

## Supplementary Materials

**Table S1.** Macroscopic and histological (microscopic) descriptions of the reproductive phases of female Gray Snapper where: OW = ovarian wall; PG = primary growth; CA = cortical alveolar; Vtg1 = primary vitellogenic; Vtg2 = secondary vitellogenic; Vtg3 = tertiary vitellogenic; OM = oocyte maturation; GVM = germinal vesicle migration; GVBD = germinal vesicle breakdown; and POF = post-ovulatory follicle (revised after Brown-Peterson et al. 2011 and Lowerre-Barbieri et al. 2023).

Phase	Macroscopic Features	Histological Features
Immature (never spawned and will not spawn in the upcoming season)	Small ovaries, transparent, closed lumen, thin ovarian wall	Oogonia and PG oocytes, no muscle bundles or large blood vessels. Lamellae are well organized. Thin OW
Developing (ovaries beginning to develop for the upcoming season but not ready to spawn)	Enlarging ovaries, Opaque, beige and/or light pink in color, oocytes not visible to the naked eye	PG, CA, Vtg1, and Vtg2 oocytes present. No evidence of POFs or Vtg3 oocytes. Some atresia can be present <i>Early developing subphase:</i> PG and CA
Spawning Capable (fish are functionally and physiologically able to spawn in this cycle)	Large ovaries, open lumen, individual oocytes visible macroscopically, clear patches visible indicating hydrated oocytes	Vtg3 oocytes become apparent. POFs and/or atresia may be present. <i>Actively spawning subphase:</i> oocytes undergoing OM: GVM, GVBD, hydration, POF
Regressing (cessation of spawning)	Flaccid ovaries, open lumen, thick ovarian wall	Atresia (any stage) and/or POFs present. Few old CA and/or vitellogenic (Vtg1, Vtg2, Vtg3) oocytes can be present
Regenerating (sexually mature, reproductively inactive)	Small ovaries, thick ovarian wall, lumen begins to fill back in, darker in color	PG oocytes present. Some CA oocytes can be present. Muscle bundles, enlarged blood vessels, thick OW and/or atresia or old, degenerating POFs may be present

**Table S2.** Macroscopic and histological (microscopic) descriptions of the phases in the reproductive cycle of male fish where: Csd = central sperm duct; GE = germinal epithelium; Sc1 = primary spermatocyte; Sc2 = secondary spermatocyte; Sg1 = primary spermatogonia; Sg2 = secondary spermatogonia; St = spermatid; and Sz = spermatozoa (revised after Brown-Peterson et al. 2011 and Lowerre-Barbieri et al. 2023).

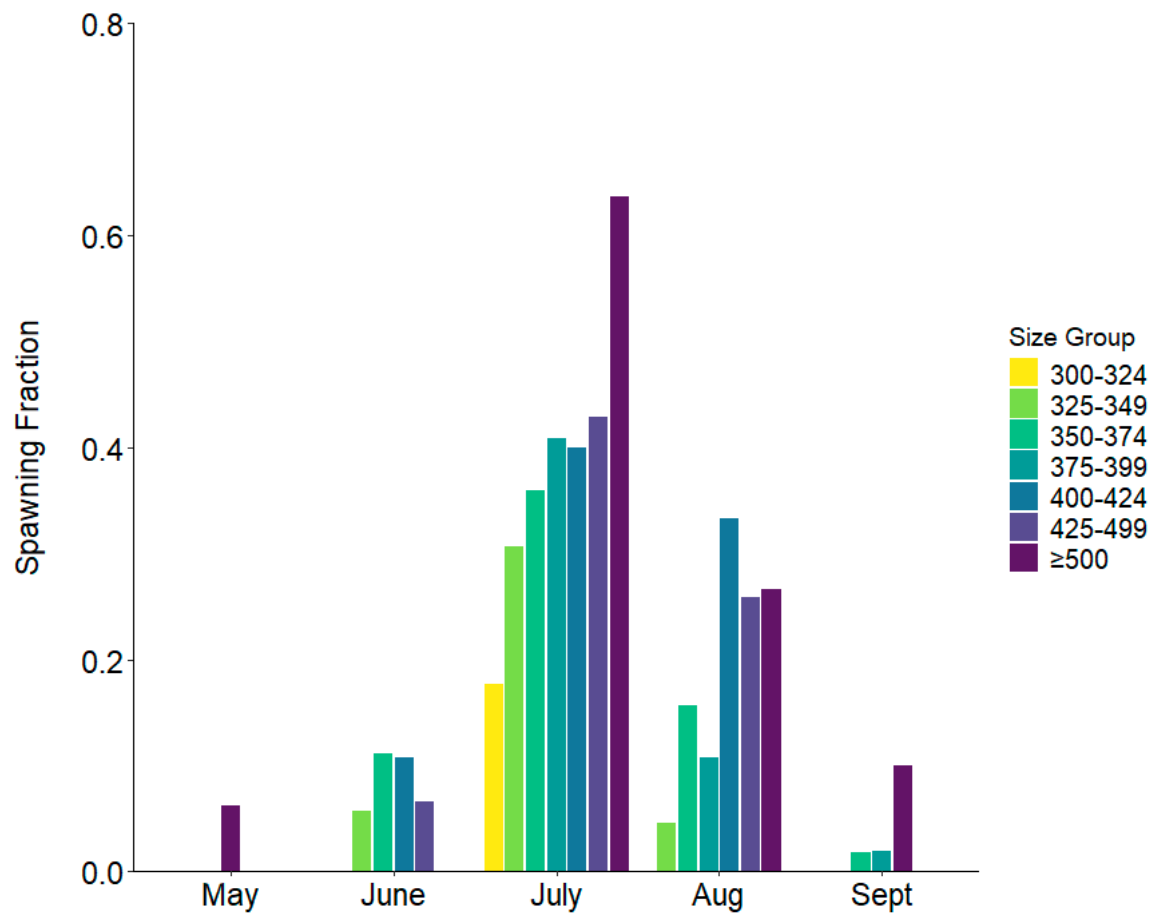
Phase	Macroscopic Features	Histological Features
Immature (never spawned)	Small, transparent and thread-like	Only Sg1 and Sg2 present; no lumen in lobules
Developing (testes beginning to develop but not ready to spawn)	Beige/opaque, no milt in Csd, no spermatogenesis in medulla	All stages of spermatogenesis (Sg, Sc, St, Sz), but no Sz present in lobule lumens and/or sperm duct. <i>Early developing subphase</i> : Sg1, Sg2, and Sc1 only
Spawning Capable (fish are functionally and physiologically able to spawn in this cycle)	Large testes, beige/white, milt in Csd <i>Actively spawning subphase</i> : milt in Csd, full spermatogenesis along testes	Sz in lumen of lobules and/or sperm ducts. All stages of spermatogenesis (Sg, Sc, St, Sz) can be present. Early: continuous GE in all lobules throughout testes. Late: discontinuous GE in all lobules throughout testes; anastomosing lobules.
Regressing (cessation of spawning)	Flaccid testes, brown/beige, feels rubbery to the touch, residual milt can be present in Csd, no spermatogenesis in medulla	Residual Sz present in lumen of lobules and in sperm ducts. Widely scattered spermatocysts near periphery containing Sc2, St, Sz. Little to no spermatogenesis. Spermatogonial proliferation and regeneration of GE common in periphery of testes
Regenerating (sexually mature, reproductively inactive)	Smaller testes, brown/beige, starting to look like developing, no spermatogenesis in medulla	No spermatocysts. Lumen of lobule often nonexistent. Proliferation of spermatogonia throughout testes. GE continuous throughout. Small amount of residual Sz can be present in lumen of lobules and sperm duct

**Table S3.** Spawning duration (days) by size group calculated from the first and last date when actively spawning female Gray Snapper were captured and histologically confirmed by oocytes in OM (GVM, GVBD, H, POFS) from 2022 and 2023 combined. *n* = the number of actively spawning females in each size class.

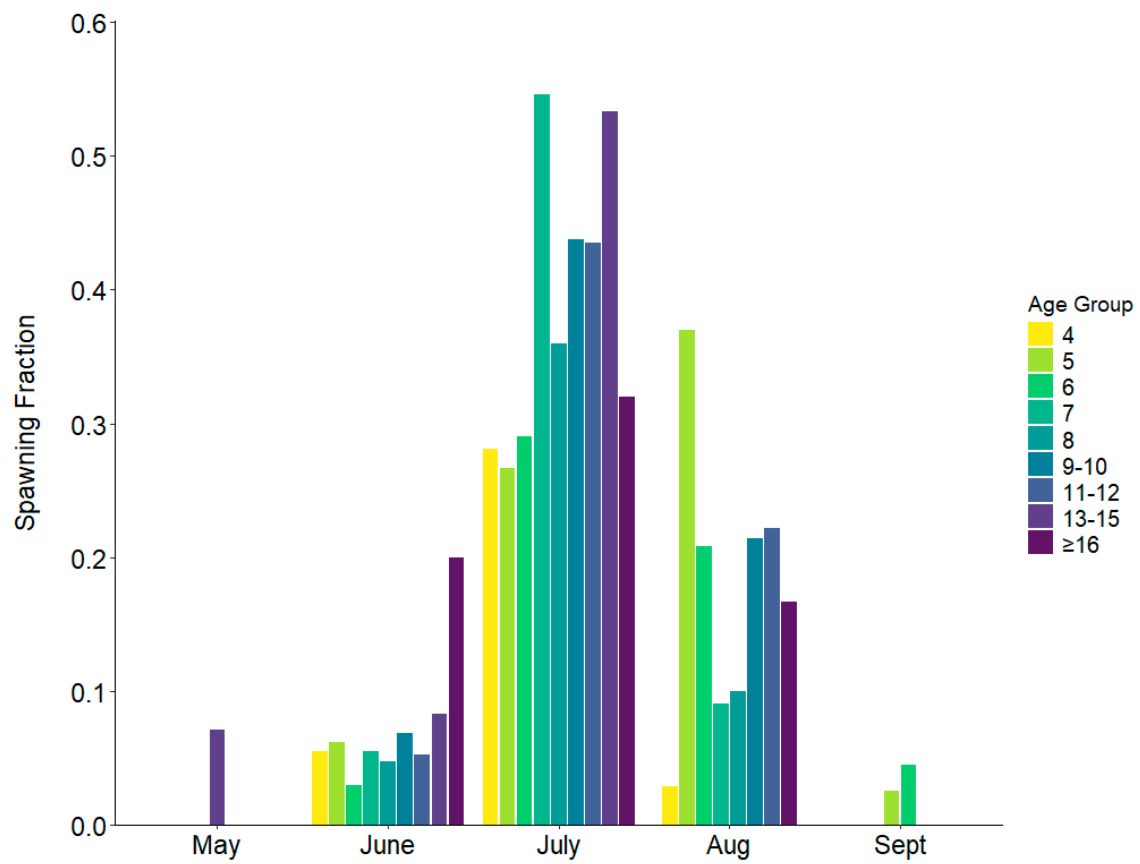
Size Group (TL mm)	<i>n</i>	First OM Date	Last OM Date	Duration (Days)
300-324	25	02 June	22 Aug	82
325-349	74	02 June	02 Sept	93
350-374	101	20 May	02 Sept	106
375-399	78	20 May	02 Sept	106
400-424	46	02 June	26 Aug	86
425-499	52	02 June	02 Sept	93
≥500	23	13 May	02 Sept	113

**Table S4.** Spawning duration (days) by age group calculated from the first and last date when actively spawning female Gray Snapper were captured and histologically confirmed by oocytes in OM (GVM, GVBD, H, POFs) from 2022 and 2023 combined. *n* = the number of actively spawning females in each age group.

Age	<i>n</i>	First OM Date	Last OM Date	Duration (Days)
4	48	10 June	02 Sept	85
5	58	05 June	02 Sept	90
6	50	05 June	02 Sept	90
7	39	02 June	22 Aug	82
8	40	05 June	02 Sept	90
9-10	54	13 May	22 Aug	102
11-12	45	20 May	22 Aug	95
13-15	25	02 June	09 Aug	69
≥16	32	20 May	14 Aug	87



**Figure S1.** The fraction of functionally mature females with POFs by size group and month collected from 2022 and 2023.



**Figure S2.** The fraction of functionally mature females with POFs by age group and month collected from 2022 and 2023.