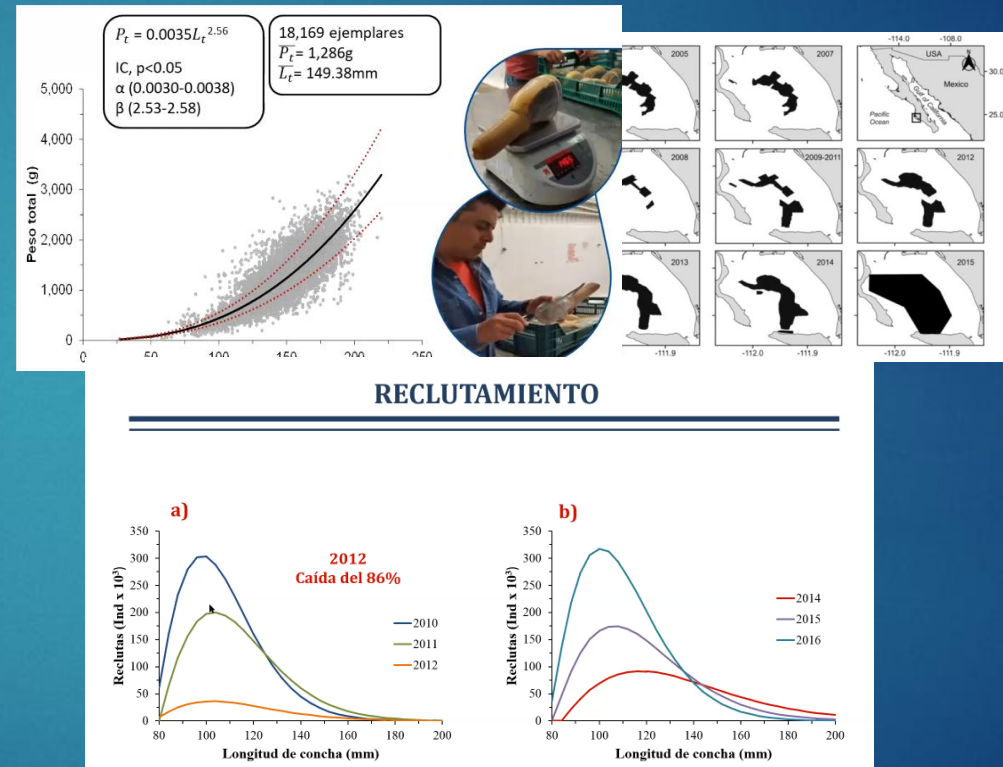
Individual growth models in populations of geoducks, a group of long-lived species whose early age classes are frequently absent in biological samples (e.g. *Arctica islandica* (Coulter and Murray, 2015), *Panopea setacea* (Ehlers et al., 1981), *Panopea generosa* (Linggenberg et al., 2012; González-Pérez et al., 2013), *Panopea generosa* (Chen et al., 2012, 2015), *Coloburiscus agilis* (Lin et al., 2013)). This scarcity of individual growth results based on SLTA data sets are frequently included for the first years of shell growth, generally when the accelerated growth phase ceases.

The growth studies undertaken in *P. generosa* are its record that during the first 30 years the highest growth rate occurs, and

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Day 2

- ▶ Risk analysis on the effectiveness of the management strategy with a horizon of 50 years and identification of a strategy that allows us to return to the healthy quadrant. • Development of other evaluation methods to cover more area in less time.
- ▶ Delimitation of banks in each region, updating information on the minimum density of banks. Evaluation of deep zones to identify the limit distribution of the banks.
- ▶ Definition of structure, abundance, population density, density correction factors, connectivity between populations incorporating population genetic studies, molecular markers, with data dependent and independent of the Fishery
- ▶ Evaluation of the effect of illegal fishing.

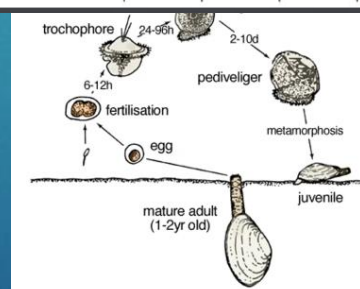
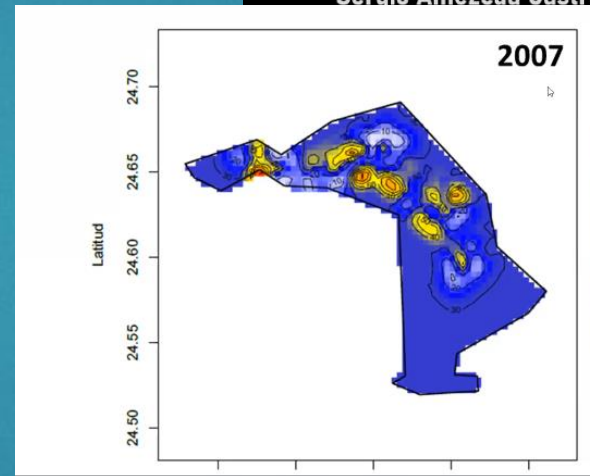


Day 3

- ▶ Public health and animal health studies (risk to human health and impacts and effects of HABs). Is it possible to use it as a biotoxin indicator?
- ▶ Exploration of correlations between the presence of harmful algal blooms and environmental variables, taking into account the presence of cysts in the clam capture areas.
- ▶ Define the relationship between larval dispersal and the effect of removal of the bottom of the fishing gear.
- ▶ Determination of the impacts of oceanographic aspects on population dynamics, including turbulence and connectivity and the relationship between the contribution of the Colorado River and the species.
- ▶ Generation of long-term data to identify the vulnerability of the fishery to long-term environmental events.
- ▶ Identification of temporal variation in recruitment and connectivity patterns based on environmental variables

Estado de explotación de almeja generosa en Bahía Magdalena durante los primeros diez años

Sergio Amezcua Castro



Temporada reproductiva:

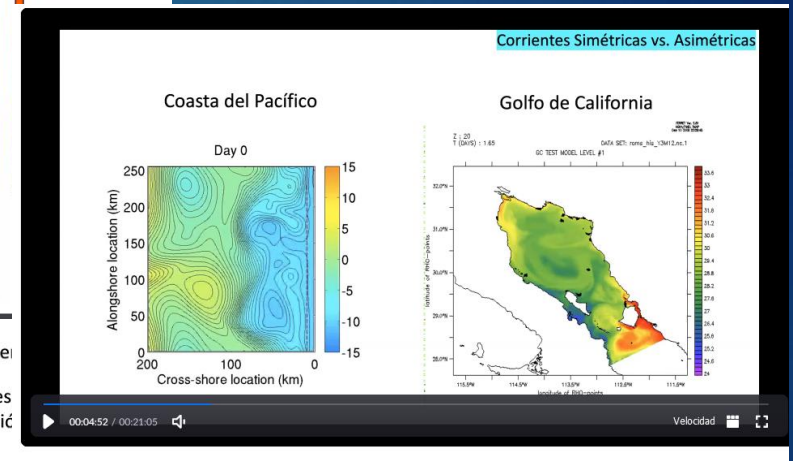
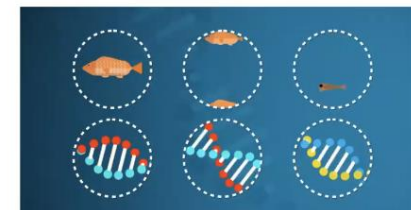
- Oct-Nov-Dic (Otoño)
- Ene (Invierno)

Duración larvaria P.D.:

Como enter:

1. Hipótesis Modelación

2. Validación: Genética poblacional



Identified challenges

- ▶ Insufficient qualified economic and human resources, as well as limitation or lack of equipment for depths.
- ▶ Ensure economic resources that can cover long-term projects given the biology of the resource.
- ▶ Difficulty of access for researchers to capture areas to obtain samples.
- ▶ Little willingness to share data.
- ▶ The law does not define topics absent from the investigation as of management interest. Likewise, adapt management strategies to the case of national populations, as particular information is generated.

Detected needs

- ▶ To integrate regional & long term studies
- ▶ To consolidate information, human & economic resources

2nd workshop. May 26th, 2021.

Participants

- ▶ INAPESCA
- ▶ CONAPESCA
- ▶ State Fishery and aquaculture office
- ▶ Fishermen representants
- ▶ Researchers
- ▶ EDF
- ▶ CEDEPESCA

