The freshwater crab, *Barytelphusa cunicularis* is continuous breeder and mature male and female crabs were found throughout the year with highest number of mature females from June to August. The increase in percentage of matured male and female crab was related to reproductive season. The gonadal index values were high during the reproductive period. The ovarian index was high in June, July and August where as minimum in January. The testis index was observed highest in June and lowest in December. In immature phase ovaries were creamy white but later changed into yellow or light orange and dark orange during vitellogenesis phase. In male and female, carapace length was maximum in the month of June, July and August and minimum in December and January. The male *Barytelphusa cunicularis* attains gonadal maturity at the 35 mm carapace length, while female attains at 38 mm carapace length.

The ovary of female *Barytelphusa cunicularis* is paired structure with dorso-lateral position with respect to hepatopancreas. It is characterized by H- shape, it’s anterior and posterior lobes are connected through an ovary bridge located in the mid-dorsal region cephalothorax. The anterior portion of each posterior lobe is connected to a thin oviduct that opens out through a genital pore located at the coxal base of third pereiopod. The process of oogenesis is classified in two vegetative phase and generative phase. In generative phase oogonial cell multiply by mitosis and give rise to primary oocytes, whereas oocyte grow in size due to accumulation of deutoplasm in the ooplasm and then immature ova
attain a vegetative phase. Primary oocyte develops into secondary oocyte by meiosis and by the expense of nutritive cells. The stages of oogenesis are primary oocytes, secondary oocytes, previtellogenic oocytes, vitellogenic oocytes-I, vitellogenic oocytes-II, and degenerative oocytes.

The testis of male *Barytelphusa cunicularis* are paired structures in dorso-lateral position with respect to the hepatopancreas, presenting with multiple testicular lobes. Each testis continue into a vas deference that present in it’s distal portion to a certain degree of coiling. Each duct opens out in the distal part of the sexual tube, located in the coxal body of the fifth pereiopod pair. The process of spermatogenesis is completed by formation of spermatogonia, spermatocytes, spermatids, spermatozoa and spermatophore.

Morphometric maturity is related to change in the relative growth of secondary sexual characters (relative to a somatic character of reference, such as carapace length) at the onset of sexual maturity. It has been widely used in population biology and aquaculture fisheries. In Brachyurans, the relative growth of the abdomen has been used only to estimate the females’ size at puberty, because certain somites showed striking modification in growth and morphology during ontogeny, whereas similar changes were not observed in males. Development of this female body structure serves to bring them to an efficient size and shape to carry and protect the incubating eggs. In males, the abdomen is only used as a support structure for the pleopods, with a copulatory function.
Relative growth of pleopods and abdomen in female *Barytelphusa cunicularis* (at and above 37 mm CL) indicated positive allometry and pleopods and abdomen grew faster and wider in females than male, at puberty and the morphologic changes were associated with gonadal development. In males of *Barytelphusa cunicularis* the relative growth of the chelae showed significant differences between juvenile and adult phases and sexual differences in the relative growth of chelae noted at 37 mm CL. In female *Barytelphusa cunicularis* there was not significant difference in chelae growth in juveniles and adults phases. In male, *Barytelphusa cunicularis*, in both chela the growth of propodus and dactylus had positive allometry whereas in females, in major chela growth of dactylus had negative allometry but it was positive for propodus and growth of carpus had isometry in both chelae.

The fecundity of *Barytelphusa cunicularis* found in our study was similar to that described for other decapods studied previously and increased with increase in carapace length and width, abdomen width and depth and Pleopod length of the animals, as found in other brachyurans. Moreover, the determination coefficient demonstrated that the carapace width, abdomen width and depth, and area of pleopod are good predictors of fecundity, since allometric relationships between fecundity and crab size variables have been attributed to the fact that egg mass is limited by the space available for the accumulation of reserves and gonadal development inside the cephalothorax. The wide variability in carapace shape as well as abdomen width affects the volume
reserved for gonadal development and consequently spawns size, since the egg mass and the volume of the body cavity usually present similar allometries. As a secondary sexual organ, spawned eggs attach to the endopods of the pleopods, and the exopods play important role in brooding, protecting and fanning the egg mass and thus, the abdominal size and area of pleopod reached during the pubertal moult in brachyurans will be adapted to accommodate the maximum number of eggs produced by a species.

Female *Barytelphusa cunicularis* collected from two different sample stations showed variation in egg number, as most species of crab show variation in their reproductive ecology at both interspecific and intraspecific levels. Interspecific variation may be controlled by many factors, including climatic regime, habitat, and some biological constraints. Changes in fecundity of *B. cunicularis* result especially from variation in body size. However, certain environmental conditions, such as the availability of food for developing females, may have some importance in the reproductive output of this crab and to find the main cause behind egg mortality and low fecundity in *B. cunicularis* in the present site; further field and laboratory studies are required.

The information on control of ovarian and testicular maturation is important in the development of commercial aquaculture of crustaceans; various investigations are still undergone to determine the roles of hormones on maturation which may lead to practices to induce maturation processes for aquaculture. It has long been suspected that ovarian maturation in crustaceans may be controlled
by two antagonistic hormones, one stimulating and other, inhibiting hormone. In *Barytelphusa cunicularis*, bilateral eyestalk ablated females ovary showed rapid maturation of oocytes, which indicated inhibitory action of eyestalk extract injection, the oogenesis was ceased and that was evident by less number of oocytes and absence of yolk droplets. The destalked crabs who received eyestalk extracts showed normal oogenesis. In destalked crabs, growth of secondary sexual organs (pleopod, abdomen and both chelae) was not recorded.

In *Barytelphusa cunicularis*, male crustaceans are different from the female in that they have special endocrine glands – a pair of the androgenic glands (AG), which are correlative with differentiation and GIH and GSH promote testicular development through AG. The present study on *Barytelphusa cunicularis* reports that eyestalk has inhibitory principle of gametogenesis, whereas brain, thoracic ganglion hormones have stimulatory principles. The brain and thoracic ganglion extract injection in destalked crabs drastically increased the wet weight of gonads. The normal crabs after receiving these hormones showed increment in the weight of gonads and size of oocytes and seminiferous tubules. These hormones when injected to destalked crab caused rapid growth of oocytes and seminiferous tubules. These gonads stimulating hormone (GSH), also stimulated growth of sexual characters. The brain and thoracic ganglion extract injection caused rapid growth of major and minor chela in male crabs, and area of pleopod and abdomen length in female crabs.