Supplementary material 2

**Population structure and reproductive cycle of the commercial sea cucumber** *Holothuria mexicana* **in Belize**

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Gametogenic stages of female and male *H. mexicana* based on gonad phenotype and histology, with corresponding tubule length and diameter.

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| Gametogenicstage | Gonadtubule |  | Gonad macroscopic morphology | Gametogenic stage description |
|  | Diameter(mm) | Length (mm) |  |  |
| **Females** |  |  |  |  |
| I-Post-spawning (Fig 5A) | 0.25 - 0.3 | 4 - 5 | Very thin and small translucent light orange tubules. | Tubule wall convoluted & lumen with empty spaces with residual oocytes & thick gonad wall.  |
| II-Recovery (Fig 5B) | 0.25 - 1 | 4 - 7 | Thin, light pink or orange, slightly translucent tubules. | Germinal epithelium convoluted & shrunken gonad tubule wall is very thick due to presence of phagocytes (140-144 µm).  |
| III-Growth (Fig 5C)  | 1 - 2 | 7 - 22 | Semi-transparent orange, long tubules. | Oocytes (44-57 µm) along germinal epithelium; some early vitellogenic oocytes (110-128 µm) present. Gonad wall and germinal layer thinner. |
| IV-Advanced growth (Fig 5D-E)  | 1 - 2.5 | 10.5 - 26 | Thick, bright orange or pink, oocytes can be seen with naked eye, long tubules. | Tubule wall thinner; tubule diameter increased; lumen filled with abundant vitellogenic & mature oocytes (173-200 µm) and few growing (19-68 µm) can be observed lining the germinal epithelium.  |
| V-Mature (Fig 5F)  | 1.9 - 3 | 25 - 39 | Very thick, bright orange or pink, smooth surface, large oocytes can be seen inside tubules with naked eye, long & wide tubules.  | Lumen filled with large mature oocytes surrounded by visible follicular cells. All or most oocytes (153-200 µm) are vitellogenic which completely fill tubule lumen and thin tubule wall. |
| **Males** |  |  |  |  |
| I-Post-spawning (Fig 5G) | 0.3 - 0.5 | 35.5-41 | Most tubules light or darker brown & few creamy translucent.  | Empty lumen spaces among the remnant gametes where sperm passed & thick gonad wall. |
| II-Recovery | 0.3 - 1.5 | 3 - 46 | Creamy tubules, smooth surface. | Thick tubule wall; still small quantities of degrading spermatozoa in lumen. No nutritive phagocyte were precisely identified.  |
| III-Growth (Fig 5H-I) | 0.5 - 0.75 | 35 - 80 | Thin creamy & smooth tubules. | Lumen filled with spermatozoa; numerous infolds of germinal epithelium; infolds lined by dense layer of spermatocytes (0.6-1 µm). Gonad tubules & germinal layer are thin. |
| IV-Advanced growth (Fig 5J) | 0.5 - 0.75 | 76 - 110 | Creamy thicker than other stages.  | Tubule wall thin but tubule diameter increased & lumen filled with spermatozoa (0.4-1 µm).  |
| V-Mature (Fig 5K) | 0.2 - 0.5 | 49 - 110 | White or creamy, very long, thicker than any other stages. | Thin tubule wall; absence of proliferation zone, great numbers of spermatozoa (1.3-3.2 µm) which fill gonad tubule lumen. |