COMPLEX MANIPULATORY ABILITIES IN STICKLEBACKS
(GASTEROSTEUS ACULEATUS)

by
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Introduction
Works on manipulatory behaviour among fishes are not, till now, very
numerous. Many scientists admitted, often without serious data, that fish
brain was too small and too simple to make possible complex behavioural
achievements. But in the last ten years an evolution became apparent in
these ideas. JERISON (1973) shows that consideration of a crude criterium
like brain weight or brain size don’t permit to believe longer that teleost
fishes are really below amphibians and reptiles. After the study of 198
vertebrate species JERISON proves that there is a considerable overlap
between brain weights of certain fishes and some reptiles: for the same
body weight there are fishes whose brain is heavier than in reptiles.
NORTHCUTT (1981) with consideration of the telencephalon, agrees with
JERISON. Therefore it is not so astonishing that sticklebacks present a
most complicated behaviour to be described below.

Results
Five isolated fishes have been studied and submitted to some trials: from
3 to 10 trials or more (duration: from some minutes to two hours or a
day, until accomplishment of the performance).

a) Some small pebbles (each pebble of the size of stickleback’s head)
were placed in superposition upon the nest entrance; all subjects per-
formed the test. Results are very comparable: fishes take each pebble in
the mouth (always the superior pebble first) and transport them further
away, sometimes to the far end of the aquarium.

1) This paper is a comment on a film presented by the author at the First Int. Sym-
posium on stickleback behaviour (Leiden, 1984). (Film S.F.R.S., Ministère Education
Nationale, 96 Bvd Raspail, 75006 Paris).
b) Small wooden rods (13 cm long, 2-3 mm diameter) were driven into
the ground around the nest entrance (fish B: one trial with 7 rods; fish
III: 1 trials with 7 rods; fish IV: 2 trials with 4 rods and one with 7 rods).
Fishes pull them away, one after the other, grasping them at the tip and
digging at the basis of the rods.

c) A loose obstacle such as a gauze was placed over the entrance: fishes
draw aside gauze fibers and perform a ventilation bout in front of the
opening (fish IV).

d) A more resistant obstacle (piece of nylon cloth) laid over the en-
trance with four lead weights at the angles (fishes II and IV). Very in-
teresting results: fish II removes first the four lead weights and then pulls
the cloth away; fish IV is not interested in the lead weights and simply
pulls the cloth away.

e) When a wire gauze was hanging at less than 5 cm over the nest fish
attack it, but very often attack also the suspension thread as if being
aware of the continuity between the thread and the wire gauze.

f) In some experiments the obstacle was too heavy to be removed
(glass or plastic tube): then the fish dig a new entrance to serve as a
substitute for the old one.

Discussion

Is there any learning? It is impossible to drive all wooden rods into the
substrate in exactly the same way in each experiment: so that resistance
to pulling them away is not, in fact, the same: it is therefore impossible to
measure a learning process, if any. I would say the same about the peb-
bles, which were not perfectly similar. Probably this was the cause of the
enormous variations in time necessary for the fish to pull out all rods and
all pebbles (from 1 to 185 minutes!). Probably we have to consider also
fatigue and motivational changes.

Nevertheless some fishes solve their problem for the first time in afew minutes:
however, situations like that are not encountered very often by fishes in
the field.

Intentional behaviour or not? Some techniques could be interpreted as im-
plicating a very accurate perception of main resistance points of the
obstacle. But fishes dig very often at the rod basis: is there an "inten-
tional" behaviour "in order to" drive the rod out? or, more simply, a
displacement activity? A minute later, some fishes may grasp the rod tip
and try to pull it to the right and left side from various directions. I can-
not give a proper interpretation of this: but I would say that a person who