

Feeding Ecology of *Anguilla bengalensis bengalensis* in the Pokkali fields at Kadamakkudy, Kerala

Mumthaz, K.M., and John George, M.

Received on 10-6-2017

Accepted on 12-8-2017

Abstract

Anguilla bengalensis bengalensis (Family: Anguillidae) is an eel coming under the order Anguilliformes, characterized by a snake like body with dark brown colouration and no marked distinction between its head and rest of the body. They show catadromous migration, mainly for the purpose of breeding.

Key words: *Anguilla bengalensis bengalensis*, Pokkali cultivation, catadromous migration

Introduction

The area opted for the study is at Kadamakkudy, which is characterized by their Pokkali cultivation practice. The pokkali fields are tidal wetlands, the tide that occur twice a day play an important role in fertility and productivity of this agro-ecosystem (Sasidharan, 2005). The retention of tidal flow during the post rice season causes inundation of brackish water into the fields, and the live feed generated from the basis of perpetual renewable bio-energetic resources for alternate production of rice and prawn in the fields (Purushan, 2002). The Pokkali fields of Kerala are usually single crop paddy fields, extending to 10,000 acres and yielding an annual production of 5,000 tonnes. The paddy fields after paddy crop are usually used to trap sluices high tide water along with prawns and then the water is let out through the filters during low tide (Raman and Menon, 1963). Pokkali fields are characterized by acidic and saline sulphidic soil material that are water logged with saline tidal waters. Drainage of these soil increase soil acidity and pH falls less than 3 (Tomy *et al.*, 1984). Pokkali field is a highly nutritive agricultural land with paddy and prawn as alternative crops. It is an eco-friendly, biodegradable area which provide high economic security. The special feature of this land is that there is no need of chemical pesticides and fertilizers for high yield. The straw and other waste product from paddy cultivation makes the land nutritive for prawn cultivation. Rice can be cultivated only during the saline months from May – June to mid October after which the fields are leased out for traditional prawn cultivation. The cultivation starts in April or May with the formation of mounds of one meter base and 50 cm height. It is a special method of seeds sprouting. Seeds, tightly packed in baskets made of plated coconut leaves with an inside lining of banana or teak leaves are soaked in freshwater for 12-15 hours. The sprouted seeds remain quiescent for more than 30 days.

With the onset of monsoon, the seeds are grown on top of the mounds or field bed formed for the purpose. After

this, transplanting of plants is done in the month of June. Once the South-West monsoon sets in, salts and various toxic elements get washed from soil mounds. After transplanting, the crop matures in the next two months. No other inputs are needed: no manure, no fertilizer, no insecticide and no chemicals of any form. The operation is based on astute water management. Water flow is controlled by shutting and opening sluice gates. In October, when the paddy is mature, corns are cut-off, leaving the stubbles in the field to decay. They form the natural feed for prawns that come in with water, once the shutter planks of the sluice gates are removed during high tides. At night, hurricane lamps are placed at the mouth of the sluice to prevent prawn progeny from leaving the phase during the low tide prawn harvesting starts by mid-December. The prawns and fishes are collected in the prawn filtration net. The fields are finally drained for taking up of paddy cultivation, by the end of March. Besides paddy, pokkali fields are characterized by possession of varied types of vegetation which are well adapted to exist including mangroves, aquatic plants, emergent vegetation, grasses etc. The fields serve as habitat to a lot of different terrestrial, semi-aquatic and aquatic animals. One of the best functions of pokkali field is to provide a habitat for many birds and migratory forms (Ali and Futehally, 1967). The fields form a rich feeding and breeding ground for diverse forms of fishes, by providing rich food supply and shelter, in turn attracts birds that eat the fishes. The abundance of fish species present in water logged area within the pokkali fields is of fascinating nature. Different forms including shallow water forms, bottom living forms and other types are seen. Eels form the major bottom living forms that come under family Anguillidae. The eel is a kind of elopomorph fish identified by a unique leptocephalus larval stage. All freshwater eels are classified within the genus *Anguilla* Schrank (Anguillidae). To shed light on the chaotic systematics of this genus, Ege (1939) examined 25 265 specimens, including 12 793 adults and 12 472 elvers, and constructed a phylogenetic synopsis based on 12 morphological characteristics. Species with a short dorsal fin and those without variegated markings were thought to derive from a common ancestor. Fishes

Post Graduate Department of Zoology and Research Centre, Mar Thoma College, Thiruvalla.

form a rich source of food and in addition provide several by-products to us. The usefulness of fish is even greater than the figures for potential suggest, because of the high biological value of the protein contained (Biswas, 1996). In India, about 79 fishes are listed under the category of threatened species. There are so many causative factors for declining trend of fish bio-diversity, in which few are very important. One of them is *Anguilla bengalensis bengalensis*, a sub-species of *Anguilla bengalensis* (Gray,1831).

Materials and Methods

Study area

Three sites were selected for the study, of which the first two sites were cultivating fields while the third one is non-cultivating one. Areas of three sites were 20, 20 and 10 acres respectively.

Methodology

The method used was percentage of occurrence method (Pillai, 1951), in which the stomach contents were removed carefully and percentage of each food item was recorded and analysed. The length-weight relationship was plotted by measuring the total body length and weight of each collected fish. The Relative Length of the Gut (RLG) was calculated by taking the ratio of the gut length and its body length by using the formula,

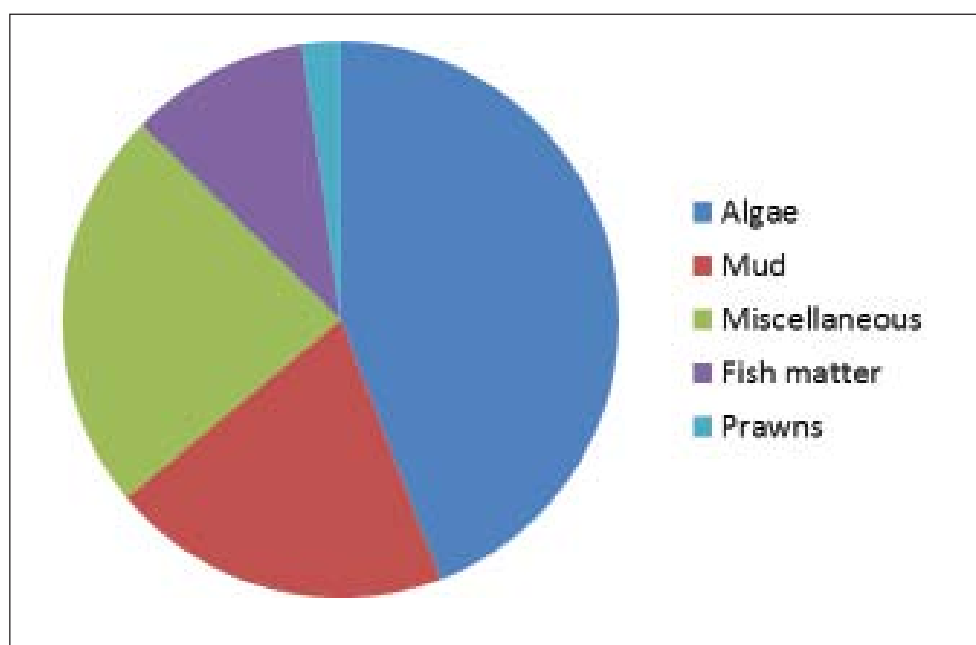
$$RLG = \frac{\text{Length of the gut}}{\text{Total body length}}$$

Results and Discussion

Anguilla bengalensis bengalensis is a sub-species of *Anguilla bengalensis*. The fish is characterized by its specific

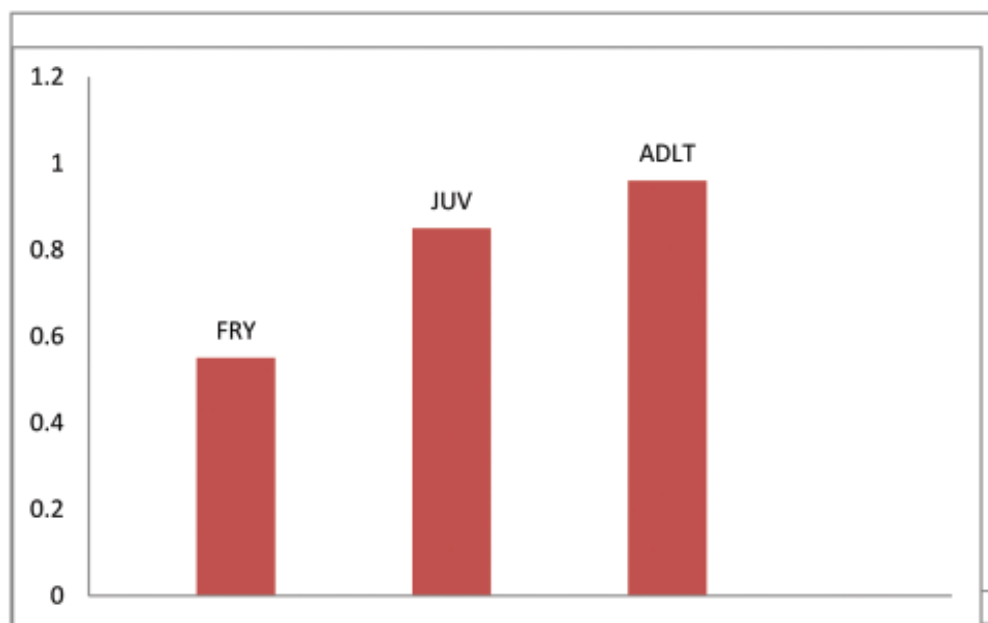
morphological characteristics similar to a long snake like body which is rounded, cylindrical in shape & configuration. The body is slippery and is dark brown coloured with no marked distinction between the head and rest of the body. The samples were collected preferably during night time or in the early hours of dusk, since they feed during the night time, by the aid of specific collecting nets, with a lamp provided at the mouth of the net. The gut contents are analyzed by numerical method and get the following data. It confers that about 44% of food items constitute algal matter, 19% constituted by mud, 13% of fish matter and 2% of prawns. Thus *Anguilla bengalensis bengalensis* is an omnivore, feeding both on the animal matter and the vegetative matter. The nature of the intestine, which is short, straight and less coiled in nature also reveals the same. It has been noticed that the fish fries are mainly herbivorous, feeding on algal matter and later as development proceeds, starts to feed on animal matter like fishes, prawns etc.

Although, *Anguilla* sps. was catadromous forms migrating from seas to rivers for spawning, and migration of leptocephali after attaining certain size, back to seas for the rest of its life, it has been observed that restricted migration from the pokkali field back to sea, hindered by the construction of fixed boundaries and sluice gates, allowing the maximum retainance of low saline waters during paddy cultivation period as well as the high saline waters during prawn cultivation period.



The collection of fish samples can be easily attained only during March-April, since of low water depth, after letting off high saline waters from the field. Fish samples cannot be seen with our naked eye at or below the water surface, since inhabiting the muddy bottom of the fields. They are collected by digging and fish traps using the specific aids for the collection by the fishermen. Pantulu (1957) found that fish predominate as a single item of food (40.34%), crabs ranking second accounted for 26.04%, followed by prawns (20.69%), and the rest of the diet constituted by insects, megalopa larvae, macro and microphytes etc.,

RLG Values at different stages of life stages



The above figure shows the RLG values at three different stages of lifecycle mainly fry stage, juvenile stage and adult stage. The values showed a gradual linear increase from the younger stage to the adult stage. The RLG has close relationship with the nature of food items of the fish that it consumes, i.e, a carnivorous fish will have low RLG value, an omnivorous fish have medium value while an herbivorous one will have high RLG values, ie. greater than 1. Fishes exhibit a gradual colour variation as well as progressive mucus secretion from early stage to later stage of life cycle. The fish fry is found to have enveloped with a transparent membrane covering the skin and the slimy mucus secretion is low, make easy to hold. But the fish shows a progressive increase in body pigmentation from fries to adult stage, i.e, pale colour to dark brown colour.. The fish has significant medicinal value that it can be used for treating rheumatoid arthritis and asthma. Comprehensive studies by Ege (1939) have discussed anguillid species diversity, geographic distribution and abundance in the world and have revealed that the highest diversity of anguillids occurs in central Indonesian waters.

The peculiarity of pokkali fields in having the periodicity of low and high saline waters triggered by low tide and high tide respectively plays a rich breeding ground for varied fauna including variety of birds and fishes, including catadromous eels like *Anguilla bengalensis bengalensis*. The increased threatening by humans have deteriorated this rich ecosystem much by converting into non cultivating fields. Hence strict protective measures have to be envisaged for the sustainable maintenance of this area.

References

- Ali. S and Futehally S.(1967). Common birds. National Book Trust India, New Delhi.
- Biswas K.P (1996). A Text book of fish, fisheries and technology, Narendra Publishing House, New Delhi.
- Ege V (1939). A revision of the genus *Anguilla* Shaw. Dana Report 16: 8-256.
- Gray J.E (1831). Illustration of Indian Zoology; chiefly selected from the collection of major General Hardwicke, F.R.S.
- Pantulu V.R (1957). Studies in Indian freshwater eel (*Anguilla bengalensis* Gray)
- Pillai T.V.R (1951). A critique of the methods of study of food of fishes *J. Zool.Soc, India*, 4(2).
- Purushan K.S (2002). Wet land ecosystem development and management in relation to pokkali areas. Wetland conservation and management in Kerala State Committee on Science, Technology and Environment, Trivandrum, Kerala.
- Raman K and Menon M.K (1969). A preliminary note on an experiment in paddy field prawn fishing. *Indian journal of fisheries*, 10 A (I), 33-39.
- Sasidharan N.K.(2005). Enhancing the productivity of the rice fish/prawn farming system in pokkali lands, K.A.U, Department of Agronomy, College of Horticulture, Vellanikkara, Trichur, Kerala, India (Ph. D. Thesis).
- Tomy P.J, George T.U and Suseel Jose. (1984). Pokkali cultivation in Kerala. Technical bulletin- 10.K.A.U, Trichur, Kerala, pp 1-20.