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Struggling with social-ecological mismatches in marine management and conservation at Easter Island

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A B S T R A C T

In Easter Island, most of fisheries regulations are top-down implemented by the central fisheries authority located ~4000 km eastwards. This could generate problems in regulations compliance, given the cultural differences between the western worldview and Polynesian culture of Easter Island. A total of 18 issues that must be considered previously to an intervention in the island were identified. Four of them scored the highest difference between Rapanui and public services representatives. Among them, “Integrating traditions and culture” had a little priority for the public services representatives, but was the most important for the Rapanui. According to the public services representatives in Easter Island and local fishermen, there is a little compliance with regulations related to fisheries and, due to cultural aspects, it is not possible to enforce regulations and apply sanctions. The low compliance with fisheries regulations is due to the lack of representativeness of regulations. Interventions in the island are based on western worldview that does not fit with social and ecological domains of social-ecological system. A flexible governance system, based on decision making at local level in line with local tradition is needed to navigate to a resource management and conservation in Easter Island.

1. Introduction

1.1. Social-ecological fit

Ecosystem governance is intrinsically difficult because both human societies and the natural environment are characterized by complex dynamics, including natural variations, scale dependencies, and associated uncertainties [1,2]. To effectively manage the natural environment, the governance system must fit or be aligned to the characteristics of the biophysical system [3], and when this match does not occur, it is referred to as a problem of fit [4]. Epstein et al. [5] described three general types of fit: a) ecological, which considers whether institutions match the ecological or biophysical problems they are meant to address; b) social, which is concerned with the congruence between institutions and the preferences, values, and needs of the human actors; and c) social-ecological system (SES) fit, which refers to interactions between institutions and the social and ecological attributes of SESs that contribute to success. Key attributes of the social system are: a) values, interests and beliefs, b) participation and psychological needs, c) spatial scale, and d) institutions. In the ecological system, the key attributes are: a) function, b) spatial scale, c) time, and d) institutions

[5]

Given the different temporal and spatial scales at which the processes of the SES occur, it is frequent to find problems of fit between governance and ecosystems. These problems of fit are frequently found in fisheries, where ecological processes often occur at spatial scales beyond the reach of existing governance systems [6] and where the temporal rates of change are often out of kilter with the rate at which governance systems are able to respond [7]. In this context, it has been argued that many of the problems related to resource management arise as a consequence of a mismatch, or lack of fit, between the scale of management and the scale of the ecological processes [8]. Such lack of fit can further be exacerbated when indigenous communities are involved. In such instances, a lack of social fit is likely to occur simultaneously with a lack of ecological fit, as national-level governance frameworks do not well represent local worldviews and understanding of ecosystem dynamics [9]. Addressing the problems of fit could enable governance arrangements to deal with constraints generated by spatial, temporal and functional characteristics of the biophysical environment, but also with values, interests and beliefs of the social system [3].

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Fig. 1. Location of Easter Island (Rapa Nui) in the context of continental Chile and the Polynesian triangle (A). General view of the main coves of Easter Island: Hanga Piko (B) and Hanga Roa (C). Fisherman preparing the hook and bait, rolling the line onto a stone to reach the desired fishing depth (D). This technique is used in Easter Island but not in continental Chile.

1.2. Governing Easter Island, a social-ecological problem of fit

Easter Island (Rapa Nui in the local language refers to the island, while Rapanui refers to the indigenous people and the language) is a small island (171 km²) located in the South Pacific Ocean (27° 07' S – 109° 22' W) and is the easternmost corner of the Polynesian triangle. It is located 3700 km west of the Chilean coast and 2030 km east of Pitcairn, the nearest oceanic island group (Fig. 1).

Easter Island and continental Chile belong to different provinces and marine ecoregions. Continental Chile belongs to the Warm Temperate Southeastern Pacific Province, while Easter Island belongs to the Easter Island Province [10]. Central and northern Chile are influenced by the Humboldt Current System, characterized by the strong upwelling of cool, nutrient-rich subsurface waters [11]. In contrast, Easter Island is situated in an ultra-oligotrophic region with low chlorophyll *a* concentrations [12]. Further, the geographic isolation of the Easter Island Ecoregion (Fig. 1) resulted in a high endemism of reef

fishes [13], with > 70% of the shore fish abundance being endemic and regionally-endemic [14].

Despite the distance from South America, Easter Island has been under Chilean administration since 1888, when Chile took formal possession of the island. Since then and until 1966, Easter Island was administered as a military territory according to naval rules [15]. Rapanui have been considered Chilean citizens since 1966, under the N° 16,441 Law. According to the 2002 census, 60% of the island population has Rapanui ethnicity.

The process of colonization of the island ended with a traditional social structure governed by the Ariki (king) and the organization of lineages in clans that were distributed in territories around the island. Since 2007, Easter Island has been officially considered a 'special territory'. This status does not mean autonomy of the local government, however, all decisions affecting the local population must be consulted to the Rapanui community according to the N° 169 convention of the International Labour Organization, although this only means a

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