ON THE PREDATOR-PREY RELATIONSHIPS AMONG LARVAL AND JUVENILE FISHES IN A SHALLOW SEA COMMUNITY

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The present investigation was designed to elucidate the biological production mechanism of larval and juvenile fishes in the food web constructed by animal communities, and intended to provide some basic information for the management of fishery resources and for the propagation of commercial fish populations.

The research work was performed in the Kashimanada Joban coast area located on the Northeast Pacific coast of Honshu, the main island of Japan.

In order to investigate the production system of the larval and juvenile fishes living in the shallow sea areas from 5 to 15 m in depth, samples were collected by gillnet, an otter trawl, a beam trawl, a shirasu-seine, and a zooplankton-net, during the period from 1975 to 1977.

All samples obtained at each station were analyzed for the species composition. Stomach contents of each fish were also analyzed.

The anchovy, *Crangon affinis* (macruran), mysidaceans, amphipods, and copepods were abundantly eaten all the year round by the various predators; *Crangon affinis* and mysidaceans were, however, far more frequently found compared to the anchovy. The larger-sized fishes, as the higher food niche predators, rarely prey on fishes in these areas. Also, the fishes caught in the shallow sea are outnumbered by the small-sized or the larval and juvenile fishes which mainly prey on the smaller crustaceans as shown in Table 1.

In the cold season, during the period from December to March, a great many species of fish in the larval or juvenile stages were sampled in the areas. Most fishes were feeding on copepods, as shown in Figures 1 and 2.

In the case of some prey organisms such as *Acrocalanus gibber*, we can sometimes observe that a single prey species was taken in large numbers by several species of predator; however, the prey composition in the stomachs of the different predator species was different. This phenomena shows that each species of fish has a specific physiological requirement and feeding capacity, and has a unique way of life.

Figure 1. A production system, observed on the sample obtained at a station of 10 m in depth, along the sandy area of Kashimanada Joban coast, by the use of a beam trawl in January 1976.

Figure 2. A production system, observed on the sample obtained at a station of 10 m in depth, along the sandy area of Kashimanada Joban coast, by the use of a beam trawl in March 1977.
which never overlaps entirely with the other species (Okata, 1975, 1976).

When a prey species population is highly abundant and widely spread, several predators having different life histories may take that prey species population, sharing the environmental space with each other. This corresponds to the principle that no two species living in a common community occupy the same ecological niche (Elton, 1927). It may be assumed that two species in a predator-prey relationship are not rigidly connected with each other, but the predators, within the limitations of their ecological potential, have the flexibility to select some prey organisms within a community comprising several species having some similar life histories and some different microhabitats.

In order to investigate the biomass relationship between larval fish and small crustaceans, we divided the rather lower production system into the two animal groups, larval or juvenile fishes under 5 cm in body length and the small-sized crustaceans under 1 cm in carapace length or under 2 cm in breadth, and
compared their seasonal variations in terms of the number of species and the biomass per unit space.

Figure 3 shows the seasonal variations of species numbers of fishes and the crustaceans from January to December. Number of species of fishes showed a marked peak in March, and that of the crustaceans showed peaks in March and September.

Following these findings, the seasonal variation of the correlation between fishes biomass and crustaceans biomass was investigated, dividing the year into five periods, January–February; March; April–July; September; and October–December. In Figure 4, the biomass correlations between both groups of fishes and crustaceans in each period throughout the year can be seen. This phenomenon reveals that there is a certain stable equilibrium between the larval or juvenile fishes as ecologically lower niche predators and the smaller-sized crustaceans.

REFERENCES

