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## Reproductive Parameters of Two Coastal Pelagic Fishes off Southeast Florida: Blackfin Tuna, *Thunnus atlanticus*, and Little Tunny, *Euthynnus alletteratus*

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**Parámetros Reproductivos de Dos Peces Pelágicos Costeros del Sudeste de la Florida:  
Atún Aleta Negra, *Thunnus atlanticus* y Bacoreta, *Euthynnus alletteratus***

**Paramètres de la Reproduction de Deux Poissons Pélagiques Côtières au Large de la Floride du  
Sud: Thon à Nageoires Noires, *Thunnus atlanticus*, et Peu de Thon, *Euthynnus alletteratus***

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**EXTENDED ABSTRACT**

Coastal pelagic fishes live in near-shore waters staying above the continental shelf. Anglers easily access these coastal waters so coastal pelagic fishes are important in both commercial and recreational fisheries, especially in South Florida. Understanding spawning patterns is important for managing fish stocks, as fishing may influence population size by being size-specific thus truncating age growth dynamics (Lowerre-Barbieri et al. 2011). The two coastal pelagic species evaluated during this research were blackfin tuna and little tunny. Blackfin tuna and little tunny belong to the family Scombridae, sharing similar physical characteristics of body shape and fast swimming ability, both blackfin tuna and little tunny are considered small tuna (Collette 2002). Spawning season of blackfin tuna caught off Miami, Florida has been determined by external gonadal observation as occurring between April to November with a May peak (Idyll and de Sylva 1963). In the Atlantic Ocean, little tunny have a range from tropical to subtropical latitudes and are found from the Mediterranean Sea to the Gulf of Mexico (Collette 2002), however no research has examined their spawning season in the western Atlantic Ocean.

Gonad samples were obtained from commercial pelagic fisheries in the U.S. South Atlantic Bight, Florida Straits, and Gulf of Mexico, and South Florida recreational fishing tournaments from 2010 – 2014. Fish were weighed, if whole, measured, and gonadal tissue was removed and preserved in formalin until the start of processing in 2013. Tissue was processed following standard histological procedures, and reproductive phases were classified according to Brown-Peterson et al. (2011).

The sex ratio for both species favors males, with the same 0.51:1 ratio. This ratio supports similar findings from previous blackfin tuna studies (Idyll and de Sylva 1963), and provides new evidence for little tunny populations. Histological examination shows that blackfin tuna females are spawning capable for two months of the year in May and June, and little tunny females are spawning capable five months of the year from April to August (Table 1). Spawning capable phase male blackfin tuna are present from February through October and little tunny are present from March through October. GSI values (Figure 1) indicate a peak within that range, with blackfin tuna spawning peak in May and June, and little tunny spawning peak in June and July. The peak of spawning season for both species spans two months, with male GSI peak first followed by female GSI peak.

Examination of ovarian tissue provides evidence of asynchronous oocyte development and indeterminate fecundity. There are multiple stages of oocytes present at once in the spawning capable females, with primary growth oocytes and vitellogenic oocytes together. Comparison of females with postovulatory follicles (POFs) showed that of the 28 little tunny in the spawning capable phase 19 had  $\leq 24$  hour POFs, and of the 21 blackfin tuna in the spawning capable phase 14 had  $\leq 24$  hour POFs. This results in an average spawning frequency of once every 1.47 days for little tunny and once every 1.49 days for blackfin tuna. Both little tunny and blackfin tuna are batch spawners, releasing a batch of fully matured oocytes and then developing another for continued spawning.

Age at maturity was determined by running a logistic regression with data from present study on maturity and age data from a previous study counting otolith bands, blackfin tuna male (n = 55, 12 immature), blackfin tuna female (n = 37, 6 immature), little tunny male (n=88, 8 immature), and little tunny female (n = 47, 1 immature) (Adams and Kerstetter 2014). These results indicate that Little Tunny mature at a smaller size and younger age than Blackfin Tuna. Size at 50% maturity for male Blackfin Tuna was 435.2 mm TL, for female Blackfin Tuna was 392.3 mm TL, and for male Little Tunny was 347.77 mm TL. Age at 50% majority for male Blackfin Tuna was 0.66 years, and for male Little Tunny was 0.50 years. Small sample size of immature females may have influenced these results, so future work would increase the power.

The results from this study provide much needed data for the reproductive cycles of blackfin tuna and little tunny in waters off Southeast Florida. It was found through histological analysis and gonadosomatic indices that the peak of

spawning season for blackfin tuna is in May and June, and the peak of spawning season for little tunny is in June and July. It was also found that blackfin tuna males mature at an older age and larger size than male little tunny. Male blackfin tuna also mature at a larger size than female blackfin tuna. The data and results generated by this study provide baseline data for these two small tuna species, which will be an important part of future ecosystem based management practices.

**LITERATURE CITED**

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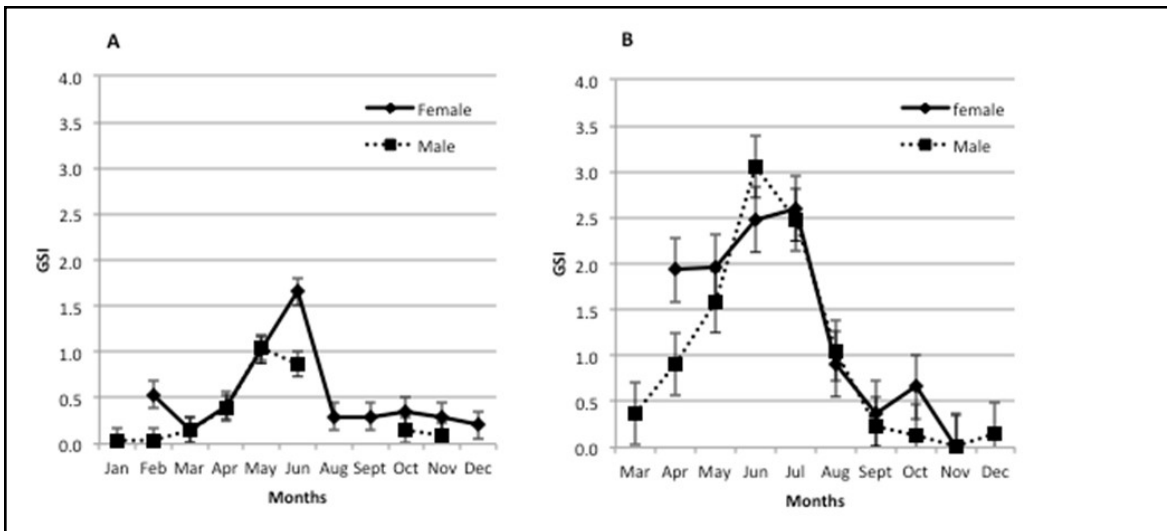
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**Table 1.** Monthly reproductive phases (% of total fish) based on histological observations for female blackfin tuna and female little tunny from collection sites in South Florida and the Florida Keys from 2010 – 2014.

Month	N	% Immature	% Regenerating	% Developing	%Spawning Capable	%Actively Spawning	% Regressing
<b>Blackfin Tuna</b>							
February	1	0	100	0	0	0	0
March	6	83	17	0	0	0	0
April	10	20	40	20	0	0	20
May	17	6	18	6	29	18	24
June	18	0	0	11	11	61	17
September	2	0	50	50	0	0	0
October	13	0	92	8	0	0	0
November	2	0	67	33	0	0	0
December	1	0	100	0	0	0	0
<b>Little tunny</b>							
April	7	0	43	29	0	29	0
May	7	0	29	29	0	43	0
June	18	0	22	6	22	11	39
July	19	0	11	0	11	53	26
August	12	0	17	8	25	17	33
September	9	11	89	0	0	0	0
October	3	0	100	0	0	0	0
November	3	0	100	0	0	0	0



**Figure 1.** Gonadosomatic Index (GSI; mean ± SE) of (A) blackfin tuna and (B) little tunny from collection sites in South Florida and the Florida Keys from 2010 – 2014.