Evidence of hermaphroditism in Golden Tilefish (*Lopholatilus chamaeleonticeps*) in the Gulf of Mexico

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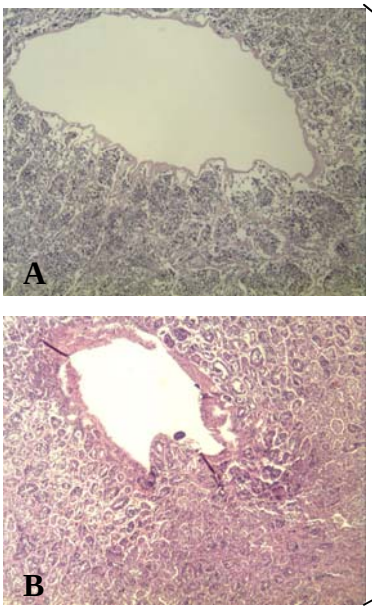
There are two main reproductive strategies in fishes, gonochoristic or hermaphroditic (Sadovy and Shapiro 1987). Gonochoristic species are individuals that are either male or female for the lifetime of the fish. Fish are classified as hermaphroditic if a proportion of the individuals in population exhibit characteristics of both males and females during any portion of their lifetime. Hermaphroditic species can be further quantified as protogynous, protandrous, simultaneous, or mixed populations of primary males and functionally bisexual individuals (Sadovy and Shapiro 1987).

There are several criterions that have been established to examine histological tissue and aid in determining whether protogynous hermaphroditism is a potential reproductive strategy in a species (Sadovy and Shapiro 1987). First, male gonads should contain a cavity in the testes that qualifies as originating from ovarian lumen (Figure1a). Second, this cavity must be membrane lined and remain unused for sperm transportation (Figure1b). Third, female gonads must contain similar membrane lined lumen (Figure 2). Fourth, male gonads must contain atretic follicles of all stages in testes (Figure 3 a and b). Fifth, the presence of a transitional stage as the degeneration of tissue of one sex with newly formed tissue of the other sex (Figure 4). And finally, sperm sinuses are present within gonad wall (Figure 5 a and b).

Histological examination of 875 gonads showed 341 fish were females and 534 were males. Of the 341 females 39 (11%) fish contained male gametes embedded or attached. Of the 534 males 330 (62%) fish contained female gametes from primary growth to late hydrated oocytes as either attached (Figure 6a), embedded (Figure 6b), or within the ducts (Figure 6c).

REFERENCES CITED

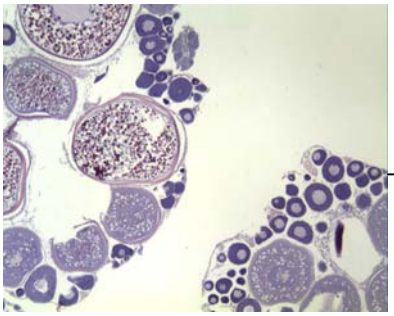
Sadovy, Y. and D. V. Shapiro. 1987. Criteria for the diagnosis of hermaphroditism in fishes. Copeia 1: 136-156.



Criteria # 1: Male gonads should contain a cavity in the testes that qualifies as originating from ovarian lumen.

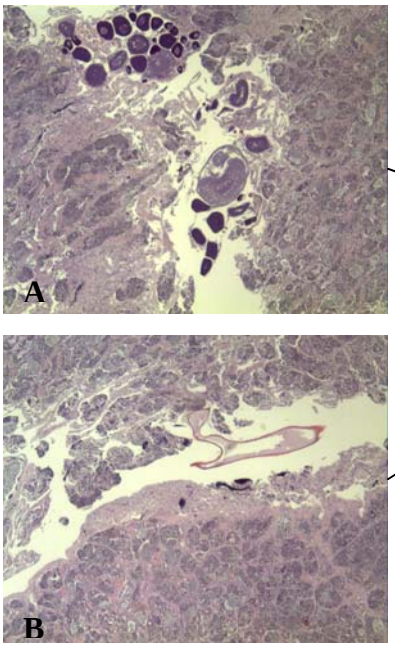
Criteria # 2: Cavity must be membrane lined and remain unused for sperm transportation.

Figure 1. **A**: Golden tilefish showing apparent membrane lined lumen to indicate fish was a previous female (date: March 2009; location: Galveston, TX; class: spawning; sex: male; TL: 605 mm; age: 12). **B**: Golden tilefish showing membrane lined lumen with primary growth oocytes which indicate fish was a previous female (date: January 2008; location: Ft. Pierce, FL; class: developing; sex: male; TL: 555 mm; FL: 524 mm; age: 10).



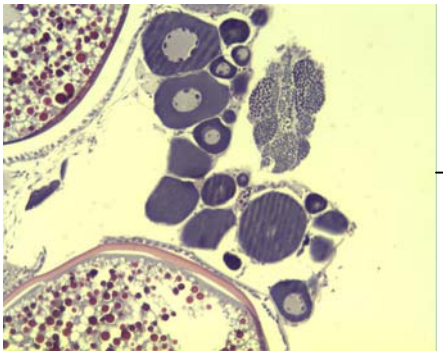
Criteria # 3: Female gonads must contain similar membrane lined lumen.

Figure 2. Female Golden tilefish showing membrane lined lumen (date: January 2007; location: Safe Harbor, AL; class: active; sex: female; TL: 519 mm; FL: 490 mm; age: 9).



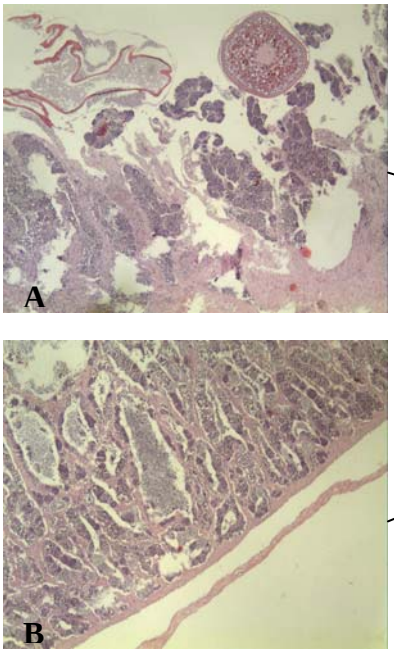
Criteria # 4: Male gonads must contain atretic follicles of all stages in testes

Figure 3. **A**: Golden tilefish showing female atretic oocytes in male gonad (date: April 2008; location: Ft. Pierce, FL; class: spawning; sex: male; TL: 551 mm; FL: 520 mm; age: 6). **B**: Additional view of gonad showing more evidence of atretic hydrated follicles within male gonad.



Criteria # 5: The presence of a transitional stage as the degeneration of tissue of one sex, with newly formed tissue of the other sex.

Figure 4. Female Golden tilefish showing male tubules in female ovary (date: January 2007; location: Safe Harbor, AL; class: active; sex: female; TL: 519 mm; FL: 490 mm; age: 9).



Criteria # 6: Sperm sinuses are present in the gonad wall.

Figure 5. **A**: Golden tilefish showing atretic hydrated and vitellogenic oocytes in a male gonad (date: June 2006; location: Pinellas, FL; class: spawning; sex: male; TL: 646 mm; age: 8). **B**: Second view of sperm sinuses present throughout the gonad.

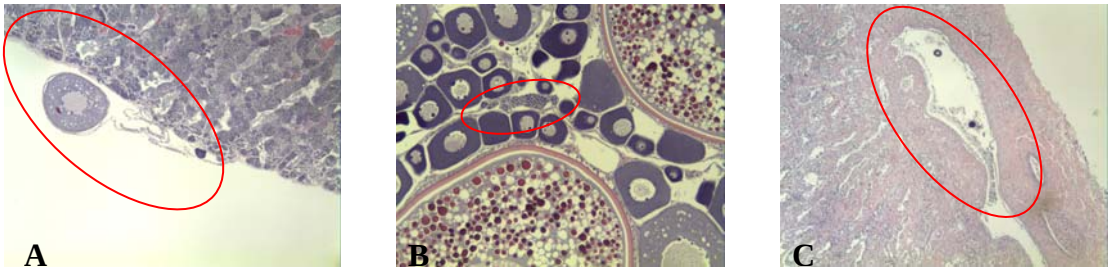


Figure 6. Examples of oocytes or sperm attached (A), embedded (B), or within the ducts (C) of gonads. **A**: Golden tilefish showing attached vitellogenic oocyte to male tunica (date: June 2009; location: Northeast Gulf of Mexico; class: spawning; sex: male; TL: 656 mm; age: 10). **B**: Golden tilefish showing embedded sperm (date: January 2007; location: Safe Harbor, AL; class: active; sex: female; TL: 519 mm; FL: 490 mm; age: 9). **C**: Golden tilefish showing primary growth oocytes contained in the ducts of a male gonad (date: August 2009; location: Northeast Gulf of Mexico; class: spawning capable; sex: male; TL: 672 mm; age: 13).