THE EFFECT OF A FLEXIBLE SPACING SYSTEM ON THE SOCIAL ORGANIZATION OF A CORAL REEF FISH, CHAETODON CAPISTRATUS

by

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Introduction

YAHNER (1978) described a social system as based upon all behavioural interactions of a group or species and a product of individual and kin selection. He suggested that behaviour was a major determinant of a social system. BROWN (1975) defined social organization, or a social system, as the relationships of three major factors among a species or group. These three factors were agonistic behaviour and spacing system, sexual behaviour and mating systems and aid related behaviour and offspring care systems. BROWN stressed that the term social organization did not imply an absence of randomness or a presence of organization. As complete randomness in all social behaviour is almost impossible to prove, he concluded that all species have some kind of social organization.

Chaetodontid social organization has not been extensively studied. REESE (1975) characterized the social organization of 20 Pacific species by their social groupings, their spatial organization and their food habits. C. capistratus has been described as an isolate species by ITZKOWITZ (1974, 1977) in a study of the social dynamics of some Jamaican reef fishes. Although chaetodontids are often noted in the literature as being observed in pairs which are said to be heterosexual (REESE, 1977; BARDACH, 1958), how this behaviour affects their social organization has not been investigated.

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It was apparent early in the present study, that *C. capistratus* showed distinct behavioural differences related to their social organization and their motional behaviour. The two extreme categories were designated "freerangers" for *C. capistratus* that kept moving rapidly, not remaining in an area, and "homerangers" for *C. capistratus* that tended to stay in a restricted area and appeared to be relatively aggressive. A quasistatistical procedure of separating the behavioural categories based upon the random walk principle was later used (Gore & Barrow, 1982). The classes were called Resident (those *C. capistratus* that remained in a particular area, swam slowly and short distances, were relatively highly aggressive and seemed to feed frequently), Transients (those that swam long distances and quickly, never remaining in one place for very long, did not appear to feed as often and seemed relatively unaggressive) and Random (those that appeared to behave in a random manner relative to the two extreme categories), respectively.

Brown & Orians (1970) wrote a concise paper on the definition of spacing patterns in mobile animals, using the perspective of proximate cause, ecological consequences and adaptive significance. They suggested that it was more important to determine what are the factors that select for an increase or decrease in individual aggression with respect to space, rather than to question what is the function of a territory. Brown (1964) introduced the concept of economic defendability of space. That is, an animal defends an area only when there is a net benefit in terms of fitness. Davies (1978) suggested that the influence of spacing upon fitness may be investigated by measuring differences in fitness between individuals who behave in different ways. Thus parameters assumed to influence fitness directly may be examined rather than attempting to measure fitness.

Parameters assumed to affect fitness may be reproduction, shelter and food (Davies, 1978); many examples of these have been reported for reef fish alone. Nursall (1977) found that the territory of the redlip blennie, *Ophioblennius atlanticus*, provided food and shelter. The damselfish, *Eupomacentrus planifrons*, is highly territorial and defends its space in connection with food and reproduction (Myrberg & Thresher, 1974; Thresher, 1976, 1977; Williams, 1978). Clark (1970) proposed that the garibaldi, *Hypsypops rubicunda*, defends a territory used for shelter, food and a nest site. Reese (1973) suggested that *Megaprotodon triangulus* defends its area to protect its food source.

Two of the three parameters, shelter and reproduction, may not be directly influential on spacing in *C. capistratus*. Clarke (1977) observed