STUDIES ON THE FOOD BASE IN THE YELLOW AND THE EAST CHINA SEAS-V. ON THE MAIN CRUSTACEANS AS THE FOOD ITEM OF FISH RESOURCES

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Introduction

In the previous papers¹⁾²⁾³⁾⁴⁾, the author presented the general plankton features in connection with oceanographic conditions, notes on some dominant zooplankters, and on indicator species in the Yellow and the East China Seas. Here, the tables of crustaceans which occurs frequently as the foods of fishes there are presented.

Material and Methods

The oceanographic and fisheries experimental survey was made on board the "Chosui-maru" of Nagasaki Fisheries High School from June to July, 1954 in the wide area of the Yellow and the East China Seas.

Out of fishes caught in this fisheries experimental survey, 2,831 specimens belonging to 84 species, of which most were demersal fish, were examined of their stomach contents and crustaceans of frequent occurrences were identified as to species so long as possible.

Besides, the same examinations on the other surveys on a fewer specimens, from time to time, were summed up with the above-mentioned data.

Results

The frequently observed crustaceans are presented tabulately as follows: Numbers in parentheses show the size in centimeter.

Species of Crustaceans	Main Feeders
(Decapoda) (Brachyura) <i>Charybdis bimaculata</i> (1.5-2.5)	<i>Nibea nibe</i> (22-28), <i>Eopsetta grigorjewi</i> (20), <i>Sebastiscus marmoratus</i> (15), <i>Scorpaena izensis</i> (20-24), <i>Chelidonichthys kumu</i> (20-29)
<i>Cosmonotus grayi</i> (2-3)	<i>Bembras japonicus</i> (21-27), <i>Lepidotrigla guntheri</i> (17-21)
<i>Thelamita picta</i> (1.5-2.5)	<i>Cocius crocodilus</i> (19-23)
<i>Cancer gibbosulus</i> (3)	<i>Cocius crocodilus</i> (23-28)

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Species of Crustaceans	Main Feeders
<i>Caracinoplax</i> sp. (2-4)	<i>Taius tumifrons</i> (8-24)
(Decapoda) (Anomura) <i>Species unknown</i> (1-2)	<i>Triacanthodes anomalus</i> (9)
(Decapoda) (Macrura) <i>Crago affinis</i> (2-3)	<i>Hapalogenys mucronatus</i> (11-19)
<i>Crangon japonicus</i> (2-2.5)	<i>Hapalogenys mucronatus</i> (12-15), <i>Orectolobus japonicus</i> (33)
<i>Crangon</i> sp. (2-2.5)	<i>Hapalogenys macronatus</i> (9-17) <i>Eopsetta grigorjewi</i> (18-21)
<i>Sclerocrangon</i> sp. (2)	<i>Hapalogenys mucronatus</i> (10-17)
<i>Leptochela aculeocaudata</i> (0.8-2.5)	<i>Scomber japonicus</i> (10-35), <i>Trachurus japonicus</i> (8-27), <i>Nibea nibe</i> (16-34), <i>Hapalogenys mucronatus</i> (10-18), <i>Cocius crocodilus</i> (18-28), <i>Bembras japonicus</i> (22-27), <i>Taius tumifrons</i> (9-24), <i>Lepidotrigla guntheri</i> (16-22), <i>Apogon lineatus</i> (9), <i>Caranx equula</i> (10-17), <i>Raja kenojei</i> (14-23), <i>Döderleinia berycoides</i> (14-22), <i>Coelorhynchus</i> sp. (10-14), <i>Parabembras curtus</i> (20-24), <i>Sillago sihama</i> (8-16), <i>Upeneus bensasi</i> (12-14), <i>Psenopsis anomala</i> (16), <i>Scorpaena izensis</i> (13-21), <i>Priacanthus boops</i> (16-28), <i>Minous inermis</i> (10-12), <i>Uranoscopus oligolepis</i> (10-19), <i>Rhinobatos formosensis</i> (26-32), <i>Pracanthus macracanthus</i> (20-26), <i>Histiopertus typus</i> (14)
<i>Latreutes planirostris</i> (2.5-3.5)	<i>Upeneus bensasi</i> (12-14), <i>Nibea nibe</i> (22-34), <i>Cocius crocodilus</i> (18-28)
<i>Penaeus</i> sp. (4-8)	<i>Hapalogenys mucronatus</i> (18-19), <i>Lepidotrigla</i> spp. <i>Chelidonichthys kumu</i> (23-28)
<i>Parapenaeus fissurus</i> (5-)	<i>Chelidonichthys kumu</i> (23-28), <i>Nibea nibe</i> (20-31), <i>Lepidotrigla</i> spp.
<i>Parapenaeopsis</i> sp. (5-9)	<i>Chelidonichthys kumu</i> (23-28), <i>Platycephalus indicus</i>
<i>Metapenaeopsis acclivis</i> (5-8)	<i>Chelidonichthys kumu</i> (23-28), <i>Lepidotrigla</i> spp., <i>Taius tumifrons</i>
<i>Leptopenaeas kyushuensis</i> (6-10)	<i>Nibea nibe</i> (17-33)
<i>Solenocera</i> sp. (6-8)	<i>Nibeannibe</i> (17-33), <i>Bembras japonicus</i> , <i>Taius tumifrons</i> , <i>Lepidotrigla</i> spp.
<i>Alpheus</i> sp. (7-10)	<i>Nibea nibe</i> (17-33)
(Euphausiidae) <i>Euphausia pacifica</i> (0.6-1.5)	<i>Trachurus japonicus</i> (10-27), <i>Scomber japonicus</i> (12-30), <i>Sillago sihama</i> (10), <i>Nibea nibe</i> (24-30), <i>Trichiurus haumela</i> (25-), <i>Priacanthus macracanthus</i> (20), <i>Pseudosciaena manchurica</i> (13-15), <i>Daicocus peterseni</i>

Species of Crustaceans	Main Feeders
(Euphausiacea) <i>Euphausia pacifica</i> (0.6-1.5)	(22), <i>Monocentris japonicus</i> (10-15), <i>Erispex potti</i> (6-11), <i>Branchiostegus japonicus</i> (21-22), <i>Acropoma japonicum</i> (6-14), <i>Raja kenojei</i> (19), <i>Apogon lineatus</i> (6-9)
<i>Pseudoeuphausia latifrons</i> (0.5-1.1)	<i>Pseudosciaena manchurica</i> (17-25)
(Isopoda) Type of <i>Tachea</i> (1.5-2)	<i>Nibea nibe</i> (29-33)
(Amphipoda) <i>Caprella</i> sp. (2-3)	<i>Hapalogenyis mucronatus</i> (11-15), <i>Neopercis sexfasciata</i>
<i>Phronima</i> sp. (0.6)	<i>Apogon lineatus</i> (8), <i>Trichiurus haumella</i> (17), <i>Scomber japonicus</i> (13-15)
<i>Hyperia</i> sp. (0.5-1)	<i>Apogon lineatus</i> (7-9), <i>Lepidotrigla alota</i> (8)
<i>Temisto</i> sp. (0.2-0.5)	<i>Sillago sihama</i> (9), <i>Cocius crocodilus</i> (17-21)
<i>Gammarus</i> spp. (?) (0.2-0.4)	<i>Scomber japonicus</i> (13-15), <i>Apogon lineatus</i> (7-9), <i>Döderleinia berycoides</i> (6-14)
Type of <i>Parascelus</i> (1)	<i>Sphaeroides vermicularis</i> (14)
Type of <i>Orchestia</i> (0.5-1)	<i>Apogon lineatus</i> (6-10), <i>Raja kenojei</i> (14-18), <i>Döderleinia berycoides</i> (14-17), <i>Parabembras curtus</i> (10-19)
Type of <i>Viblia</i>	<i>Coelorhynchus</i> spp. (11-19), <i>Hapalogenyis mucronatus</i> (7-11), <i>Nibea nibe</i> (15-30), <i>Raja kenojei</i> (14-18), <i>Psenopsis anomala</i> (19), <i>Tiacanthodes anomalus</i> (6-11), <i>Uranoscopus oligolepis</i> (15)
(Stomatopoda) <i>Squilla mikado</i> (6-9)	<i>Mustelus kanekonis</i> (60-65)
(Mysidaceae) <i>Parastilomysis paradoxa</i> (0.7-1.3)	<i>Cocius crocodilus</i> (19-20), <i>Bembras japonicus</i> (22-25)
(Copepoda) <i>Euchaeta marina</i> (0.2)	<i>Pseudosciaena manchurica</i> (16-18), <i>Scomber japonicus</i> (6-30)
<i>Euchaeta</i> spp. (0.2)	<i>Pseudosciaena manchurica</i> (16-18), <i>Scomber japonicus</i> (6-30), <i>Trachurus japonicus</i> (6-27)
<i>Calanus helgolandicus</i> (0.2)	<i>Hapalogenyis mucronatus</i> (11), <i>Sillago sihama</i> (9), <i>Trachurus japonicus</i> (6-25), <i>Scomber japonicus</i> (6-30)
<i>Oncaea venusta</i> (0.1) <i>Oithona</i> spp. (0.1)	<i>Priacanthus boops</i> (11-14), <i>Trachurus japonicus</i> (14-20)

Discussions

The author's first volition was to elucidate production system in the Yellow and the East China Seas quantitatively from the view point of energy flow: solar radiation to phytoplankters, to herbivora, to 1st carnivora and to higher carnivora. But in the course of observation, it was found that too little knowledges were yet known for such a calculation. About those crustaceans shown in this paper, also too little were known to discuss in connection with their feeders. Many of them were hardly collected by plankton-nets or dredges. So, only tabulated presentation may be of some use in the present situation of the study there in the Yellow and the East China Seas.

By the author's impression during these observations, the biomass of the crustaceans utilized by demersal fishes may constitute about a half of fish foods in the Yellow and the East China Seas, another half being miscellaneous fish and their larvae.

Sometimes the species identification was difficult owing to the promoted digestions. So, it might be possible that not a few species might yet remain being not reported in this paper mainly because of their difficulty of collection but not because of their scarcity of presence.

While, the frequent occurrence of *Euphausia pacifica*, *Leptochela aculeocaudata* and some species coincids with their dominant occurrence as the plankters³⁾.

Besides, miscellaneous amphipods, which have hardly been collected with plankton nets or dredges, impressed the author of their not-overlooked contribution as the food items for demersal fishes by their frequent occurrence, though they were seldom eaten so much as to fill the fish stomachs fully by themselves.

Some crabs as *Charybdis bimacurata* or *Cosmonotus grayi* were observed to fill the fish stomachs fully by themselves in a season and a fishing ground.

Larger penaeid shrimps seem to be most important foods of demersal fishes, constituting very frequently the stomach contents of the many fishes. Most of fishes seem to have affinity to eat them though the discription in this paper is rather abbreviated owing to the difficulty of species identification about digested shrimp pieces.

Summary

Crustaceans which occurred frequently as the stomach contents of fishes, mainly demersal fishes, are tabulated in connection with their feeders in the Yellow and the East China Seas.

Some crustaceans as *Euphausia pacifica* and *Leptochela aculeocaudata* occurred very frequently in accordance with their occurrence as plankters. While, many amphipods, panaeids and a few crabs occurred very frequently as stomach contensts in spite of rather few collected by plankton nets or dredges, of which studies in details should

be done before discussing productivity in each niche from phytoplankters to higher canivora.

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