Abundance and Distribution of Harvested Sea Cucumbers

**Become familiar with this terminology:**

- **Abundance**— amount of species in an area
  - 1 red, 2 green, 2 pink, 2 orange, 2 purple marbles

- **Density**— how many organisms in unit area
  - 2 green marbles/cm²

- **Distribution**— where species are found over an area
  - Green marbles found mostly in center and bottom half of box.

**Objectives:**
The main objectives of this study were:
- to provide a quantitative density estimate for Donkey Dong sea cucumber (*Holothuria Mexicana*) and Three-rowed sea cucumber (*Isostichopus badionotus*)
- to examine their distribution within the surveyed areas
- to obtain an estimate of population size
- to provide length data
- To provide an abundance estimate for both species
- to identify species found in Belizean waters

**Species recorded in this study**
During this study, a total of 8 species were recorded.

- **Donkey Dong** (*Holothuria mexicana*)
  - Found: Port Honduras
  - Photo: A. Rogers

- **Three-Rowed** (*Isostichopus badionotus*)
  - Found: Monkey River
  - Photo: A. Rogers

- **Beaded** (*Euapta lappa*)
  - Found: Turneffe
  - Photo: J. Salazar

- **Tiger Tail** (*Holothuria thomasi*)
  - Found: Mango Creek
  - Photo: A. Rogers

- **Florida** (*Holothuria floridana*)
  - Found: Turneffe
  - Photo: J. Salazar

- **Five-toothed** (*Actinopyga agassizi*)
  - Found: Mango Creek
  - Photo: A. Rogers

- **Slender** (*Holothuria impatiens*)
  - Found: Caye Caulker
  - Photo: A. Rogers

- **Furry** (*Astichopus multifidus*)
  - Found: Turneffe
  - Photo: J. Salazar
**Population structure**

Detailed size measurements were obtained from landed specimens of Donkey Dong and Three-Rowed sea cucumbers to determine population structure. Data collected for the two species are summarized below.

**Table 1. Length and weight averages for Donkey Dong and Three-Rowed**

<table>
<thead>
<tr>
<th>Characteristics</th>
<th>Donkey Dong</th>
<th>Three-Rowed</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mean length</td>
<td>20.5 cm</td>
<td>22 cm</td>
</tr>
<tr>
<td>Mean weight</td>
<td>562 g</td>
<td>346 g</td>
</tr>
</tbody>
</table>

Size distribution for Donkey Dong and Three Rowed are summarized below. The largest number of individuals ranged from 12-17 cm and 27-32 cm for Donkey Dong and 17-22 cm for Three-Rowed.

**Figure 1. Size distribution for Donkey Dong (A) and Three-Rowed sea cucumber (B).**

**Population Distribution and Abundance**

Surveyed areas included different biological communities and habitats. Density data based on habitat type indicated that Donkey Dong was more abundant in sparse sea grass beds, patch reef and sea grass beds with coral. Density for Three-Rowed was low and the species was only found in sparse sea grass.

**Figure 2. Density for Donkey Dong and Three-Rowed based on habitat type.**

Literature on minimum length at maturity suggests that both Donkey Dong and Three-Rowed species have different maturity sizes in different countries; except for Three-Rowed that had the same length at maturity in Venezuela and Florida.

**Table 2. Minimum length at maturity for Donkey Dong and Three-Rowed in the region.**

<table>
<thead>
<tr>
<th>Country</th>
<th>Minimum Length at Maturity/cm</th>
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<tbody>
<tr>
<td></td>
<td>Donkey Dong</td>
</tr>
<tr>
<td>Panama¹</td>
<td>13-15</td>
</tr>
<tr>
<td>Venezuela²</td>
<td>n/a</td>
</tr>
<tr>
<td>Florida³</td>
<td>57.9 (males)</td>
</tr>
<tr>
<td></td>
<td>75.7 (females)</td>
</tr>
</tbody>
</table>

Density data based on area showed that Donkey Dong density was the highest in Gladden, Laughing Bird, Sapodillas, Port Honduras and near areas. Three-rowed was only found in low densities at Turneffe, Gladden, Laughing Bird, Sapodillas, Port Honduras and near areas.

Figure 3. Density for Donkey Dong and Three-Rowed based on surveyed area.

We found a total of 124 individuals of *H. mexicana* and 108 individuals of *I. badionotus* in 2.16 hectares sampled, with average densities of 12.9 ind./ha and 1.8 ind./ha respectively.

The data gathered helped to estimate a total abundance of 6,840,159.76 individuals of *H. mexicana* and 1,117,987.41 individuals of *I. badionotus* in the area with suitable shallow habitats along the coast of Belize (120,213.7 ha). This abundance discounts new recruits, reproductive success, predation and fishing.

Data was collected during the fishing season (January 1 to June 31) and this may have contributed to the low number of individuals found. In order to obtain more samples, more sites needed to be surveyed. The total number of samples was low to make adequate abundance estimates.
**Conclusion**

This study is the first that included all areas of the coast. The results of this study indicate that very few species exist in the areas studied. The results also indicate that the commercially exploited species are not abundant. Of the two species, the most abundant species was *H. mexicana* in Area 6.

Area 6 is an interesting area as sediments and nutrients from major watersheds are transported by the rivers and creeks in Southern Belize into the sea. These sediments dictate the distribution of marine habitats (CZMA/I, 2013) and their corresponding organisms. Detritus feeders like sea cucumbers depend on these sediments. The fact that four major rivers; Monkey River, Deep River, Rio Grande and Moho River and a number of streams empty into this area may be the reason for the abundance of sea cucumber in this area.

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**Based on the findings from this study, we recommend the following:**

- A study on the reproductive cycle of the commercial species be conducted for Donkey Dong and Three-Rowed.

- The precautionary principle be adopted and close the fishery until weight and size at maturity for the 2 species have been established.

- Sea cucumber fishing with SCUBA and hookah be discouraged.

- Highlight conditions to adhere to when reviewing the status of the fisheries such as the reproductive biology and stock abundance of the species

- Provide adequate information regarding the biology and ecology of the species and related issues to end users to clarify the importance of managing the fishery.

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