

# Size of S-type Rotifer Preyed by Japanese Flounder Larvae, *Paralichthys olivaceus*

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The size selection of S-type rotifer prey by reared Japanese flounder larvae was investigated. The results showed that the larvae (about 9 mm in total body length) have a tendency to prey favorably rotifers with greater than 140  $\mu\text{m}$  in lorica length.

## Introduction

Availability of plankton feeders from the viewpoint of their quality and quantity is the most important factor that determines the future life of fish<sup>1)</sup>. The feeding habit of carnivorous fish is mostly controlled by the structure of the mouth which limits the size of prey<sup>2)</sup>. Furthermore, it is necessary to investigate the feed efficiency relating to the growth of fish larvae.

In Japanese flounder mariculture, rotifers are fed to the larvae after the opened mouth stage when they become 9-10 mm in total body length. As the size of rotifers increases with maturity and the growth is generally not synchronized, rotifers fed to the larvae are a mixture with various sizes.

Therefore, in this study, the author investigated the size selection of S-type rotifer by Japanese flounder larvae with about 9 mm in total body length.

## Materials and Methods

Japanese flounder eggs, naturally fertilized on May 16, 1996, were obtained from the Japan Sea-farming Association, Hakata, Ehime and transferred into a 1 m<sup>3</sup> FRP tank with 800 ℓ rearing water at temperature of 18.0 °C in the same day. The eggs were hatched out on May 18 ( about 95 % hatching rate ).

The rearing water was aerated with four air stones at a rate of 200 ml/min and exchanged continuously at a rate of 1.5 turnovers/day. Water temperature was 20.0 ± 1.0 °C.

Cultures of S-type rotifer ( 2 × 10<sup>7</sup> individuals ) were fed to the larvae ( 4 × 10<sup>4</sup> fish ) at 9 a. m. on June 4 (17 days after hatching) when they grew up to 9.0 ± 4.3 mm in total body length. About one hundred S-type rotifers were sampled from the experimental tank at 5, 30, 60, 120 min and 24 hr after feeding and their lorica lengths were measured using an electric measure ( CD-15, Mitutoyo ) on a projector ( V-12, Nikon ).

## Results

The mean lorica length of S-type rotifer and its distribution at each lapse time in the rearing water are shown in Table 1 and Fig. 1, respectively. There was no difference between the distribution of lorica lengths at initial time and those of lorica lengths after 5 and 30 min. After 60 min, the frequency of lorica length 170 μm was decreased to 10 from 25 % and those of lorica lengths 120 and 130 μm increased to 18 from 5 % and 12 from 6 %, respectively. After 120 min, the frequency of lorica length 150 μm was decreased to 7 from 15 %. After 24 hr, the frequencies of lorica lengths 190, 180, 170 and 160 μm were decreased to 0 from 10 %, 3 from 10 %, 1.5 from 20 % and 8 from 15 %, respectively, whereas those of lorica lengths 120, 110 and 100 μm were increased to 23 from 12 %, 15.5 from 8 % and 12 from 2 %, respectively.

Frequencies of lorica lengths and titer of prey of larvae at initial time and after 24 hr are shown in Table 2. Titer was calculated as (Initial/After 24 hr) - 1 where "Initial" and "After 24 hr" represent the frequencies of lorica length at initial time and after 24 hr, respectively. Positive (+) and negative (-) numerals of titer indicate a degree of favorable and unfavorable sizes of prey, respectively. Frequencies of lorica length greater than 140 μm were decreased ("+" of titer), and those of lorica length

Table 1. Mean lorica length of S type rotifer at each lapse time in experimental tank

Lapse time	Initial	5 min	30 min	60 min	120 min	24 hr
Lorica length( $\mu\text{m}$ )	156.5	161.9	165.0	150.7	151.9	131.7
S. D.	25.1	23.8	19.7	22.3	24.9	20.9

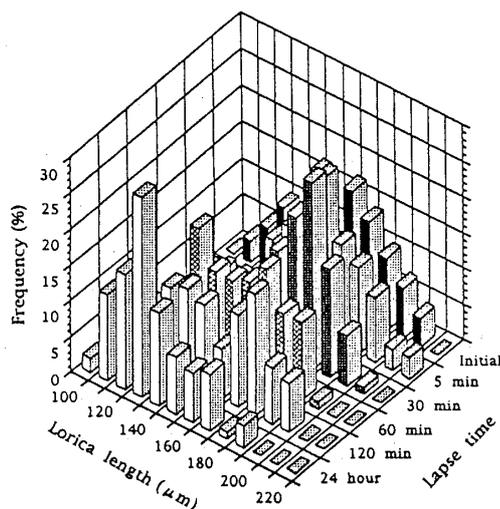


Fig. 1. Distribution of S type rotifers with different lorica length at each lapse time in experimental tank.

Table 2. Frequencies of S type rotifer with different lorica length and titer of prey at initial time and after 24 hr

Lorica length ( $\mu\text{m}$ )	Initial (%)	After 24 hr (%)	Titer of prey [(Initial/After 24hr) - 1]
90	0	2.0	-1.00
100	2.5	12.0	-0.98
110	5.5	15.5	-0.64
120	10.0	23.0	-0.56
130	7.5	12.5	-0.40
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140	17.0	8.0	+1.13
150	8.0	7.0	+0.14
160	17.0	10.0	+0.70
170	15.0	1.5	+9.00
180	10.0	3.0	+2.33
190	7.5	0	$+\infty$
200	3.0	0	$+\infty$

less than 140  $\mu\text{m}$  increased ("-" of titer) after 24 hr.

From these results the larvae were found to show a favorable size selection of S-type rotifer prey.

### Discussion

The mouth structures of fish, especially the sizes of cleft and breadth are very important for feeding of fish in their young stages<sup>1)</sup>. There is a close relationship between the mouth size of larval fish and the size of natural foods<sup>3)</sup>, and the proper size of prey is thought to be almost equal to the size of mouth breadth of predator<sup>2)</sup>.

In this experiment, the sizes of mouth cleft and mouth breadth of Japanese flounder larvae were about 1.1 mm and about 0.5 mm, respectively. The larvae preyed S-type rotifers with greater than 140  $\mu\text{m}$  lorica length selectively. This size (140  $\mu\text{m}$ ) corresponds to 12.5 % of the size of mouth cleft and 26.4 % of the size of mouth breadth.

In this study, we found that Japanese flounder larvae show a favorable size selection of S-type rotifer prey, however, the size selection of prey at different growth stages of larvae and the feeding time of prey to larvae are necessary to be investigated furthermore.

### Acknowledgement

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### References

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## 要 約

ヒラメ仔魚へのワムシの給餌は、開口時から全長が 9-10 mmに達する頃まで行うのが一般的である。餌料として与えるワムシには、その成熟に応じて様々な大きさの個体が存在する。実際に、仔魚への給餌は、これらが混在した状態のものを使用している。しかし、ヒラメ仔魚は成長にともなって捕食する餌のサイズに選択性をもつことから、給餌するワムシのサイズが仔魚の摂餌行動に影響することが推察される。そこで本試験では、平均全長が約 9 mmに達したヒラメ仔魚が捕食した S 型ワムシのサイズを調査した。

その結果、ヒラメ仔魚は、背甲長が 140  $\mu$ m 以上のワムシを捕食する傾向にあった。