# Draft Status Review Report

# of

# The Black Teatfish (*Holothuria nobilis*)

Peer Reviewer Comments

---

We solicited review of the Draft Status Review Report of the Black Teatfish (*Holothuria nobilis*) Petitioned Under the U.S. Endangered Species Act. Three people agreed to serve as peer reviewers. Reviewer comments are compiled below from comments on drafts of the manuscript and are not in the order of the reviewer identification list below. Comments are not associated with the order of the reviewers as listed below.

Reviewers (listed alphabetically):

**Dr. Chantal Conand**
Emeritus Professor
University of Reunion

**Mohamed Hasan**
Suez University
Department of Environmental Sciences

**Dr. Jeffrey Kinch**
Pacific Community
New Caledonia

---

**Specific Responses to Terms of Reference Questions** (not associated with order of names as they appear above)**:**

**Reviewer 1:**

**Evaluate the adequacy, appropriateness and application of data used in the Status Review document.**

1. In general, does the Status Review include and cite the best scientific and commercial information available on the species, its biology, stock structure, habitats, threats, and risks of extinction?
   A few more recent references are given to update the Review. It is questioned why this species *H. nobilis* has been reviewed before *H. whitmaei* for which the situation is clearer for CITES (2019).

2. Are the scientific conclusions factually supported, sound, and logical?
   Probably necessary to be less categoric in conclusions.

3. Where available, are opposing scientific studies or theories acknowledged and discussed?
   The decisions by IUCN and CITES are important and the species *H nobilis* is listed in their appendix and category of endangered species.

4. Are uncertainties assessed and clearly stated?
   They are, but some updating is needed

**Evaluate the findings made in the "Individual Species Extinction Risk Assessments" section of the Status Review**

1. Are the methods used for the Extinction Risk Analysis valid and appropriate?
   They are appropriate

2. Are the results and conclusions of the Extinction Risk Analysis supported by the information presented?
   Yes, some update is important

**Reviewer 2:**

**Evaluate the adequacy, appropriateness and application of data used in the Status Review document.**

1. In general, does the Status Review include and cite the best scientific and commercial information available on the species, its biology, stock structure, habitats, threats, and risks of extinction?
   Yes, for what is available. The FAO Expert Panel had similar issues with finding suitable information.

2. Are the scientific conclusions factually supported, sound, and logical?
   Yes, given the information used. I do think however that more information from *H. whitmaei* assessments, particularly density data could have been used as proxy data. But this is also limited.

3. Where available, are opposing scientific studies or theories acknowledged and discussed?
   Yes, where this allows.

4. Are uncertainties assessed and clearly stated?
   Yes, maybe a little too much reiteration.

**Evaluate the findings made in the "Individual Species Extinction Risk Assessments" section of the Status Review**

1. Are the methods used for the Extinction Risk Analysis valid and appropriate?
   Yes
2. Are the results and conclusions of the Extinction Risk Analysis supported by the information presented?
   Yes

**Reviewer 3:**

**Evaluate the adequacy, appropriateness and application of data used in the Status Review document.**

1. In general, does the Status Review include and cite the best scientific and commercial information available on the species, its biology, stock structure, habitats, threats, and risks of extinction?
   Yes, it does but there are some missing and inadequate information as follows:
   1. The author stated that " Life history information can be difficult to assess in sea cucumbers because they have few hard body parts, making it difficult to measure, weigh accurately and tag", these can be done see Hasan and Johnson, 2019 " Restoration of Stocks of the Sea Cucumber *Holothuria fuscogilva* in the Red Sea with transplanted Wild Juveniles".

2. In his survey the author doesn't provide a major areas and fishing grounds as Indonesia, Philippines, Australia ..etc.
3. The data from major beche de mer markets must be provided as Singapore, Indonesia and Hong Kong markets. The landings in these markets reflects the tonnage and destination of each species, this determine the pressure on each fishing ground in the world and the species risk index.
4. The data from table (1) is old (2011) and doesn't expressed the present status (2021).
5. The fishery data didn't provided the status of fishery at the present date (2021), catch per unit effort, fishing pressure ..etc.
6. The biological data provided need further investigations as:
    a) Length at first sexual maturity, Gonadal index, fecundity..etc.
    b) As broadcast spawner species, its necessary to determine the minimum density required for reproduction occurrence.
7. The author need to clearly determine the effect of management procedures taken on the stocks and abundance of the species.
8. The author didn't mentioned *Holothuria scarab* as a highly threatened species

2. Are the scientific conclusions factually supported, sound, and logical?
   Yes, they are.

3. Where available, are opposing scientific studies or theories acknowledged and discussed?
   Yes, the author made a good effort in stating and analyze the different point of views, researches and theories.

4. Are uncertainties assessed and clearly stated?
   Yes, they are.

**Evaluate the findings made in the "Individual Species Extinction Risk Assessments" section of the Status Review**

1. Are the methods used for the Extinction Risk Analysis valid and appropriate?
   Yes, they are but some other factors could be added as:

   - Population Structure expressed as size-frequency distribution.
   - Estimates of standing stocks
   - Stock assessment, which include population estimates, stock status and standing stocks.

2. Are the results and conclusions of the Extinction Risk Analysis supported by the information presented?
   At the productivity risk, the author stated that " Teatfish generally exhibit low natural mortality rates, low to moderate population growth rates, and variable success of larval survival and recruitment, resulting in generally low productivity", there are no data provided for all these risk factors.

---

**General Comments** (not associated with order of names as they appear above)**:**

**Reviewer 3:** In his study the author analyze the five factors concerning ESA Section 4(A)(1) to determine whether a species is endangered or threatened as they relate to the status of the black teatfish (*H. nobilis*). The result provided need more clarification as follows:

**Factor I: Present or Threatened Destruction, Modification, or Curtailment of Habitat or Range**

The author stated that "we cannot identify any specific present or future threats that may affect the features of the habitat on which the species' relies. Instead, we focus our discussion on threats to coral reef habitat as a whole.

The data given had a great deal of uncertainty because the species concerned occupy generally the hard substrates as dead corals, rocks and not only the life corals, thus the death of live corals can't be correlated with the sea cucumber species concerned.

**Climate Change Impacts to Coral Reefs**

The author stated that "Although the thermal requirements for *H. nobilis* are not well known, the species only occurs in coral reef areas of the Indian ocean. Corals exhibit high sensitivity to temperature changes and are therefore subject to bleaching"

The effect was mainly reported for coral species not for *H. nobilis*, while the depth range for the black teat is from 0 to 40 m deep, it could escape the higher temperature by going under to deeper water which have lower temperature also the animal is nocturnal in its activity thus escape higher temperature by daytime.

Temperature affects the growth and physiological performance of sea cucumbers. Generally, as temperature rises, growth rate increases, but at very high and low temperatures, individuals become dormant or die (Dong & Dong, 2009; Dong, Dong, & Ji, 2008). Also temperature mainly affects feeding and locomotion see (Sun et al, 2018).

I think it is more appropriate to examine stomach content with elevated temperature.

**Factor II:Overutilization for Commercial, Recreational, Scientific, or Educational Purposes**

This is the main factor (probably the only one) that affect the existence of sea cucumber population especially high value species.

**Factor III: Disease or Predation**

This factor has very low importance in the existence and density of sea cucumber.

**Factor IV: Inadequacy of Existing Regulatory Mechanisms**

The author provided both international and local regulations and management at different countries very well and satisfactory, but there is a need to correlate these regulation with the population status and the success of limiting the overexploitation in each country to identify the most appropriate regulation to manage the sea cucumber population.

**Factor V: other natural or manmade factors affecting its survival.**

The author stated that "At this time, we were unable to find any information on other natural or manmade factors that may be affecting the continued existence of *H. nobilis*.". I think it was better to list these factors and identify which of them affect the species and which is not.

---

**Editorial Comments** (by section of the report, reviewer numbers are not associated with order of names as they appear above):

## Executive Summary

**Reviewer 1:** RE: “bêche-de-mer”.

Or Trepang

**Reviewer 1:** RE: Additionally there is a lack of data on the current global abundance of *H. nobilis* and the species’ habitat needs, recruitment success and population connectivity.

Nevertheless it has recently been put in Appendix II of CITES (CITES 2020). Despite the present poor detailed status of knowledge, the importance of illegal fisheries makes a conservation decision necessary

**Reviewer 1:** RE: We recognize that a number of sea cucumbers are overfished, but the available data do not support a conclusion that *H. nobilis* is at risk of extinction currently or in the foreseeable future.

I do not agree with the last sentence. Look at CITES discussions and contributions by Di Simone, horellou, Conand in SPC Beche de mer Bulletin 2018, 2019 and 2020.

**Reviewer 2:** RE: This report was produced in response to a petition received from Center for Biological Diversity on May 14, 2020, to list the **sea cucumber species**, black teatfish (Holothuria nobilis) as endangered or threatened under the Endangered Species Act (ESA).

Reviewer wanted to add the bolded statement because “In the Pacific Islands region, black teatfish is reagarded as a different species, *H. whitmaei”*

**Reviewer 2:** change **“**The global abundance of *H. nobilis* is unknown, with no available historical baseline population data.” to “Actual abundance of *H. nobilis* is largely unknown across most of its geographical range.”

Abundance - measured as density, number of animals per hectare
There is some abundance information for Eygpt, Zanzibar, Seychelles, Madagascar, Kenya

**Reviewer 2:** change “appear” to “have largely been”

**Reviewer 2:** RE: moratoriums - current? or past and also present?

**Reviewer 2:** Add “to supply mostly Asian markets with”

**Reviewer 2:** change **“**bêche-de-mer” to “beche-de-mer”

as this is an English written report, the Anglicised version is used. Also explain that beche-de-mer is the processed form of a sea cucumber

**Reviewer 2:** RE: consequently may be one of the most exploited sea cucumber species in the Indo-Pacific region.

In the Pacific, black teatfish is regarded as a different species, *H. whitmaei* – suggest changing Indo-Pacific to Indian Ocean.

**Reviewer 2:** Add “understanding exploitation levels is difficult because”

**Reviewer 2:** Remove “global” - Black teatfish (*H. nobilis*) the focus of this report is restricted to the Indian Ocean and is thus not a global species

**Reviewer 2:** RE: We recognize that a number of sea cucumbers are overfished, but the available data do not support a conclusion that *H. nobilis* is at risk of extinction currently or in the foreseeable future.

This is what we assessed for FAO for CITES. Though this could change quickly depending on market demand and supply from certain countries.

## INTRODUCTION

### Scope and Intent

**Reviewer 1:** RE: We, therefore, cite extensively to this proposal throughout this status review (through directly quoted excerpts from the proposal, identified as "Excerpt from CITES (2019)" and provide updates based on new or missing information we have found since submission of this proposal. Based on this information, we present an evaluation of the species' status and extinction risk.

It is necessary to cite the IUCN decisions

**Reviewer 2:** change "This document is the scientific review of the biology, population status, and future outlook for the black teatfish (Holothuria nobilis). It provides a summary of the available data and information on the species." To "This document therefore is the scientific review of the biology, population status, and outlook for the Indian Ocean species of black teatfish (Holothuria nobilis)."

**Reviewer 2:** Add "of America (USA)"

**Reviewer 2:** RE: to include three species

Add "of sea cucumber"

**Reviewer 2:** RE: This proposal was comprehensive in its portrayal of the species' biology and ecology as well as its discussion of potential threats to the species.

There were some errors which were dealt with by the Expert Panel

**Reviewer 2:** RE: We, therefore, cite extensively to this proposal throughout this status review

better to use the Expert Panel report

**Reviewer 2:** change "the species" to "*H. nobilis*"

## LIFE HISTORY AND ECOLOGY

### Taxonomy and Distinctive Characteristics

**Reviewer 1:** RE: Further molecular analyses support the distinction between *H. nobilis* and *H. fuscogilva*, once considered synonyms, as different species (Ahmed et al. 2016).

OK

**Reviewer 1:** RE: Order: Aspidochirotida

look at WORMS the order has recently changed

**Reviewer 2:** change "The more recent use of molecular analyses resolved taxonomic confusion between teatfish in the western Indian Ocean and southwester Pacific Oceans distinguishing between three species:" To "The more recent use of molecular analyses resolved the taxonomic confusion between teatfish species in the Indian and Pacific Oceans. From this analysis, three species were distinguished:"

**Reviewer 2:** remove "olothuria (Microthele)" and "(*H. whitmaei*, with distribution in the Pacific Ocean, and *H. nobilis*, with distribution in the Indian Ocean)"

**Reviewer 2: RE:** “implying a divergence during the Pliocene of approximately 1.8-4.6 million years” Add “before present”

**Reviewer 2:** Change “protuberances (teat-like) on the tegument, visible in their” to “protuberances (which do look ‘"teat-like’") on the tegument, which are visible in both their”

**Reviewer 2:** RE: *Holothuria s.* - Are you referring to pentard teatfish (*H. sp. pentard*)? what is this, the way written is a generic discription? or unidentifed?

**Reviewer 2:** delete “However, Sweet et al. (2016) are believed to have spotted two juveniles within the patch reef off Vavvaru on Lhaviyani Atoll in Maldives in August 2015 (see Figure 4 below).” - I don't think this adds anything to the report as it is 'believed'. Was there genetic testing?

### Range, Distribution, and Habitat Use

**Reviewer 1:** RE: The species does not occur in the United States or its territories you should add details on the species given in in Purcell Samyn and Conand 2012 (FAO book)

**Reviewer 2:** Change “The black teatfish (*H. nobilis*) occurs in coral reef habitats between 0 and 40 meters depth, and is most commonly found in reef flats and outer reef slopes with a preference for hard substrates” to “*H. nobilis* occurs in tropical coral reef flats and outer reef slopes to depths between 0 and 40 meters.”

**Reviewer 2:** change “but this species” to “though it”

**Reviewer 2:** change “The species does not occur in the United States or its territories.” To “The species does not occur in the waters of the United States of America or its overseas territories.”

### Feeding and Growth

**Reviewer 1:** RE: *H. nobilis* like other sea cucumbers of the order *Aspidochirotida* are deposit see previous comment on order and again elsewhere in the text

**Reviewer 2:** Change “Digestion of nitrogen-rich compounds such as proteins converts organic nitrogen to inorganic forms, which in turn can be utilized by primary producers (Purcell et al. 2011; Purcell et al. 2016).” To “Digestion of nitrogen-rich compounds such as proteins converts organic nitrogen to inorganic forms, which in turn can be utilized by other primary producers inhabiting the respective coral reef system (Purcell et al. 2011; Purcell et al. 2016).”

### Reproduction and Growth

**Reviewer 2:** Add “in a particular location” to “With this reproductive strategy, successful fertilization depends upon the density of male and female teatfish”

They have been observed to congregate for spawning

**Reviewer 2:** change “estimated” to “thought” and “up to” to “for”

**Reviewer 2:** delete “is reported to”

**Reviewer 2:** RE: cold season - which is? I thought they would spawn as most coral reef associated organisms do in the Austral Summer months

**Reviewer 2:** Delete “Successful fertilization depends upon sufficient population density and proximity of adults (Purcell et al. 2010; Purcell et al. 2011; CITES 2019a; FAO 2019).” - repetitive to the above paragraph

**Reviewer 2:** RE: It is unknown if the species can successfully reproduce in deeper waters (Conand et al. 2013).

I would think unlikely as they are not deep dwelling species despite being found to 40 m, this would an the odd animal

**Reviewer 2:** RE: sea cucumbers settle on the seafloor - specific cues for settlement?

**Reviewer 2:** RE: Mortality of pelagic larvae is believed to be quite high, while natural mortality rates of adults is believed to be low - though they are predated

**Reviewer 2:** RE: sediment or crevices within the coral habitat - cryptic

## Genetics and Population Structure

**Reviewer 2:** change “we could not find any” to “there is limited additional”

## ABUNDANCE AND TRENDS

**Reviewer 1:** RE: Because this harvest is illegal, park agents have difficulty determining the quantities and species involved (Mulochau 2018b).

For more infos on the illegal cite Conand 2018 in SPC BDM Bulletin

**Reviewer 1:** update and check what is Madagascar and France - Eparses islands are French

**Reviewer 1:** You often cite Conand and Muthiga 2007 (the start of the programme) but look at the results in Muthiga and Conand 2013 wiomsa book

**Reviewer 2:** Add “mostly” after “This is due”

**Reviewer 2:** RE: Additionally, few countries record catches or exports by species, making it difficult to determine the utilization of a single species - I think most countries would do this as needed for GDP estimates and foriegn earnings

**Reviewer 2:** Change “they are even more sparse for *H. nobilis*” to “they are considered even more so for *H. nobilis*”

**Reviewer 2:** RE: Egypt - see the Expert Panel report

**Reviewer 2:** Change “individuals of the species” to “*H. nobilis”*

**Reviewer 2:** Delete “extremely”

**Reviewer 2:** Change “widen their” to explore potential fishing grounds further away”

**Reviewer 2:** change “For” to “As an”

**Reviewer 2:** change “has developed” to “of sea cucumbers is now seen”

**Reviewer 2:** change “harvests appeared” to “harvesting commenced”

**Reviewer 2:** Delete “*H. nobilis* has been fished for many years in Tanzania and shows signs of depletion (Mgaya and Mmbaga 2007 and Mmbaga 2013). Additionally,”

**Reviewer 2:** RE: 4-5m vs. 2-3m - its not really that much of a range shift

**Reviewer 2:** delete “This may suggest over harvest of the species in shallow reef areas.”

**Reviewer 2:** RE: Tanzanian natural resource managers have struggled with implementing a management plan (Mmbaga 2013). - see Erikkson et al, 2012

**Reviwer 2:** RE: This may help in the recovery of sea cucumber populations. - how? it is also very remote?

**Reviewer 2:** delete "based on a lack of data, or their status is only described in qualitative terms."

**Reviewer 2:** change "in abundance are unknown due to a lack of data." To "in abundance is very limited."

**Reviewer 2:** RE: with one exception – the Seychelles - why, because they have a MPA as mentioned above?

**Reviewer 2:** delete "The population of *H. nobilis* in the Seychelles is" replace with "where it is"

## ANALYSIS OF ESA SECTION 4(A)(1) FACTORS

### Present or Threatened Destruction, Modification, or Curtailment of Habitat or Range

**Reviewer 2:** delete "whether it be for protection or for the organic matter found in the sediment, we do"

**Reviewer 2:** add "supporting overall" before coral reef health

**Reviewer 2:** change "can be utilized by primary producers" to "can be utilized by other primary producers inhabiting the respective coral reef system"

**Reviewer 2:** RE: Further, the role of sea cucumbers in the breakdown of calcium carbonate sediment provides an important source of alkalinity and may, at a local scale, play a role in buffering ocean acidification on coral reefs

sea cucumbers are themselves at risk from ocean acificication.

Human-induced increases in of atmospheric carbon dioxide (CO2) concentrations are expected to cause rapid changes in the earth's climate causing significant effect on coastal ecosystems, especially estuaries and coral reefs through changes in temperature, sea level rise, the availability of water and associated nutrients from precipitation and runoff from land, wind patterns, and storminess. Increased CO2 concentrations lower ocean pH, which in turn lower saturation states of the carbonate minerals calcite, aragonite, and high-magnesium calcite, the materials used to form supporting skeletal structures in many major groups of benthic calcifiers such as corals calcifying macroalgae, benthic foraminifera, molluscs, and echinoderms resulting in smaller size and body weight (Shirayama and Thornton, 2005). It is possible, but untested, that reduced calcification rates would also effect holothurian spicule formation. (from Kinch et al., 2008)

**Reviewer 2:** change "not provide us with an understanding" to "not provide a suitable understanding"

**Reviewer 2:** change "we cannot" to "it is difficult to"

**Reviewer 2:** RE: may affect the features of the habitat on which the species' relies

Rising temperatures also influence organism's biology, affect dissolved oxygen concentrations in water, and play a direct role in sea level rise and in major patterns of coastal and oceanic circulation. Global climate change, thus has a major potential to affect sea cucumber populations and could in fact, result in the extinction of some species, the alteration of species distributions, and modifications in the flow of energy and cycling of materials within ecosystems. On reefs near low-lying coastal areas, sea level rise would likely increase coastal erosion rates, thus degrading water quality and reducing light penetration. (from Kinch et al., 2008)

**Reviewer 2:** delete "Instead, we focus our discussion on threats to coral reef habitat as a whole."

**Reviewer 2:** change “ones” to “potential impacts”

**Reviewer 2:** change “likely to drastically affect reef-building coral species and thus coral reef habitat” to “likely to affect coral reef habitats”

**Reviewer 2:** RE: pollution (LBSP; i.e., sedimentation and nutrients)

See: https://coastfish.spc.int/component/content/article/412-vulnerability-of-tropical-pacifc-fisheries-and-aquaculture-to-climate-change.html

**Reviewer 2:** delete and also discuss the physical destruction of coral reefs

**Reviewer 2:** add “tropical” before coral reefs

**Reviewer 2:** capitalize the “o” in Ocean

**Reviewer 2:** change “(expulsion of symbiotic zooxanthellae)” to “(i.e., the expulsion of their symbiotic zooxanthellae)”

**Reviewer 2:** delete “below shows the extent of mass bleaching of corals in 2015 and 2016 globally.”

**Reviewer 2:** RE: Although the years 2015 and 4 to 20167 were the worst on record for reef coral reefs thus far – reference?

**Reviewer 2:** change “Indo-Pacific reef coral communities is predicted to accelerate” to “Indo-Pacific coral reefs is predicted to accelerate”

**Reviewer 2:** change “coral reef areas that” to “coral reefs that”

**Reviewer 2:** change “in number; additionally, the size of spatial refuges for coral reefs will diminish, with impacts already underway (Hughes et al. 2018b).” to “in number along with the size of spatial refuges for coral reefs (Hughes et al. 2018b).”

**Reviewer 2:** change “This degradation likely has negative implications for *H. nobilis* which predominately rely on coral for habitat.” to “This continued degradation will likely have negative implications for *H. nobilis* also as they live in coral reef for habitats.”

**Reviewer 2:** delete “Because the specific habitat requirements of *H. nobilis* are still unclear, the nature and extent of impacts on *H. nobilis* as a consequence of coral reef degradation in the Indian Ocean is unknown. Therefore, it is difficult to predict how changes in structure and/or composition of its habitat may affect its extinction risk and to what degree.”

**Reviewer 2:** RE: it is unclear whether and to what degree the changes in coral reef composition and ecological function will affect the extinction risk of this sea cucumber species throughout its range

Bell et al. (2011) also suggest that the productivity of invertebrates will decrease by five per cent by 2050, and by 10 per cent by 2100. Plaganyi et al. (2013) have suggested that climate-change could have some benefits certain shallow-water species due to an increase in habitat availability.

**Reviewer 2:** RE: there is no information to suggest which features of the coral reef or species of coral H. nobilis may be dependent on

See
https://www.researchgate.net/publication/311234596_Ecological_Roles_of_Exploited_Sea_Cucumbers

## Overutilization for Commercial, Recreational, Scientific, or Educational Purposes

**Reviewer 1:** RE: The global catch of sea cucumbers was estimated at 25,000 tonnes in 1983 and increased to 90,000 tonnes by 1989 (Purcell et al 2011, CITES 2019).

you should probably use Conand 2017 Revista Biologia tropical for recent data and analyses and Conand 2017 in Marine pollution Bulletin for the tropical fisheries, both based on more recent statistics then the ones you present here

**Reviewer 1:** In the recent years many studies have presented these and new medicinal uses. Look at SPC BDM Bulletins

**Reviewer 2:** delete “and consequently may be one of the most exploited sea cucumbers in the Indo-Pacific region”

**Reviewer 2**: RE: 1980s - 1990 more accurately coinciding with the rise of an increasingly affluent China

**Reviewer 2:** change “bêche-de-mer (boiled, dried, and smoked sea cucumbers)” to “beche-de-mer (i.e., the processed form of sea cucumbers, either boiled, dried, and smoked)

**Reviewer 2:** reformat list of forms of potential overutilization

**Reviewer 2:** change “through their range” to “throughout their range”

**Reviewer 2:** change “has proven tough to manage” to “has proven difficult”

**Reviewer 2:** RE: Overall, there is little international or regional coordination in management of these fisheries

CITES?

**Reviewer 2:** after “hand collection” add “(i.e., gleaning)” and delete “, also known as gleaning”

**Reviewer 2:** edit to “fibre-glass”

**Reviewer 2:** change “fishermen” to “fishers”

women harvest as well, and gender norms state 'fisher'

**Reviewer 2:** RE: small trawlers (e.g., roller pulling nets, beam trawl nets, scallop-drag gear) may be used

where and for *H. nobilis*?

**Reviewer 2:** delete “These fisheries tend to initially target the largest individuals of the high-value species, like *H. nobilis*. However,”

**Reviewer 2:** change “High-value species, such as *H. nobilis* will continue to be collected but more opportunistically” to “High-value species, such as *H. nobilis* will continue to be collected opportunistically as they are encountered”

as small animals are cryptic, only larger animals will be taken. This provides some refuge for *H. nobilis*?

**Reviewer 2:** RE: Then once an area is no longer economical to fish, fishersmen/buyers move on to other reefs.

if they have access and use rights? otherwise they become poachers

**Reviewer 2:** RE: The global catch of sea cucumbers was estimated at 25,000 tonnes in 1983 and increased to 90,000 tonnes by 1989

this information is now 30 years old. Is there more recent information?

**Reviewer 2**: RE: As global catches have continued to increase it is difficult to say whether catches are just being better reported than before and/or that more species are being harvested

increase in supply and demand

**Reviewer 2:** change "Overall, many of the fished populations of sea cucumbers, including across the range of *H. nobilis* (Western Indian Ocean), are considered fully exploited," to "Many of the harvested populations of sea cucumbers, including across the range of *H. nobilis* are considered either to be fully exploited,"

**Reviewer 2:** change "We will discuss the sea cucumber fisheries within the range of *H. nobilis* below:" to "Within the range of *H. nobilis*, the following can be noted."

**Reviewer 2:** change "demand of bêche-de-mer from traders from the United Arab Emirates." To "demand from traders in the United Arab Emirates"

**Reviewer 2:** add "harvesting" between "significant pressure"

**Reviewer 2:** change "Harvest in Oman was originally targeting Holothuria scabra another "high value" species (FAO 2013). We do not have data that suggests that *H. nobils* was specifically targeted, but we do know that *H. nobilis* is also considered a "high value" species in international trade." To "Harvest in Oman was originally targeting *H. scabra* (sandfish) another 'high value' species (FAO 2013) with *H. nobilis* also targeted as a complimentary 'high value' species."

**Reviewer 2:** change "The main signs of over-exploitation of sea cucumbers in Madagascar are a declining quality (high vs. low value species)" to "The main signs of over-exploitation of sea cucumbers in Madagascar is an observed shift in species composition (i.e., from high values species to lower value species).

**Reviewer 2:** delete "for the product" and "and more fishers entered the fishery"

**Reviewer 2:** change "but due to a lack of data and low financial and human resources, it was not feasible to attempt stock assessments that would inform the development" to "but due to a lack of data and limited financial and human resources, stock assessments were not conducted that could help inform the development"

**Reviewer 2:** RE: CPUE - aconymn, catch-per-unit-effort

**Reviewer 2:** change "however, this fishery is considered to not be depleted and is still actively fished" to ". The fishery however is considered to not be yet depleted and is still being actively fished"

**Reviewer 2:** change "species'" to "*H. nobilis*"

**Reviewer 2:** Change "through Illegal Unregulated Fisheries, discussed below, which may be influencing the status of *H. nobilis*." To "through IUU fisheries, discussed below, which may be influencing the status of *H. nobilis*."

**Reviewer 2:** Change subtitle from "Illegal, Unregulated Fisheries" to "Illegal Unregulated and Unreported Fisheries"

**Reviewer 2:** change “In Saudi Arabia, harvesting of sea cucumbers started in 1999 but in 2004, a ban was put in place. However, based on the results from Hasan’s (2009) survey, it is evident that illegal fishing has continued” to “In Saudi Arabia, the harvesting of sea cucumbers started in 1999 and bybut in 2004, a ban was put in place. However, based on the results from Hasan’s (2009) survey, it is evident that illegal fishing continued

**Reviewer 2:** change “banned by laws, issued by the Minister of Fish Wealth, but illegal catches and collection of sea cucumbers still occurs (FOA 2013).” To “banned by the Minister of Fish Wealth, but illegal catches and collection of sea cucumbers is still considered to be occuring (FOA 2013).”

**Reviewer 2:** change “with illegal, unregulated and unreported sea cucumbers fisheries in Egypt, which has led to dramatic declines in the population abundance and species diversity of sea cucumbers in Egyptian waters” to “with IUU fishing for sea cucumbers fisheries in Egypt, which has led to dramatic declines in the population abundance and species diversity in Egyptian waters”

**Reviewer 2:** RE: In Mauritius, the Ministry of Fisheries instituted a two-year moratorium on sea cucumber collection,

When?

**Reviewer 2:** change “While this information is about” to “The above information is for”

**Reviewer 2:** change “not specific to *H. nobilis*, one can conclude that illegal unregulated fisheries are common in the range of this species as depicted in figure 10 above, and are likely contributing to the overutilization of the species given that *H. nobilis* is a “high value” species. To “not specific to *H. nobilis*. However, it can be concluded that IUU fisheries are common in the range of *H. nobilis* (see Figure 10).”

**Reviewer 2:** change “Specific trade numbers for *H. nobilis* are unknown. The trade value chains and fishery to market traceability do not identify down to the species level. As such, the information below presents the trade of all sea cucumber species.” To “Overall and country specific trade data for *H. nobilis* are unknown in part to grouping species together.”

**Reviewer 2:** change “dried and processed sea cucumber” to “beche-de-mer”

**Reviewer 2:** delete “from marine ecosystems annually”

**Reviewer 2:** change “Sea cucumbers” to “Beche-de-mer”

**Reviewer 2:** delete “dried and processed as “bêche-de-mer””

**Reviewer 2:** change “luxury food” to “Asian”

**Reviewer 2:** add “People Republic of” before “China”

**Reviewer 2:** add USD before currency amounts

**Reviewer 2:** RE: Hong Kong retail markets range from $USD 106 to USD$ 139/kg dried

more recent figures? see https://www.sciencedirect.com/science/article/pii/S0308597X17308035

**Reviewer 2:** delete “In recent decades, production and trade of teatfish species has increased and expanded, respectively.”

**Reviewer 2:** change “about” to “approximately”

**Reviewer 2:** change “significantly” to “by almost half” and delete “of that volume”

**Reviewer 2:** delete “The entire catch is processed as bêche-de-mer and” and add “All exports went” and delete “exported to”

**Reviewer 2:** change “For example, fishermen sell to village buyers, who then sell the product to a “middleman” who sells to an exporting agent before leaving the country (Eriksson et al. 2010).” To “For example, fishers sell to ‘middlemen’ who then accumulate and on sells to an exporting agent (Eriksson et al. 2010).”

**Reviewer 2:** delete “throughout the Indo-Pacific for”

**Reviewer 2:** delete “Therefore, monitoring trade chains and sales of bêche-de- mer is very difficult in much of this region (Purcell 2011).”

**Reviewer 2:** delete “While we do not have species-specific sea cucumber trade data”

**Reviewer 2:** delete “one of the most”

**Reviewer 2:** delete “and consequently thought to be one of the most exploited sea cucumber species in the Indo-Pacific region”

**Reviewer 2:** change “may” to “could”

**Reviewer 2:** replace “on the level at which *H. nobilis* is specifically targeted or used” with “available to show that *H. nobilis* is specifically used in medical research.”

### Disease or Predation

**Reviewer 2:** Change “Birds, sea turtles, and marine mammals may prey on sea cucumbers on occasion as well” to “Birds, sea turtles, and marine mammals may also prey on sea cucumbers on occasion”

### Inadequacy of Existing Regulatory Mechanisms

**Reviewer 1:** I prefer: ‘Existing…’ and you conclude later, instead of starting with inadequacy

**Reviewer 1:** RE: Regulations to Address Climate Change

This is not my field

**Reviewer 1:** RE: Overall, many of these management measures for sea cucumber species have not performed well due to the artisanal nature of these fisheries; shortcomings in stock monitoring, catch reporting, and enforcement (Conand & Muthiga 2007; Toral-Granda et al. 2008; Purcell et al. 2010; Conand and Muthinga 2013; FAO 2019).

As I have not access to your references I am not sure that this ref is probably Muthiga and Conand 2014

**Reviewer 2:** change “The CITES  governs the international trade of CITES-listed species.” To “The CITES  governs the international trade of endangered species that are listed in the CITES Appendices.”

spell out acronymn as first time noted

**Reviewer 2:** change “August 2019, the member nations to CITES agreed to add three species of teatfish to Appendix II of CITES” to “August 2019, it was endorsed that the three species of teatfish be added to Appendix II of CITES”

many countries did not vote for listing

**Reviewer 2:** change "This listing means that some legal and sustainable trade in *H. nobilis* is allowed but is regulated. Export of black teatfish (*H. nobilis*) requires CITES export permits or re-export certificates that certify the products were legally" to "This listing means that some legal and sustainable trade in *H. nobilis* is allowed, but is to be regulated. Exports of *H. nobilis* now requires CITES export permits or re-export certificates that certify the beche-de-mer from *H. nobilis* was legally"

**Reviewer 2:** Replace "overutilization" with "market demand"

**Reviewer 2:** RE: this listing may be provide *H. nobilis* some safeguards against future depletion of populations

though probably not likely if you look at other listings of marine resources. See http://www.fao.org/3/cb2971en/cb2971en.pdf

**Reviewer 2:** change "it is likely difficult for State Authorities to determine" to "it is likely difficult for Scientific Authorities of exporting countries to determine"

**Reviewer 2:** change "establishes an expert Panel in advance of each CoP with the main task to assess" to "establishes an expert Panel in advance of each CoP. This Expert Panel is, tasked with assessing"

**Reviewer 2:** delete "but the available data for"

**Reviewer 2:** change "there was insufficient evidence of declines to make a determination for" to "was unable to make a determination due to insufficient data"

**Reviewer 2:** change "identifying" to "identification"

**Reviewer 2:** delete "to describe the adequacy of existing global and national climate change regulatory mechanisms."

**Reviewer 2:** change "In the final management report, which accompanied the 2014 final rule to list 20 species of coral" to "In the final management report for corals, which accompanied the 2014 final rule which saw 20 species of coral listed"

**Reviewer 2:** Change "United States" to "USA"

**Reviewer 2:** Add "under the Donald Trump Presidential leadership."

**Reviewer 2:** delete "the best available information indicates threats as a result of climate change will worsen into the future."

**Reviewer 2:** delete "We discuss area and location specific regulations below."

**Reviewer 2:** Change "the fishery and the export of sea cucumbers are both banned by a number of laws, issued by the Minister of Fish Wealth" to "the sea cucumber fishery and the export of beche-de-mer are both banned by the Minister of Fish Wealth"

**Reviewer 2:** Change "observations on the stocks showed rapid decline of the sea cucumber resources, so a new ban was established in 2003 (Conand 2008). There continues to be a problem with illegal, unregulated and unreported fisheries in Egypt, which continue to lead to dramatic decline in the population abundance and species diversity of sea cucumbers" to "observations on sea cucumber stocks showed rapid decline, so a new ban was established in 2003 (Conand 2008). There continues to be a problem with IUU fisheries in Egypt"

**Reviewer 2:** delete “of most sea cucumber species” and “to prevent fishery collapse”

**Reviewer 2:** change “to have the product” to “the the beche-de-mer traded is”

**Reviewer 2:** add “Zanzibar’s sea cucumber and beche-de-mer trade is”

**Reviewer 2:** RE: SCUBA - acronym or footnote definition

**Reviewer 2:** Change “are managed and regulated under several Fisheries regulations.” To “are managed under several regulations.”

**Reviewer 2:** Change “taken specimens of” to “caught”

**Reviewer 2:** Change “illegal trade of both raw and dried sea cucumbers” to “illegal trade of both fresh sea cucumbers and beche-de-mer”

**Reviewer 2:** Change “This program requires a sea cucumber license for fishing or processing and a yearly fee of 55USD is required as well.” To “This program requires an annual sea cucumber fishing and processing license be purchased for USD 55.”

**Reviewer 2:** Change “Thus, we conclude that while the” to “Subsequently, while”

**Reviewer 2:** delete “as evidenced by the continued illegal, unregulated and unreported fishing that occurs in many parts of the species’ range and may be contributing to declines in populations.”

### Other Natural or Manmade Factors Affecting its Continued Existence

**Reviewer 2:** delete “we were unable to find any”

**Reviewer 2:** Add “is not available”

### Summary of Threats and Conclusion

**Reviewer 1:** RE: However, the impacts of these threats on the species has largely been inferred based on available data on general sea cucumber populations as species-specific data are limited.

Add: ‘with the exception of Seychelles’

**Reviewer 2:** delete “in bêche-de-mer”

**Reviewer 2:** Change “Small-scale fisheries, illegal poaching, and international have” to “Supply and demand for international trade to Asian markets has”

**Reviewer 2:** delete “Major declines in sea cucumber populations have been observed as early as the 1960s (Conand et al. 2013; CITES 2019).”

**Reviewer 2:** delete “are likely the most significant threats to” add “impact on *H. nobilis* stocks”

**Reviewer 2:** delete “on the species”

**Reviewer 2:** Change “are concerning” to “are also of concern”

## EXTINCTION RISK ANALYSIS

**Reviewer 2:** Change “conducted for the black teatfish (*H. nobilis*) and considered alongside the information presented on threats to the species in the first section of this status review report.” To “conducted for the *H. nobilis* and considered with the information presented on threats as detailed in this report.”

**Reviewer 2:** Change “information on the section 4(a)(1) factors” to “information listed in Section 4(a)(1)”

**Reviewer 2:** Change “maturity ranges from 3 to 7 years” to “age of sexual maturity ranging from three to seven years”

**Reviewer 2:** RE: density-dependent reproduction and potentially low rates of recruitment, it would likely take more than a few decades (i.e., multiple generations) for any recent management actions to be realized and reflected in population abundance.

Recruitment success is important. This is influenced by current regimes and reef morphology

**Reviewer 2:** Change “time frame” to “period”

## Demographic Risk Analysis

**Reviewer 2:** delete “Below, we provide a discussion of the demographic risks for the species.”

**Reviewer 2:** delete “according to anecdotal data and site surveys”

**Reviewer 2:** Change “like other teatfish, *H. nobilis* it is thought to be more rare than other types of sea cucumber” to “Similar to other teatfish species, *H. nobilis* is thought to be rare when compared with other species of sea cucumber”

**Reviewer 2:** delete “including Geyser Bank in Mayotte and Eel Garden in Egypt”

**Reviewer 2:** add “all seen notable”

**Reviewer 2:** delete “species-specific”

**Reviewer 2:** Change “we are unable” to “it is not possible”

**Reviewer 2:** Change “needed” to “required”

**Reviewer 2:** Change “no wide-spread extirpations or a curtailment of range have been reported for this species.” To “, no widespread extirpations or a reduction of range have been reported.”

**Reviewer 2:** Change “no” to “limited”

**Reviewer 2:** Change “We considered using other species of teatfish as a reference for connectivity.” To “As a proxy other species of teatfish were used as a reference for connectivity.”

**Reviewer 2:** RE: Thus, differences in population structure may alternatively stem from subtle, species-specific differences in habitat usage, population size, or history that also have large impacts on genetic structure (Skillings et al 2014).

Work of Sven Uthicke on *H. whitmaei* on the GBR? Western Australia?

I think you could suitably use *H. whitmaei* as they are essentially the same species with *H. nobilis*

**Reviewer 2:** Delete “species’ add “*H. nobilis* specific”

**Reviewer 2:** Delete “on this species”

## Overall Risk of Extinction

**Reviewer 2:** Delete “In this process, we considered the best available scientific and commercial information regarding *H. nobilis* across its range, including associated uncertainties, and analyzed the collective condition of its populations to assess the species’ overall extinction risk.”

**Reviewer 2:** Delete “Despite much uncertainty due to limited information”

**Reviewer 2:** change “the species” to “*H. nobilis*”

**Reviewer 2:** change “curtailment” to “reduction”

**Reviewer 2:** change “its” to “*H. nobilis’*”

**Reviewer 2:** RE: species-specific information on the current abundance is unknown.

in the 2008 FAO assessment we suggested a healthy population for *H. whitmaei* should be 12.5 animalsi per hectare. See http://www.fao.org/3/i0375e/i0375e00.htm (Pages 26-27)

**Reviewer 2:** change “we do not have reliable catch or trade data for *H. nobilis*” to “reliable catch or trade data is limited”

**Reviewer 2:** Delete “which includes over 100 species, making it difficult to parse out or determine the impacts of threats on *H. nobilis* and the species’ response and current status. Additionally, we could not find catch or trade data that showed *H. nobilis* is specifically targeted throughout its range.”

**Reviewer 2:** change “*H. nobilis’* response into the future is limited” to “*H. nobilis’* future sustainability is limited”

**Reviewer 2:** Delete “across the species' range regarding its occurrence and the potential impacts to the species from ongoing and predicted stressors,”

**Reviewer 2:** Delete “given that the demographic information for this species is severely limited. We recognize that a number of sea cucumbers are overfished, but being overfished is not necessarily equivalent to being at risk of extinction.

Given the limitations of the available data, including sparse species-specific information hindering status and trend analyses, significant uncertainty regarding the identification and magnitude of potential threats to the species throughout most of its range, and a lack of demographic data to assess how *H. nobilis* is or may respond to these threats, we are unable to determine, with any confidence, the impact of identified potential threats on the status of the species presently or in the foreseeable future. Thus, we find that the best available commercial and scientific data available do not support a conclusion that *H. nobilis* is at risk of extinction currently or in the foreseeable future.”

## Significant Portion of its Range (SPR) Analysis

**Reviewer 2:** change “foreseeable” to “near”

**Reviewer 2:** Delete “currently or in the foreseeable future based on the rangewide assessment, we examined whether”

**Reviewer 2:** change “any portions of the species’ range where *H. nobilis’*” to “areas with *H. nobilis’* range that”

**Reviewer 2:** Delete “and whether any such portions qualify as “significant portions” in order to determine whether the species may qualify for listing on the basis of its status within a portion of its range.

**Reviewer 2:** add “has” in front of “partially guided”

**Reviewer 2:** change “Under the SPR Policy, we must determine whether” to “Under the SPR Policy, the determination of whether”

**Reviewer 2:** change "we first examined information relevant to making the second determination by considering whether there may be a concentration of threats in certain portions of the range and whether the species is at risk of extinction within those portions." To "the information relevant to making the second determination looks at the concentration of threats in certain areas of a species' range and whether the species is at risk of extinction within those areas."

**Reviewer 2:** change "for international trade in bêche-de-mer" to "to supply Asian markets"

**Reviewer 2:** change "as these are the main threats that we identified as likely" to "These two factors are considered the main threats likely"

**Reviewer 2:** Delete "demand throughout the western Indian Ocean (i.e. the range of *H. nobilis*). Given the wide-spread nature of these threats, we next considered whether the species may be responding differently in certain portions of its range to the point where it may be at risk of extinction from these threats within those portions."

**Reviewer 2:** change "Where we had available species-specific information" to "Where species-specific information is available"

**Reviewer 2:** RE: was considered to represent an under exploited *H. nobilis* population – reference?

**Reviewer 2:** change "While we do have limited data on the locations listed above, we do not have the demographic data to determine how *H. nobilis* may be responding to these threats and we are unable to determine the extinction risk of *H. nobilis* in any portion of its range." To "While there is limited data on the locations listed above, demographic data to determine how *H. nobilis* may be responding to these threats is largely lacking. Subsequently, it is not possible to determine the extinction risk of *H. nobilis* in any area of its range."

**Reviewer 2:** Delete "Thus, we cannot conclude that the species may be in danger of extinction in any portion of its range or likely to become so within the foreseeable future. Because we have made this determination, we did not separately examine whether any portions qualify as "significant.""

**Additional References provided by Reviewers 1, 2, and 3:**


Conand C., Polidoro2, Mercier,Gamboa, Hamel and Purcell. 2014.The IUCN Red List assessment of aspidochirotid sea cucumbers and its implications. SPC Beche-de-mer Information Bulletin #34 – May 2014.

CONAND C, MICHONNEAU F., PAULAY G. & BRUGGEMANN H. 2010. Diversity of the holothuroid fauna (Echinodermata) in La Réunion (Western Indian Ocean). WIOJMS 9 (2) : 145-151

CONAND C., STOHR S., ELEAUME M., MAGALON H. and CHABANET P. 2013. The Echinoderm fauna of Europa, Eparses Island, (Scattered Islands) in the Mozambique channel (South Western Indian Ocean). Cahiers de Biologie Marine 54: 499-504

Cahuzac S., Conand C., Govinden, E, , Léopold M. 2019. Size at sexual maturity of the flowerfish Holothuria (Microthele) sp. in Seychelles. SPC Bêche-de-mer Information Bulletin, 39

Hasan, M.H. and Johnson, K.S. (2019) Restoration of Stocks of the Sea Cucumber Holothuria fuscogilva in the Red Sea with Transplanted Wild Juveniles. Journal of Water Resource and Protection, 11, 959-980. https://doi.org/10.4236/jwarp.2019.118057

KOHLER S., GAUDRON S. & CONAND C. 2009. Reproductive biology of Actinopyga echinites and other sea cucumbers from Reunion Island (Western Indian Ocean): a contribution for a regional management of the fishery. WIOJMS 8 (1) 97-111

Léopold M. and Govinden R. 2018. SEACUSEY: Comanagement of the sea cucumber fishery in the Seychelles (2017–2018). SPC Beche-de-mer Information Bulletin 38:85–87

Plaganyi, E.; Skewes, T.; Dowling, N. and Haddon, M. 2013. Risk management tools for sustainable fisheries management under changing climate: a sea cucumber example. Climatic Change. 119: 181-197.

Purcell S.W., Polidoro B.A., Hamel J.-F., GamboaR. and Mercier A. 2014. The cost of being valuable: Predictors of extinctionrisk in marine invertebrates exploited as luxury seafood. Proceedings of theRoyal Society B – Biological SciencesDOI: 10.1098/rspb.2013.3296.