COGNITIVE-BEHAVIOR AND STICKLEBACKS

by

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"Fear of the dangers of anthropomorphism has caused ethologists to neglect many interesting phenomena, and it has become apparent that they could afford a little disciplined indulgence."


Introduction

"The teleological implications of 'purpose' ... were formerly anathema to purists, but since it has been recognized that even machines can be regarded as teleological mechanisms (e.g., Rosenblueth, Wiener & Bigelow, 1943) teleology is no longer disreputable. With the swing of the scientific pendulum, there has been a growing feeling against oversimple explanations of the behavior of even lower organisms and a tendency once again to use concepts of 'goal-direction' or 'purpose' in describing it" (Hinde & Stevenson, 1970).

Some ethologists and comparative psychologists reject explanation of animal behavior in cognitive terms. Nevertheless, they use such terms in description of animal behavior. What does it take? How can one describe behavior cognitively and at the same time objectively?

The word "cognition" is defined as: 1. The act or faculty of knowing or perceiving. 2. A thing known; a conception or perception. It is cognition as an "act" concerned with environmental "things" that is of concern. At what point in describing behavior does "description" begin to border on "explanation"? Under what circumstances does it become necessary to refer to behavior in cognitive terms? When does an "act" constitute knowledge of an environmental "thing"?

To "know" something implies representation (preservation of the effects) of past and current events (if not something more). Wherever an "act" differentiates behaviors differing widely in complexity, while emphasis remains on the organismic-environmental interface, and "something more" is implied, the existence of "knowledge" (cognition) is denoted.

Is there reason to seek indications denoting cognitive processing of behavior (knowledge) in sticklebacks? What sorts of criteria would denote its existence? Six are offered here.

1. Decision hierarchy.
"Much complex behaviour in fact involves a succession of goals, which may be hierarchically organized with respect to each other" (Hinde, 1982; p. 76). The behavior of three-spined sticklebacks is a typical example (see Dawkins, 1976).

The behavior of sticklebacks is viewed as a hierarchically organized set of strategic moves oriented to individual reproductive success as the final goal. Even so, the tactics of individual fish in implementing the strategies can vary widely (Wootton, 1984; Giles, 1984). This point of view (see Wootton, 1984) recognizes constraints while recognizing other forms of individual variation. Cognitive-behavior is one.

2. Self initiation and goal orientation.
Cognitive-behavior implies some degree of "self-initiation" as well as "goal-orientation". Internal representation of past and current events control ongoing behavior. Behavior "stops" when current circumstances correspond to "goal-orientation". Accordingly description of behavior as cognitive must focus on "initiating" and "stopping" circumstances, but need not rest there. Behavior "stops" when it changes, but "change" is in the human "eye". The essence of cognitive-behavior rests in the intervening events differentiating "initiation" and "stopping".

3. Means activities and least effort.
Intervening events are characterized at a "molar" and "purposive" level (Tolman, 1932). It is what the stickleback does as a whole, as a part of the circumstances it is embedded in, that counts. This in the light of circumstances currently, recently, or long-since experienced.

What it does in moving from nest to "goal" varies depending not only on the "goal" (e.g., predator, prey, female, male, or offspring), but on