

Reproductive Anatomy of a Three Spotted Swimming Crab (*Portunussanguinolentus* - *Herbst*)

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Abstract: *Portunussanguinolentus Herbst* male and female crabs were collected from Kasimedu fishing harbors landing center to study the morphology of male and female reproductive system. Male reproductive system consisting of an "H" shaped structure with a pair of testes, pair of vas deferentia and ejaculatory ducts. The testes connected to the vas deferens by means of a small duct known as vas efferens. The vas deferens is divided into three different structural regions according to their different synthetic activities (Anterior, median and posterior vas deferens). The morphology of female reproductive system composed of a pair of ovaries, a pair of seminal receptacles (or) spermatheca, and a pair of oviducts open to the exterior through the female genital opening. The oviducts pass ventrally from the seminal receptacle. The ovary is surrounded by a fibrous connective tissue, which separates the ovary from the surrounding hemocoel other morphological structures were also discussed.

Keywords: Ovary, Testes and Crab

1. Introduction

Marine crabs are one of the valuable crustacean resources of India having very good domestic as well as international market demand. Though about 600 species of crabs have been recorded from Indian waters, only few species are consumed (Rao et al., 1973). The fishery of edible crabs in India is sustained mainly by crabs of the family Portunidae. The three-spot swimming crab, *Portunussanguinolentus* (Herbst, 1783) is widely distributed in ocean waters from east Africa, through the Indo-Pacific region, to the Hawaiian Islands. Other major species in the fishery include *Charybdis feriata*, and *Portunuspelagicus*. Exploitation of crabs in Gujarat was at a subsistence scale till late nineties and were mainly exploited by traditional gears like traps, fence net, umbrella net, drag net, spears etc. Diminishing marine fish production and increasing demand for sea foods in domestic as well as international markets brought remarkable changes in utilisation pattern of catch and by-catch of trawls. Crabs are one of the non-commercial group which benefited greatly by this change and since then a small scale fishery for crabs has been continuing in the state, where the resource is mainly being exploited by trawl nets and gill nets. In Veraval, crabs are not a targeted fishery resource and are mainly landed as by-catch of trawling. The crabs are sorted and inedible species as well as very small sizes are usually discarded, due to which the estimation of actual catch and juvenile discard becomes difficult. Moreover, most of the crabs are landed in a putrefied state and can be used only for fish meal production. *P. sanguinolentus* contributes about 40% of the edible crab landing at Veraval.

2. Materials and Methods

Systematic position

Phylum: Arthropoda

Order: Decapoda Latreille

Family: Portunidae Rafinesque

Genus: *Portunus* Weber

Species: *P. sanguinolentus* Herbst

Nomenclature: Common and vernacular names of *P. sanguinolentus* in India are given below:

Common name-Three spotted crab (or) Blood spotted crab
Gujarathi-Karachla
Marathi-Khekhada
Kannada-Denji
Malayalam-Kavalannjandu
Tamil-Mukkannunandu
Telugu-Chukkalapeeta
Oriya-Kankda/Cheralapetta
Bengali-Lajjabotikankra

Portunussanguinolentus Herbst male and female crabs were collected from Kasimedu fishing harbours landing centre (Lat.13.1280° N; Long. 80.2969° E) and brought to the laboratory by using plastic container with seawater. The crabs were segregated as male and females. They were weighed individually and the size of the carapace width was measured. Sexes were determined by examining the abdominal morphology. The crabs were cold-anesthetized by the ice and killed at 20°C during 10 minutes. Then the crabs were dissected to study the morphology of the reproductive tract.

3. Results and Discussion

Morphology of the male reproductive system

The male reproductive system of *P. sanguinolentus* is bilaterally symmetrical creamy to whitish in colour (fig 1), as it was observed by (Gracia and Silva., 2006), composed of a pair of testes, a pair of vas differentia, and a pair of ejaculatory ducts internally, and a pair of pleopods externally as accessory reproductive organs, present on the inner side of the abdominal flab (fig 1) as it was reported by (Simeo et al., 2009) in spider crab.

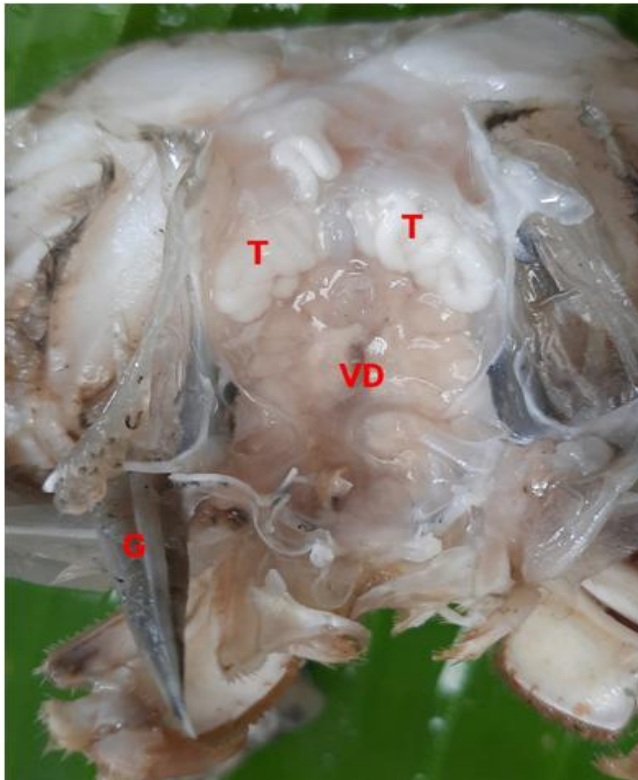


Figure 1: Dorsal view of *Portunussanguinolentus* male reproductive system T-Testes, G- Gills, VD- Vas deferens

The testes are flat and highly coiled, roughly in the form of "H" located on the dorsal portion of the hepatopancreas sandwiched between the hepatopancreas and the hypodermis of the carapace, and continuing laterally to the stomach up to vas deferens (fig 1) as it was mentioned by (Beninger *et al.*, 1988). Just before the posterior stomach and anterior to the heart, the left and right testis are bridged by a commissure as it was discussed by (Sapeklin and Fedoseev., 1981) in Tanner crabs. The testes are connected with the vas deferens through a short small duct called vas efferens. Vas differentia is a pair of elongated and coiled tubules, which extend longitudinally from the posterior testes up to the posterior region of the body as it was reported by (Fasten., 1915). The vas differentia has been divided into three distinct regions, based on the morphological and functional criteria: Anterior Vas deferens (AVD), Median (MVD) and Posterior (PVD) vas deferens as it was discussed by (Kon and Honma., 1970). The AVD are white, tightly coiled, and lying on either side of the median line of cephalothorax, posterior to the dorsal part of the stomach as it was demonstrated by (Cronin., 1947). The coils of the AVD increase in size postero-ventrally and lead into the middle vas deferens, which are milky-white meandering tubules of a higher caliber than both the testes and AVD as it was reported by (Castilho *et al.*, 2007) in mangrove land crab. The posterior vas deferens are whitish in colour arises from the posterior end of the median vas deferens, which are massive for its proximal part, but gradually narrow before opening to the ejaculatory duct as it was mentioned by (Krol *et al.*, 1992) in invertebrates. Each posterior Vas Deferens (VD) is connected with an ejaculatory duct, which is a smooth narrow duct extending between the musculature of the swimming peddle was observed by (Adiyodi and Anilkumar., 1988). The ejaculatory duct leads into the slender weak tube like genital papilla (or) penis, which are

located at the base of the swimming legs as it was reported by (Diesel., 1991) in spider crab. Each penis passes into the two pairs of abdominal appendages called pleopods (or) gonopods situated in the inner side of the abdominal flab as it was discussed by (Hinsch and McKnight., 1988) in Spanish lobster. The first pleopod is made up of two segments, the basal one is broad to the sternal wall and the terminal one is long tube-like and tapering towards the tip, which is actually inserted into the seminal receptacle of the female during copulation as it was observed by (McLaughlin., 1993). The second pleopod helps in passing the seminal fluids from the penis into the funnel like portion of the first pleopod as it was mentioned by (Lawal., 2010) in blue crab.

Morphology of the female reproductive tract

The female reproductive system composed of a pair of ovaries, a pair of seminal receptacles (or) spermatheca, and a pair of oviducts (open to the exterior through the female genital opening situated on the left and right sternites of sixth thoracic segment) as it was reported by (Binford., 2013) in crabs. The oviducts pass ventrally from the seminal receptacle. The ovary is surrounded by a fibrous connective tissue, which separates the ovary from the surrounding hemocoel as it was discussed by (Adiyodi and Anilkumar., 1988) The ovary is roughly in the form of a 'H' and lies on top of the hepatopancreas, extending on both sides along the anterior margin of the cephalothorax are called anterior horns (fig 2) as it was mentioned by (Lawal., 2010) in blue crab.

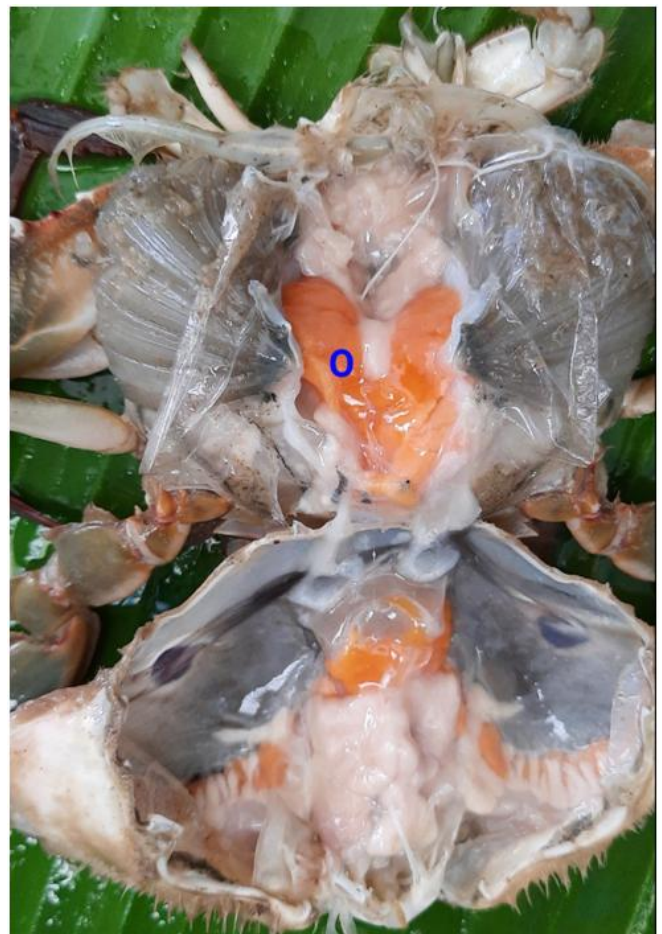


Figure 2: Dissected female with ovary-O

The ovaries run in posterior cardinal direction to the cardiac stomach and just posterior to the stomach, anterior horns are joined by a commissure as it was observed by (Krol *et al.*, 1992) in invertebrates. The posterior horns pass posteriodorsally and laterally, and applied dorsally to the seminal receptacles which are sandwiched on either side between the lateral wall of the body cavity and lateral part of the pericardium and the posterior horns extend up to posterior margin occupies all spaces of the body cavity as it was reported by (Corgo and Freire., 2006) in spider crab. The posterior horns are equal in size at the posterior end as it was mentioned by (Chiba and Honma., 1972) in marine invertebrates.

4. Conclusion

The reproductive morphology of male and female *Portunus sanguinolentus* Herbst crab was similar to that of other marine crabs and also similar to that of many marine invertebrates, but with few exceptions.

References

- [1] Adiyodi K.G and Anilkumar R.G, 1988. Accessory sex glands. In: Adiyodi KG, Adiyodi RG (Eds.), Rep Biol Invert, Vol 3, John Wiley and Sons, Kerala, India 261-318.
- [2] Beninger PG, Elnor RW, Foyleand TP, Odense PH (1988) Functional anatomy of the male reproductive system and the female spermatheca in the snow crab *Chionoecetes opilio* (O. Fabricius) (Decapoda: Majidae), and a hypotheses for fertilization. J Crustacean Biol 8: 322-332.
- [3] Beninger PG, Lanteigne C, Elnor RW (1993) Reproductive process revealed by spermatophore dehiscence experiments and by histology, ultrastructure, and histochemistry of the female reproductive system in the snow crab *Chionoecetes opilio* (O. Fabricius). J Crust Biol 13: 1-16.
- [4] Binford R (1913) The germ-cells and the process of fertilization in the crab, *Menippemercenaria*. J Morphol 24: 147-201.
- [5] Castilho GG, Ostrensky A, Pie MR, Boeger WA (2007) Morphology and histology of the male reproductive system of the mangrove land crab *Ucidescordatus* (L.) (Crustacea, Brachyura, Ocypodidae). Acta Zool 89: 157-161.
- [6] Chiba A, Honma Y (1972) Studies on the maturity of the gonad in some marine invertebrates? IV: Seasonal changes in the testes of the lined shored crab. Nippon Suisan Gakkai Shi 38: 317-329.
- [7] Corgo A, Freire J (2006) Morphometric and gonad maturity in the spider crab *Maja brachydactyla*: A comparison of methods for estimating size at maturity in species with determinate growth. ICES Mar Sci 63: 851-859.
- [8] Cronin LE (1947) Anatomy and histology of the male reproductive system of *Callinectes sapidus*. J Morphol 81: 209-239.
- [9] Diesel R (1991) Sperm competition and the evolution of mating behaviour in *Brachyura*, with special reference to spider crabs (Decapoda, Majidae). In: Bauer RT, Martin JW (Eds.), Crust Sex Biol Columbia University Press, New York, USA 145-163.
- [10] Fasten N (1915) The male reproductive organs of some common crabs of Puget Sound. Puget Sound Mar Sta Pub 1: 35-45.
- [11] Garcia TM, Silva JF (2006) Testis and vas deferens morphology of the red-clawed mangrove tree crab (*Goniopsiscruentata*) (Latreille, 1803). Braz Arch Biol Technol 49: 339-345.
- [12] Haefner PA (1976) Distribution, reproduction and molting of the rock crab, *Cancer irrigates* say 1917 in the mid Atlantic Bight. J Nat Hist 10: 377-397.
- [13] Hinsch GW, McKnight CE (1988) The vas deferens of the Spanish lobster, *Scyllarides chacei*. Int J Invertebr Reprod Dev 13: 267-280.
- [14] Hoestlandt H (1948) Recherchessurlablogie de l'*Eriocheirsinensis* en France. Ann Ins Oceanogr 24: 1-116.
- [15] Kon T, Honma Y (1970) Studies on the maturity of the gonad in some marine invertebrates? IV: Seasonal changes in the testes of the Tanner crab. Nippon Suisan Gakkai Shi 36: 1028-1031.
- [16] Krol RM, Hawkins WE, Overstreet RM (1992) Reproductive components. In: Microscopic Anatomy of Invertebrates. Decapod Crustacea 10: 295-343.
- [17] Lawal-Are AO (2010) Reproductive biology of the blue crab, *Callinectes amnicola* (De Rocheburne) in the Lagos Lagoon, Nigeria. Turkish J Fish Aquat Sci 10: 1-7.
- [18] Manjon-Cabeza ME, Raso JEG (2000) Morphological reproductive aspects of males of *Diogenes pugilator* (Roux, 1829) (Crustacea, Decapoda, Anomura) from Southern Spain. Sarsia 85: 195-202.
- [19] McLaughlin PA (1993) Internal anatomy. In: Mantel LH (Ed), The Biology of Crustacea, Vol 5 Academic Press, New York, USA 1-52.
- [20] Sapelkin AA, Fedoseev VY (1981) Structure of male reproductive system of Tanner crabs. Sov J Mar Biol 7: 37-43.
- [21] Simeo CG, Ribes E, Rotllant G (2009) Internal anatomy and ultra structure of the male reproductive system of the spider crab *Maja brachydactyla* (Decapoda: Brachyura). Tissue Cell 45: 345-361.