STUDIES ON THE FOOD BASE IN THE YELLOW AND THE EAST CHINA SEAS—IV.

Notes on Some Indicator Plankton Species

Yoshimasa ENOMOTO*

(Received September 3, 1962)

Introduction

In the previous paper¹²⁾, notes on five dominant plankton in the Yellow and the East China Seas were presented. In this paper, notes on the characteristic occurrence of some plankton, if not dominant, in the mentioned areas are presented.

Material and Methods

Plankton samples were collected at 14 surveys in the Yellow and the East China Seas from June, 1956 to July, 1960¹²⁾.

They were examined and counted by the method reported before¹⁰⁾. Notes on each characteristic species were made by summing-up the data of the mentioned 14 surveys.

Results and Discussions

1. In the Yellow Sea

As presented in the previous papers^{10,11,12)}, predominancy of *Calanus helgolandicus* in macrocopepods, *Euphausia pacifica* in euphausiids, and *Sagitta bedoti* in chaetognaths is very obvious.

Besides them, *Pontocrates altamarinus*, an amphipod, is characteristic in occurrence.

Pontocrates altamarinus (B. & W.) which is found fairly commonly in the warm littoral areas around Japan was collected abundantly in the northern parts of the Yellow Sea. That species, more benthic than planktonic, was never found in the southern areas even in the waters jutting out southwards from the Yellow Sea. Its spawning season may be in winter, for females embracing eggs were observed commonly in February, 1957.

2. In the waters jutting out from the Yantsu River

The occurrence of *Pseudoeuphausia latifrons* in the estuary of the Yantsu River is characteristic for those sea areas as mentioned in the previous paper¹²⁾. Besides it, occurrences of the following species are characteristic.

a) *Acetes chinensis* (HANSEN)

Acetes chinensis, a small macruran shrimp, was reported from the coast of China

* The Tokai Regional Fisheries Research Laboratory (榎本義正, 東海区水産研究所)

around the estuary of the Yantsu River (RYUN, Z., 1955). In this series of plankton surveys, that species was collected commonly in September, 1956 and February, 1957 in the waters jutting out from the Yantsu River. A small shrimp, which is deemed to be *Acetes chinensis* by the author, has been widely fished in the vast coastal waters around the estuary of the Yantsu River (SHINDO, S., personal communication).

Fig. 1. Schematic illustration of the indicator plankton species in the Yellow and the East China Seas.

b) *Labidocera euchaeta* GIESBRECHT

Labidocera euchaeta, a gymnoplea copepod, has been reported from the Taiwan Strait and the Yellow Sea in a few number. Its abundant occurrence in winter in the waters from the Yantsu River is very obvious, while no individual was collected in the other sea areas during this series of plankton surveys.

3. In the both waters jutting out from the Yantsu River and influenced by the Kuroshio Current

Leptochela aculeocaudata occurs in the both waters mentioned above^{10,11,12}). Besides it, following species are characteristic in occurrence.

a) *Trichodesmium erythraeum* EHRENBURG

Trichodesmium erythraeum, a phytoplankton belonging to Cyanophyceae, is a cosmopolite found in the temperate and tropical sea. In the present sea areas, that species was observed in the waters jutting out from the Yantsu River and the waters influenced by the Kuroshio Current during autumn to winter. Its tremendous augment was observed in September, 1956 when the sea surface was covered by the numberless colonies like rice husks.

b) *Euchaeta marina* PRESTANDREA

Euchaeta marina, a gymnoplea copepod, is a cosmopolite species in warm waters of all over the world oceans. In the present sea areas, that species is observed in the waters influenced by the Kuroshio Current and jutting out from the Yantsu River, sometimes taking the rôle of *Calanus helgolandicus* which is dominant in macro-copepods in the waters jutting out from the Yellow Sea. It seems to be more abundant in summer to autumn than in winter to spring. While, one of its spawning season may be in autumn, when many females embracing eggs and copepodite stage larvae were abundantly observed in the wide southern areas of the East China Sea.

4) *In the waters influenced by the Kuroshio Current*

These waters are characterized by the occurrence of the miscellaneous species of zooplankton as stated in the previous papers^{10,11,12}).

Following species are somewhat of value as the indicator species for those sea areas.

a) *Salpa fusiformis* CUVIER

Salpa fusiformis, a tunicate, is a cosmopolite in the world ocean including the adjacent waters of Japan. In the present sea areas, its occurrence in the waters where the Kuroshio Current contacts with the coastal waters on the continental shelf was referred by AIKAWA, H. (1936). In this series of planktons surveys, the tremendous augment of *Salpa fusiformis* was observed in the same areas AIKAWA stated in June, 1957. They, forming the stripe-like colonies about half to one meter long and moving up and down like snakes, covered the upper layer of the sea by "transparent pink stripes" because each of them contained a lot of diatoms in the stomach.

b) *Sagitta enflata* GRASSI

Sagitta enflata, a chaetognath, is a cosmopolite in the warm waters of the world oceans. In the concerned sea areas, that species well indicates the presence of the waters influenced by the Kuroshio Current. In the southern areas of the East China Sea, it predominates in chaetognaths in place of *Sagitta bedoti* which is dominant in the Yellow Sea. Its spawning season in the concerned sea areas seems to be in summer to autumn judging from the occurrence of the females with large gonad and small individuals in summer to autumn as is the case in the Kii Straits¹⁵). The largest

individual, 28 mm., was collected in September, 1956.

c) *The other plankton*

Thalia democratica (FORSKAL) and *Doliolum nationalis* BORGERT, two tunicates, occur in the waters where the Kuroshio Current contacts with the coastal waters in the southern areas of the East China Sea all the year round. While, *Euphausia kronii* BRANDT, an euphausiid, and *Creseis acicula* RANG., a pteropod, may be the indicator for the Kuroshio Current itself.

Summary

Characteristic occurrences of some plankton species were presented in the Yellow and the East China Seas in addition to the dominant zooplankton in the preceding paper¹²⁾; *Pontocrates altamarinus* in the Yellow Sea, *Acetes chinensis* and *Labidocera euchaeta* in the waters from the Yantsu River, *Trichodesmium erythraeum* and *Euchaeta marina* in the waters from the Yantsu River and the waters where the Kuroshio Current takes the influence, and *Sapla fusiformis* and *Sagitta enflata* and so on in the Kuroshio Current.

Acknowledgement

The author wishes to express his cordial gratitudes to Director Ito and Dr. TSUJITA (the Seikai Regional Fisheries Research Laboratory) for their ceaseless encouragement to this work and to Dr. KUBO (the Tokyo University of Fisheries), Mr. IKEMATSU (the Seikai Regional Fisheries Research Laboratory) and Mr. NAGATA (the Naikai Regional Fisheries Research Laboratory) for their kind guidance in the study of some crustaceans.

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