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## **DEEP SEA MARINE BIODIVERSITY: Fishing the final frontier to extinction?**

### 1. INTRODUCTION

“Clearly we are in the midst of one of the great extinction spasms of geological history” E.O. Wilson, *The Diversity of Life* (pg. 268).

E.O. Wilson in his widely read book *The Diversity of Life* was referring primarily to the extinction of terrestrial life associated with the destruction of tropical rainforests and island ecosystems. However, recent scientific information and assessments of trends in the marine environment suggest that the threat to marine biodiversity may be comparable to the mass extinction currently underway in terrestrial ecosystems.

The UN FAO report on the State of World Fisheries and Aquaculture 2000 states that 72-78% of major fisheries are fully exploited, over exploited or depleted and that most of the world’s marine ecosystems are “...close to full exploitation”. More worrisome are scientific studies indicating the profound changes to ocean and coastal ecosystems as a result of overfishing. Reviewing 40 years of catch data compiled by the UN FAO, Pauly et al in 1998 calculated that the mean trophic levels of marine ecosystems are in decline as a result of overfishing top predators such as sharks, cod, tunas, and swordfish – a trend sometimes referred to as ‘fishing down the marine food chain’.

More recently, Jackson et al took a much longer term view and reviewed paleoecological, archaeological and historical data on the exploitation and collapse of coastal ecosystems over the past 125,000 years. They conclude that the massive overharvesting of large marine vertebrates including fish species, dugongs, sea cows, sea turtles, whales and other marine mammals has led to major structural and functional changes in coastal ecosystems, often leading to the wholesale collapse of ecological communities and weakening these systems’ ability to withstand the deleterious effects of other human impacts such as nutrient runoff or global climate change. The authors conclude that the collapse of marine ecosystems may take decades or centuries to occur after the initial onslaught of overfishing, raising the specter that many more marine ecosystems may yet collapse as a result of the technological intensification and globalization of overfishing within the past 50 years.

As coastal fisheries and ecosystems are overfished, the fishing and seafood industries have increasingly turned to developing new fisheries and markets for species found in deep-sea areas. As a result, a new problem has arisen in regard to fishing on the high seas, one that involves a threat to marine biodiversity on a scale as yet unknown but likely to be severe and potentially comparable to the threat to terrestrial biodiversity associated with the loss of tropical rainforests. One of the key areas now being targeted by the deep sea fishing industry is seamounts.

### 2. WHAT ARE SEAMOUNTS?

Seamounts and associated topographical features such as deep-sea ridges and plateaus are essentially the tops of mountains or chains of mountains beneath the sea. They are generally of volcanic origin, though some are formed by vertical tectonic movement along converging plate margins. There are some 30,000 – 50,000 seamounts, deep-sea ridges and plateaus covering some 15%-20% of the ocean bottom world-wide. A large number, if not a majority, of seamounts are located in international waters. Deep-sea seamounts are generally considered to be those that are 500 meters or more beneath the surface of the sea.

While data is limited, it appears that seamounts are areas of the deep-sea high in endemic biodiversity. This means that there are species unique to seamounts that are found nowhere else in the world. Richer

de Forges, Koslow and Poore report that of 921 species of fish and benthic macrofauna collected on 24 seamounts in the Tasman and south Coral Seas, 16-36% were new to science and many, if not most, were potentially endemic to the individual seamounts or seamount clusters on which they were collected. Information reviewed by the Canadian Department of Fisheries and Oceans (DFO) found that of 92 seamounts for which information was available, on average approximately fifteen percent of the species found appeared to be unique or endemic to those individual seamounts.

Although precise information is unavailable - only a small fraction of deep-sea seamount ecosystems have been studied - information currently available indicates that the total number of species endemic to deep-sea seamounts may range from tens of thousands to several million species. These ecosystems are amongst the most prolific and potentially diverse on the planet. They are, in effect, islands of unique biodiversity beneath the surface of the sea.

### 3. WHAT IS THE PROBLEM?

Bottom trawling on seamounts has developed over the past several decades in areas of the high seas such as the Tasman Sea, the North Atlantic and North Pacific Oceans and the Southwest Indian Ocean. Australian scientists have surveyed seamount areas after trawl fleets had fished them out and moved on. They found that up to 95% of the area was stripped of the deep-water corals, sponges and other species of benthic macrofauna that characterize these unique ecosystems. Nothing but bare rock was left behind.

Deep sea bottom fishing, in particular trawl fishing, on fish stocks and species found exclusively in high seas areas on seamounts, deep-sea ridges and plateaus, is likely to grow significantly over the next several decades. Large-scale industrial fleets are increasingly developing fisheries in these deep-sea areas in response to the growing demand for seafood and the depletion of fisheries in more coastal waters. Species such as orange roughy, alfonsino and deep water red fish are amongst the species fished on seamounts on the high seas and for which a market is ready available.

In historical terms the fisheries on high seas seamounts have only just begun. However, the expertise, technology and markets are improving for these fisheries and it is not inconceivable that a major biodiversity crisis is in the making and in fact may already be underway. In terms of evolutionary biology, the widespread destruction of the marine life endemic to seamounts could be equivalent to a mass extinction event. Tens of thousands of species, hundreds of thousands, or possibly more could be vulnerable to extinction as a result of bottom fishing on seamounts. If so, the legacy of the extinction caused by fishing these areas would not be measured in terms of decades or even generations but in terms of hundreds of thousands or even millions of years.

Unlike tropical rainforests however, high seas seamounts do not support indigenous communities or local peoples for whom fishing is important to economic development or essential for survival (although this is the case in some areas with shallow-water seamounts close to shore). Rather, the deep-sea bottom fisheries on the high seas have been and are being developed by a rather select fleet of high technology, large-scale trawlers from a small number of industrialized countries. The fish caught in these areas does not contribute to global food security but is destined for high value markets in 'developed' countries. Even so, the economic value of high seas fisheries on seamounts is probably insignificant in global terms. It is unlikely that the number of vessels fishing on seamounts on the high seas amounts to more than a few hundred; the actual number may only be several dozen or so. All too often the technology, capacity and markets that drive overfishing have progressed far faster than the science, political will, and capacity to regulate the fleets and fisheries in question. This problem is ubiquitous in coastal fisheries and the same is now happening in the deep sea.

### 4. LEGAL OBLIGATION

The legal obligation to protect marine biodiversity has been established through UNCLOS, the 1995 UN Fisheries Agreement and the Convention on Biological Diversity among other instruments. However, there are gaps in international law with respect to the protection of biodiversity from the impact of bottom fishing in deep-sea areas. The Convention on Biological Diversity does not apply beyond the EEZs. The International Seabed Authority does not exercise jurisdiction over the extraction of the 'living marine resources' of the seabed in international waters. And the 1995 UN Fisheries Agreement covers fisheries for straddling and highly migratory fish stocks on the high seas, but does

not cover fisheries on stocks or species found wholly in high seas areas. There is clearly a gap in the legal regime governing fishing activities and the protection of deep-sea marine biodiversity on the high seas.

## 5. WHAT SHOULD BE DONE? RECOMMENDATIONS TO UNICPO

Greenpeace urges that the UN General Assembly should establish a moratorium on all bottom fishing on seamounts, deep-sea ridges and plateaus on the high seas.

### Rationale

1. These fisheries are uncontrolled and unregulated (IUU). With a few exceptions, Regional Fisheries Management Organizations do not have the competency to regulate bottom fishing on the high seas.
2. The high degree of endemism associated with seamount ecosystems means that the potential loss of biodiversity from uncontrolled and unregulated exploitation of these areas is unacceptable.

In the long term, given the threats to marine biodiversity in coastal areas from overfishing, global climate change, pollution and the destruction of coastal habitat, seamounts and other deep sea areas may well serve as the reservoirs of biodiversity that will ultimately replenish degraded coastal seas. This is, of course, speculation at this point but the question concerning extinction must be viewed in the context of a very long framework of evolutionary history and time.

### References

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