

## The influence of processing techniques on the quality and nutritional composition of tropical sea cucumbers

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*Sea cucumbers in the Pacific Islands region are processed according to methods outlined by Chinese processors some two centuries ago. Sea cucumber tissue is composed of high quality nutrients that help maintain the well-being of human consumers. Processing sea cucumbers through a subsequent boiling and drying process, however, leads to the loss of vital nutrients such as omega-3 fatty acids and proteins. The current study is in progress at James Cook University in Townsville, Australia, and is investigating nutrient loss from sea cucumbers through various processing techniques used in the Pacific Islands region. The main outcome from this study is the development of a novel technique aimed at reducing nutrient loss during the processing stage, and increasing the income for Pacific Island communities.*

### Introduction

Holothurians (sea cucumbers) have been harvested for over two centuries and at least 58 species are currently harvested and traded around the world. Sea cucumbers are generally gutted, boiled (several times) and dried, and the final dried product is known as beche-de-mer. The current market mainly targets species from the genus *Holothuria* but also trades in species belonging to the genera *Actinopyga*, *Bohadschia*, *Stichopus* and *Thelenotia*. *Holothuria* species such as *H. scabra*, *H. fuscogilva* and *H. whitmaei* are among the most highly valued tropical species on the Asian markets.

According to the available scientific literature, sea cucumber tissue is rich in protein (43%) but low in fat (2%). The edible tissue of sea cucumbers also serves as a tonic and traditional remedy for hypertension, asthma, rheumatism, cuts and burns, impotence and constipation. Sea cucumbers are also known for their unique biological and pharmacological activities such as their antiangiogenic, anticancer, anticoagulant, antihypertension, anti-inflammatory, antimicrobial, antioxidant, antithrombotic, antitumor and wound healing properties. In addition, sea cucumbers are well supplied with amino acids, collagen and fatty acids.

Some research has investigated the relationship between varying sea cucumber processing techniques and the chemical composition of the end-product, beche-de-mer. It is likely that the nutrient content of beche-de-mer is significantly affected by processing. Current processing techniques (cooking and drying), which have been used in the Pacific Islands since the 1800s, have been studied at the University of the South Pacific.

The results show that poor processing techniques lead to heavy losses in revenue, as could be expected with the trading of poor-quality products to Asian markets. The effects of improved and/or new processing methods on the physical characteristics, nutrient content and marketability of beche-de-mer have yet to be determined. This aspect provides a basis for this study, which investigates the impacts of processing techniques on the quality and nutritional composition of *Holothuria scabra* (sandfish). *H. scabra* was chosen for this study because it is the most valued tropical holothurian species, and can easily be handled in ponds for mass production.

### Research purpose

The traditional sea cucumber processing technique (which mostly involves gutting, boiling and drying) has been used in the Pacific Islands region since the 1800s with little to no innovations. It is still considered to be the best possible method for processing and preserving sea cucumbers. With this method, however, processors are unaware of the losses of essential nutrients such as important collagen, lipids and proteins due to the multiple times the sea cucumbers are boiled and dried. Therefore, the purpose of the current project is to determine a good quality yield when processing tropical sea cucumbers using the traditional drying and salting technique, and compare it with the one obtained when using newer techniques that are designed as a part of the current project. The essential nutrients within the processed sea cucumbers will also be analysed for all processing techniques used in the present study. It is hoped that the study will help elaborate a new technique that would suit the modern market and make a product that is marketable globally.

### Materials and methods

The study, which is being conducted at James Cook University in Townsville Australia, and will run from 2013–2017. It is funded by the Australian Centre for International Agricultural Research (ACIAR) project (FIS/2010/096), “Evaluating the impacts of improving postharvest processing of sea cucumbers in the western Pacific region”, which is administered by Southern Cross University, with James Cook University being a major research partner. This ACIAR project is aimed at raising awareness about the importance of sea cucumber processing for village communities that are dependent on this resource for income. The targeted research species, *H. scabra*, will be sourced from Fijian waters where it can be easily harvested or purchased from fishers and processed at the University of the South Pacific in Fiji. The target species will be subject to different treatments during processing, using modified processing conditions and flavourings together with the preservatives and packaged using a number of advanced packaging techniques. The newly developed sea cucumber processing method will enable beche-de-mer to have a longer shelf life, and better texture and taste.

### Expected outcomes and significance of the present study

The results from this study will provide an understanding of processing techniques that could be used to preserve the nutrient content of sea cucumbers and produce a better quality yield. These techniques could potentially eliminate the drying process because the new generations of Asian consumers are more inclined to use “ready-to-eat” sea cucumber products than going through the time-consuming rehydrating, preparing and cooking process. Successfully applying the newly developed processing method could lead to the development of new products and new markets for beche-de-mer. The introduction of novel techniques could also enable value adding to low-value species, thus providing better revenue for fishers in the Pacific. As an example, a processor in Tonga has increased the return value of *Holothuria atra* (lollyfish) by selling fresh vacuum-packed products, whole or shredded (see Fig. 1).

It is also hoped that the outcome of this study will create opportunities to increase food safety when processing sea cucumbers.



Figure 1. Frozen whole (left) and shredded (right) lollyfish (*Holothuria atra*).