

Quantifying the economic potential of small-scale fisheries in the Gulf of Nicoya, Costa Rica

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Overfishing in the Gulf of Nicoya

The Gulf of Nicoya is one of the largest gulfs in Central America and is home to dozens of communities that are highly dependent on fishing as their main economic activity.

Declining catch rates and a persistent low socio-economic development in the Gulf suggest current management is not generating optimal benefits for resource users. Fisheries managers have not been able to regulate the exploitation of the resources in the Gulf in a sustainable way (1).

Both lack of compliance and poor scientific and/or economic criteria in the design of current regulations have been identified as important sources of ineffective management (2,3).



Map of the Gulf of Nicoya in Costa Rica. Source: Adapted from José Francisco Nuñez.

Project Goal

Guide the allocation of efforts to increase compliance and inform the improvement of policy design by quantifying the economic potential of Nicoya's small-scale fisheries under different management approaches.

Case Study: Corvina reina fishery in the upper gulf

Corvina reina (*Cynoscion albus*) is the main finfish fishery in the upper gulf, accounting for 51% of the catch in this region. It is caught with gillnet, handline and bottom longline and sold in three main size categories, with a higher price per gram for larger fish.



Corvina reina (*Cynoscion albus*). Photo: Comisión Nacional para el Conocimiento y Uso de la Biodiversidad, Mexico.

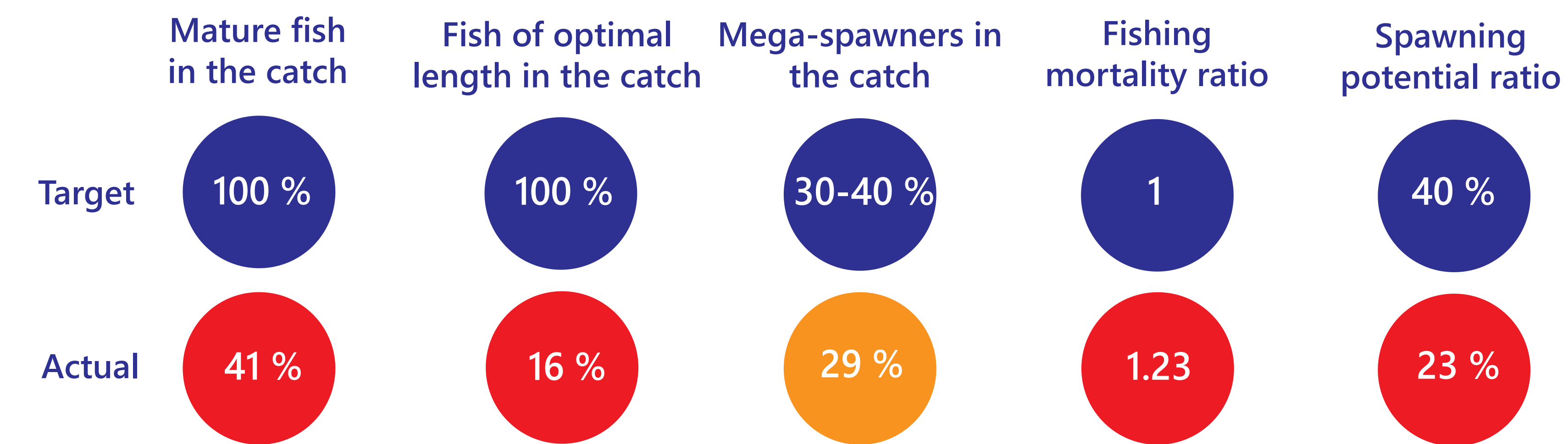
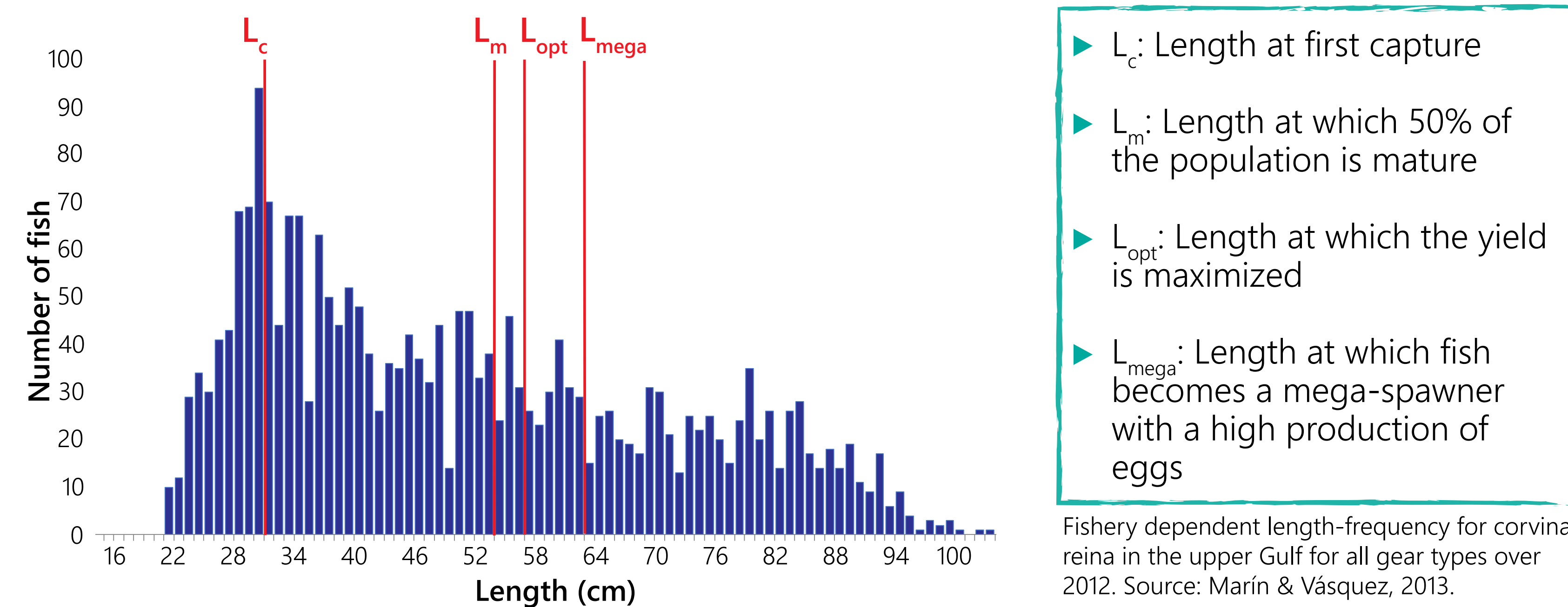


Research questions and key findings

- 1 What is the status of the corvina reina fishery in the region?**
Corvina reina is being overfished in the upper gulf, and the population presents an unhealthy size-structure.
- 2 What is the economic potential of the fishery for current management approaches under perfect compliance and improved design?**
If the current management remains unchanged, the fishery will underperform by 2.5 million USD due to noncompliance and an additional 1.1 million USD due to sub-optimal economic design.
- 3 What are the socio-economic tradeoffs associated to the outcomes of the optimal policies?**
Effort reduction shows consistent profits over time, while seasonal closure and size selectivity initially generate negative profits. In the long run selectivity outperforms all management approaches, but requires gear adaptation and investment to sustain the economic lag.

1 Status of the corvina reina fishery in the upper gulf

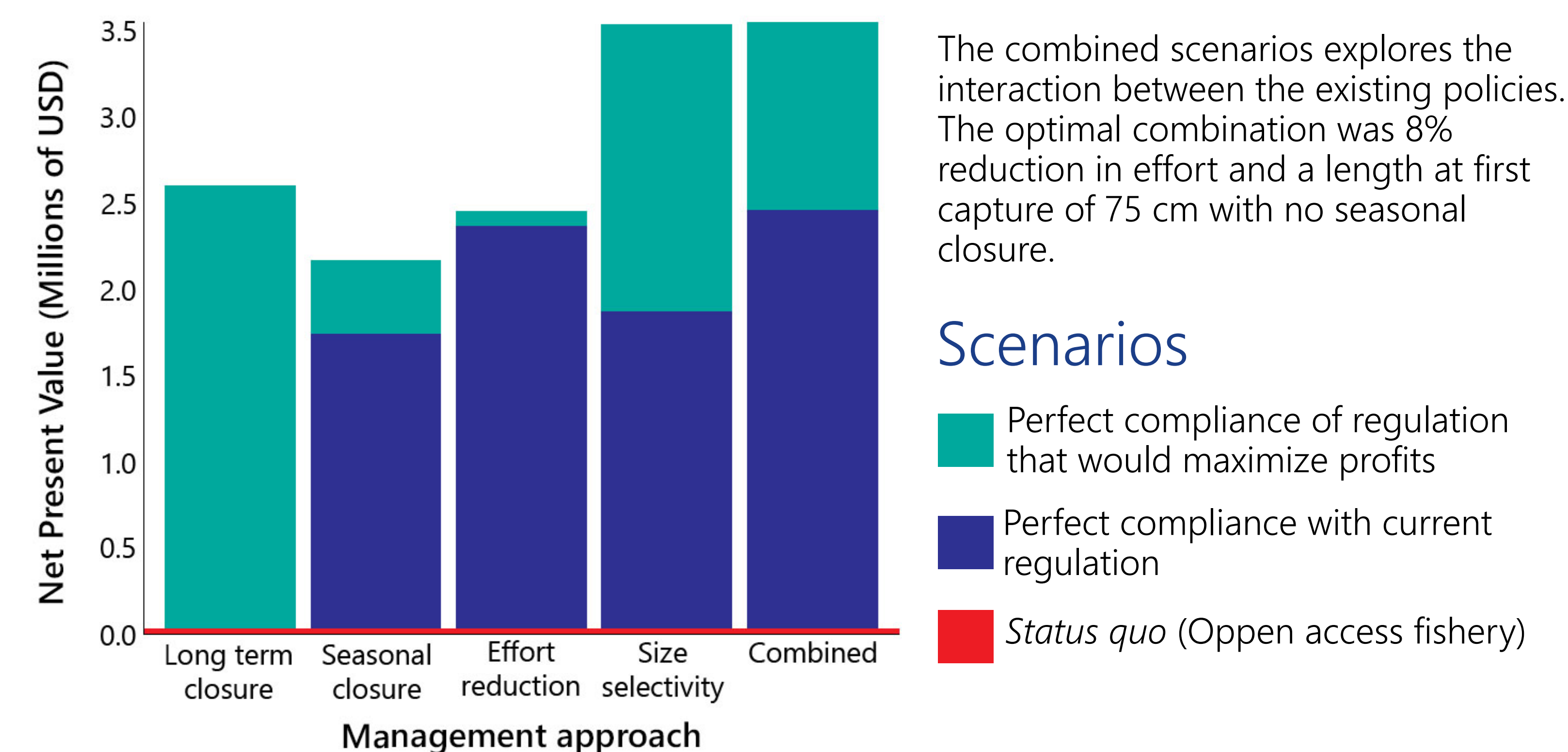
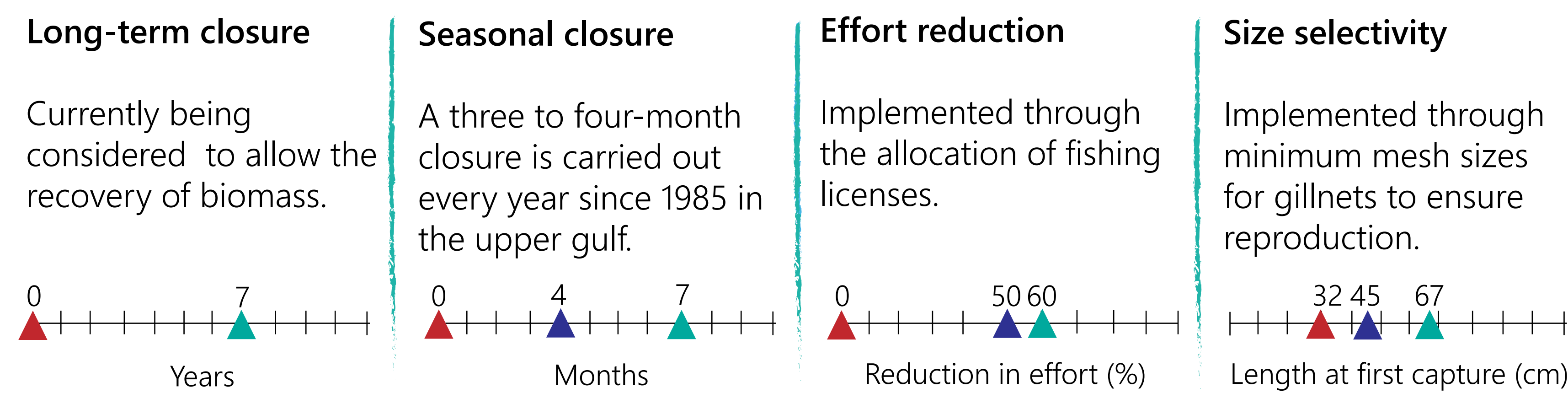
We applied widely used length-based data limited assesment to the corvina reina fishery in the upper Gulf (Zone 201), based on data for 2012. We specifically looked into the Froese sustainability indicators (4), the fishing mortality ratio and the spawning potential ratio.



2 Economic potential of the fishery under perfect compliance and improved design

We developed an age-structure model for corvina reina. Age-specific survival rate was estimated based on control variables that represent different management approaches. We explored the net present value of two scenarios over 20 years, with a discount rate of 9%: perfect compliance with current regulation (▲) and perfect compliance with the regulation that would maximize profits (▲), holding the status quo to an open access equilibrium (▲).

Management approaches and modeled scenarios



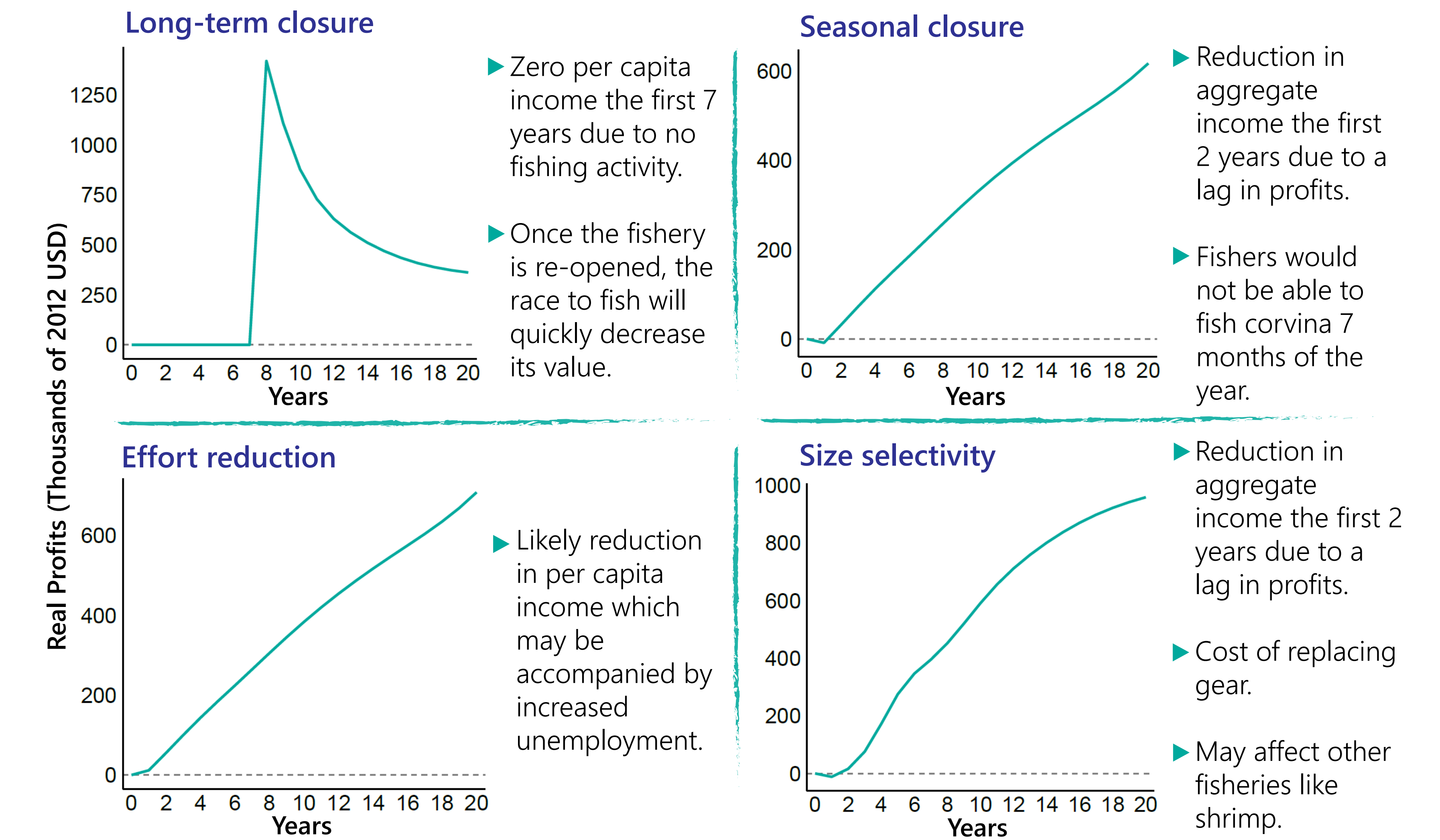
The combined scenarios explores the interaction between the existing policies. The optimal combination was 8% reduction in effort and a length at first capture of 75 cm with no seasonal closure.

Scenarios

- Perfect compliance of regulation that would maximize profits
- Perfect compliance with current regulation
- Status quo (Oppen access fishery)

3 Social and economic tradeoffs of optimal economic management over time

We projected the profits generated over 20 years for each optimal management approach and inferred the associated socio-economic impacts considering the context of the gulf.



The optimal strategy that combines the different management approaches, follows a path almost identical to size selectivity and would involve all tradeoffs described for effort reduction and size selectivity. Including a long-term closure may increase profit levels but adds all the tradeoffs described above.

Recommendations

- If no adjustments to current regulations are made, prioritize compliance with effort restrictions. A first step would be to conduct a census of fishing effort in the area.
- The implementation of a minimum size of 67 cm for corvina reina will be the most effective regulation adjustment to increase profits. This estimate does not require a reduction in the current fishing effort in the Gulf. Although, this measure may interfere with other fisheries.
- Similar size limit regulations may favor other 13 fisheries that also present price premiums for larger individuals.
- Under any legislation adjustment, surveillance and enforcement must be a priority. Otherwise, a *de facto* open access will lead to zero profits.



Fishers preparing the boat to fish in Guanacaste region, Costa Rica. Photo: Andrés Jiménez.

Acknowledgments

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