

SHORT TERM ANALYSIS OF CATCH PER UNIT EFFORT (CPUE) AND GUT CONTENT ANALYSIS OF GROUPERS AND SNAPPERS FROM PORT BLAIR

Kiruba Sankar*, Grinson George, Krishnan, P, M.P. Goutham Bharathi, S. Rajesh and S. Dam Roy
Fisheries Science Division, Central Agricultural Research Institute, Post Box No. 181, Garacharma Post,
Port Blair – 744101, Andaman and Nicobar Islands

*Corresponding Author Email: rkirubsasankar@gmail.com

ABSTRACT

The present study is aimed at estimating the catch per unit effort (CPUE) of dominant groupers and snappers and to examine the gut contents of the two dominant species viz., *Aprion virescens* (Lutjanidae) and *Epinephelus malabaricus* (Serranidae) from January-March 2011. Length frequency analysis revealed that most dominant landed length group of *Epinephelus malabaricus* ranges between 31-50 cm contributing to more than 50 % of total landings. The most dominant landed length group of *Aprion virescens* was 31-60 cm, wherein 51-60 cm contributes to approximately 35% of landings. During the study period, mean CPUE (kg/day) of Serranids and Lutjanids were 48.33 and 38.71 respectively. In *Aprion virescens* Crustacea (Portunid crabs) dominated the diet with an occurrence frequency of 93.75% followed by copepod (*Calanus* spp) with 75% and in *Epinephelus malabaricus* Teleostei (usually only vertebrae, muscle tissue and scales) was dominant with 81% followed by Sepia (75%).

Keywords: Andaman and Nicobar Islands; *Aprion virescens*; *Epinephelus malabaricus*; Lutjanids; Perches Serranids.

INTRODUCTION

The family Serranidae, Sub family *Epinephelinae* comprises 17 genera and 137 species and the family *Lutjanidae* comprise of 17 genera and 103 species of mostly reef dwelling marine fishes commonly known as Groupers and Snappers. They are mainly restricted to tropical and subtropical marine waters. The studies of Heemstra and Randall (1993) accounted 137 species of Groupers and 103 species of Snappers presently known with as many as 110 species of Groupers and 67 species of Snappers from Indo-Pacific region (Allen, 1985). Perch fishery is of great economic importance, of which Groupers (Serranidae) and Snappers (Lutjanidae) are the most significant demersal resources contributing to the livelihood security of the fishers of Andaman and Nicobar Islands. Hook and line is the most commonly deployed gear and besides this, long line, hand line, float set and long line are also used (Rajan, 2002). These fishes have high market value and few species are currently being exported in frozen condition to numerous European and South East Asian countries. Previously, grouper fishing as live trade was concentrated in Islands of Ritchie's archipelago and Mayabunder (Middle Andaman). Literature on the important perch resources in India is scant and mostly deals with some aspects of experimental fishing catch statistics and trap fishery.

Groupers and Snappers are active predators. These fishes tend to occur at rather high levels in trophic web. The diet accepted by most species seems broad enough to permit shifts in feeding, ever between rather diverse prey group e.g. pelagic fish, demersal fish, large or small benthic crustaceans and a variety of invertebrates. The exported fish are fishing fleet of traditional crafts over the western fishing zone of south Andaman could operate only for seven months due to rough weather, for rest of the five months there is no fishing beginning mid-May to mid-October coinciding with the onset of south-west monsoon. Information on the Grouper and Snapper availability and sustainability of specific gear on the ground along the South Andaman coast and on diversity of groupers and snappers and its spatio-temporal distribution in Andaman waters are limited as the habitats of these fishes are unsuitable for the operation of gears for fishing. The present study has been carried out with an objective to estimate the catch per unit

effort (CPUE) of dominant groupers and snappers and to examine the gut contents of the two dominant species viz., *Aprion virescens* (Lutjanidae) and *Epinephelus malabaricus* (Serranidae).

MATERIALS AND METHODS

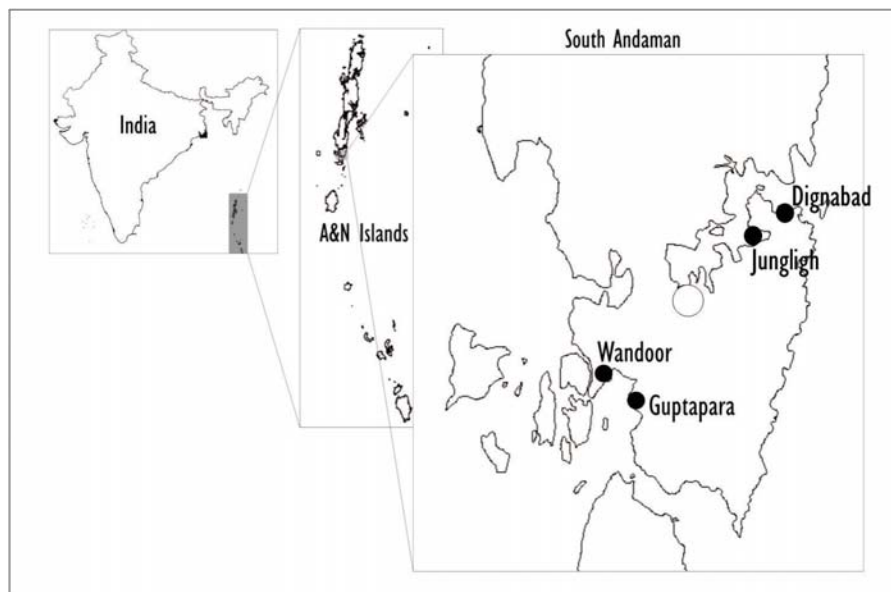
Study area and data collection

The sampling sites were four major landing centres viz., Dignabad, Junglighat, Guptapara and Wandoor of South Andaman (**Fig. 1**). All the fish landing centers were visited at weekly regular intervals for three months from Jan-Mar 2011 for quantifying the distribution pattern of groupers and snappers. Data pertaining to fish catch, number of species, morphometric characters for the targeted species were observed *in situ*.

Catch effort data

Analysis of catch and effort of the fishery over the study period was done using CPUE. The total catch of particular species or multispecies of groupers and snappers on specific landing center day was recorded with catch in kilogram (kg) and effort in units (Number of boats). The catch effort data was collected for 9 landing center days in a month and then raised to monthly values for further analysis. One calendar month is the unit of the time stratum for sampling. This was divided into 3 equal clusters of 10 days each for sampling from the population. Generally craft, its gear and crew members were taken as one fishing unit.

Fig.1: Map showing study area with sampling sites



Morphometric data collection

The morphometric measurements of Total length (TL), weight (W) and depth were taken. TL was measured from the tip of the snout (mouth closed) to the extended tip of the caudal fin. TL was taken with the help of measuring board (Biotech-fish scale reader) to the nearest millimeter. The greatest vertical diameter of individual fish was recorded as depth. It was calculated using a scale to the nearest millimeter. Similarly body weight of individual fish

was measured to the nearest gram.

Gut content analysis

The specimens were cut open and intact stomachs were removed by cutting above the cardiac sphincter and below the pyloric sphincter (Arendt *et al.*, 2001). The stomachs thus removed was thoroughly homogenized with 4% formalin and poured into a Petri dish. The stomach

distension was categorized as (i) filled to 25% (quarter); (ii) filled to 25-50% (half); (iii) filled to 50-75% (3/4th) and (iv) filled to 75-100% (full) modified from Chitravadivelu and Sivapalan (1984). Segregation of larger prey items which can be visualized without the aid of microscope was carried out using forceps. The sub-samples was then observed under microscope and completely quantified adopting Bagenal’s (1978) frequency of occurrence method. In the frequency of occurrence method, the number of stomachs containing each food item is expressed as a percentage of all non-empty stomachs. Though this method is quick and requires minimal apparatus, it gives little indication of the relative quantities of each food category present in the stomach.

RESULTS AND DISCUSSION

Morphometric analysis and LWR

Length frequency plot analysis (Fig. 2) shows that the most dominant landed length group of *Epinephelus malabaricus* is 31-50 cm which is more than 50 % of total landings. In case of *Aprion virescens* 51-60 cm is most dominant wherein 51-60 cm is almost 35% of landings.

Mean length and weight of *E. malabaricus* and *Aprion virescens* were given along with the other dominant landed species during the period of study (Table 1).

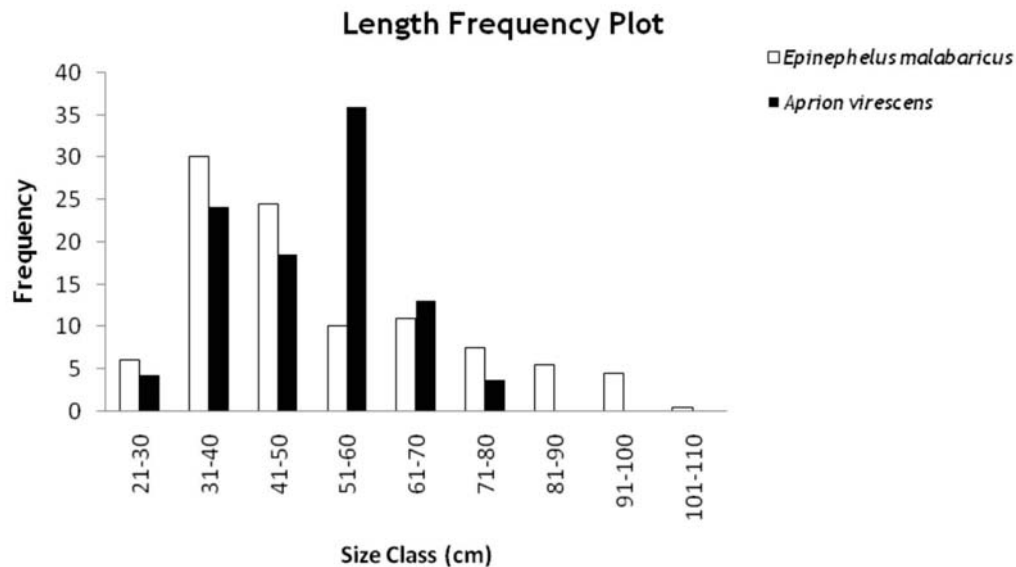


Fig. 2: Length frequency plot

Table 1: Morphometrics of commercial Groupers and Snappers of South Andaman

Family	Name of the species	Length (cm)*	Weight (kg)*
Serranidae	<i>Epinephelus malabaricus</i>	48.01 ± 1.26	4.18± 0.27
	<i>Cephalopholis miniata</i>	49.91 ± 2.57	1.64 ± 0.20
	<i>Cephalopholis argus</i>	43.87 ±3.70	1.32 ± 0.25
	<i>Epinepheleus fuscoguttatus</i>	80.65 ± 1.17	5.56 ± 0.17
	<i>Epinepheleus tauvina</i>	38.51 ± 2.52	1.61 ± 0.37
	<i>Variola louti</i>	74.00 ± 3.12	4.62 ± 0.53
Lutjanidae	<i>Lutjanus deccusatus</i>	25.58 ± 0.80	0.32 ± 0.04
	<i>Lutjanus gibbus</i>	35.50 ± 1.56	0.96 ± 0.05
	<i>Lutjanus bohar</i>	43.60 ± 0.84	0.98 ± 0.05
	<i>Aprion virescens</i>	48.76 ± 1.03	2.26± 0.01

* Mean ± Standard Error (Kirubasankar et al., 2013)

Gut content analysis

The occurrence frequency of the major prey items of *Aprion virescens* and *Epinephelus malabaricus* was recorded (Table 2). A total 32 specimens of *Aprion virescens* were examined, of which all had food in their stomachs. Gut content analysis revealed that crustacea dominated the diet with an occurrence frequency of 93.75% followed by copepoda with 75%. Portunid crabs were the most

abundant of the crustaceans in the gut. *Calanus* spp were the most abundant of copepods. Broken larval appendages in various stages of digestion were also present. Other important food items in terms of occurrence frequency were Teleostei (usually only vertebrae, muscle tissue and scales) and Polychaeta (Nereididae, Capitellidae, Phyllodocidae). *Sepia* was found in few guts with an occurrence frequency of 18.75%.

Table 2. Gut content analysis

Prey items	Frequency of occurrence (% F)	
	<i>Aprion virescens</i>	<i>Epinephelus malabaricus</i>
Copepods	75	-
Crustacea	93.75	50
Polychaetes	87.5	68.75
Teleostei	43.75	81.25
Sepia	18.75	75

Teleostei was dominant with 81% followed by *Sepia* with a frequency of 75% from the guts of *Epinephelus malabaricus* (n=52). Polychaetes were present with a frequency percent of 68.75. Precise identification of polychaetes was not possible due to mastication. Crustaceans were the less important prey item found in the guts of *E. malabaricus* with a frequency of 50%. Crustaceans were represented by portunid crabs.

Catch effort analysis

Details pertaining to the CPUE are summarized in Table 3. In case of Groupers the average catch per unit effort for the study period was 48.33 kg/day with the maximum CPUE on January (59.41kg/day) and minimum on March (38.71 kg/day). Since the catch is multispecies, analysis of single species CPUE was not possible. In case of Snappers, average CPUE was 37.62kg/day, with the maximum CPUE on January and February (39.78kg and 39.39 kg) wherein case of March it was 33.70kg. All the units landed and sampled are of standard size 32 feet OAL with a crew of 3-5 members.

Table 3. CPUE of Serranidae and Lutjanidae (Jan-March 2011/day)

Month	Serranidae	Lutjanidae
January	59.41	39.78
February	47.03	39.39
March	38.71	33.7

Perches are the most abundant demersal fishery resources in Andaman and Nicobar Islands comprise of Serranidae, Lutjanidae and Lethrinidae. Among them, groupers and snappers are the most demanded and widely sought due to their export market availability and consumer preference in the local markets. In Andaman group of Islands, North (Mayabundar) and South Andaman are the

rich resources of Grouper and Snapper landings. South Andaman was selected for data collection due to easy and regular access to landing centers. were also procured to lab for gut content analysis and estimation of gastro somatic index.

The length frequency plot shows that 31-50 cm is the most dominant landed length groups, indicative of the

higher catch of juveniles from the landings which is apparent from the mean length of Groupers. Similar exploitations of grouper fishery in Maldives noted wherein 40% of fished groupers were immature (Sattar and Adam, 2005). Catch effort analysis shows the multispecies trend in catch for Groupers and Snappers where the average catch of Groupers are 48.38 kg which mainly comprises of *Epinephelus malabaricus*, *E. fasciatus*, *Cephalopholis miniata*, *C. argus* and *Variola louti*. The Catch-effort shows a decreasing trend from January to March which probably denotes the stock depletion as approaching to close fishing season. Snappers mainly comprise of *Aprion virescens*, *Lutjanus gibbus*, *Lutjanus bohar* and *L. deccusates* with average catch per unit effort of 37.62 kg. Though the period of study being short could not bring a comprehensive data on catch and effort rather giving an overview and a complete year round analysis could add up and generate valuable information.

Gut content analysis plays an important role in analyzing the feeding intensity of the fishes. Generally Gastro somatic index varies with the season, maturity and it is maximal during the post spawning period and minimum during the breeding period. The most abundant stomach contents for Groupers are mainly fishes, crustaceans and cephalopods (Sattar and Adam, 2005). The data analysis gives an idea on the species composition and landing pattern for a short period of three months in South Andaman. The catch and effort is multispecies since single species targeted fishing is not done and required further dedicated studies to achieve a comprehensive data. Mortality and discards during fishing trips were not accounted since reliable information was not available with fishermen. Discards and mortality were 5 to 10% during the fishing trips recorded from fishermen survey but still unclear and needs further attention in future.

Data on minimum and maximum length and weight landed will give a view on immature juveniles catch which is basis for management policies and recommendations. Such cases observed in Groupers mainly and restrictions in hook size and numbers can be imposed considering an input control. Gut content analysis is basically done with the idea of getting the food preference of particular species which may help in feed formulation if such reared in captivity. Further expansion of this data with the coming months for a year analysis of data will expand the scope

of this work and could evolve as base for biology and stock assessment studies.

REFERENCES

- Allen, G.R., (1985). FAO species catalogue. Vol. 6. Snappers of the world. An annotated and illustrated catalogue of lutjanid species known to date. FAO Fish. Synop., 125 (6) : 208.
- Arendt, M.D., Olney, J.E. & Lucy, J.A. (2001). Stomach content analysis of cobia, *Rachycentron canadum* from lower Chesapeake Bay. Fishery Bulletin, 99:665-670.
- Bagenal, T. 1978. Methods for Assessment of Fish Production in Fresh Waters (3rd edition). IBP Handbook No. 3. Blackwell Scientific Publications, Oxford, U.K., pp 365.
- Chitravadivelu, K. & Sivapalan, A. (1984). Food and feeding of *Siganus lineatus* from waters around Northern Srilanka. Journal of the National Science Council of Sri Lanka. 12(1): 129-139.
- Heemstra, P.C. & Randall, J.E. (1993). Groupers of the world (Family Serranidae, Subfamily Epinephelinae). An annotated and illustrated catalogue of the grouper, rockcod, hind, coral grouper and lyretail species known to date. (FAO Fisheries Synopsis No. 125 Vol. 16). Food and Agriculture Organization of the United Nations, Rome, pp 382.
- Kirubasankar, R., Dam-Roy, S., Grinson-George., Sarma, K., Krishnan, P., Ram-Kumar, S., Kaliamoorthy, M., & Goutham, Bharathi (2013). Fishery and Exploitation of Malabar Grouper (*Epinephelus malabaricus*) from Andaman Islands. 26(2013):167-177. Asian Fisheries Science.
- Rajan, P.T. (2002). Field Guide of Grouper fishes (Family: Serranidae, SubFamily: Epinephelinae) and Snapper fishes (Family : Lutjanidae) of Andaman and Nicobar Islands. Published by Director, ZSI, Kolkata, 103pp.
- Sattar, S.A., & Adam, M.S. (2005). Review of grouper fishery of the Maldives with additional notes on the Faafu atoll. Marine Fishery Research Centre, Male, Maldives, 54 pp.
- Simon, K.D., Bakar, Y., Samat, A., Zaidi, C.C., Aziz., & Mazlan, A.G. (2009). Population growth, trophic level, and reproductive biology of two congeneric archer fishes (*Toxotes chatareus*, Hamilton 1822 and *Toxotes jaculatrix*, Pallas 1767) inhabiting Malaysian coastal waters. Journal of Zhejiang University Science B. 10(12): 902-911.