

## **Ecological and socio-economic feasibility of a long-term scallop bottom culture in Sechura Bay, Northern Peru**

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Aquaculture has become an important factor to support global fisheries in achieving sustainable levels for overexploited natural stocks. The Peruvian scallop *Argopecten purpuratus* represents one of the economically most important bivalve along the Pacific coast of South America. Sechura Bay (5.6°S, 80.9°W), located close to the northern border of Peru, has become a major spot for its cultivation. Here, culture activities exponentially increased during the last years and today represent an important socioeconomic factor, with approximately 2500 artisanal fishers involved and an export value of more than 70 million US\$ per year. A large part of cultivation, however, is still conducted without legal authorization thus formal control, which makes management efforts for the bay's system a challenging priority. A recently initiated interdisciplinary study will therefore determine the bay's carrying capacity in ecological and socio-economic terms. Carrying capacity was defined as the maximum amount of cultivated organisms that a system can support without causing an unacceptable impact on the ecological or social level. Using different modelling approaches (e.g. ECOPATH), respective limits will be determined. Ecological experiments will provide information to establish a trophic model by investigating how the increase of scallops' biomass due to culture efforts has changed trophic fluxes. Data from ecological and socio-economic surveys will be integrated to explore the response of the system under different culture scenarios and environmental conditions, such as the occurrence of El Niño. Resulting carrying capacity thresholds are urgently needed to establish a decision-framework supporting both local fishers and managers in their difficult position of finding a sustainable long-term level of scallop culture in Sechura Bay, Peru. Understanding possible future statutes of this local bay and developing an according adaptive management plan will help to adapt other culture system worldwide to a changing earth environment.

Although the theory of carrying capacity appears straight forward, the modelling process is complicated by the lack of data, multi-use of the bay, overlapping stakeholder groups and complex political structures surrounding the bay's system. Careful observation and mapping of the social structure, consulting and integrating different stakeholder's interests are crucial for the identification of what represents unacceptable levels of disturbance. Effectiveness of resulting management suggestions will strongly depend on acceptance and active participation of the involved population. The challenge of ecological and socio-economic modelling is therefore not only to define certain limits to production, but also to establish a useful and applicable decision-framework for local stakeholders and managers. One key for a successful application of new management strategies will be a continuous communication flow between different participatory levels. Anticipating future scenarios of coastal systems became a key goal of ecosystem-based management, for which ecological modelling and the concept of carrying capacity represent important tools. Techniques to address the social level, however, still have to be further developed. The presented study therefore aims on contributing to on-going research on the estimation of carrying capacity for aquaculture by providing an holistic approach. Presented results can be taken as an example for the governance of other coastal system exposed to aquaculture.