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## A synthesis from 40 years of Pacific Island sea cucumber export

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### 1. Background

Pacific Island countries and territories (PICTs) have been producing beche-de-mer for Chinese consumers for over a century (Conand 1989). There is now widespread overfishing across the region and many countries have resorted to the extreme but necessary measure of export moratoria, to protect their stocks (Pakoa and Bertram 2013; Purcell et al. 2013). Today, it is evident that the modern exploitation of sea cucumbers in the Pacific, starting in the 1980's, has been unsustainable.

The global beche-de-mer market has been resilient to changing production and trade conditions (e.g. stock declines, closed fisheries, regulations, public opinion on conservation). Global sourcing has expanded rapidly, developing new products and absorbing alternative target species (Eriksson and Clarke 2015). Over 90% of tropical coastlines now lie within countries that supply sea cucumber to Hong Kong, an intermediary market for China (Eriksson et al. 2015).

Historically, the lack of ecological and fishery data has limited PICTs ability to determine sustainable rates of exploitation. One data source that has been under-utilized is the national trade statistics. Export volumes are generally recorded by national customs agencies because countries collect revenue on export licenses or trade tariffs, or regulate the fishery through export quotas. These trade statistics have so far been used to summarize broad trends (e.g. Kinch et al. 2008, Purcell et al. 2009, Pakoa 2014) and to explore the value of fisheries in the Melanesian sub-region (Carleton et al. 2013). These export data offer an opportunity to evaluate patterns of production to assist in establishing and refining management approaches that respect realistic levels of production, and could yield more continuous market supply.

We collated historic export statistics from 14 PICTs (Fiji, French Polynesia, Fed. States of Micronesia, Kiribati, New Caledonia, Palau, Papua New Guinea, Rep. Marshall Islands, Samoa, Solomon Islands, Tonga, Tuvalu, Vanuatu, Wallis and Futuna). The data comprised total annual exports of beche-de-mer for the period 1971-2013. We also used Hong Kong trade statistics 1996-2011 to evaluate Pacific contribution to global trade.

## 2. Pacific historical production and trade patterns

Since 1971 these PICTs have recorded over 32,000 t of beche-de-mer exports. Annual sea cucumber production from the region peaked in 1992 at 2,043 t (Figure 1). Melanesian countries exported considerably more sea cucumbers than countries from Polynesia or Micronesia. Exports from Melanesia fell sharply from 2010, responding to fisheries closures in PNG, Vanuatu and Solomon Islands. In contrast, Polynesia and Micronesia have more recently increased exports from re-openings of fisheries, notably in Tonga (Polynesia) and in Palau and Marshall Islands (Micronesia).

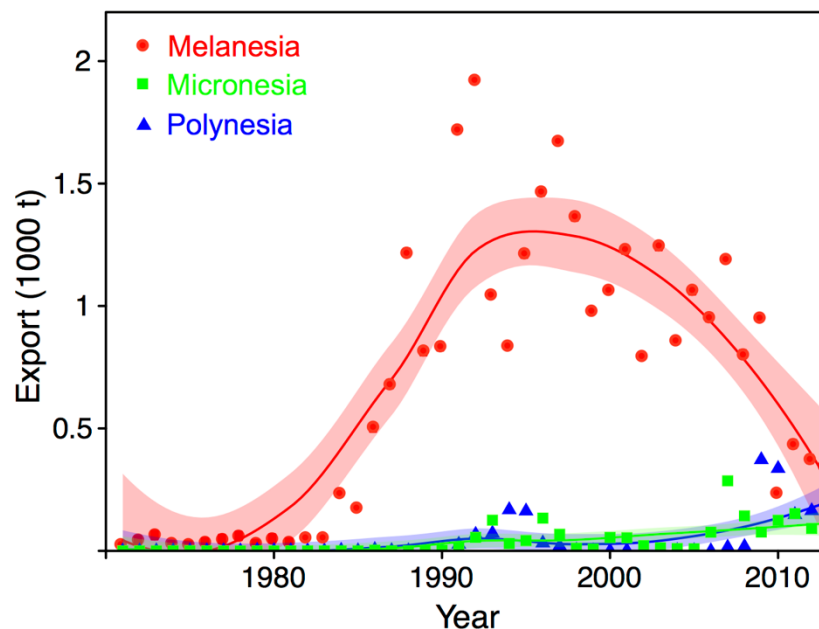


Figure 1. Total annual sea cucumber exports from Melanesia, Micronesia and Polynesia. Fitted lines are loess curves and shaded areas are 95% confidence intervals.

The region's historical production pattern is mirrored in Hong Kong imports: in 1998 the Pacific contributed nearly half of total Hong Kong sea cucumber imports, however this fell to 14% in 2011. The percentage contribution is influenced both by increased imports from a growing number of other countries in the world and a decline in exports from the Pacific.

### 3. Different countries operate fisheries under different realities

Country land area was the most influential factor on beche-de-mer production dynamics through time. Land area can be interpreted as a proxy for productivity of coastal waters and habitat complexity, because island geology-type and its biogeography influences nutrient input through terrigenous influx and oceanography (Littler et al. 1999, McClanahan 2015, Williams et al. 2015). Land area can also be interpreted as a measure of coastline complexity influencing species distribution (Chefaoui 2014). Stocks will be more able to absorb fishing pressure in high-island states with large landmass, than in low lying atolls because these are productive complex interconnected environments that have a greater capacity to support diverse, abundant and productive sea cucumber assemblages and fisheries.

### 4. Towards guidelines for tailored approaches to management

The message is that rates of exploitation must be balanced against local environmental conditions. Countries will need to tailor approaches based on the inherent productivity of shallow inshore habitats. Harvests from atoll nations will need to be at lower levels per unit area than in the high islands in Melanesia, where nutrient loads are greater. Two information sources can help guide tailored approaches:

First, historical fishing intensity per unit area measurements, coupled with understanding about fishery status, can help tailor exploitation levels at the national level. For example, Tonga has exported about 41 kg year<sup>-1</sup> km<sup>-2</sup> shallow water (0–30 m depth) and fishing periods have been followed by extended closures due to overfishing. Evaluating and adjusting this measure can help identify rates of exploitation that might be sustained over longer periods than past booms and busts.

Second, abundance assessments can inform management about impact and recovery when snapshot in-water stock surveys are repeated through time. Through extensive fishery independent in-water surveys across 17 PICTs, SPC have provided early suggestions of what might constitute densities for “healthy” sea cucumber stocks for 18 commercial species (see table 6 in Pakoa et al. 2014). These abundance measures are valuable references for future assessments and to inform managers when there are no local baselines to compare against.

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