

## VII. SUMMARY AND CONCLUSION

- ❖ Siganids, rabbit fish, marbled spine foot fish locally named "Batata" are a group of marine fish originally belong to Indopacific waters and represented in Red Sea by five species out of 20 from genus *Siganus*.
- ❖ While Suez Canal was opened to connect Mediterranean Sea with Red Sea during 1869, two species of *Siganus* could immigrate to live in eastern Mediterranean waters viz. *Siganus rivulatus* and *Siganus luridus* which are the main topic of the present study.
- ❖ Genus *Siganus* is comprising nearly 0.56% of the total annual catch of marine waters in Egypt. This amount of fish landing could be doubled if proper measures may be taken toward capture and culture fisheries.
- ❖ In the present study, almost 1134 fish from *S. rivulatus* and 324 fish of *S. luridus* were sampled to conduct various aspects of biological investigations. The samples were representing the fish catch from the coastal zone area off Alexandria and marketed in the two main fish markets; Alanfoushy for the west side of the city and Abu Qir for the east side of it.
- ❖ Samples collected here ranged between 11-28 cm and 17-238 g in length and weight, respectively, which covered one year time from March 1994 to February 1995 for both studied species: *S. rivulatus* and *S. luridus*. The former is *de facto* more common than the latter.

- ❖ *S. rivulatus* and *S. luridus* proved to be herbivorous fish thrive best during summer season, while in winter feeding coefficient becomes less as per fullness coefficient and emptiness coefficient.
- ❖ Selectivity index showed that plant origin material is more selected food item while the feeding intensity or filling index was also high in summer less in winter. Hepatosomatic index has supported the same observation in both species.
- ❖ Gut content analysis conducted by occurrence and points method showed that plant origin material was dominant represented by mostly Chlorophyceae. Plant origin material contributed 94% and 91% by composition. On the other hand, other food items comprise 6% and 9% only in case of *S. rivulatus* and *S. luridus*, respectively.
- ❖ The index of preponderance of food items as a combination of employed methods proved exactly that plant origin material occupies 99% or 98.3 as the first rank while other food items consist only 1% or 1.7 for *S. rivulatus* and *S. luridus*, respectively.
- ❖ Age and growth of *S. rivulatus* was studied for age assessment : two graphical methods and two indirect employing hard parts. Petersen method was supported by Harding-Cassie plot and the length frequency in both methods revealed the presence of five modes representing age class from one to five similarly for *S. luridus*.

- ❖ Vertebrae were employed for age assessment and the relation between vertebral radius-fish length manifested that four age groups were recorded and the corresponding lengths were also calculated.
- ❖ Eye lens weight was used to evaluate the age and hence the growth of *S. rivulatus* is calculated. In this method, the relationship between eye lens weight and fish length pointed out towards the same results in which *S. rivulatus* here were sampled from five age groups and similar results were obtained for *S. luridus*.
- ❖ Length-weight relationship was determined and the equation was:  
 $\log W = -1.866 + 2.872 \log L$  for *S. rivulatus*. Perusal of the results proved also that, condition factor "K" was increased during summer and decreased in winter, which is related to food abundance and the spawning season. The equation for *S. luridus* was:  $\log W = -1.821 + 2.881 \log L$ .
- ❖ Growth increment in length and weight was calculated to be 11.95, 15.81, 18.59 and 21.25 cm for length increment for *S. rivulatus*. The age class of one year to four years, on the other hand weight increment for the same year classes were 19.49, 23.89, 25.79 and 32.26 g, respectively. The maximum length theoretically is 32 cm as Von Bertalanffy growth equation represented by Ford Walford. In case of *S. luridus*, the length recorded at 11.84, 15.75, 18.55 and 21.12 cm, respectively for the first till the fifth year of life while the annual weight increment recorded against these figures were 18.68, 23.82, 25.59 and 30.87 g, respectively. The maximum length is 30 cm as per used equation of Ford-Walford.

- ❖ *S. rivulatus* has sex ratio in which females commonly outnumbered males as 1 : 1.30, while for *S. luridus* sex ratio was less (1:1.17) and the gonadosomatic index was higher during May-August and the length or weight of gonads tend to increase while fish size increases.
  - ❖ Seven maturity stages were described and the size at fish gains its maturation was determined at 18-19 cm of fish length or at the end of its second year of life.
  - ❖ Ova size ranged between 0.4 to 0.7 mm for ripe stage and the female releases ~~one~~ patch of eggs during the spawning season of 0.7 mm ova size and the spawning season of *S. rivulatus* as revealed by maturity stages as gonadosomatic appears to be during summer in between May-August and its peak falls in June and for *S. luridus* as well.
  - ❖ Fecundity of *S. rivulatus* is ranging between 283.569 to 865.377 while it is 14.924 to 30.906 as absolute and relative, respectively. The equation for the absolute fecundity was:  

$$\log F_a = 1.8087 + 2.8256 \log L \text{ or } \log F_r = 1.7707 + 1.8533 \log L$$
for the fecundity count related to length, while it was:  

$$\log F_a = 3.7720 + 0.8873 \log W \text{ or } \log F_r = 3.7681 - 0.1106 \log L$$
for the fecundity related to weight. Fecundity always increases with the corresponding increase in fish size.
  - ❖ Siganids could boost the production rate of fishes both ways capture and culture fisheries, since the fish has acceptable growth rate and high fecundity as well as it thrive best on sea weeds and plants. The fish normally inhabit the off-shore waters which can be utilized with reasonable measurements.
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