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Ontogenetic Vertical and Horizontal Migration of an Opossum Shrimp, *Acanthomysis pseudomacropsis* (Crustacea: Mysidacea) in the Japan Sea

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Abstract

Oblique tows with IKMT and 130-cm ring net between surface and near the sea bottom and otter trawl net tows on the sea bottom were made in the coastal waters of the Japan Sea off Akita and Yamagata Prefectures during June-September in 1978 and 1979 for the investigation on life history of *Acanthomysis pseudomacropsis*. Ontogenetic migration of this species can be summarized as follows. The juveniles of the opossum shrimp released from marsupium of their mother in the nearshore waters at the depth of 10–45 m during early spring spend pelagic life for very short periods and then get set to the vicinity of the sea bottom. They migrate from shallow areas of the continental shelf during June to the sea floor at the depth of 250–300 m where they spend the summer, autumn and winter seasons. Then, they migrate again in dense swarms to the shallow areas in the next early spring for the reproduction. They may die after releasing young forms. The spatial distance of their ontogenetic migration measures 200–250 m vertically and 5 miles or more horizontally.

I. Introduction

An opossum shrimp, *Acanthomysis pseudomacropsis* TATTERSALL (Crustacea: Mysidacea, Japanese name: "Kobuhige-hama-ami," local name: "Ko-ami"), is distributed in the Gulf of Alaska, Kamchatka waters and the Japan Sea (II 1964), and is of certain importance in commercial fisheries in Akita and Yamagata Prefectures of the northern Honshu as krill or euphausiids, copepods and other mysids in the various waters of the world.

During early spring about one thousand vessel-days fishing efforts are expended with small trawlers less than 3 tons in the coastal waters of the depth of 10–45 m in Yamagata Prefecture. The catch per unit effort ranged from 210 to 1820 kg per boat per day for years 1974–1977. The catches are only consisted of adult, and half of them are occupied by females with eggs or embryos in their brood pouch or marsupium. The fishing season and catches are greatly fluctuated annually, and the prospect of the fisheries of coming season is very difficult because there are little knowledge on biology and ecology of this species.

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This paper intended to show the locus of the migration through their whole life history from the results of net tows in the neritic waters of Akita and Yamagata Prefectures.

II. Method and materials

To collect the juveniles of *Acanthomysis pseudomacropsis* three kinds of sampling operation, namely, oblique tow with 130-cm ring net and 6-ft Isaacs-Kidd midwater trawl (IKMT) and sea bottom otter trawl net tow, were made. The otter trawl net was designed for the present research vessel and was bigger than that used in the commercial fishery of the opossum shrimp in these areas. Net tows were made from a small fishing boat, Hakusan Maru (3 tons), or R/V Mizuho Maru (79 tons) for 15–40 min. in daytime along the isobaths as much as possible in the coastal waters of Akita and Yamagata Prefectures during June-September in 1978 and 1979 (Table 1, Fig. 1). The length of rope payed out was about three times as long as the depth of water in all kinds of sampling. The 130-cm net sometimes incidentally touched the sea bottom through towing.

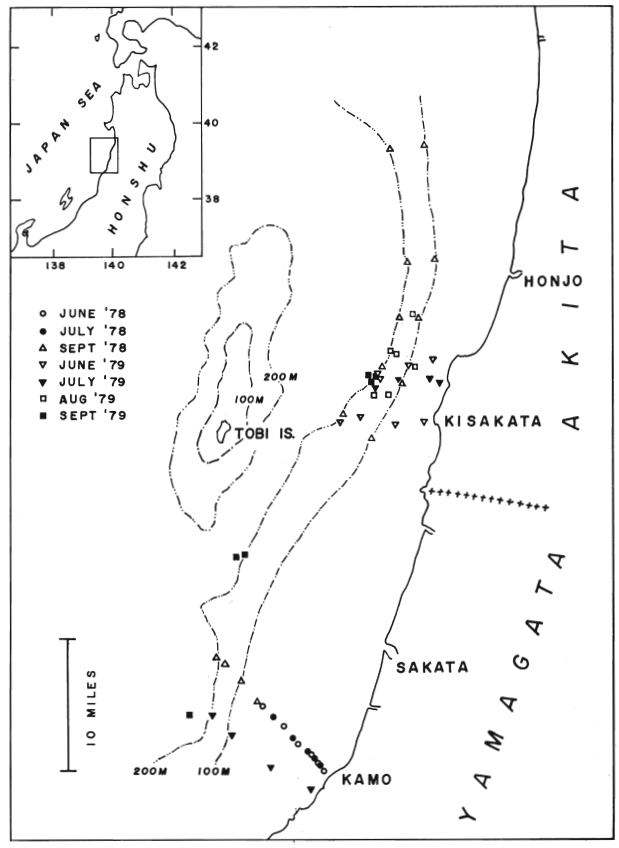

Fig. 1. Location of sampling stations for *Acanthomysis pseudomacropsis*.

Table 1. Summary of sampling operations for *Acanthomysis pseudomacropsis*.

Date	Sea area	Ship	Duration of tow (min.)	Depth of tow (m)	Gear
June 2, '78	Off Kamo	Hakusan Maru	15	10–65	130-cm ring net, 650 cm long, cylindo-conical, 0.34 mm mesh
July 26, '78	do	do	20	15–73	do
Sep. 6–8, '78	Off Akita and Yamagata	Mizuho Maru	40	100, 200	6-feet IKMT, cod-end 1.24 mm mesh
June 5, '79	Off Kisakata	do	30	50–200	Bottom trawl net, 37 m long with otter boards, cod-end 1.24 mm mesh
July 9–13, '79	do	do	ca. 30	25–200	do
Aug. 7, 9, '79	do	do	ca. 30	100, 200	do
Sep. 4, 6, '79	Off Kisakata and Sakata	do	ca. 30	200–300	do

Samples obtained were fixed in the 10% sea water formalin immediately after the catch. The body length from the frontal margin of the carapace to the end of telson was measured for the individuals of straight body under the dissecting microscope. As many individuals are fixed bowed the projected area of lateral view of organisms was also determined electrically by means of IIMC Particle Measurement Computer System manufactured by Millipore Co., Ltd. to observe the size composition of the opossum shrimp. The telson and pleopods, and the distal segments of antennae and thoracic limbs in the juveniles look like to be transparent, and figure of silhouette of the organisms is not always clear-cut on the Braun tube image. Therefore, the shown values not always mean true projected area. But relative comparison each other is likely probable.

III. Results and discussion

Acanthomysis pseudomacropsis could not be found from a total of twenty-five samples collected by 130-cm ring net tows and IKMT operations during June, July and September in 1978. It is suggested by these trials that this species has no pelagic life in the shallow waters of the surveyed area in summer at least in daytime, though TANIGUCHI (1968) caught certain amount of juveniles of this species at midwater in daytime in the Akkeshi Bay of Hokkaido. In the 1979 survey, we concentrated our attention to the sea bottom and adopted an otter trawl net for sampling. Using this net, collections were made in the offing of Kisakata, Akita Prefecture, at depth of 50 to 200 m in June. The opossum shrimp was caught in 4 among a total of 8 tows. The catches of the *Acanthomysis* ranged from 1 to 19000 in number per tow. The largest catch was from the sea floor at a depth of 50 m (Fig. 2). The samllest may be a residue of the preceding tow. In July and August no *Acanthomysis* were caught in 16 tows at the stations of various depths on the continental shelf where good catches were made in June. This suggests that the opossum shrimp may migrate rapidly from shallow waters to deeper areas on the continental

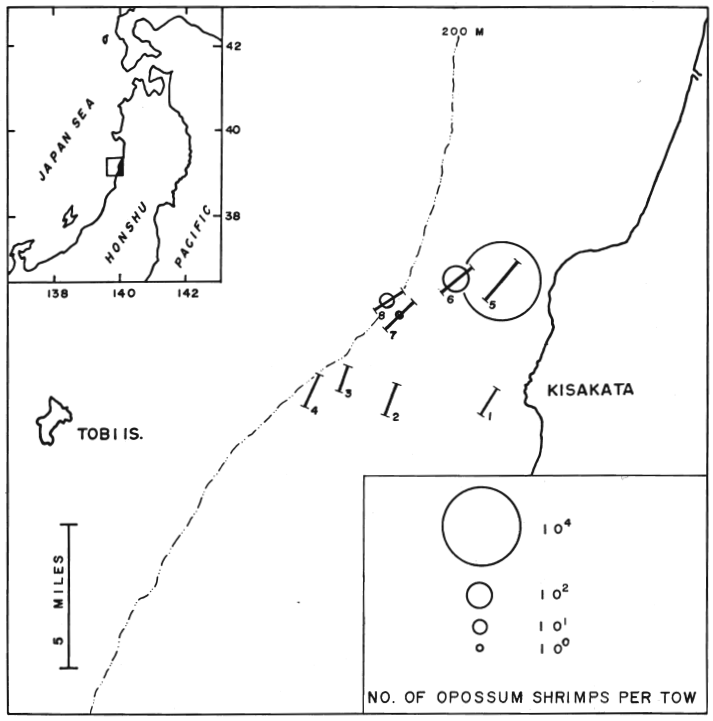

Fig. 2. Position of bottom trawl net tows (bars with station number) and the catch of *Acanthomysis pseudomacropsis* off Kisakata, Akita Prefecture in June 1979.

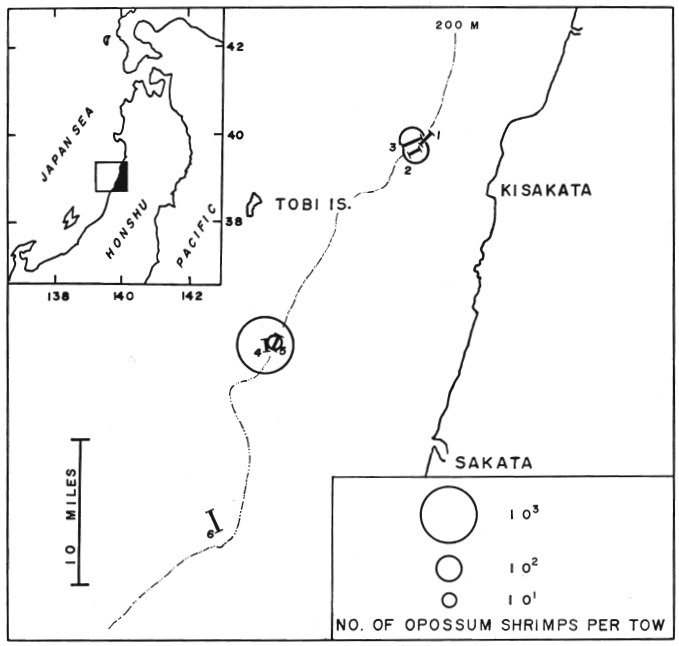

Fig. 3. Position of bottom trawl net tows (bars with station number) and the catch of *Acanthomysis pseudomacropsis* off Kisakata, Akita Prefecture and Sakata, Yamagata Prefecture in September 1979.

slope. In September, at the upper part of continental slope with the depth of water of 250–300 m were caught certain amount of the opossum shrimps by the trawl net (Fig. 3). This indicates that they, little creatures of 8–11 mm in body length, migrate rather long distance, e.g. 200–250 m vertically and 5 miles or more horizontally. Size composition of the catches in the projected area shows their growth during three months. In September, however, the small-sized subpopulation was also observed at Stn. 2 (Fig. 4).

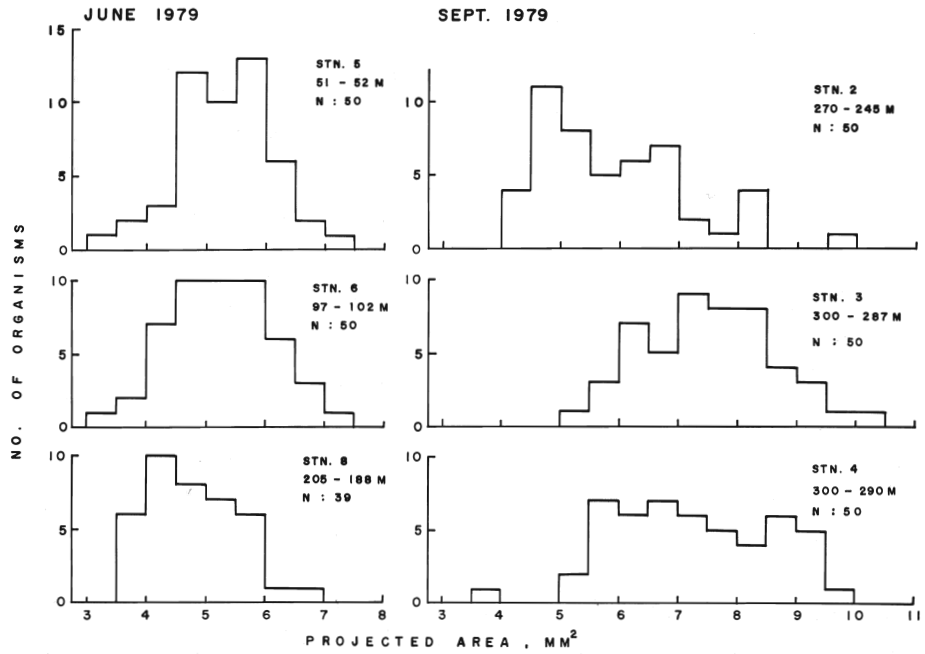

Fig. 4. Frequency distribution of projected area of *Acanthomysis pseudomacropsis* in the Akita and Yamagata waters in June and September 1979.

The opossum shrimp specimens of adults with eggs or embryos were obtained from commercial catches in early spring. The body length composition of the eggs, embryos and adults and the present specimens was plotted against months, and the growth curve of this species was obtained (Fig. 5). It shows sigmoidal one before younger juvenile and linear after that stage. This figure is similar to one observed by MURANO (1964) in *Neomysis intermedia* CZERNIAWSKY. He described linear growth after juvenile and suggested that the sigmoidal growth lies in the stages of embryo in the marsupium. It is tentatively assumed that the juveniles of the *Acanthomysis* which are emerged wavily from marsupium of their mother in the coastal shallow waters in the early spring migrate to the edge of continental shelf before mid-summer along sea bottom and grow during autumn and winter seasons at a certain depth. In next early spring they appear again as adults in the coastal waters making dense swarm. It may take for one year for maturing. The longevity is presumed to be one year, because the adult forms were absent from the samples in

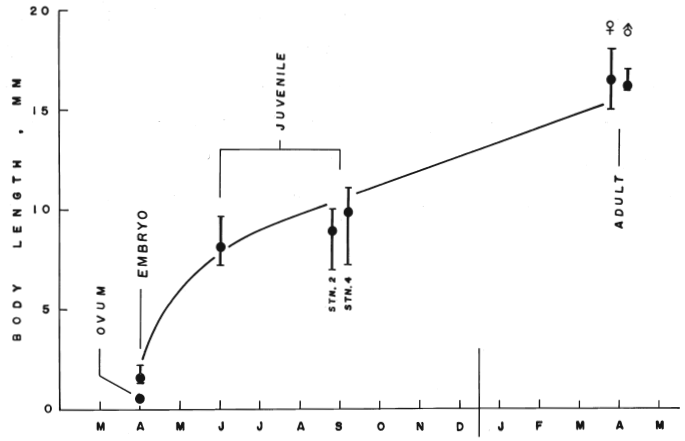

Fig. 5. Seasonal change of body length (mean and range) and tentative growth curve of *Acanthomysis pseudomacropsis* in the Akita and Yamagata waters.

this survey and it is said by fishermen that they entirely disappear from the coastal waters after fishing season. The duration for maturing is very similar to that of this species mentioned by TANIGUCHI (1968) in the Akkeshi Bay of Hokkaido, and is slightly longer than that given by MAUCHLINE (1972) who plotted the body length of adult of some epipelagic species of mysid against age on log-log scales and indicated the growth rates settled within a certain range. According to him, species of 15 mm in body length mature sexually at an age of ca. 6–10 months.

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コブヒゲハマアミの成長に伴う鉛直・水平移動

森岡泰啓・高橋善弥

要　旨

コブヒゲハマアミ（アミ目甲殻類）は早春秋田県南部から新潟県北部の沿岸域の浅所に雌雄成体が濃密に成群して，秋田・山形両県では漁獲対象となつている．漁期や豊凶は年によつて激しく変わるがその原因は不明である．

発育初期の生態を調べるために1978年6月，7月および9月に秋田—山形の大陸棚海域でプランクトンネットとアイザックス・キッド中層トロール網（ＩＫＭＴ）を曳いた．目的のアミは得られず，翌1979年6月に同様の海域で試みた底曳網の曳網によつて初めて幼生が採集できた．しかし，7月と8月には同じ方法，同じ海域での曳網では採集されず，9月に大陸斜面を曳網して得ることができた．このことと各発育段階の体長組成の季節変化とから，早春に極く沿岸の浅部で放出された幼生は夏になる前に大陸斜面の深部に移動し，そこで越冬して成熟し，晩冬に再び沿岸域に向つて移動し始める，すなわち，成熟には1カ年を要し，幼生の放出後死亡し，移動距離は鉛直的に200～250m，水平的には少なくとも5マイル程度，と推定できる．