

Table 1 Macro- and microscopic criteria of female gonadal development (modified from de Souza, 1988; Ntiba and Jaccarini, 1990; Samoilyis and Roelofs, 2000; West, 1990)

Development stage	Microscopic oocyte stage	Microscopic: other criteria	Macro-stage description	Macro-stage no
Immature, IM	Pre-vitellogenic oocytes: Oogonia, chromatin nucleus, early perinucleolus stains darkly, late perinucleolus stains faintly, oocytes irregularly shaped with no defined cell membrane	No sign of prior spawning: Thin gonad wall, compact, lamellae well packed, no cytoplasmic vacuoles	Gonads thin and threadlike, running longitudinally along dorsal wall of the body cavity, sex indeterminate	I
Resting, RE	Pre-vitellogenic oocytes (as above): Residual atretic oocytes present, cytoplasmic vacuoles	Thick wall, lamellae not compact, often vacuolated, few rounded oocytes brown bodies	Ovaries are cylindrical and pinkish tapering gradually toward posterior end, and occupy half the body cavity	II
Mature, RI	Vitellogenic oocytes: Yolk vesicle, early and late yolk globule, migratory Nucleus stage	May have atretic oocytes, may have post-ovulatory follicles (POFs) from previous spawning	Ovaries are opaque and yellowish with some large oocytes clearly visible; Ovaries fully swollen with Oocytes clearly visible, heavy network of blood vessels appears on the surface of ovary wall	III
			Ovaries are very soft and swollen: translucent and full of water; slight pressure on abdomen produces eggs at the vent, yellowish in color due to large yellow oocytes, blood vessels coalesce to form large ones on the external of ovary wall	IV
Running ripe, RR	Hydrated oocyte: Yolk granules in the cytoplasm, defined striated cell membrane	Final stage of oocyte development leading to egg release. Ovulation results in ruptured or empty POFs	Ovaries are very soft and swollen: translucent and full of water; slight pressure on abdomen produces eggs at the vent, yellowish in color due to large yellow oocytes, blood vessels coalesce to form large ones on the external of ovary wall	V
Spent, SP	Atretic vitellogenic oocytes: Pre-vitellogenic oocytes, dense network of blood vessels	Lamellae disrupted and remnant late-stage oocytes and prominent muscle bundles present	Ovaries are small, flaccid, wrinkled and very red with loose follicular tissue	VI