

Note

Food patch choice in climbing perch *Anabas testudineus* (Bloch, 1792)

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ABSTRACT

The current study analysed how the climbing perch *Anabas testudineus* an air-breathing freshwater fish make choice when a pair of food patches differing in the gain is presented. The results revealed no significant variation in the preference towards the patch of food material cumulated in one place over the same amount of food dispersed in a wider area and located at an equal distance. Additionally, enhancement of the value of dispersed or cumulated patch, by moving it towards the subject fish (spatial discounting) was also found to be ineffective in influencing the food patch utilisation in this species.

Keywords: Decision making, Feeding, Foraging, Spatial discounting

In most of the natural habitats, food materials are usually found distributed in patches and understanding how different species including fishes choose patches, at both individual and population level, has been a topic of ecological research for several decades (MacArthur and Pianka, 1966). In natural aquatic habitats, where even a mild disturbance can alter the distribution of food material available, fishes are shown to employ ecologically rational strategies considering the cost (*i.e.*, metabolic, predation, travel and missed opportunity costs) and the benefit associated with each patch (Petty and Grossman, 2010) while making a foraging decision. For instance, many fishes prefer to feed from places where food materials are cumulated (high density patch) over an equal amount of food dispersed in a wider area (low density patch), because the individual can obtain more food per unit amount of energy and time spent, if it focuses its feeding activity in the former than later (Warburton and Hughes, 2011). However, individuals of many species are shown to modify the patch choice behaviour in accordance with the nature of the ecological context available. Guppy (*Poecilia reticulata*) selects smaller and closer ones above larger but distantly placed patch, since the energetic cost required for acquiring reward, decreases as the distance to the reward reduces (spatial discounting) (Muhlhoff *et al.*, 2011). Although, understanding the determinants of food patch selection by a fish is essential to design strategies to enhance food utilisation in aquaculture ponds as well as to manage the existing population in natural water bodies, very few native species have been analysed for these traits in the Indian subcontinent. The present study analysed how the climbing perch *Anabas testudineus*, a medium-sized, omnivorous, shoal-living fish inhabiting freshwater ecosystems such as ponds, rivers and swamps in India and

several south-east Asian countries, choose food patches differing in the benefits associated.

Fishes (*A. testudineus*) were collected using cast net, from Kole paddy fields at Irinjalakuda (10.30° - 10.42°N; 76.20° - 76.28°E) in the southern state of Kerala in India. In the laboratory, fish of standard length 5.24 ± 1.89 cm (mean \pm SD) were sorted and kept isolated in aquaria ($60 \times 35 \times 35$ cm) divided into small ($20 \times 35 \times 35$ cm) and large ($40 \times 35 \times 35$ cm) chambers using transparent plexiglas sheet with a guillotine door (8×6 cm; height \times breadth) in the centre (Fig. 1). These aquaria were used for the experiments involving these subjects. Water temperature was maintained at $25 \pm 1^\circ\text{C}$ and photoperiod at 12:12 (light: dark). Three sides of all the aquaria were covered with black paper while steel grids were placed on the top to prevent the fish from jumping out.

On the sixth day, food patch selection by individual climbing perch was tested by presenting a pair of stimulus patches in the large chamber, one comprising of 20 pellets arranged in an area of 1.5×1.5 cm (cumulated) and the

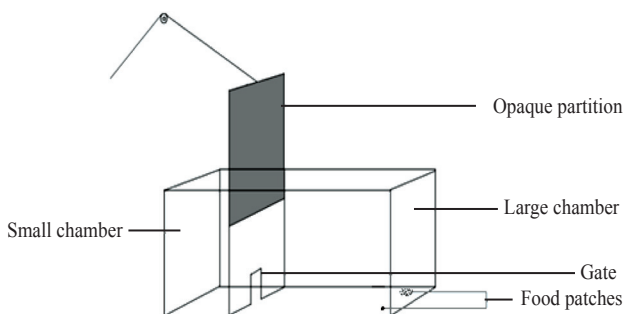


Fig. 1. Diagrammatic representation of the apparatus used to study the food patch selection in climbing perch

other patch with 20 pellets arranged evenly in an area of 5.5×5.5 cm (dispersed). The distance between the stimulus patches were 19 cm and these patches were placed 33 cm away from the guillotine door. The total number of pellets consumed from each patch (experiment 1) was recorded after following the feeding procedure discussed earlier. The positions of cumulated and dispersed patches were interchanged in successive trials to avoid any kind of side bias (if present). The influence of the spatial discounting on patch selection was tested by reducing the distance to be travelled to reach one of the stimulus patches (either cumulative or dispersed), while keeping the position of other patch intact. One set of climbing perch were tested individually, by reducing the distance to the cumulated patch (from the door) to 7 cm from 33 cm (experiment 2), while another group of individuals got dispersed patch 7 cm away from the door (experiment 3). The number of pellets consumed from cumulated and dispersed patches by the subject fish in all the three experiments were recorded and the data was analysed using paired t test. Twenty five individual fishes were tested in experiment 1 and twenty each in experiments 2 and 3. Fish once tested was never used in any other experiment and all these fishes were released in the site of collection after the experiment.

The results of the study revealed that the climbing perch did not exhibit any significant variation in the number of pellets consumed from high density or low density patches, when presented at an equal distance (paired t test; $t_{24} = -1.05$; $p > 0.05$; Fig. 2). Moreover modification of the values of either cumulated ($t_{19} = -1.30$; $p > 0.05$) or dispersed ($t_{19} = 1.87$; $p > 0.05$) patch by moving it towards the subject fish also failed to influence the food patch selection in this species. This lack of preference towards any of the stimulus patches varying in the value,

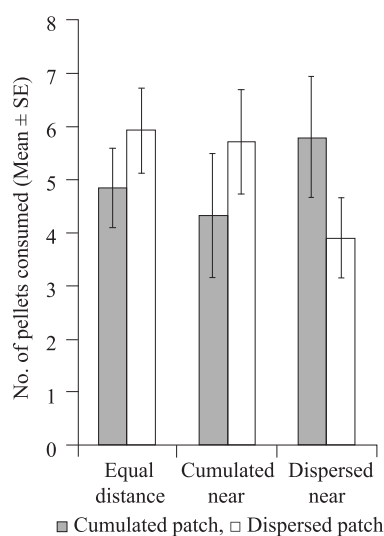


Fig. 2. Selection of food patches by climbing perch

the common strategy utilised by the climbing perch in different patch choice contexts tested was different from that of other piscine species (Petty and Grossman, 2010). Additionally, the spatial discounting, a proven determinant of patch choice in guppy (Muhlhoff *et al.*, 2011), was also found to be ineffective in inducing any alteration in the food patch selection behaviour in climbing perch.

The divergence in the patch choice behaviour from other piscine species exhibited by climbing perch could be the result of food stocking behaviour, a unique kind of foraging strategy reported only in this piscine species (Binoy and Thomas, 2008). Climbing perch collects and stocks food materials in the mouth, before consuming, in a way homologous to the female tilapia (*Oreochromis mossambicus*) keeping young ones in its mouth. Hence, being a species having terminal mouth, collection of food pellets distributed on the floor of the experimental arena could be completed more effectively, without losing already collected pellets from the mouth, if the fish utilises both cumulated and dispersed patches. Nevertheless, the inability to accredit values to the resources available and choosing the most beneficial amongst, cannot be attributed as a reason for the indiscriminate patch choice by this species, since climbing perch has been reported to choose shoals based on the benefits available (Binoy and Thomas, 2004). Hence, further studies in both controlled conditions of the laboratory and natural habitats are essential to trace out the exact reason behind the indiscriminate exploitation of the patches varying in the reward associated with and to elucidate a clear picture of food patch selection in this species.

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