

## ABSTRACT - Online Oral Presentation

### Review of Past and Recent Studies Applying Gonad Histology to Define Reproductive Phases and Maturity Status in Billfish Species

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Gonad histology continues to provide the most accurate assessment of ovarian and testicular maturation in teleost fishes. The first gonad histology investigations of billfishes focused on describing the sequence of ovarian and testicular maturation and classifying this progressive development of gametes into distinct reproductive phases. These earlier studies were based on six species of istiophorids sampled in the western Indian Ocean (Merrett 1970, 1971) and western Atlantic Ocean (de Sylva & Breder 1997). Arocha (2000) provided histology-based descriptions of ovarian development and proposed reproductive phases for swordfish sampled in the western Atlantic Ocean. In the 40 years since the publications of Merrett (1970, 1971), 12 gonad histology studies to determine maturity status and length-at-maturity were conducted on swordfish and two istiophorid species. Gonad histology has also been used to validate non-histology techniques that attempt to determine reproductive phase and maturity status based on whole oocyte size, the macroscopic appearance of gonads, and indices based on total gonad weight and fish length. These reproductive studies used differing gonadal reproductive phases; some based on earlier studies (Merrett 1970, 1971; Arocha 2002) and the remainder based on other teleosts including anchovy, tunas, and insular demersal species. The lack of universal terminology, differing names and number of reproductive phases represented, and variation in developmental features used to define reproductive phases, all hinder our ability to compare reproductive traits between studies. This lack of a standardized approach in terminology and reproductive phase classification is not unique to billfish but a reflection of a wider problem among histology-based reproductive maturity studies for many marine and freshwater fishes. The publication of Brown-Peterson et al. (2011) sought to address this problem by proposing a standard classification framework, using universal terminology, to define and standardize the stages of gamete development and other histological features associated with each reproductive phase undergone by most teleosts. Since publication of the Brown-Peterson et al. (2011) paper, an additional 16 reproductive maturity studies on billfish have been published. Seven of the latter billfish maturity studies (2012-2018 publication dates) did not cite nor use the classification scheme of Brown-Peterson et al. (2011). The remaining nine studies (2016-2024 publication dates) adopted Brown-Peterson et al. (2011) in two different ways; one of which was a hybrid approach (in five studies) that used the universal terminology but applied reproductive phases developed in previous studies of large pelagic tunas. The other approach (used in four studies) adopted the universal terminology and reproductive phases specified in Brown-Peterson et al. (2011) albeit with minor modifications. This workshop provides an opportunity to foster a new collaborative effort to standardize reproductive classification for all billfish species based on universal terminology, revised descriptions (relevant to billfishes) of each reproductive phase, and consensus on the corresponding maturity status of each recognized phase.