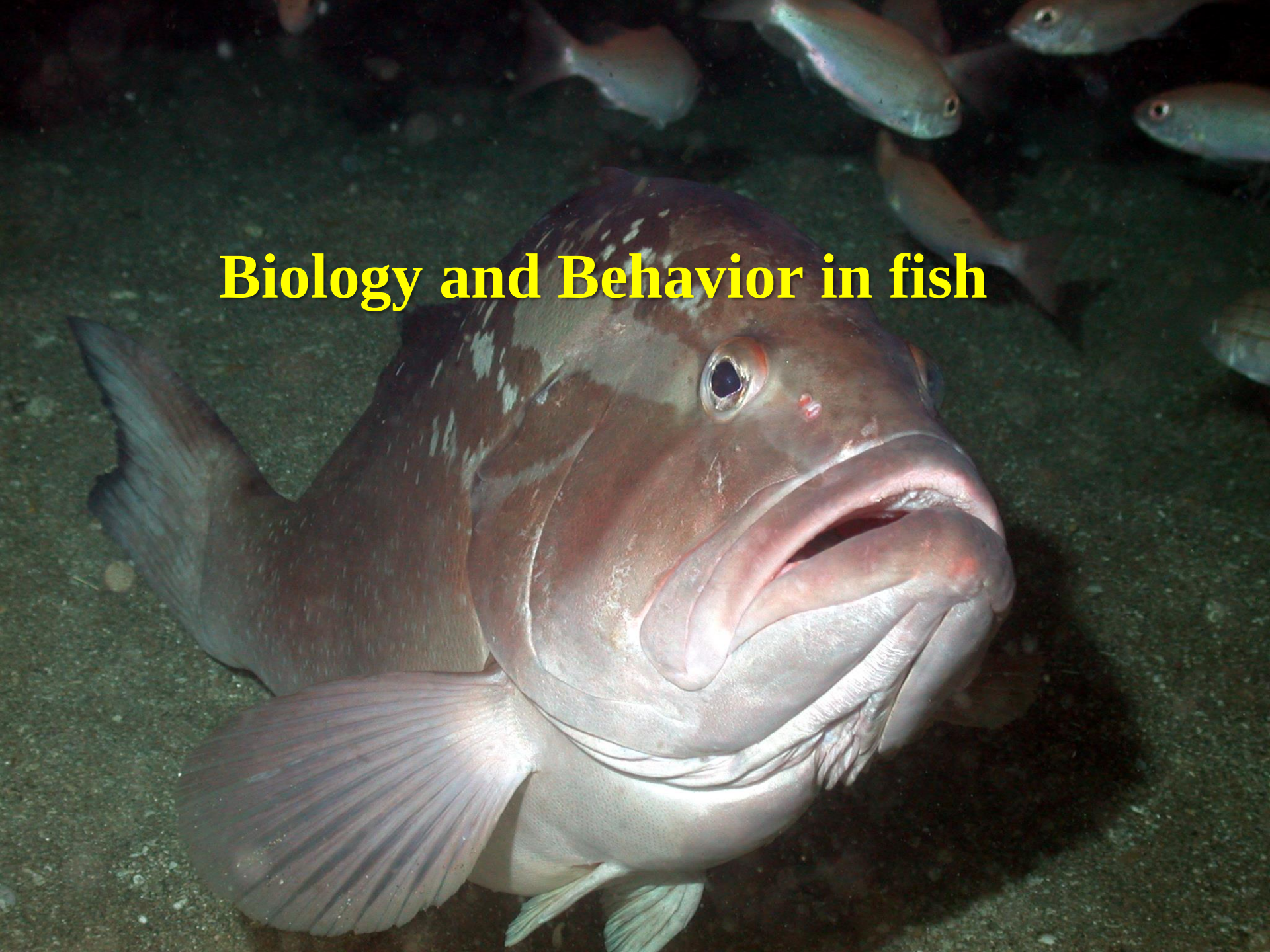
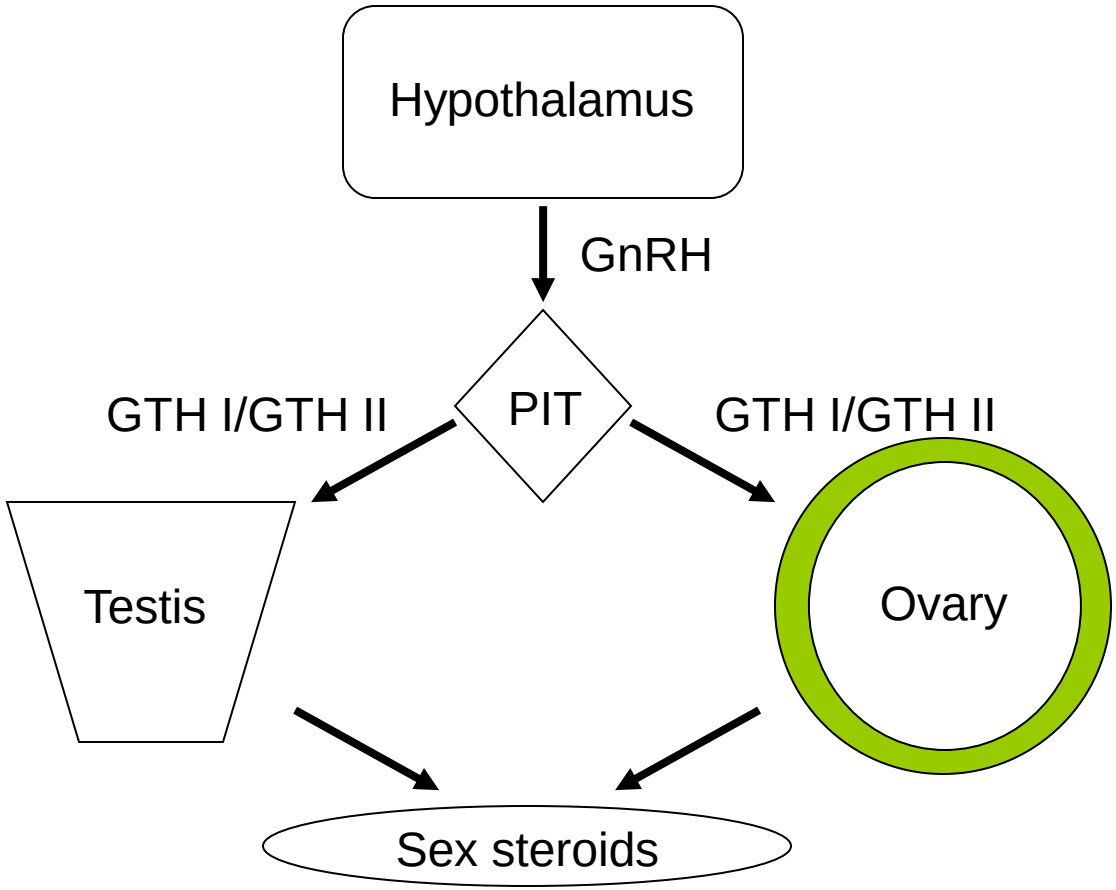
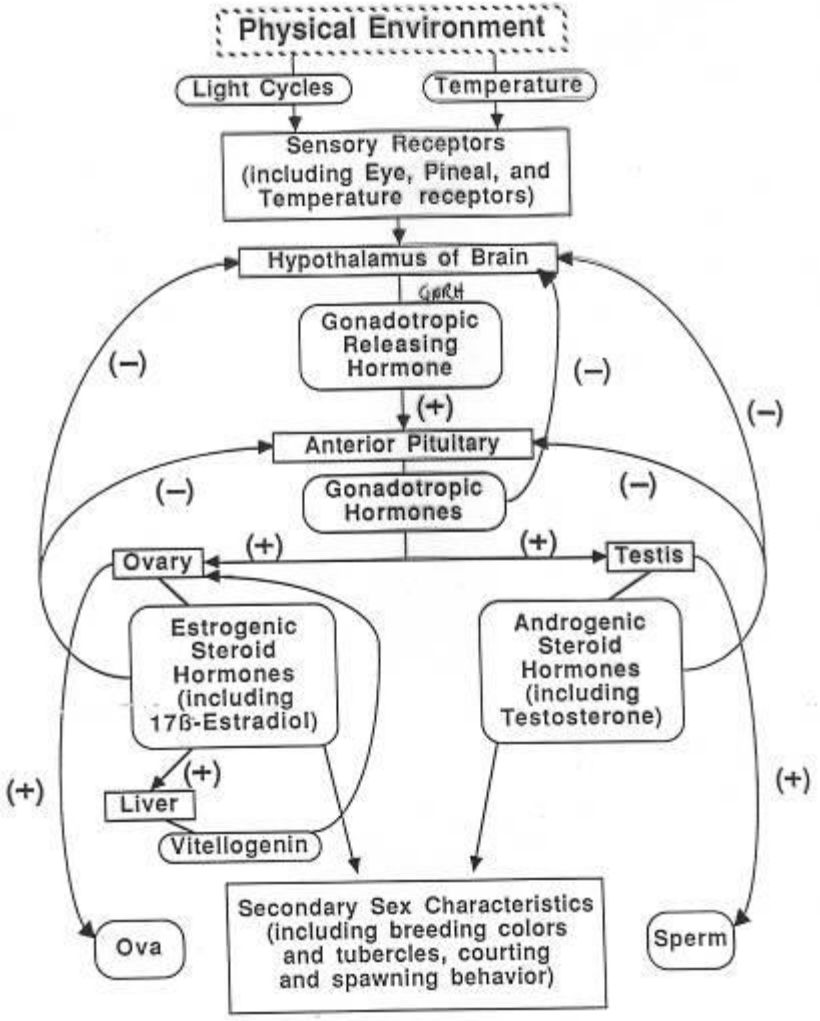

Biology and Behavior in fish

Fish Reproduction

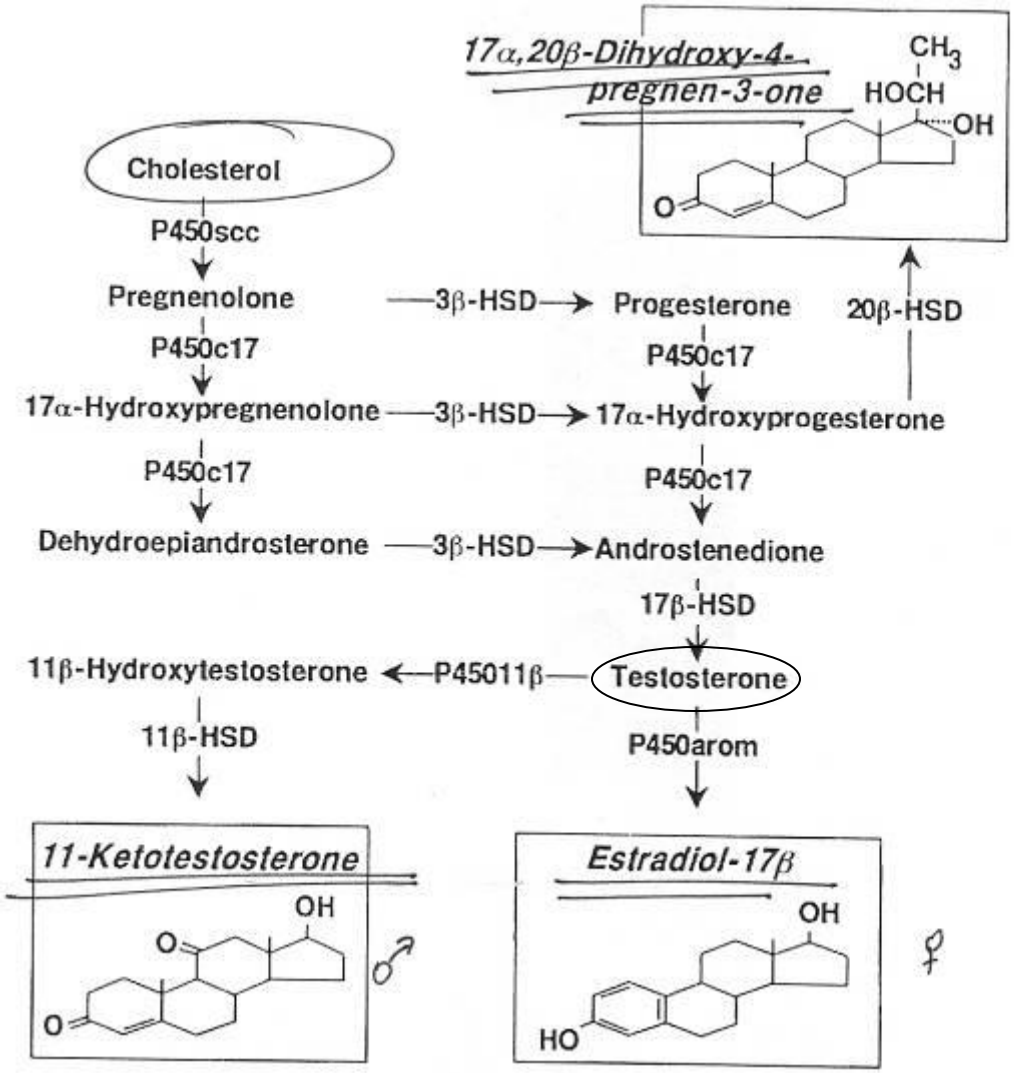
The H-P-G axis


Hypothalamus
GnRH
PIT
GTH I/GTH II
GTH I/GTH II
Testis
Ovary
Sex steroids

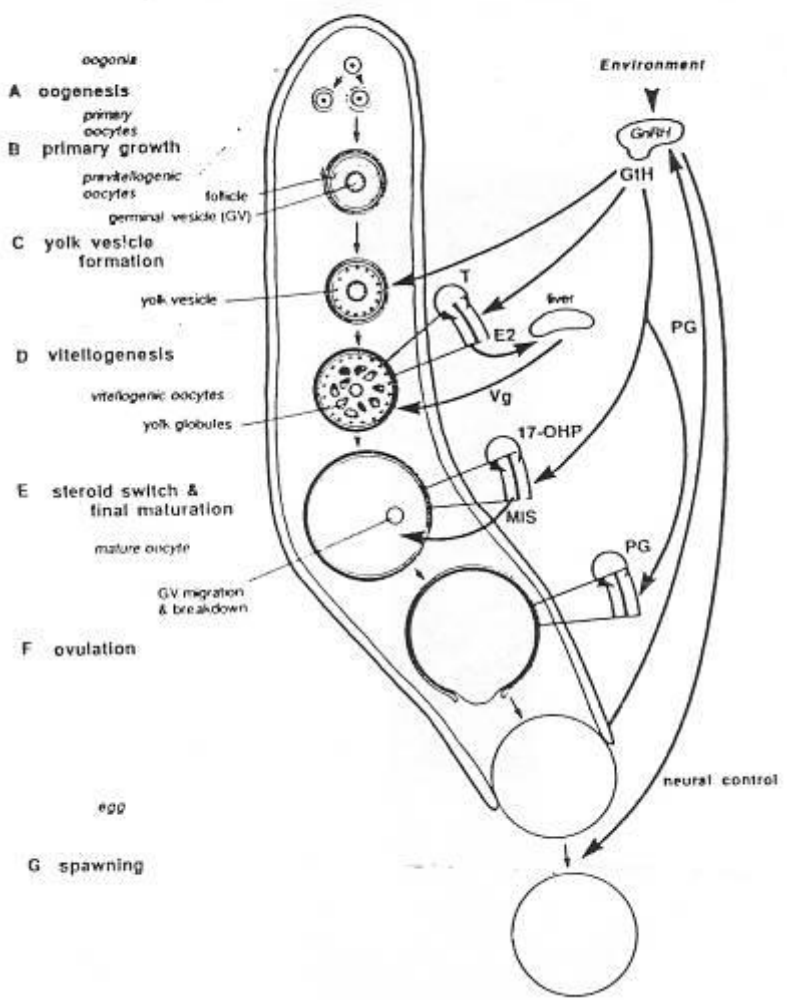
The HPG Feedback loops



Steroid biosynthesis



Hormonal control of oocyte maturation



Stages of maturation

STAGE	DESCRIPTION	COMMENTS
Stage 0	Immature	Not capable of producing viable gametes
Stage 1	Primary growth	Resting or recently mature
Stage 2	Secondary growth	Vitellogenin independent, cortical alveoli present
Stage 3	Early vitellogenesis	Vitellogenin granules present, oocyte increasing in diameter
Stage 4	Late vitellogenesis	Strong presence of vitellogenin in oocyte, gametes approaching maximum pre-spawning diameter
Stage 5	Mature/spawning/ Running ripe	Hydrated oocytes, final maturation of gametes
Stage 6	Spent	High rates of atresia, gonad loosely organized

Stages of gonad maturation (female)

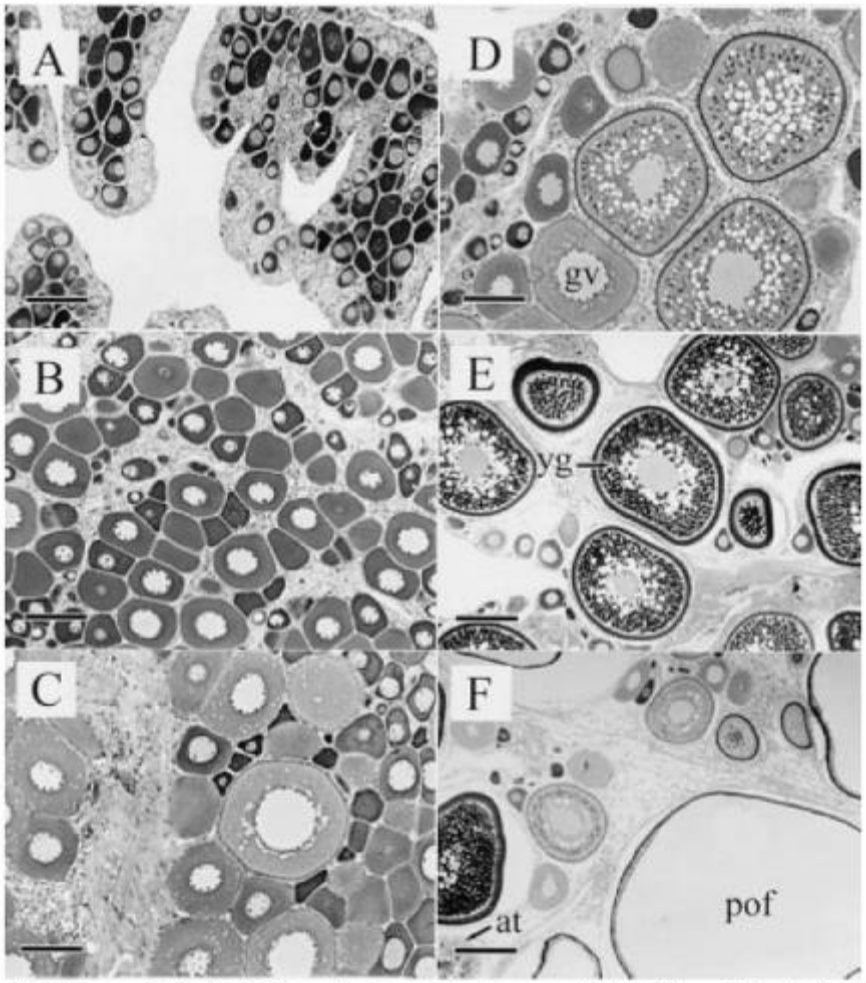
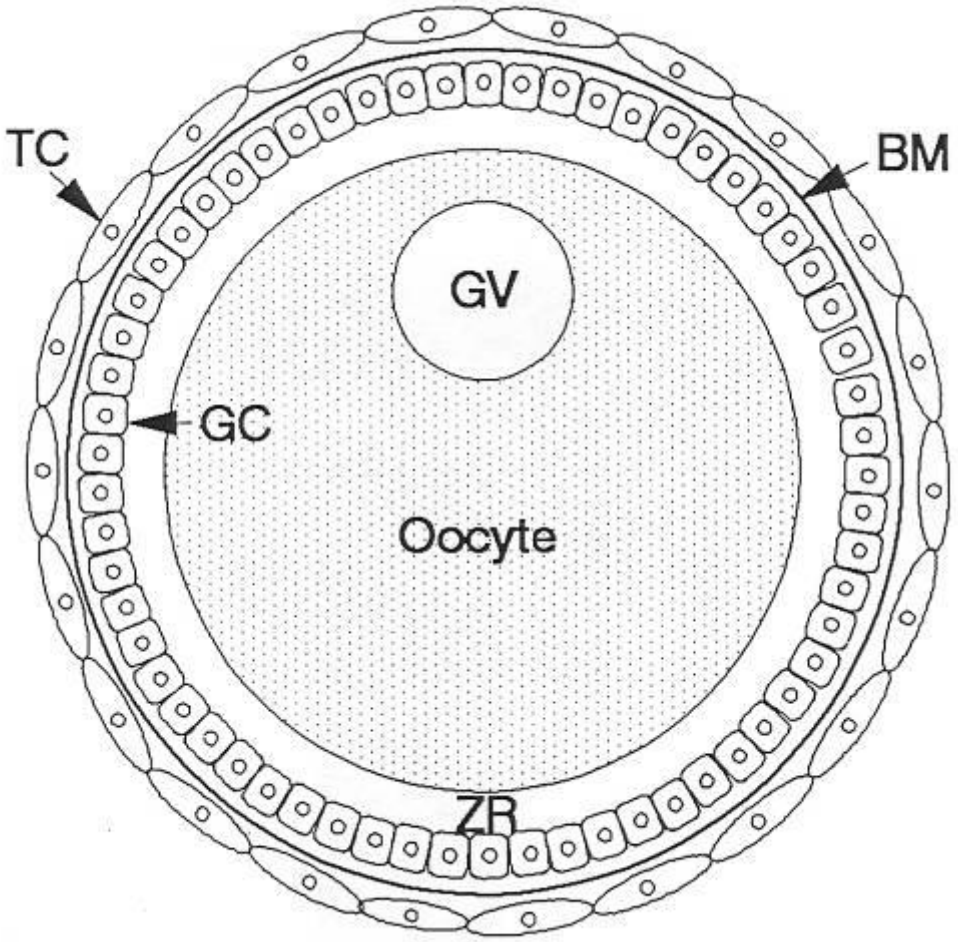


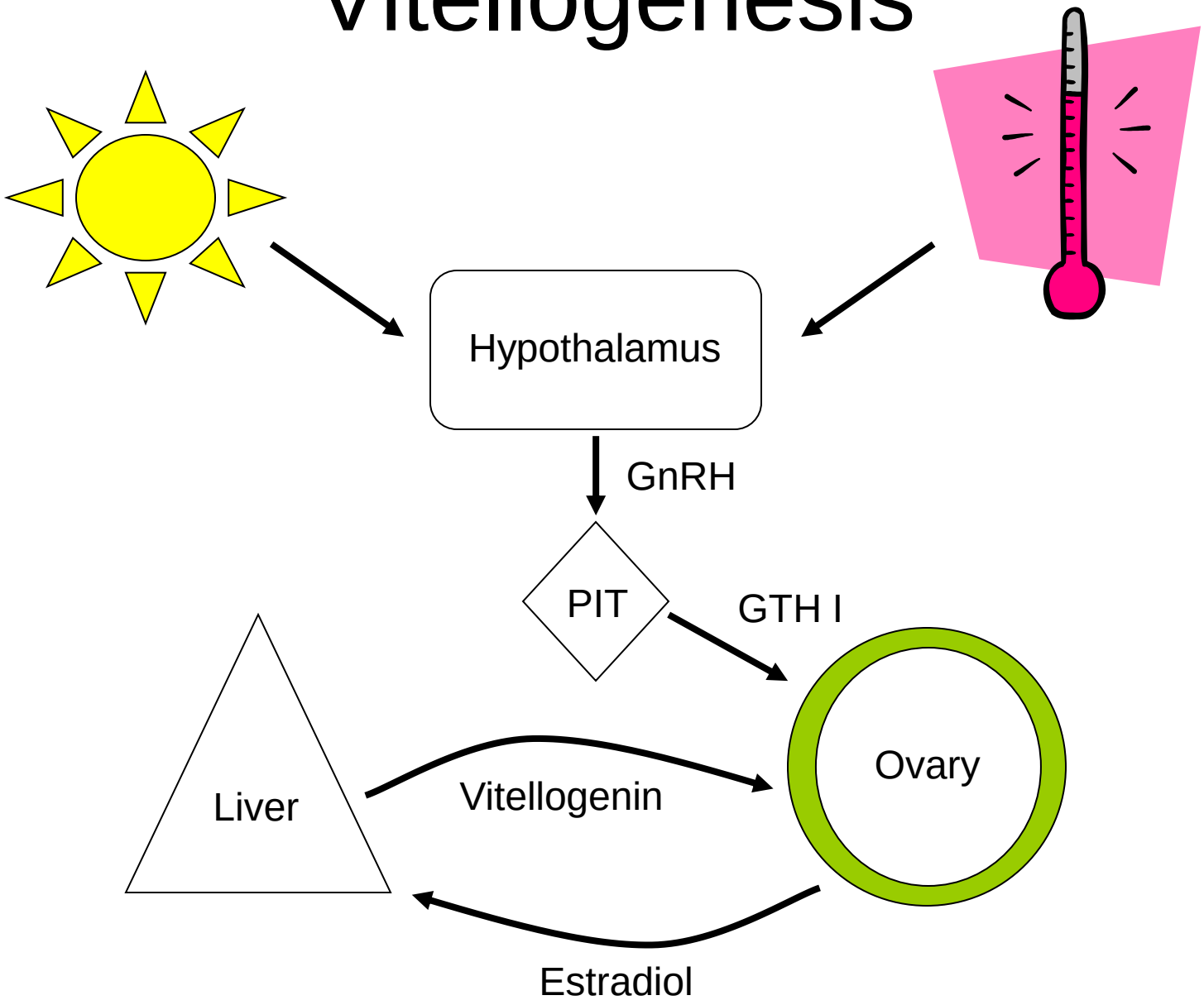
Figure 1. Photomicrographs of the histological stages of ovarian maturation in gag grouper. (A) Stage 0 – Immature (magnification 100 ×, bar = 115 μm); (B) Stage 1 – Primary Growth (magnification 100 ×, bar = 115 μm); (C) Stage 2 – Early Secondary Growth (magnification 40×, bar = 240 μm); (D) Stage 3 – Early Vitellogenesis (magnification 40 ×, bar = 240 μm); (E) Stage 4 – Late Vitellogenesis (magnification 40 ×, bar = 240 μm); (F) Stage 5 – Final Maturation and Ovulation (magnification 40 ×, bar = 240 μm). See *Materials and methods* for detailed description of the ovarian stages. Key: gv = germinal vesicle, yg = yolk granules, pof = pre-ovulatory follicle, at = atretic.

Heppell and Sullivan FP&B 1999

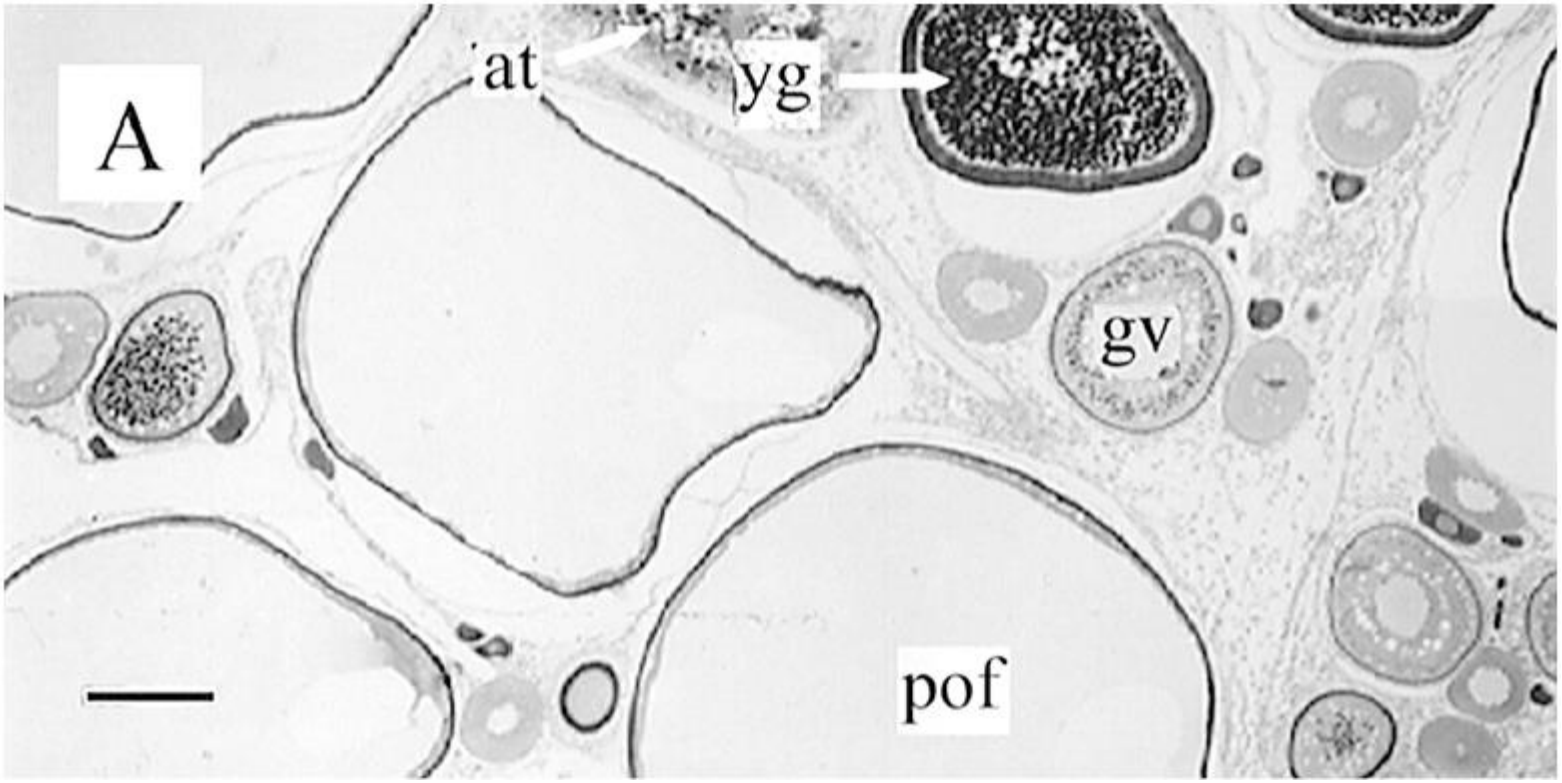
The two-cell model



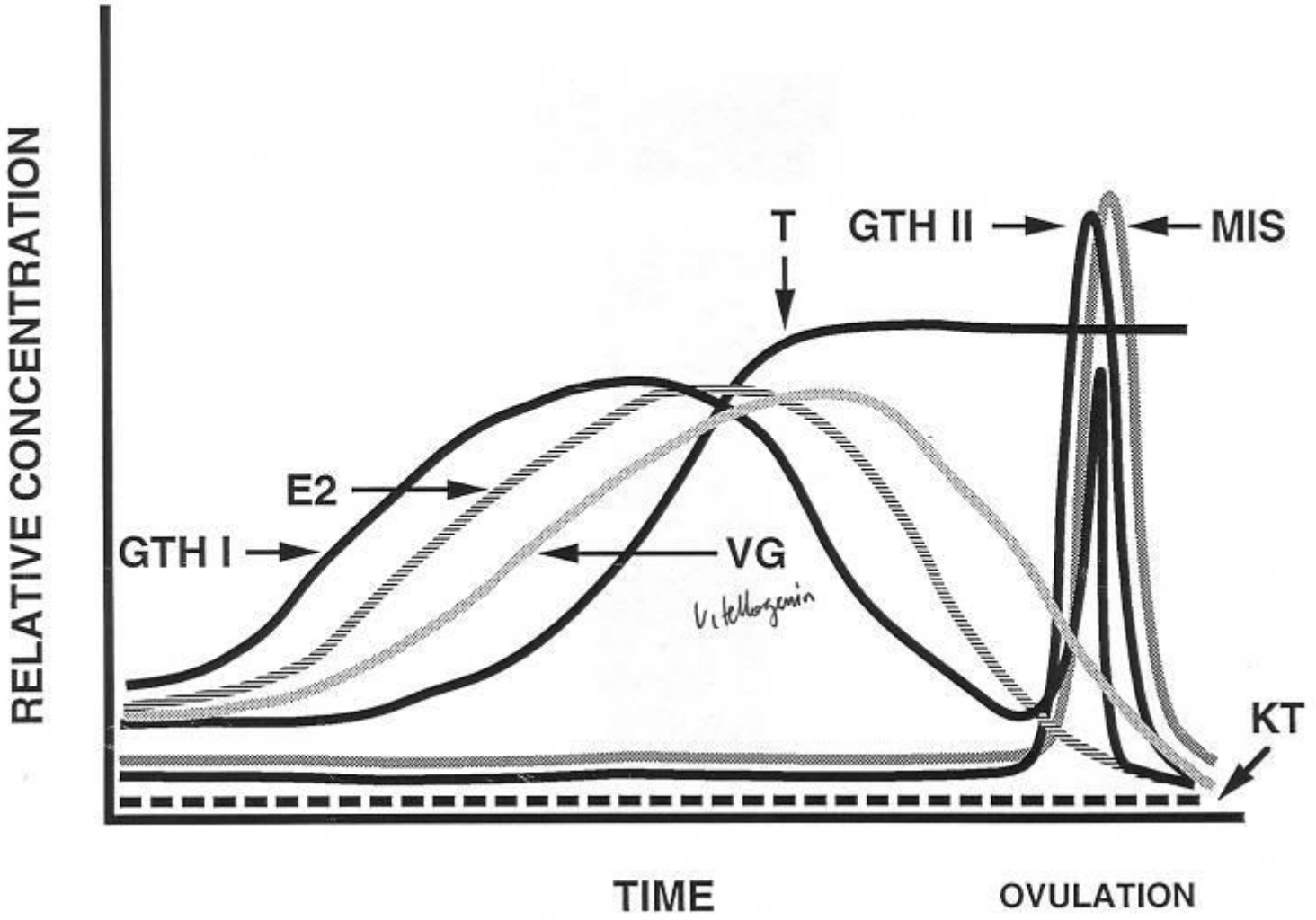
Vitellogenesis



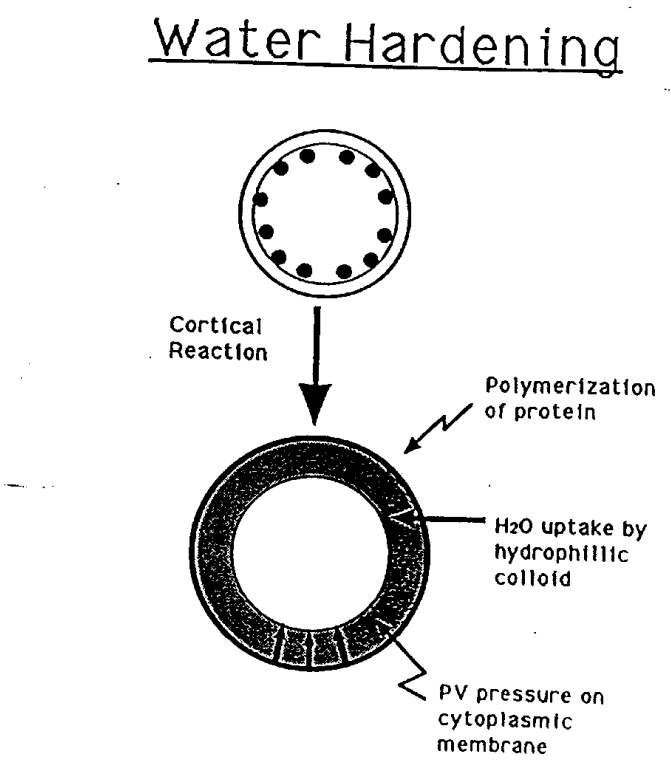
Female final maturation



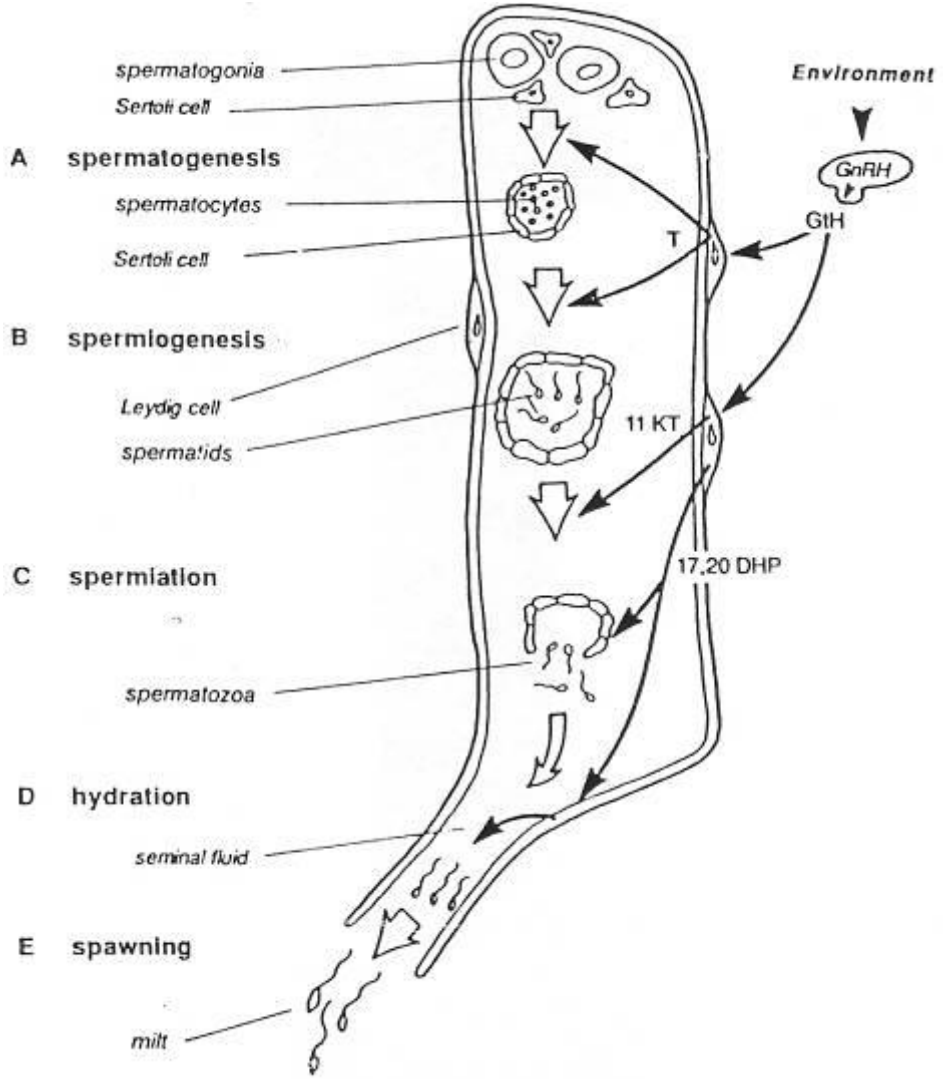
The female hormonal cycle



Water hardening



Hormonal control of sperm maturation



The male hormonal cycle