

An Improved and Simplified Terminology for Reproductive Classification in Fishes by N.J. Brown-Peterson^{1*}, S.K. Lowerre-Barbieri², B.J. Macewicz³, F.Saborido-Rey⁴, J. Tomkiewicz⁵, and D.M. Wyanski⁶. ¹Department of Coastal Sciences, University of Southern Mississippi, Ocean Springs, MS 39564; ²Fish and Wildlife Research Institute, Florida Fish and Wildlife Conservation Commission, St. Petersburg, FL 33701; ³Southwest Fisheries Science Center, National Marine Fisheries Service, La Jolla, CA 92037; ⁴Instituto de Investigaciones Marinas, c/Educado Cabello, Vigo, Spain; ⁵Technical University of Denmark, Danish Institute for Fisheries Research, Charlottenlund, Denmark; ⁶Marine Resources Research Institute, South Carolina Department of Natural Resources, Charleston, SC 29422; *Order of authorship is alphabetical. Presented at JMIH (ASIH) conference July 2007 and AFS conference, September 2007.

Phase	Previous Terminology	Female	Male
Immature Never spawned	Immature, Virgin	Only oogonia and primary growth oocytes present, including chromatin nucleolar and perinucleolar oocytes. Usually no atresia.	Small testes, only primary spermatogonia, no lumen in lobules.
Developing Gonads beginning to develop, will not spawn soon	Maturing, early developing, early maturation, ripening, previtellogenesis	Oocytes in the following stages may be present: primary growth, cortical alveolar, and/or early vitellogenic. No evidence of POFs. Some atresia can be present. <i>Fish with determinate fecundity</i> : mid-vitellogenic oocytes present.	Initiation of spermatogenesis and formation of spermatocysts. Secondary spermatogonia, primary spermatocytes, secondary spermatocytes, spermatids and spermatozoa can be present in spermatocysts. Spermatozoa not present in lumen of lobules or sperm ducts. Germinal epithelium continuous throughout.
Spawning Capable Fish will spawn in this cycle (or season).	Late developing, late maturation, late ripening, gravid, vitellogenesis	Vitellogenic oocytes present. Some atresia and old POF may be present. <i>Determinate fecundity</i> : Late vitellogenic oocytes predominant, potential fecundity estimates made in sub-phase with no POF. <i>Indeterminate fecundity</i> : Mid and late vitellogenic oocytes prevalent (with or without evidence of previous spawning, POFs); or early vitellogenic oocytes with evidence of previous spawning (POFs). Less-developed oocytes often present.	Spermatozoa in lumen of lobules and/or sperm ducts. All stages of spermatogenesis (spermatogonia, spermatocytes, spermatids) can be present. Spermatocysts throughout testis. Germinal epithelium continuous or discontinuous. Macroscopically, testis large but milt not released with gentle pressure. Histologically undistinguishable from Actively Spawning phase.
Actively Spawning Imminent, active or recent spawning.	Ripe, running ripe, FOM, spawning	Ovulating (spawning) or approximately 12 hr prior to or after spawning as indicated by either GVM, GVBD/hydrated oocytes, or POFs < ~12 hr old. Atresia of late vitellogenic/hydrated oocytes may be present. <i>Indeterminate fecundity</i> : Less-developed oocytes often present. Fecundity and spawning frequency estimates made in 12 hr pre- and post-spawn sub-phases.	Spermatozoa in lumen of lobules and/or sperm ducts. All stages of spermatogenesis (spermatogonia, spermatocytes, spermatids) can be present. Spermatocysts throughout testis. Germinal epithelium continuous or discontinuous. Macroscopically, milt freely flowing with gentle pressure. Histologically undistinguishable from Spawning Capable phase.
Regressing Cessation of spawning	Spent, regression, post spawning, recovering	Atresia present (any stage). Majority of vitellogenic oocytes undergoing alpha or beta atresia common. Less-developed oocytes often present. POFs may be present.	Residual spermatozoa present in lumen of lobules and sperm ducts. Widely scattered spermatocysts near periphery containing spermatids. Spermatogonial proliferation and regeneration of germinal epithelium common in periphery of testis. Macroscopically, testes small and milt not released with pressure.
Regenerating Sexually mature, reproductively inactive	Resting, regressed, recovering	Only oogonia and primary growth oocytes present, including chromatin nucleolar and perinucleolar oocytes. Muscle bundles, enlarged blood vessels, thick ovarian wall and/or gamma, delta atresia may be present.	Testes small. No spermatocysts. Lumen of lobule small or nonexistent. Proliferation of primary, occasionally secondary, spermatogonia throughout testes. Residual spermatozoa occasionally present in lumen of lobules and sperm duct.

Table legend: General description of the phases in fish reproductive cycles. Timing within each phase is species-dependent. Previously developed histological classification schemes for individual species may be added as sub-phases within each of the defined phases. Some criteria listed for phases may vary depending on species, reproductive strategy or water temperature.