

This document summarizes a draft rule for sea cucumbers, which are regulated under the Florida Fish and Wildlife Conservation Commission's (FWC) Marine Life rule, 68B-42, Florida Administrative Code (FAC). Staff is recommending regulatory changes requested by the commercial marine life fishery that would implement a commercial trip limit for sea cucumbers in response to concerns that a developing export market may lead to over harvest. The proposed draft rule would create a commercial daily trip and vessel limit of 200 sea cucumbers.

This document has been updated to reflect the fact that this item is being brought forward for Commission consideration as a draft rule, with no further hearing unless requested.

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Marine Life Fishery

- Non-lethal harvest of saltwater fish, invertebrates, and plants – primarily for the aquarium trade
 - Organisms must be landed alive and are typically sold to wholesalers, retailers, and aquarium owners
- In the U.S., collection of many species is limited to Florida and Hawaii
- In Florida, collection is primarily from Monroe, Miami-Dade, Broward, and Palm Beach Counties
- Commercial fishery is a limited entry program with roughly 160 participants



Sea cucumbers are regulated as marine life species. The term marine life refers to tropical ornamental species that are typically collected for live display in private and public aquaria. These species, including saltwater fish, invertebrates, and plants, are harvested by both recreational and commercial collectors using non-lethal methods, such as hand-held nets or as bycatch in traps and trawls. All marine life species are required to be landed alive and those collected by members of the commercial fishery are typically sold to wholesalers, retailers, and owners of public or private aquariums. Within the U.S., this fishery is relatively unique to Florida with many of the targeted species collected only from Florida and Hawaii. The commercial fishery in Florida is conducted primarily from Monroe County to Palm Beach County.

The commercial marine life fishery is subject to a limited entry program. Commercial collectors are required to hold a marine life (ML) endorsement in order to harvest or sell any marine life species. Currently, there are roughly 160 ML endorsement holders, including those who directly target marine life species and those licensed to retain marine life species taken as bycatch in other fisheries.

Sea Cucumbers

- Invertebrates
- Sedentary deposit feeders
- Reside in seagrass beds, lagoons, and nearshore reefs
- Vulnerable to overfishing
 - Easily located and collected
 - Late reproductive age (at least 2 years)
 - Broadcast spawning – successful reproduction requires dense populations
- When depleted, recovery takes decades
- Small commercial fishery in FL Keys for live aquarium trade
- Globally, highly valuable in food trade in Asian markets
 - Staff has confirmed that an exporter is established in the Keys



Sea cucumbers are sedentary marine invertebrates that inhabit shallow water habitats, residing in seagrass beds, lagoons, and nearshore reefs. They are vulnerable to overfishing because of their visible and sedentary nature, which makes them easy to locate and collect. Their life history characteristics also make them vulnerable to overfishing, due to their late reproductive age (at least 2 years), long life span (up to 15 years), and spawning behavior. Sea cucumbers are broadcast spawners, meaning they release their sperm and eggs out into the water column. This spawning technique requires dense populations in order to be successful because adequate numbers of sperm and eggs must be released in the same vicinity at the same time in order for sufficient levels of fertilization to occur. This spawning behavior also contributes to slow recovery times once the populations become depleted. In the case of sea cucumbers, recovery can take decades.

Currently, there is a small commercial fishery for sea cucumbers in Florida, primarily in the Keys. While the Florida fishery has historically targeted them only for sale into the aquarium trade, they are commonly targeted elsewhere in the world as a food product because of their high value in Asian markets. Staff has confirmed that at least one exporter has established a processing facility in the Keys and is working with licensed harvesters to supply the export market.

Market Value of Sea Cucumbers

Live Aquarium Trade

- Market value around \$1.00 per individual for live animals



Photo by Don DeMaria

Food Trade

- Highly variable depending on species
 - \$0.05 – \$3.00 per individual
 - Florida fishers reportedly getting around \$1.00 each
- As a final processed product, some species can be sold dried for up to \$200 per pound
- Market Driving Force: exploitation and depletion near Asia driving value higher with increasing opportunities found in areas farther away



Sea cucumbers are of modest value in the live aquarium trade, with ex-vessel values in Florida averaging \$1 per sea cucumber. In the food trade however, the ex-vessel value is highly variable, and ranges from 5 cents to \$3, depending on the species. Collectors in Florida are currently receiving around \$1 per sea cucumber, the same as they receive for those sold into the aquarium trade. However, they are much more valuable once they have been dried and processed, with some species found in Japan historically bringing in up to \$200 per pound processed. According to the Food and Agriculture Organization of the United Nations (FAO), the driving force for development and expansion of sea cucumber fisheries is the exploitation and depletion of stocks near Asia, with increasing opportunities found in areas farther away where stocks have not yet been exploited.

Importance of Florida's Sea Cucumbers



Economic Value

- Prior to 2012, fishery valued at approximately \$14,000 per year for Florida's commercial marine life industry
- Landings jumped in 2013 with value escalating to \$41,000 by September

Ecological Value

- Important for nutrient cycling in otherwise nutrient-poor tropical reefs
- Recycle nutrients to make them available to seagrasses
- Oxygenate sediments by burying behavior
- Keep algal mats low on coral reefs



Florida's commercial sea cucumber fishery has historically been a low-value fishery, averaging \$14,000 per year for ML endorsement holders prior to 2012. However, landings jumped dramatically in 2013. The value of landings through September of 2013 was \$41,000, which is nearly three times the previous average for an entire year.

In addition to their economic value, sea cucumbers play a very important role in South Florida marine ecosystems. These animals are important for nutrient cycling in otherwise nutrient-poor tropical reefs. They also make nutrients available to seagrasses by recycling nutrients that have been deposited in the sediment. Sea cucumbers also help to oxygenate the sediments for other bottom-dwelling organisms by burying themselves. Laboratory experiments have demonstrated that removing sea cucumbers can lead to the development of unwanted algal mats on the sediment, which further limit the availability of oxygen.

Current Florida Regulations

- All marine life species must be transported and landed alive

Recreational

- Recreational fishing license required
- Bag limit: 5 of each species per day, included in the 20-organism aggregate bag limit for all marine life species

Commercial

- Commercial Saltwater Products License (SPL) with Restricted Species (RS) and Marine Life (ML) endorsements required
- **Trip limit: none**



Like all marine life species, sea cucumbers harvested either commercially or recreationally must be transported and landed alive.

Current recreational regulations for sea cucumbers include a bag limit of five of each species per person per day, which is included in the marine life aggregate bag limit of 20 organisms that applies to all marine life species. Commercial harvest requires a commercial Saltwater Products License (SPL) with Restricted Species (RS) and ML endorsements. There is no commercial bag limit or trip limit for sea cucumbers.

Industry Concerns

- Traditionally harvested in Florida in small numbers for the live aquarium trade
- Marine life fishermen approached by a processor wanting to purchase high numbers for export to China
 - Highly valued in Asian markets for their medicinal and nutritional qualities
 - Dried and sold by the gram, primarily in Hong Kong
 - Cuban fishery harvested over 3 million sea cucumbers in the first 2 years
- Lack of commercial trip limit may allow overexploitation in Florida

Trip limit has been requested by industry due to concern about potential over-exploitation



Photo by Man Nadeem

Although sea cucumbers are traditionally harvested in Florida for the aquarium trade, members of the commercial marine life fishery began expressing concerns about potential unsustainable expansion of the fishery after several members of the industry were approached by a processor wanting to acquire large numbers for export to China. Sea cucumbers are highly valued in Asian markets due to their nutritional and medicinal qualities. Once harvested, sea cucumbers destined for this market are dried and sold by the gram, with almost all of them imported directly into Hong Kong for further Asian distribution. A food fishery that was established in Cuba in 1999 harvested over three million sea cucumbers in the first two years of the fishery, with only 12 boats in operation, before steep declines in the catch led to a series of management measures to ensure the sustainability of the fishery.

The primary concern from the marine life industry is the lack of a commercial trip limit for sea cucumbers, which may allow rapid, over-exploitation to occur in Florida. Due to these concerns, a commercial trip limit has been requested by the Florida Marine Life Association (FMLA), the official industry organization for ML endorsement holders.

Global Food Fisheries

- Most international sea cucumber fisheries deemed unsustainable by the Food and Agriculture Organization of the United Nations (FAO)
 - Typically boom-and-bust
 - Most fisheries are either fully depleted (20%) or otherwise overexploited (52%)
 - Extinctions from overfishing reported from Indo-Pacific region
 - Complete ban on harvest implemented in many tropical fisheries due to overharvest
- Severe population crashes due to overfishing in high profile conservation sites such as the Great Barrier Reef and Galapagos Islands National Park
 - No signs of recovery at these sites

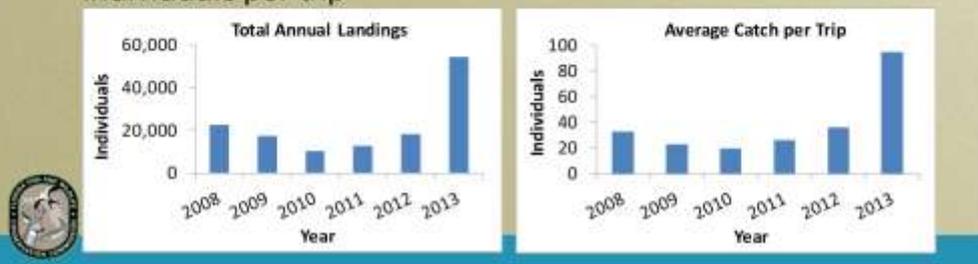


Photo by Don DeMaria

Many of the sea cucumber fisheries that have developed around the world have done so in the absence of regulation, resulting in a series of boom-and-bust fisheries. The FAO has determined that most of the sea cucumber fisheries worldwide are unsustainable. Worldwide, 20% of the sea cucumber fisheries have been deemed fully depleted, with an additional 52% deemed overexploited. Extinctions of some species from overfishing have been reported from the Indo-Pacific region, and complete bans on sea cucumber harvest due to population collapse have been implemented in many tropical and subtropical fisheries including Costa Rica, Ecuador, India, France, Panama, Papua New Guinea, Solomon Islands, Tanzania, Tonga, Vanuatu, and Venezuela. There have also been severe population crashes recorded in high profile conservation sites such as the Great Barrier Reef and Galapagos Islands National Park due to overfishing, with no signs of recovery at these sites.

Sea Cucumber Fishery – Florida

- Traditionally a small fishery
 - Annual landings around 16,000 sea cucumbers
 - Average catch rate of 28 sea cucumbers per trip
- Industry began expressing concern in 2012
- June 2012 Commission meeting – staff committed to monitor the fishery for changes
- Through September of 2013, annual landings tripled to over 54,000 sea cucumbers with an average catch rate of 95 individuals per trip



Traditionally, Florida's sea cucumber fishery has been small, with annual landings around 16,000 sea cucumbers and an average catch rate of 28 sea cucumbers per trip. But in 2012, industry began expressing concerns about potential future overexploitation. At that time, the landings data did not indicate any increase in harvest of sea cucumbers or any discernible change in fishery practices. But because of industry concerns, staff committed to closely monitoring the fishery and to work with the industry to implement additional regulations if needed. Through September of 2013, the landings have more than tripled the previous annual average with over 54,000 sea cucumbers, and a catch rate of approximately 95 sea cucumbers per trip.

Public and Commission Input to Date



Photo by Don DeMaria

- 2012 – 2013 Public Workshops
 - Requests for commercial trip limits
 - Concern about declining populations
 - Local markets developing for export to China
- ML endorsement holders email survey
 - Suggested daily vessel limits ranging from 10-400 individuals
- Florida Marine Life Association (FMLA)
 - Requested a daily vessel limit of 200 sea cucumbers
- In November, Commission approved a draft rule to implement a commercial trip limit of 200 sea cucumbers



Since 2012, two series of public workshops have been conducted to gather public comment specific to the marine life fishery and fisheries issues in South Florida. Prior to the marine life rulemaking in 2012, workshops were held in Tallahassee (statewide by phone), Bradenton, West Palm Beach, Key Colony Beach, and Key West. In 2013, the South Florida workshops jointly conducted by the FWC and the Gulf of Mexico and South Atlantic Fishery Management Councils were held in Dania Beach, Key Largo, Key Colony Beach, Key West, and Marco Island. Stakeholders within the marine life industry voiced concerns at these workshops about potentially declining populations and the local development of an export market, with some suggesting commercial trip limits to sustain the resource.

Based on the increasing landings and the continued concerns of the industry, staff conducted an email survey of all ML endorsement holders. Of those that responded to the survey, nearly all supported commercial limits on the fishery, with most suggesting trip limits ranging from 10 to 400 sea cucumbers per vessel per day. The official industry organization, the FMLA, also held a meeting in October of 2013 to discuss potential commercial trip limits for sea cucumbers. The FMLA requested a daily commercial vessel limit of 200 sea cucumbers.

At the November Commission meeting in Weston, the Commission approved a proposed draft rule to implement a commercial trip limit of 200 sea cucumbers per person and per vessel.

Proposed Rule: Sea Cucumbers

68B-42.006 Commercial Season, Harvest Limits

- *Establish a commercial daily trip limit and vessel limit of 200 individual sea cucumbers*
- Will not impede current practices of the fishery for the aquarium trade
- Proactive measure to help ensure any food fishery that develops will be sustainable
- Will help prevent depletion of these ecologically important animals



Photo by Dorit Dekker

The proposed draft rule would establish a commercial trip limit of 200 individual sea cucumbers per person per day, as well as a daily vessel limit of 200 sea cucumbers, inclusive of all sea cucumber species. The proposed rule would allow the traditional fishery that supplies sea cucumbers to the aquarium trade to continue to operate under its current practices. Additionally, the trip limit would be a proactive measure to help ensure that the food fishery, if it continues to develop, will be sustainable and to help prevent depletion of these ecologically important animals.

Staff Recommendation

Approve the proposed rule

- *Establish a commercial daily trip limit and vessel limit of 200 individual sea cucumbers*

If approved, the rule will be noticed and filed without further hearing unless requested and made effective on April 1, 2014



Staff recommends approving the proposed draft rule establishing a commercial trip limit of 200 individual sea cucumbers per person per day, as well as a daily vessel limit of 200 sea cucumbers.

If approved, staff recommends noticing and filing the rule without further hearing unless requested. If no further hearing is requested, staff recommends making the rule effective on April 1, 2014. Staff has evaluated the rule under the standards of 68-1.004, FAC, and found it to be in compliance.

The following slides are considered back up material and are not anticipated to be part of the actual presentation to the Commission



Suggested Management from FAO

Top recommended management strategies

- Limited access – already accomplished via ML endorsements
- Adaptive management – start with conservative harvest limits and allow fishery to expand under close watch
 - Best option when lacking information or when fishery is new or expanding
 - Proactive
 - Successful in British Columbia fishery



Through workshops involving experts from around the world, the FAO has published many technical papers and management guidelines on the management of sea cucumbers. The FAO recommends managing sea cucumbers through limited access (which the ML endorsement program already accomplishes) and adaptive management. Through adaptive management, fisheries managers can start with a conservative catch quota and allow the fishery to expand under close monitoring. This strategy is suggested as the best option when lacking information to construct maximum sustainable yield (MSY), or when the fishery is new or expanding, both of which apply to the Florida sea cucumber fishery. This strategy has been successfully applied to the sea cucumber fishery of British Columbia.

Additional Strategy for Monitoring the Fishery

- Staff included a question about trip ticket reporting in the email survey of ML holders earlier this year
 - Broad support for implementing species-specific reporting codes
 - FMLA requested a separate trip ticket code for sea cucumbers destined for the food market to facilitate separate management strategies for that aspect of the fishery
- Division of Marine Fisheries Management staff will work with FWC's research staff and the ML industry in the near future to implement additional reporting codes for this fishery



Photo by Stan DeMena

In addition to questions about the status of the sea cucumber fishery and support for new commercial harvest limits, staff included a question about trip ticket reporting codes for this fishery in the email survey that was distributed to ML endorsement holders earlier this year. There was broad support from individual marine life collectors and from the FMLA for additional trip ticket reporting codes for this fishery. Currently, there is only one species-specific reporting code for sea cucumbers with all other species lumped into a single reporting code. In addition to species-specific codes, the FMLA suggested additional codes for sea cucumbers supplied to the food market. There is currently a single trip ticket code for sea cucumbers harvested for this purpose, but no landings have been reported under that code in recent years.

In order to gather more information about the species composition of the harvest in the commercial fishery, Division of Marine Fisheries Management staff will work with research staff at the Fish and Wildlife Research Institute and the marine life industry to implement additional trip ticket codes for this fishery and provide the fishery with the information needed to facilitate species identification and accurate reporting.

Nearby Sea Cucumber Food Fisheries

Export markets driving harvest of high numbers from nearby areas



Photo by Don DeMaria

Mexico

- Exports over 300 tons to Hong Kong annually
- Targets many species also found in Florida
- Harvest of one species banned after just 4 years due to it becoming "endangered"

Cuba

- Millions of individuals exported to Hong Kong annually
- Targets chocolate chip sea cucumber, a common species in Florida

British Columbia

- Exports over 800 tons to Hong Kong annually

United States (Washington, Oregon, California, Alaska, and Maine)

- Total exports to China range from 4 to 10,000 tons annually



This slide summarizes the characteristics of several sea cucumber fisheries operating in regions within relatively close proximity to Florida that supply large numbers of sea cucumbers to food-based export markets.

Nutritional and Medicinal Properties of Sea Cucumbers

Nutritional

- High in vitamins A, B1, B2, B3
- High in calcium, magnesium, and zinc
- Contain essential amino acids
- Contain fatty acids EPA and DHA



Pharmacological and Medicinal

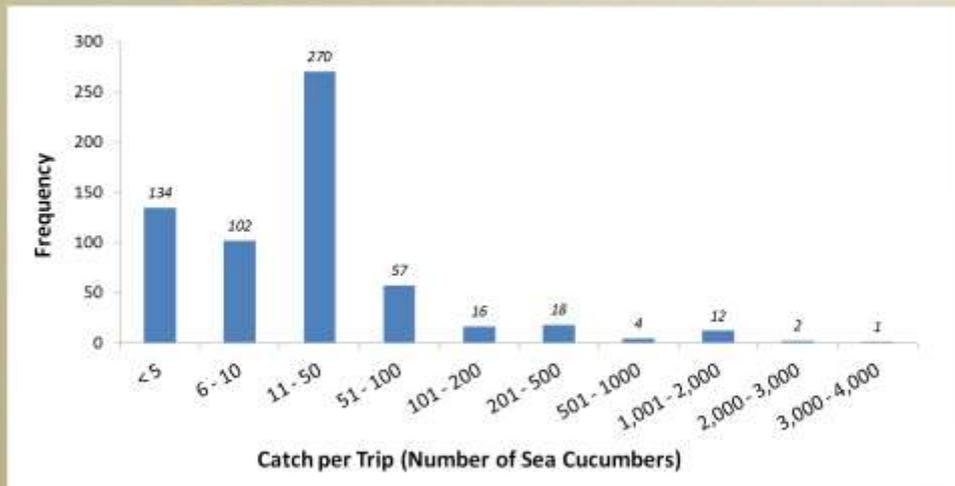
- Antiangiogenic
- Anticancer
- Anticoagulant
- Anti-fatigue
- Antimicrobial
- Antibacterial
- Antifungal
- Antioxidants
- Anti-blood clotting
- Antitumor
- Antiviral
- Osteoarthritis
- Wound healing



Recent attention has been focused on the nutritional and medicinal properties of sea cucumbers for their use as a source of medicine. Nutritional studies have reported high levels of vitamins A, B1, B2, and B3, as well as minerals such as calcium, magnesium, and zinc. Research has also found that sea cucumbers contain essential amino acids that help regulate immune function, and important fatty acids such as EPA and DHA, which are thought to reduce heart disease and certain cancers.

Additionally, several studies have isolated compounds that may be useful for drug development. Many of these compounds have also been tested on lab mice and found to potentially have the following properties: antiangiogenic (antitumor), anticancer, anticoagulant, anti-fatigue, antimicrobial, antibacterial, antifungal, antioxidizing, antithrombotic (anti-blood clotting), antitumor, antiviral, reduce osteoarthritis, and speeding wound healing.

2013 Commercial Sea Cucumber Landings



This slide summarizes the number of sea cucumbers landed per trip for commercial trips taken during January – December of 2013. Approximately 94% of the trips that reported sea cucumber landings in 2013 landed 200 or fewer sea cucumbers. However, more than 1,000 sea cucumbers were landed from each of 15 trips taken during this timeframe, with the largest number of sea cucumbers reportedly collected on a single trip being 3,123.