

DISTRIBUTION OF MYCTOPHID FISHES ACROSS THE EQUATORIAL CURRENT SYSTEM
IN THE CENTRAL PACIFIC

A THESIS SUBMITTED TO THE GRADUATE DIVISIONS OF THE
UNIVERSITY OF HAWAII IN PARTIAL FULFILLMENT
OF THE REQUIREMENTS FOR THE DEGREE OF

MASTER OF SCIENCE

IN OCEANOGRAPHY

DECEMBER 1971

By

Alfred Rucker Hartmann

Thesis Committee:

Thomas A. Clarke, chairman
Garth I. Murphy
Richard E. Young

INTRODUCTION

Ranges of pelagic species often conform with major water masses as defined by temperature-salinity curves (Johnson and Brinton, 1963). Because T-S curves exclude the upper 100 m of the water column, variations of temperature and salinity in the upper layers do not affect the shape of the curves. Thus, major water masses, so defined, are large scale, sub-surface features. There may be considerable variation in the hydrography of the mixed layer above a given water mass which may affect organisms living within, or periodically inhabiting the surface layers, resulting in subpatterns of species' distributions which do not follow the horizontal limits of the water mass below.

Sampling along the equator in the Pacific, Grandperrin and Rivaton (1966) have demonstrated the existence of four distinct longitudinal faunal zones which are correlated with variations in the depth of the Cromwell Current and associated variations in carbon dioxide concentration, oxygen concentration, nutrient levels and productivity. All four zones lie along the equator within the Pacific Equatorial Water mass, yet each is characterized by a distinct faunal assemblage including endemic species. Major faunal changes, then, occur within the Pacific Equatorial Water mass coincident with longitudinal hydrographical changes in the surface layers. Thus, it may be expected that faunal breaks also occur latitudinally across the Pacific Equatorial Water mass where major and presumably biologically relevant changes in surface hydrographic conditions are observed.

Myctophids were chosen for this study for several reasons. They are primarily mesopelagic fishes, but typically migrate upward at night. Most species cross into the mixed layer where they are sus-

ceptible to capture by the sampling methods used in this study. Many species of this family inhabit equatorial waters and some are quite abundant. Recently, their taxonomy has become stabilized, thus allowing definitive investigations of their distribution.

This study attempts to determine the latitudinal zonation of myctophids occurring in the equatorial waters of the Pacific. The study is limited to shallow water samples collected at night. Distribution patterns of myctophids and several hydrographical features are examined and an attempt is made to determine which features are most closely related to the distribution of myctophid fishes.

MATERIALS AND METHODS

Data for this study were collected during cruise 43 of the U.S. Fish and Wildlife Service Vessel Townsend Cromwell from April 29 to June 11, 1969. Pelagic trawl collections were made along a transect at 145° west longitude at five locations, approximately at $12\frac{1}{2}^{\circ}$ N, $7\frac{1}{2}^{\circ}$ N, $3\frac{1}{2}^{\circ}$ N, 0° , and $3\frac{1}{2}^{\circ}$ S (Table 1). At each latitude five tows were made (except at $3\frac{1}{2}^{\circ}$ S, where four tows were made) using an anchovy number two Cobb pelagic trawl (Higgins, 1970). All tows were taken at night and each lasted from about 2000 to 0200 hours. Depths of tows, determined from wire angle and amount of wire out, was 20 m and 50 m. (More precise depth determinations made on a later cruise indicate that tows made on cruise 43 were probably at 30 m and 75 m.) Towing depth was alternated nightly except at the equator where all tows were at 50 m. Depth was regulated by controlling ship's speed and amount of wire out.

When the total sample size exceeded four gallons, one gallon