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FINAL REPORT, CONTRACT WITH OFFICE OF NAVAL RESEARCH (Nonr-2762 (00)),  
NR 104-386.

Title: INVESTIGATION OF THE POSSIBLE UTILITY OF MERISTIC CHARACTERS OF  
FISHES AS INDICATORS OF COASTAL CIRCULATION

## INTRODUCTION

The meristic characters of fishes, e.g. numbers of vertebrae, fin spines, and fin rays, reflect in the numbers of their elements the developmental temperature under which they were laid down. Since the sensitive periods of the various characters are different from one another, it was considered possible that the relative condition of the characters (in given collection lots of specimens) would give a good account of the thermal history during early development. Preliminary studies indicated that by intensive sampling of populations of juveniles of certain species as they arrived from their larval tour in the plankton, a good assessment could be made of the direction this larval tour had taken. In preliminary studies several species of the marine Cottidae of the Pacific coast of the United States were considered.

## MATERIALS AND METHODS

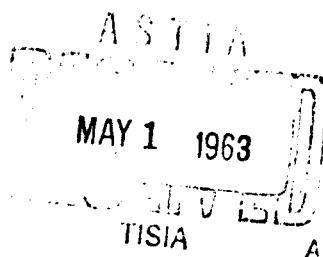
The species selected for the present work was Leptocottus armatus armatus, the northern staghorn sculpin. It ranges from Alaska south to about Monterey, California. A southern subspecies of this species extends on south from Monterey. Eggs of this species are laid offshore in demersal clusters. Individual clusters may contain as many as several hundred eggs. The eggs are laid during the period September to November. Upon hatching the larvae enter the plankton of the coastal waters. They metamorphose and take up benthonic existence on mud flats during the period December to May.

The years covered in the present study were 1959 to 1962, inclusive.

Eighty-eight collections were made during the study period. An effort was made to take at least 100 of the smallest available juveniles in each collection. The total number of specimens collected was approximately 12,000.

The collections were made every four weeks during the period from December to June at each of two collecting stations on the Oregon coast. These stations were on Yaquina Bay and on Coos Bay. Additional stations were collected each year during the months of April and May. These stations of annual collecting extended from Puget Sound, Washington to Monterey Bay, California.

The specimens were all fixed and preserved in 10 per cent. formalin. They were then cleared in KOH and stained with alizarin. This process permits enumeration of the numbers of elements in the vertebral column and fins. The meristic characters for which counts were made on each specimen were: Trunk vertebrae, total vertebrae, anal fin rays, dorsal fin rays, and dorsal fin spines. The standard length of each specimen was also noted.



Approximately 72,000 items of data have been recorded. These data are under continuing study. They are being treated for determination of the following:

1. Multiple correlation coefficients are being determined to ascertain the degree of independence of the various characters studied.
2. The extent of variation observed in each character.
3. The degree of shift in condition of each character as regards to:
  - a. Latitude of collection station
  - b. Season of collection
  - c. Year of collection

The statistical unit throughout these analyses is the individual collection sample.

At the present time all specimens have been cleared and stained, their meristic characters enumerated, and for each character of each collection lot the mean, standard deviation of the mean, and range, have been determined. Preliminary graphs have been constructed showing:

1. A well-defined cline in condition of meristic characters with numbers of elements increasing from south to north.
2. A high degree of inconsistency in amount of variation among the various collection samples.
3. In the condition of characters the degree of oscillation or shift from year to year is slight, i.e. indicating little annual change in origin of recruits at a given collection site.
4. It has been discovered that there is a strong and consistent seasonal shift in meristic character conditions indicating that the Oregon collection stations receive recruits from the south during the early part of the season (December to February) and from the north during the latter part of the season (March to May).

Continuing studies will relate these data to available temperature data from the Oregon Coast collected by personnel of Oregon State University under the direction of Dr. Wayne V. Burt.

Continuing statistical analyses of the data described above will require some additional time. I believe I will be able to get the material into publication form by June 1964.