Netherlands Journal of Zoology
20 *(1): 81–92 (1970)*

ANGLING EXPERIMENTS WITH CARP (*CYPRINUS CARPIO* L.)

II. DECREASING CATCHABILITY THROUGH ONE-TRIAL LEARNING

by

J. J. BEUKEMA*

(Organization for the Improvement of Inland Fisheries, Utrecht & Zoological Laboratory, State University of Groningen, The Netherlands)

CONTENTS

A. INTRODUCTION

In the course of the fishing season catches per angling-hour tend to decrease in heavily fished waters. Such a decrease is not invariably accompanied by an equally steep decrease of the stock of fish present (*e.g.*, WATERS, 1960). It may even occur when all captured fishes are returned to the water (WESTMAN *et al.*, cited from BENNET, 1962: 244). A decreasing vulnerability of the fish to angling may be assumed in such cases. It may be caused by the ability of the fishes to learn to avoid baits presented upon hooks, as has been observed in aquarium experiments (HUTCHENS & WITT, both cited from BENNET, *l.c.*).

Decreasing vulnerability to angling of carp, observed consistently in intensively fished ponds, is analyzed in the following paper by means of controlled angling for individually tagged carp in closed, drainable ponds.

---

* Present address: Netherlands Institute for Sea Research, Texel, The Netherlands.

B. MATERIAL AND METHODS

Data were gathered during the same or similar angling experiments as described in BEUKEMA (1969), where details on place and time of the experiments can be found.

The following characteristics of the experiments are of special importance for the observations on decreasing vulnerability:

1) all carp were tagged individually in advance; tag loss was less than 3%;

2) all carp captured were returned to the same pond within a few minutes; mortality was only about 2%;

3) the thus constant numbers of carp were fished in 2000 m^2 ponds during 12 to 200 man-hours in relatively close succession; part of these carps were fished again during the next summer after mixing with previously unfished carp of the same age and the same strain, and

4) the carp were fished with a wide variety of fishing tackle and baits, such as bread (63% of time), potato (23%), earth-worm (9%) and gentles (4%).

C. RESULTS

1. CATCH PER EFFORT ON SUCCESSIVE ANGLING DAYS

Both graphs of Figure 1 show the mean numbers of domesticated carps captured per man-hour on successive angling days. The left hand graph concerns catches made in one pond containing 60 carp and fished for 12 hours per day, the right hand graph concerns mean catches from two ponds with 30 carps in each and fished for 8 or 12 hours per day. These three ponds were fished for 14 or 15 days at a rate of 2 or 3 days a week. As a control six further ponds with 30 carps in each were fished for only one day (12 man-hours), *viz.*, at the end of the angling period at the frequently fished ponds.

The mean catches per man-hour on the first angling day in any pond were especially high. Differences with averages of all later catches per man-hour from the same ponds are significant ($p<0.05$) in both cases shown and in many others (t-test, SNEDECOR, 1956). Moreover, the decrease of mean catch per man-hour with time (14 or 15 angling days) is significant ($p<0.05$) in the came cases (Spearman's rank correlation test, SIEGEL, 1956). Since the numbers of carp present in the ponds remained constant, the catchability of these carp must have been decreasing during the fishing period. This decrease must have been caused by the intensive fishing, at least for a significant part, as the mean catch per man-hour on the first (and only) angling day