PRIOR EXPOSURE TO VISUAL CUES AFFECTING DOMINANCE IN THE JEWEL FISH, *HEMICHROMIS BIMACULATUS* GILL 1862 (PISCES, CICHLIDAE)

by

J. N. DE BOER 1) and B. A. HEUTS 2)

(Afd. Psychologie en Ethologie der Dieren, Zoölogisch Laboratorium, Universiteit van Amsterdam, Amsterdam, Nederland)

(With 6 Figures)
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INTRODUCTION

Experiments by Braddock (1949) suggested that Poeciliid fishes were dominant over conspecifics, if they had previously been isolated in the dominance test environment. However, the dominance advantage of such resident fishes could also be attributed to the fact that they had not been caught and transferred (handled) immediately before the dominance test, as the newcomers had. In an experiment of Reinboth (1956, p. 233), with a Cichlid species, the residents were taken out of their tank and reintroduced into it, so as to simulate a real transfer. The higher dominance of the resident fishes, therefore, could only be a result of their prior exposure to the dominance test area. Unlike the Poeciliids, the Cichlids occupied a territory in the exposure areas from which they could court or chase away conspecifics until the moment of the dominance test. We designed an experiment with isolated Cichlids (prior exposure in isolation) similar to Braddock's, but we did the "control transfer" of Reinboth, in order to find out whether presence in a familiar environment without having had experiences of dominance, territoriality, sexual behaviour etc. in that environment, also results in a higher dominance probability than presence in an unfamiliar environment. Furthermore, we wanted to investigate whether visual characteristics of the isolation area, are important in establishing dominance. This was done by presenting either one single system of visual cues during the dominance

1) Present address: Dierfysiologisch Laboratorium, Universiteit van Amsterdam, Amsterdam, Nederland. We wish to express our thanks to Prof. Dr J. H. Srock for his support during the last stage of this work.
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test, or two systems, one of which was known to one of the opponents, the other to the other one.

The jewel fish, *Hemichromis bimaculatus*, which was used for the experiments, belongs to the family of the Cichlids, whose behaviour is largely determined by visual stimuli from the environment. It is a territorial species whose behavioural characteristics are rather well known (see for example Noble et al., 1938; Noble & Curtis, 1939; Peters, 1941; Seitz, 1942; Baerends & Baerends-van Roon, 1950; Oehlert, 1958; Greenberg, 1961, 1963; Kühme, 1963; Myrberg, 1964, 1966; Myrberg et al., 1965). We did not choose a non-territorial species such as the Poeciliid used by Braddock, because in a further series of experiments (Heuts & De Boer, 1973), fishes occupying territories were needed.

**MATERIAL AND METHODS**

**Subjects and Experimental Material.**

Some 50 *Hemichromis bimaculatus* measuring from about 2.5 to 9 cm in body length and aged from about 6 months to 2 years, were kept in three living tanks measuring $60 \times 35 \times 35$ cm having a sand bottom of about 3 cm. The tanks were filled with tap water cleaned by an inside filter containing polyester fiber wool and charcoal. The glass walls of the aquaria were covered with green algae except the side through which the observations were made. The fishes came from a Belgian and a Dutch aquarium stock, the smaller individuals being born in the laboratory, probably from a cross-breed between the two stocks. These young fishes did not seem to have reached full sexual maturity at the beginning of the experiments, but they showed the common agonistic behaviour patterns of biting, chasing, fleeing, lateral display, frontal display, tail-beating, "Parallelgallopp" (Oehlert, 1958), mouth-fighting, biting while circling ("Karussell" or "Beschädigungs-kampf", Oehlert, 1958). The experimental aquaria were of the same size and arrangement as the living tanks were, except that the algae were removed regularly in the experimental tank and two filters were placed symmetrically, each in one half of the tank. Smaller tanks of $30 \times 20 \times 20$ cm, and plastic reservoirs of $17 \times 11 \times 13$ cm, were used to isolate the fishes. The animals were fed once a day or once every two days with *Tubifex*, Tetramin dry food and/or *Daphnia*, usually in the evening. Water temperature varied from about $22^\circ$ to $28^\circ$ C. Daylight came from one side of the experimental room during the day, which was long in June when the experiments started, and short in November at the end of the experiments. Fishes were transferred from one tank to another in common green nets as available in the aquarium shops.