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La pesca en Isla de Pascua, una historia reciente (1950-2010)

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ABSTRACT. Easter Island (Rapa Nui) is well studied in terms of its archaeology; however, information regarding the history of fishing is extremely limited. Marine resources have likely been exploited from the time the first Polynesians arrived on this remote island. While large pelagics are part of the traditional Rapa Nui diet, inshore fish and invertebrates have also made their way into the diet. Official records of fisheries catches in what is now the Easter Island Province of Chile, which also includes the uninhabited island of Salas y Gómez, are very limited and were available for only some years. Using anecdotal information, historical descriptions and the limited quantitative information available, we reconstructed fisheries catches in the Exclusive Economic Zone (EEZ) of the Easter Island Province over the 1950–2010 time period. Totaling almost 6,000 metric tonnes, legal catches have been increasing rapidly since the late 1970s, but are now stagnating at around 150–200 t·year^{-1}. The main species targeted were Pacific chub (‘*nanue’*; *Kyphosus sandwicensis*) and yellowfin tuna (*‘kahi’*; *Thunnus albacares*), with spiny lobster (‘*ura*’; *Panulirus pascuensis*) being the most important invertebrate species. There are indications of a substantial illegal fishery for large pelagics in the EEZ of the province, estimated at 200–2,000 t·year^{-1}, which may have operated for two decades and may be the cause for the declining artisanal catch of tuna by Rapa Nui fishers. Continued pressure on these geographically remote oceanic and inshore marine species, especially those popular amongst tourists, makes accounting for fisheries catches an even greater priority.

Keywords: catch, reconstruction, artisanal fishing, subsistence, illegal fishing, Rapa Nui

RESUMEN. La Isla de Pascua (Rapa Nui) ha sido muy estudiada en cuanto a su arqueología, sin embargo, la historia de la recursos pesqueros es extremadamente limitada. Especies pelágicas, peces costeros y invertebrados son parte de la dieta tradicional de los habitantes de Rapa Nui. Los desembarques oficiales de Rapa Nui pertencen a la Provincia de Isla de Pascua de Chile, los cuales estan disponibles sólo para algunos años. Mediante descripciones históricas y información cuantitativa disponible, se reconstruyó los desembarques para la Zona Económica Exclusiva (ZEE) de la provincia de Isla de Pascua para el periodo 1950–2010. Se cuantificó casi 6.000 toneladas métricas. Los desembarques se incrementaron rápidamente desde finales de 1970, pero recientemente estos se han mantenido entre los 150–200 t·año^{-1}. Las principales especies registradas fueron '*nanue*' (*Kyphosus sandwicensis*), el atún de aleta amarilla o '*kahi*' (*Thunnus albacares*), y el invertebrado más importante fue la langosta espinuda o '*ura*' (*Panulirus pascuensis*). Hay indicios de una sustancial pesca ilegal de grandes pelágicos fuera

de la ZEE de la provincia de Isla de Pascua, estimada en 200–2.000 t·año^{-1}. Esta pesca ilegal podria haber estado operado durante dos décadas y puede ser la causa de la disminución de las capturas de atún por parte de los pescadores artesanles de Rapa Nui. La continua presión pesquera sobre especies oceánicas y costeras de areas geográficamente remotas, especies que son especialmente populares entre los turistas que visitan Isla de Pascua, hacen que la recopilacion de imformacion tenga una prioridad aún mayor.

Palabras clave: captura, la reconstrucción, pesca artesanal, pesca de subsistencia, pesca ilegal, Rapa Nui

INTRODUCTION

Easter Island, or Rapa Nui in the Polynesian language of its original inhabitants (also called Papa Nui), is located at 27º10'S, 109º20'W in the middle of the Eastern Pacific Ocean, 3,760 kilometers southwest of mainland Chile (Fig. 1). The Island (known as 'Isla de Pascua' in Chile) has had an interesting and somewhat mysterious past. The arrival of Polynesians on the Island, 2,200 km from the nearest populated island, was originally thought to have occurred around the 4th century AD (Mulloy, 1979) with the population increasing to 7,000–20,000 by 800 AD (Glynn *et al.*, 2003). However, more recent dating places the earliest human habitation much later, around 1200 AD (Hunt and Lipo, 2011), with peak population occurring from 1400–1700 AD (Hunt, 2007). Easter Island has often been cited as an example of extreme resource over-exploitation, which is thought to have ultimately lead to the near-demise of its population (Diamond, 2005). However, this viewpoint is challenged by Hunt and Lipo (2009), who suggested the hypothesis that this collapse was due to the later introduction of epidemic diseases (Hunt and Lipo, 2009). Between 1200 and 1650 AD, an agrarian society existed on the island, constructing large statues (*moai*) and ceremonial platforms (*ahu*), and transforming both the terrestrial and near-shore ecosystems of Rapa Nui (Mann *et al.*, 2008). The first Europeans, led by the Dutch mariner Jacob Roggeveen, arrived on Easter day in 1722 (McCall, 1995; Kirksey, 2003). This and subsequent visits to the island brought with them disease and a slave trade which further decimated the population to a nadir of 111 people by 1877 (Baker, 2012). Peruvians were also involved in the slave trade and approximately 1,000 islanders were forced to leave the island over a span of four years to work on plantations and mines in coastal Peru (Métraux, 1957; Porteous, 1978). Although the Republic of Chile annexed the island in 1888 (Makihara, 2005), it was left as a 'company state' for almost a century (i.e., the island was subject to the economic,

social, and political control of a business rather than a government; Porteous, 1978). The company Williamson-Balfour took over control in the mid-1890s and created a subsidiary company specifically to run Easter Island, which was the Easter Island Exploitation Company (Compañia Explotadora de Isla de Pascua, CEDIP). CEDIP maintained the goals of the previous owners, which was to produce wool, and therefore, until the mid-1900s, it was mostly sheep herders who lived on the island, with the few remaining Rapa Nui forced to live on a native reserve in Hanga Roa so that they could be supervised and used as laborers as the need arose (Porteous, 1978). Then, in 1968, the completion of an airstrip brought an influx of migrants and tourists, mainly from Chile (Maino Prado, 1985), and today it is inhabited by roughly 5,800 residents and visited by upwards of 70,000 tourists annually (Kootnikoff, 2010).

Easter Island Province (i.e., including Salas y Gómez Island) has a land area of 164 km^2 and an Exclusive Economic Zone (EEZ) of over 720,400 km^2. The uninhabited Salas y Gómez Island is located 450 km to the east. Other than that, the nearest land is the Pitcairn Island group, 2,200 km to the west (Randall and Cea, 2011). This extreme geographic isolation has resulted in an unusual assemblage of species unique to the Island (DiSalvo *et al.*, 1988). A portion of the waters surrounding the nearby Island of Salas y Gómez were recently designated as a no-take marine park (Eilperin, 2010). The 150,000 square kilometer marine park surrounding the uninhabited island is a substantial stride toward protecting its unique marine life. Indeed, the waters around Easter Island Province are generally unproductive (Longhurst, 2006), but their isolation has generated a high level of endemism across all groups (D. Palomares, FishBase, pers. com.).

The fishes of Easter Island have been particularly well studied, notably by an expedition funded by the World Health Organization in the early 1960s, which included two scientists from the University of British Columbia, Ian Efford and then graduate student Jack Mathias (Reid, 1965). Also, work by ichthyologist John Randall and colleagues Louis H. DiSalvo and Alfredo Cea also contributed immensely to understanding the fish fauna of Easter Island (DiSalvo *et al.*, 1988; Disalvo and Randall, 1993; Randall and Allen, 2004; Randall and Cea, 2011).

Easter Island's embayed coastline offers easy access to near-shore fish and shellfish (Anderson, 2001). Archeological evidence suggests that early Rapa Nui employed a diverse range of fishing techniques, including both single and compound hooks, and lures and sinkers (Anderson, 2001).

Bones of tuna, shark and swordfish have also been found in numerous excavations (Anderson, 2001), indicating that offshore fishing also occurred. Archeological evidence also exists for inshore angling and other collection methods such as net, snare and spear (Ayers, 1979).

While the early settlement history of Easter Island has been extensively studied, the recent history has had much less attention. Once a densely forested subtropical landscape, Easter Island today is devoid of woody vegetation (Glynn *et al.*, 2003). The over-exploitation of the island's resources, and near collapse of the Rapa Nui population, sometimes referred to as an 'ecocide', have been the subject of many essays, papers and books on the history of Easter Island (e.g., Anderson, 2001; Diamond, 2005). New hypotheses contrast the notion that the Rapa Nui alone were responsible for the terrestrial destruction of the island by cutting down all the trees, when it could have been an infestation of rats—brought to the island by the Rapa Nui—which caused this destruction (Hunt, 2007; Mann *et al.*, 2008). While some archeological work has described the marine fauna and discussed the diet of the early inhabitants, information on the recent history of marine resource exploitation is extremely scarce, which limits understanding the current impacts and status of the island's marine ecosystems. However, it is quite likely that early and later human settlements on the island have had a strong impact on the inshore ecosystem over time (DiSalvo *et al.*, 1988). Although included in the fisheries jurisdiction of the Valparaiso Region (of Chile), few records exist that document fisheries catches and effort from the waters of Easter Island, except for the very recent years (since 2000). Traditionally, the Rapa Nui people engaged in small-scale fishing in near-shore waters (Muñoz, 2011). In 1970, for example, registered artisanal fishers and boats numbered 66 and 19 (Eberhard Burgos and Inostroza, 1977), respectively. According to SERNAPESCA (2012), in 2011 the number of fishers had increased to 126, while 33 boats were registered. The number of unregistered and/or subsistence fishers is not known. Archeological evidence suggests that early Easter Islanders (e.g., pre-1722) had a diet consisting of one-third porpoise and one-quarter fish, with the remainder consisting of birds, seals and root crops (Glynn *et al.*, 2003). One estimate of *per capita* fish (mostly tuna) consumption before European contact was in the range of 150 $kg \cdot person^{-1} \cdot year^{-1}$ (Pollock, 1993). With the disappearance of the forests, wooden canoes, which would have been used to access these marine resources, were no longer an option. At that stage, the diet switched to near-shore species, such as crustaceans, molluscs and reef fish, which could be collected from shore (Glynn

et al., 2003). Over the time period considered in this study (1950–2010), local consumption of marine species includes both fish and invertebrates. The main fish consumed are yellowfin tuna or '*kahi'* (*Thunnus albacares*) and Pacific chub or '*nanue'* (*Kyphosus sandwicensis*). Lobster, sea urchin and octopus are also commonly eaten.

Besides commercial fishing, the tourism sector may also, indirectly, pose a substantial threat to the marine biota, as species such as lobsters are caught to meet the demand generated by an increasing number of tourists (Boyko, 2003). The most popular lobster served to tourists is the spiny lobster, or *'ura'* (*Panulirus pascuensis*), whose populations have severely declined in recent years (Disalvo and Randall, 1993). This lobster species was also traditionally consumed by locals. Two other endemic lobster species (*Parribacus perlatus* and *Scyllarides roggeveeni*) are caught and sold, albeit to a lesser extent than *P. pascuensis*. With the decrease of the spiny lobster populations, annual catches of the other two species have increased (Boyko, 2003). Warning of potential over-exploitation of lobster species came as early as the 1980s (Castilla, 1987 in Glynn et al. 2003). These species are now quite rare in shallow waters, difficult to trap in deeper waters, and rarely appear in local markets and restaurants (DiSalvo *et al.*, 1988; Glynn *et al.*, 2003). Corals, mollusc shells and other marine invertebrates are often collected and sold as jewelry and curios, putting further pressure on these resources (DiSalvo *et al.*, 1988; Disalvo and Randall, 1993; Glynn *et al.*, 2003). Octopus (*Octopus rapanui*) and sea urchin (*Echinometra insularis*) are also traditional food items of the Rapa Nui people. Octopus may be at risk of overfishing, as an increasing numbers of Chileans, with a taste for octopus, move to the Island (Boyko, 2003). Populations of sharks, including *Carcharhinus galapagensis*, the most common shark species around Easter Island, have likely decreased due to fishing pressure on sharks and their prey (DiSalvo *et al.*, 1988), and possibly, because they are part of the by-catch of illegal industrial pelagic fisheries (see below).

While some information exists on what species are caught by Rapa Nui fishers, the details of exactly how much is caught remain elusive. As all fish and invertebrates caught in Easter Island are consumed locally, continuous fisheries statistics are lacking, as is enforcement of fishing regulations (Glynn *et al.*, 2003). However, understanding past and present resource exploitation is fundamental for ensuring sustainable use into the future, and thus this study aims to reconstruct marine fisheries catches in the waters surrounding Easter Island for the period 1950–2010. This

should provide a useful baseline for improving the protection and management of fisheries resources.

MATERIALS AND METHODS

A thorough literature review unveiled few records of fisheries catches for the time period being considered (1950–2010). Despite severely limited data, we estimated fisheries catches using the reconstruction approach described in Zeller *et al.* (2007), which we modified as required.

For the early period (the late 1970s), Inostroza (1979) provides information on catch levels and on catch composition. For the more recent period (2000–2010), national catch statistics by taxa were obtained from the National Fisheries Service (SERNAPESCA), based on records from fisheries officers located in the town of Hanga Roa. Personal communications from Rapa Nui fishers also provided information on catches throughout the time period.

The human population, which was lowest at the end of the 19th century, has since steadily increased from 1,155 in 1960 (Porteous, 1993) to 5,000 in 2009 (Randall and Cea, 2011), but is probably an underestimate (Eugenio Figueroa, Director, Centro Nacional del Medio Ambiente, Universidad de Chile, pers. comm.). The complete time series of the Easter Island population was estimated using various anchor points with linear interpolation in between (Loret and Tanacredi, 2003; www.populstat.org). Ninety percent of the population of Rapa Nui is concentrated in and around Hanga Roa (Kirksey, 2003; Baker, 2012).

In addition to the resident population, many tourists visit Easter Island every year. The opening of the airport in the late 1960s brought the first tourists, estimated at roughly 5,000 per year by 1970 (Maino Prado, 1985; Porteous, 1993). By the mid-1990s, approximately 14,000 tourists visited the island annually (Randall and Cea, 2011), increasing to 22,000 by the early 2000s (Ross, 2008) and 70,000 by 2009 (Kootnikoff, 2010). While seafood consumption by tourists was not estimated directly, they likely consume a portion of the small-scale catch, sold to and served at local restaurants, while the remainder of the tourist demand is being met by seafood flown in from the Chilean mainland.

From May 1977 to May 1978, catches were sampled from the cove Hanga Roa Otai, where up to 90% of the catch of the artisanal fleet was being landed (Inostroza, 1979). Although Inostroza

(1979) estimated that his sample represented 85% of total landings, it was likely that the sample was closer to being representative of 70% of the catch (R. Vega, pers. obs.). Catches were disaggregated by species and presented as being either 'coastal' or 'offshore'. The total catch of these two components were raised to account for the missing 30% of the total catch. These were our anchor points for artisanal catch in 1977. For the offshore catches, the proportional species composition of the sample catch was applied directly to the new total catch. For the coastal catch, the species composition from the sample was modified slightly to account for known under-reporting of lobster catches (R. Vega, pers. obs.). The coastal and offshore artisanal total catches were converted into *per capita* catch rates for 1977. These *per capita* catch rates were kept fixed back to 1950 and applied to the population for each year. The species breakdown was also carried back, unaltered. These assumptions were made as we had no additional information.

Data obtained from SERNAPESCA,[1] provided landings estimates for the 2000–2010 time period. These catches, which include both fish and invertebrates, and information on the tonnage of each species caught, were taken to be representative of the artisanal sector.[2] Data for the year 2002 appeared to be an outlier (i.e., a data error) and were replaced, for each species, by an interpolation between the catch from 2001 and 2003. A second outlier in 2009 was adjusted as well (albacore and swordfish appeared to be an order of magnitude too high). The data for 2000–2010 were separated into coastal and offshore catches by species, with the 'miscellaneous fishes' category divided proportionally between the two areas. To derive a complete time series of catches from 1950 to 2010, the tonnages, by species (for both coastal and offshore catches), were interpolated from the 1977 anchor point to the first point of SERNAPESCA data in 2000.

Information from fishers indicated that in the late 1970s shore-based fishing for direct subsistence purposes would reach approximately 20 tonnes (S. Pakarati, Rapa Nui fisher, pers. comm.). It was therefore assumed that in 1977, subsistence catches reached 20 t. This was converted to a *per capita* catch rate, which was kept fixed back to 1950. Combining the *per capita* rate with the population time series, subsistence catches were estimated from 1950–1976. Information from local fishers also indicated that in the recent time period approximately 25%

[1] http://siit2.bcn.cl/indicadores/pesca [Reviewed: 21 January 2014]
[2] Note that within the SERNAPESCA data, there were landings recorded as *Thyrsites atun* or '*sierra*' (snoek). Based on local knowledge of the fisheries, these catches were assumed to be misidentified and were considered to be *Decapterus muroadsi* or '*ature*' (Amberstripe scad; R. Vega, pers. obs.).

of the total catch goes unreported (S. Pakarati, pers. comm.; M. Hey, SERNAPESCA, pers. comm.), with these catches representing shore-based subsistence fishing. Therefore, from 2000–2010, the SERNAPESCA data (representing artisanal catches) were taken to represent 75% of total catch, and used to calculate the missing 25% subsistence catch. To derive a complete time series, the estimated subsistence catch in 2000 was converted into a *per capita* catch rate. The *per capita* subsistence catch rate for the years between 1977 and 2000 were then interpolated, and combined with population information to complete the time series of subsistence estimates.

As there was no specific information pertaining to the species composition of subsistence catches, a composition was derived using information on coastal catches (Inostroza, 1979) along with local expert knowledge (R. Vega, pers. obs.). This composition (Table 1) was applied to the subsistence catch for the whole time period.

Some (legal) catches of swordfish, sharks, marlins and other pelagic species are commonly made in the EEZ of Easter Island Province in the course of prospective or other surveys by Chilean vessels (Vega *et al.*, 2009). These are included in official Chilean national catch statistics simply as 'Chilean catches'. The quantities involved here are, however, likely dwarfed by the catches of illegal pelagic fleets operating in the EEZ of Easter Island Province. Thus, the inhabitants of Easter Island frequently observe the lights of industrial vessels operating at night, and the remains of longline fishing gear washing up on the shores (Yáñez *et al.*, 2007; Muñoz, 2011).

A rough estimate of the magnitude of the illegal catch taken from the EEZ of Easter Island was attempted here based on preliminary results of a remote-sensing study performed by SkyTruth (skytruth.org) for the Pew Charitable Trusts' Global Ocean Legacy Project,[3] which were made available by Mr. Paul Woods (SkyTruth, pers. comm.). The approach used involved two different, satellite-based detection methods, one being based on picking up the signals given by the globally available Automatic Identification System (AIS) (i.e., by ships transponders), the other (more expensive) detection method being radar-based. Since vessels commonly lose their insurance coverage during the times that their transponders are switched off, it can be assumed

[3] http://www.pewenvironment.org/campaigns/global-ocean-legacy-easter-island/id/85899397305

that any vessel identified by radar within the Easter Island EEZ with its transponder switched off was not innocently passing through, but was (illegally) fishing.

In the six months from January to June 2013, SkyTruth estimated 295 vessel-days of illegal fishing. Thus, this equates to 590 vessel days per year if proportionality can be assumed, or two vessels fishing 250 days a year to remain conservative. These vessels were likely pelagic trawlers or longliners (i.e., vessels that require catching between 100 and 1,000 $t \cdot year^{-1}$ to operate profitably; see Figure 3 in Pauly *et al.*, 2013).

RESULTS

Total reconstructed catches (excluding illegal) for Easter Island over the 1950–2010 time period were estimated to be almost 6,000 t (Fig. 2). Total catches were, on average, 37 $t \cdot year^{-1}$ in the 1950s, increasing steadily until 2000 (175 $t \cdot year^{-1}$), after which catches display year to year fluctuations, averaging 185 $t \cdot year^{-1}$ in the 2000s (Fig. 2a). Over the entire time period considered, subsistence catches represented just over 1,500 t and artisanal catches amounted to 4,400 t (Fig. 2a). Subsistence catches increase only gradually over the time period, whereas artisanal catches increase from 47 $t \cdot year^{-1}$ in 1977 to almost three times that amount (130 $t \cdot year^{-1}$) in 2000.

The main fish species caught were Pacific chub (*Kyphosus sandwicensis*), yellowfin tuna (*Thunnus albacares*), amberstripe scad or *'ature'* (*Decapterus muroadsi*), and rainbow runner or '*remo'* (*Elagatis bipinnulata*), with approximately 1,870 t, 1,400 t, 510 t, and 480 t, respectively, over the 1950–2010 time period (Fig. 2b). Invertebrate catches were dominated by lobster with approximately 80 t over the study period, while octopus and sea urchins each accounted for 9 t over the same period.

Artisanal catches consisted of 2,100 t of offshore catches and almost 2,300 t of coastal catches. The offshore catches dramatically increased after 1977 from 16 $t \cdot year^{-1}$ to a peak of 83 $t \cdot year^{-1}$ in 2000. Offshore catches then declined to 43 $t \cdot year^{-1}$ in 2005, before experiencing a resurgence in 2007–2008 of 80 $t \cdot year^{-1}$, before declining again thereafter (Fig. 3a). Coastal catches increased steadily from 16 $t \cdot year^{-1}$ in 1950 to 47 $t \cdot year^{-1}$ in 2000. In the 2000s, coastal catches increased suddenly to a peak at 110 $t \cdot year^{-1}$ in 2006. After a sudden decline in 2007, catches have been increasing steadily and were 97 $t \cdot year^{-1}$ in 2010 (Fig. 3b).

Artisanal offshore catches were dominated by yellowfin tuna with 1,400 t (65% of offshore catches; Fig. 3a). Bigeye tuna or '*mata tata'* (*Thunnus obesus*) and swordfish or '*ivi heheu'* (*Xiphias gladius*) are the next highest contributors to the catch (8% and 7%, respectively). Artisanal coastal catches were dominated by '*nanue'* (*Kyphosus sandwicensis*) with 1,200 t (53% of the coastal catch; Fig. 3b). Amberstripe scad and rainbow runners were the next most important contributors to the coastal catch (22% and 5%, respectively). Subsistence catches were also dominated by Pacific chub with 650 t (42% of subsistence catches; Fig. 3c). Amberstripe scad and labyrinth fish ('*cojinoba'*) were the next most important contributors (370 t and 280 t, respectively). Table 2 lists some species that are not in Table 1, but which also appear in the artisanal catches (see FishBase [www.fishbase.org] for a complete list of the fishes occurring in Easter Island, including their Rapa Nui names, their threat status and other information).

Finally, illegal industrial catches may be in the range of between 200 and 2,000 $t \cdot year^{-1}$, or to take the geometric mean of these extremes (Weinstein, 2012), about 630 $t \cdot year^{-1}$, which is over 3 times the current Rapa Nui catch. When that fishery began is unknown; however, the maps of ship surface observation presented by Parrish (1989), which refer to 1984–1987, suggest that at the time, the large Soviet fleets targeting horse mackerel or '*jurel*' (*Trachurus murphyi*) did not operate in the vicinity of Easter Island. Therefore, if we assume that vessels began fishing in the area in 1990 and reached the mean catch by 1995 (and then maintained that catch), it would equate to 11,655 t of illegally caught fish from 1990–2010, which is nearly twice the estimated domestic catch by the Rapa Nui from 1950–2010. Although this is a rough estimate of the illegal catches in the waters of Easter Island it highlights the importance of assessing these catches.

DISCUSSION

The fishing history of Easter Island, as reconstructed here, suggests that domestic fisheries catches have increased substantially since the late 1970s. This is due to an increase in offshore catches, specifically yellowfin tuna. The increase in tuna and other large pelagics from the late 1970s to the recent time period may be partially due to the increase in tourist arrivals to the island. As mentioned earlier, tourist consumption was not estimated separately, but is assumed to be included, at least partially, in the artisanal estimate.

Over the 1950–2010 time period, approximately 6,000 t of catch was taken. Although catches from the artisanal sector in recent years appear to be documented in official records, it is unknown whether catches were also included in previous years. Whether any of these catches have been incorporated into the official landings data for mainland Chile, which is supplied to the United Nations Food and Agriculture Organization (FAO), remains unclear. Nevertheless, detailed fisheries catches for Easter Island were not readily available for this study (with the exception of the 2000–2010 time period), suggesting that such data are also not easily obtained for management and conservation purposes. Furthermore, the data that are available are very incomplete. Subsistence fishing is not captured by official landing statistics, despite being important when discussing food security issues. Enumeration of catches, even if small in comparison with other countries, is crucial to fisheries management, particularly for remote islands where people are reliant on local resources (Zeller *et al.*, 2006).

Another major concern is the status of the tuna stocks. Tunas are oceanic fishes with often long migration routes. If there have been recent declines in landings of yellowfin tuna, the main species caught in Easter Island, the reason could thus be depletion by foreign fleets in neighbouring waters, among others (Castilla *et al.*, 2013). The catch taken by fishing vessels operating illegally within the EEZ of Easter Island Province, however, should also have an adverse impact on the domestic catch of oceanic fishes such as yellowfin tuna, given the oligotrophic (i.e., unproductive) nature of the waters in that EEZ. Hence, enforcement will be of utmost importance if, in addition to the existing marine reserve of Salas y Gómez, a marine reserve should be declared around Rapa Nui.

With increasing migration from mainland Chile and a developing tourism market, Easter Island's natural environment is under threat of overexploitation. Although the terrestrial landscape was stripped away long ago, the marine environment can still recover. The fate of this unique ecosystem and the array of endemic species present depend on the ability to establish areas where fishing and invertebrate collection is prohibited (DiSalvo *et al.*, 1988). Protection of key marine areas such as *motus* (islets) off the southwest point of the Island would extend protection to important archeological and species-rich sites (DiSalvo *et al.*, 1988; Disalvo and Randall, 1993). A fishery management plan for coastal species could ensure the availability of species for domestic consumption on the island. We hope that a way will be found to protect the marine

environment of this unique landscape, which has such an interesting ecological and anthropological past.

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Table 1. Taxonomic breakdown (percent contribution) of subsistence fisheries catches for Easter Island based on Inostroza (1979) and expert opinion (R. Vega, pers. obs.). English names verified in Randall and Cea (2011).

Local name	English name	Scientific name	%
Nanue[a]	Pacific chub	*Kyphosus sandwicensis*	42.2
Remo[a]	Rainbow runner	*Elagatis bipinnulata*	24.0
Cojinoba[b]	Labyrinth fish	*Schedophilus velani*	18.0
Ruhi[a]	Black trevally	*Caranx lugubris*	4.5
Ura[a]	Lobster	*Panulirus pascuensis*	2.5
Erizo[b]	Sea urchins	*Echinometra insularis*	0.6
Pulpo[b]	Octopus	*Octopus rapanui*	0.6
Po'opo'o[a]	Deepwater jack	*Carangoides equula*	0.4
Tollo o tiburón[b]	Galapagos shark	*Carcharhinus galapagensis*	0.3
Pescado no classificado	Miscellaneous fish nei	Marine fishes nei	6.9

[a] Rapa Nui name; [b] Spanish name

Table 2. Scientific and common names (in *Rapa Nui* if available) of fishes not in Table 1, but which may appear in artisanal catches (from Eberhard Burgos and Inostroza, 1977, and R. Vega, pers. obs.).

English (and *Rapa Nui*) names	Scientific names
Albacore (*ave ave*)	*Thunnus alalunga*
Amberstripe scad (*ature*)	*Decapterus muroadsi*
Bigeye tuna (*mata tata*)	*Thunnus obesus*
Glasseye (*mata uira*)	*Heteropriacanthus cruentatus*
Hapuku wreckfish (*kopuku haharoa*)	*Polyprion oxygeneios*
Jack (*papara'uri*)	Carangidae
Oilfish (*konso*)	*Ruvettus pretiosus*
Pomfret	*Taractes rubescens*
Ruby snapper (*paratoti*)	*Etelis carbunculus*[a]
Skipjack tuna (*barrilete*)	*Katsuwonus pelamis*
Squid (*calamar*)	Ommastrephidae
Swordfish (*ivi heheu*)	*Xiphias gladius*
Wahoo (*kana kana*)	*Acanthocybium solandri*
Yellowfin tuna (*kahi*)	*Thunnus albacares*
Yellowtail amberjack (*toremo*)	*Seriola lalandi*

[a] Note that in Randall and Cea (2011) this species was listed as *Etelis marshi*. *Etelis marshi* remains a synonym, but is no longer the valid name.

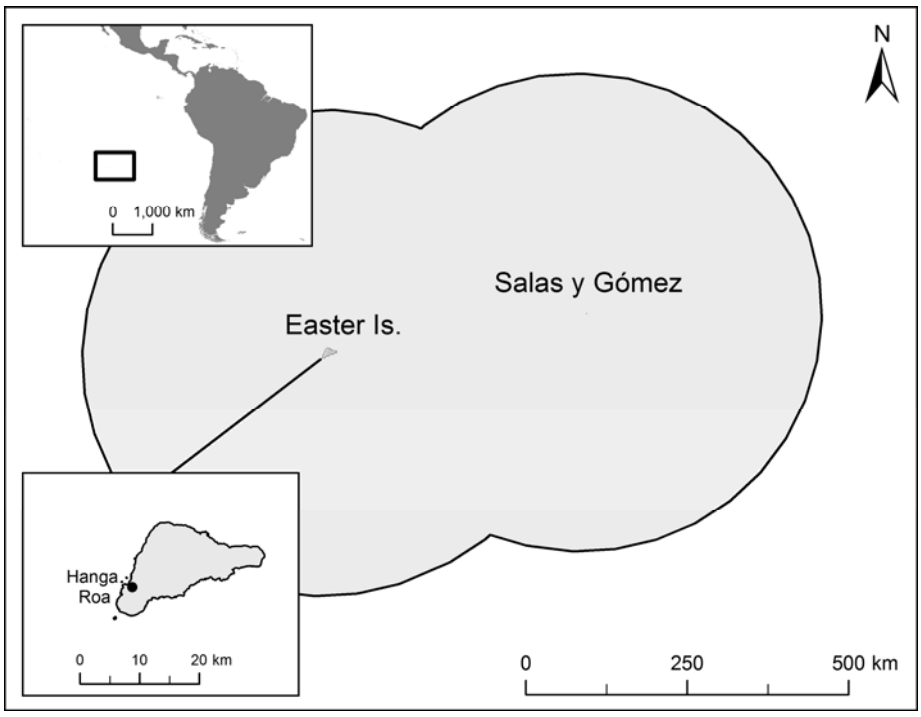

Figure 1. The Exclusive Economic Zone of the Easter Island Province of Chile, which is comprised of Easter Island proper (or Rapa Nui) and Salas y Gómez.

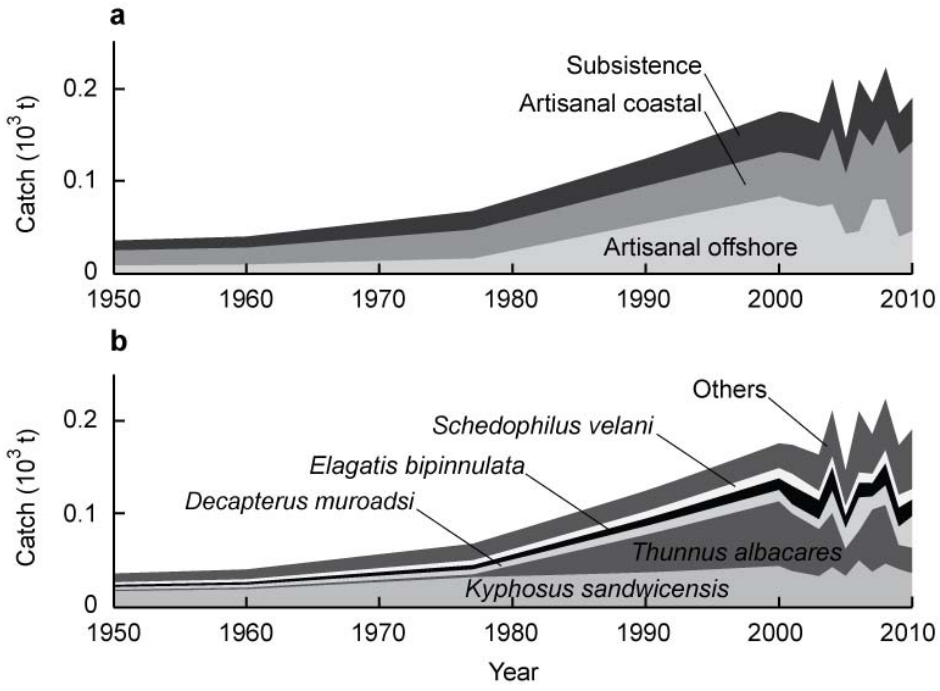

Figure 2. Total reconstructed catches for Easter Island, 1950-2010, by a) fishing sector, and b) taxonomic breakdown (see Tables 1 and 2 for the corresponding common names). The 'other' category consists of 19 additional taxonomic groups.

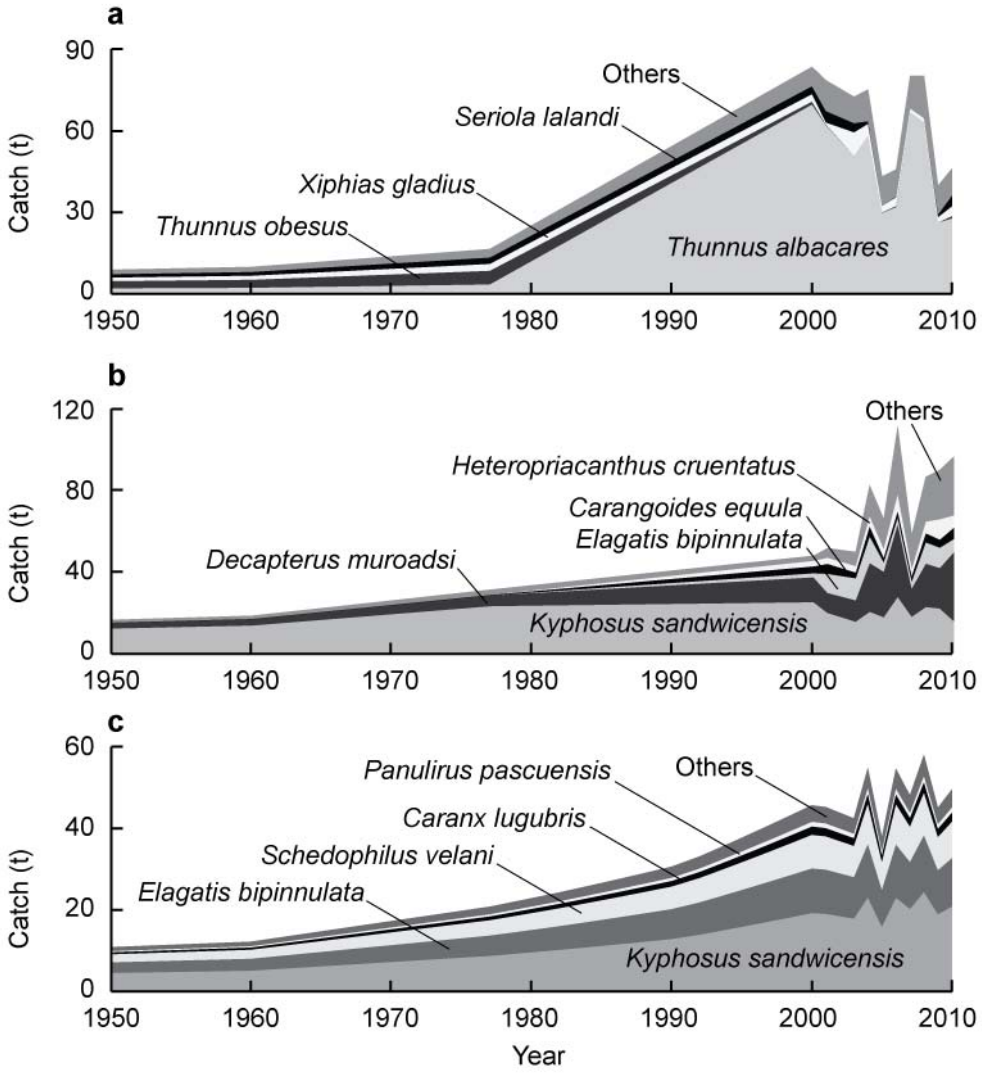

Figure 3. Total reconstructed catches for Easter Island, by taxa, 1950-2010, for a) the artisanal offshore sector; b) the artisanal coastal sector; and c) the subsistence sector (see Tables 1 and 2 for the corresponding common names).