Establishment of a rearing system of larval and juvenile walleye pollock for elucidating their biological properties and responses to environmental changes

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Introduction

- Environmental factors controlling recruitment of walleye pollock have attracted great interest
- Laboratory experiments would be effective tool for elucidating the responses of larvae and juvenile pollock to environmental changes
- Feeding and rearing pollock larvae have not succeeded

We conducted experiments to establish the rearing system of pollock from hatching to juveniles

Experimental design

First experiment

- Small tanks (0.5 kL) 5 February-27 March (52days)
  5, 8, 11˚C
- Large tank (15 kL→45 kL) 8 February-
  9 ˚C (0-140 days after hatching)

➢ Focused on feeding and rearing larvae

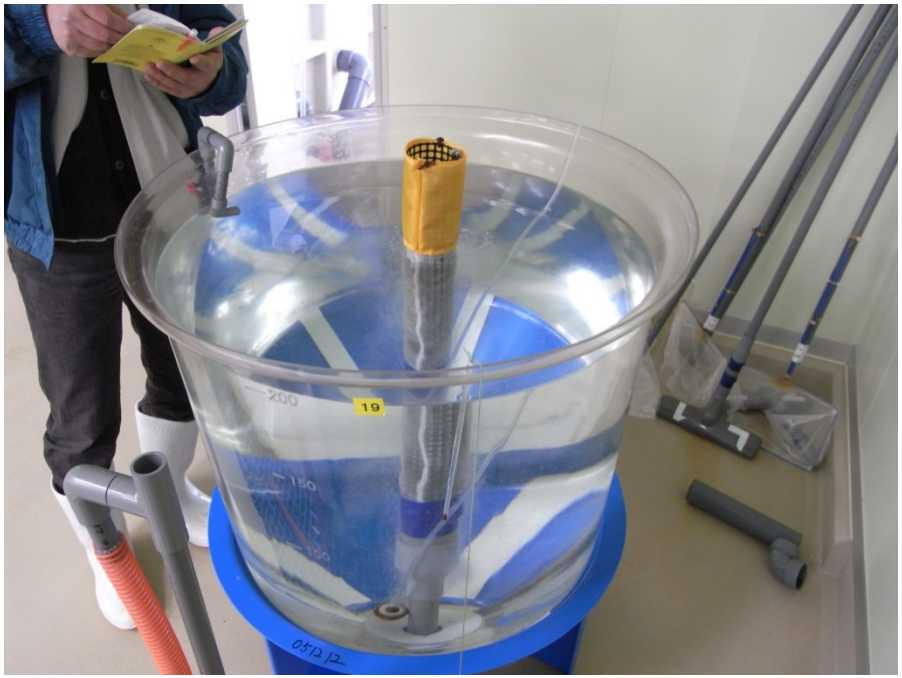
Second experiment

- Large tank (15 kL) 24 March-
  5 ˚C (0-60 days after hatching)

➢ We used n-3 highly unsaturated fatty acid (n-3 HUFA) rich rotifers and focused on rearing larvae under the temperatures which wild larvae will be exposed

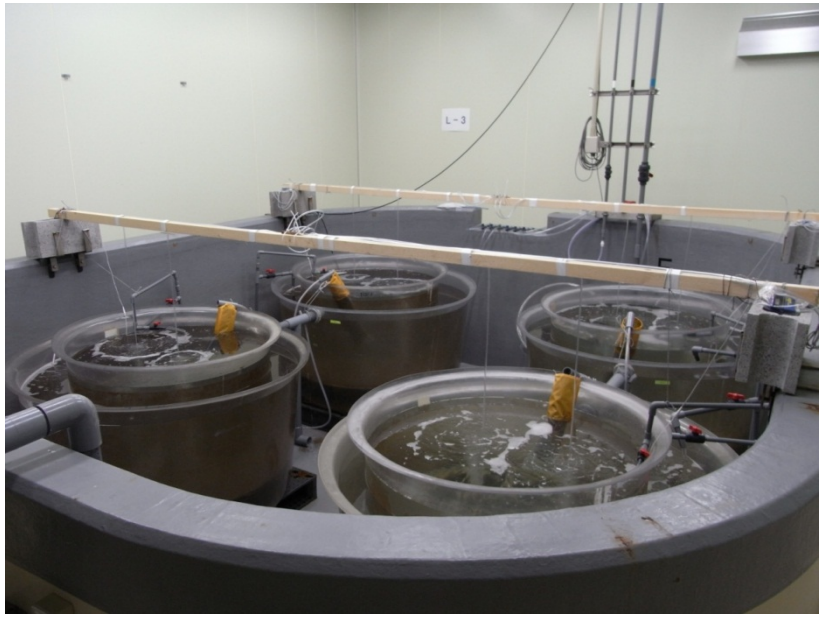
Collection and incubation of eggs

- Fertilized eggs were obtained from adult fish reared in a tank at Muroran marin station about 450 km west of our laboratory
- Eggs were transferred to our laboratory at blastula-gastrula stage by parcel delivery service
- Incubated with filtered flowing seawater at 5 ˚C



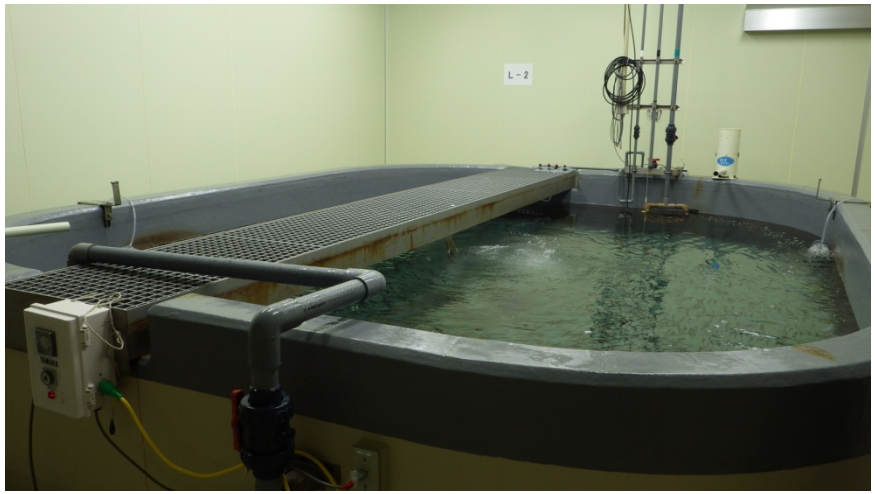
Rearing condition of first experiment
Small tanks (0.5 kL)

- 3 temperatures (5▪8▪11 ˚C) with 2 replicate tanks
- Initial density of larvae : 11.0 individuals/L
- Still water (0-14 days after hatching),
  Filtered flowing seawater
  (15-51 days after hatching, 0.2-2.6 exchanges/day)



Rearing condition of first experiment
Large tank (15 kL→45 kL)

- Temperatures 8.9˚C : 6-140 days after hatching
  9.1-18.5˚C : 141-235 days after hatching
- Initial density of larvae : 4.2 individuals/L
- Filtered flowing seawater (0.5-4.3 exchanges/day)
- Transferred to 45 kL tank when juvenile reached about 140 mm in total length (183 days after hatching)



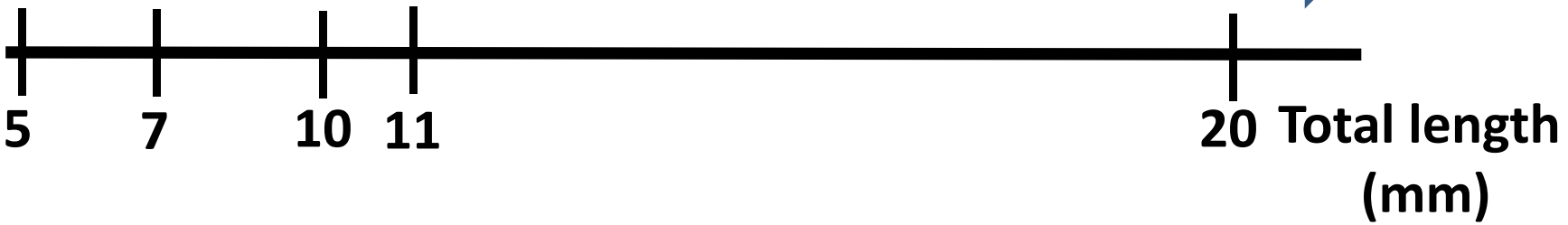
Feeds for larvae in the small tanks

Rotifers 10 rotifers/mL stand low temperature (8˚C)

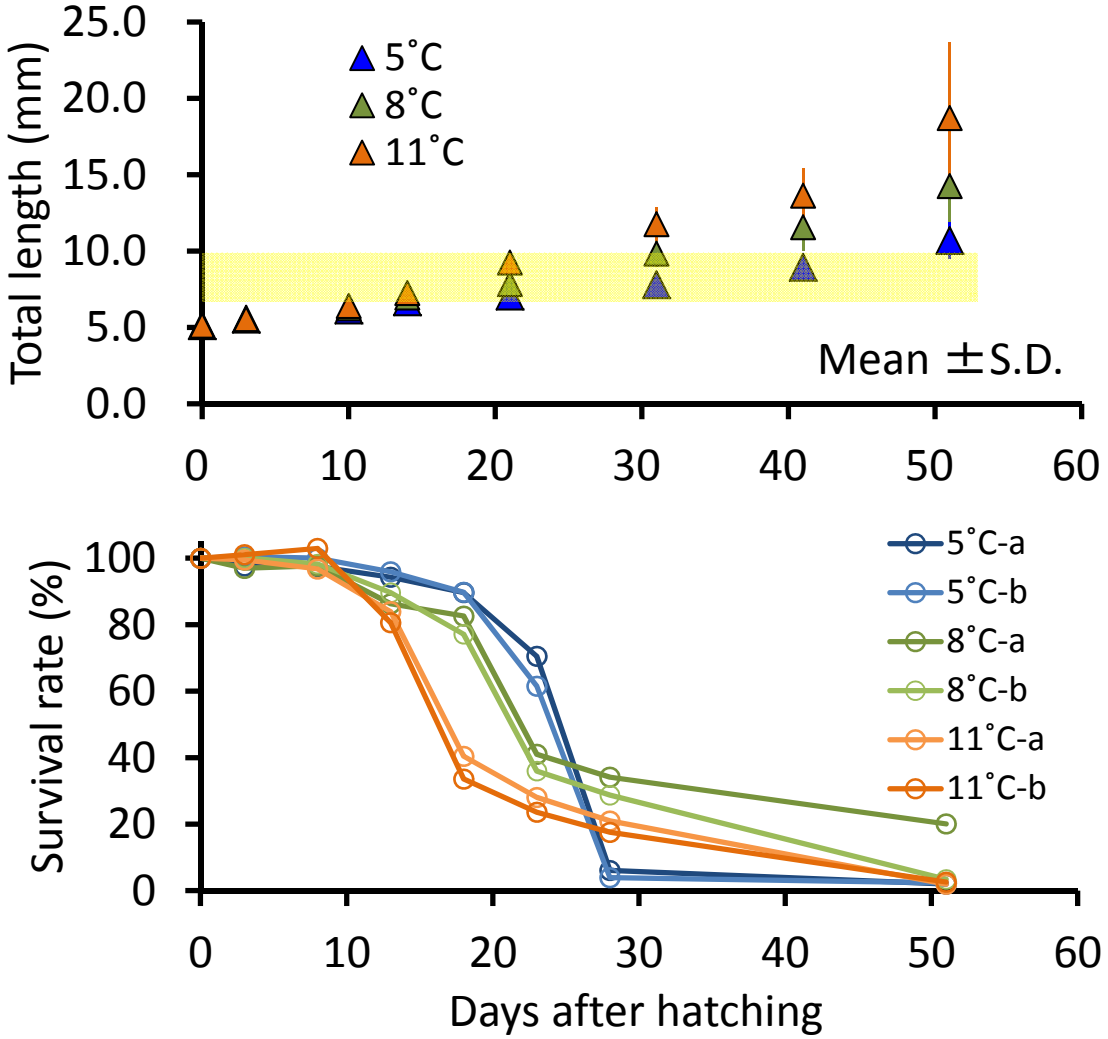
Artemia franciscana nauplii

Frozen copepod
body length : 0.35-0.60 mm

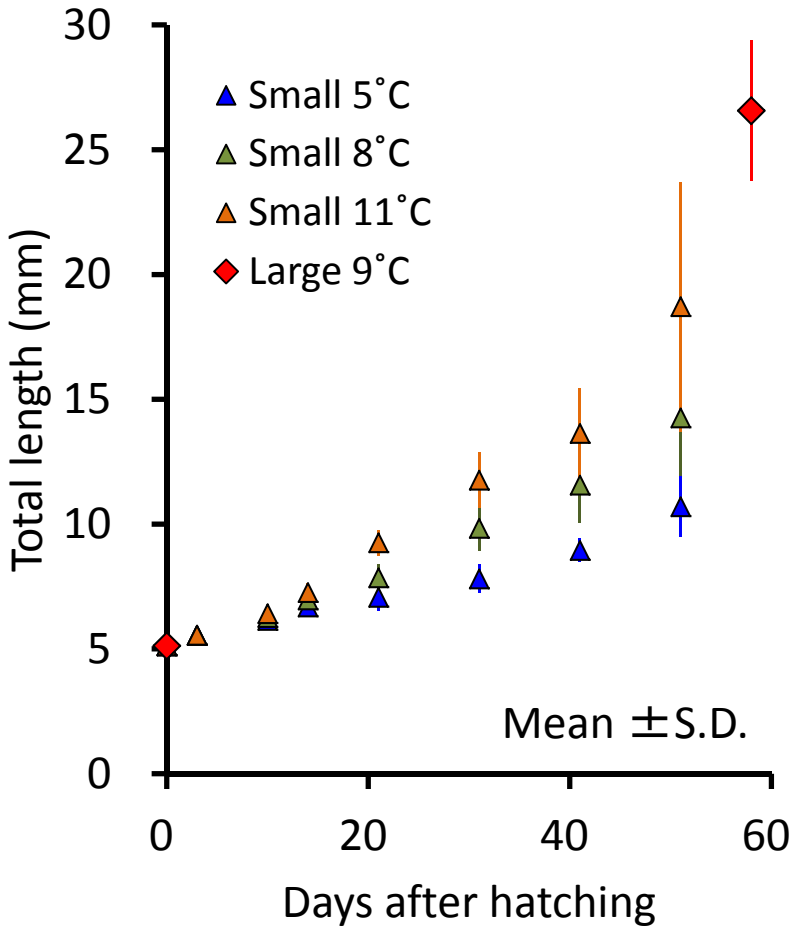
Artificial dry diet
size (diameter) : 0.26-0.36 mm

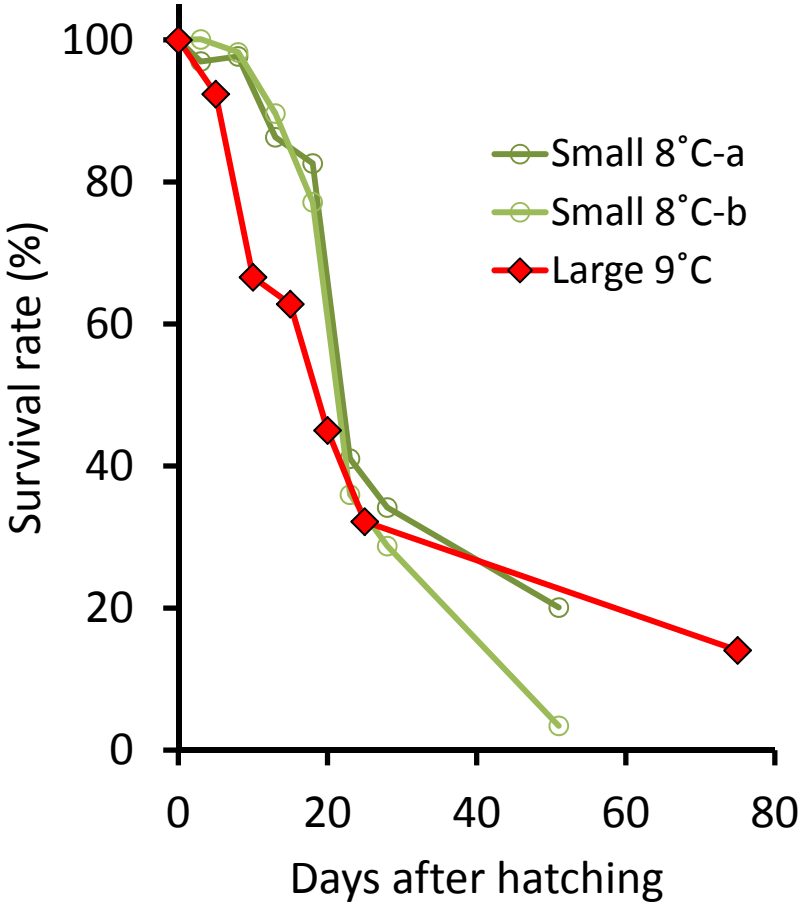


Growth and Survival of larvae in the small tanks



Growth and Survival of larvae in the large tank (Red diamond)





Summary of the first experiment

- ✓ We succeeded in feeding and rearing pollock from hatching to juvenile
- ✓ Larvae exposed to higher temperatures grew faster
- ✓ n-3 highly unsaturated fatty acid (n-3 HUFA) content of rotifers may be inadequate for larvae to survive

Rearing condition of second experiment (15 kL)

- **Temperatures** 5.3˚C : 0- 60 days after hatching
  6.0-11.7˚C : 61-190 days after hatching
- **Initial density of larvae** : 5.6 individuals/L
- Filtered flowing seawater (0.5-2.9 exchanges/day)
- **Food**

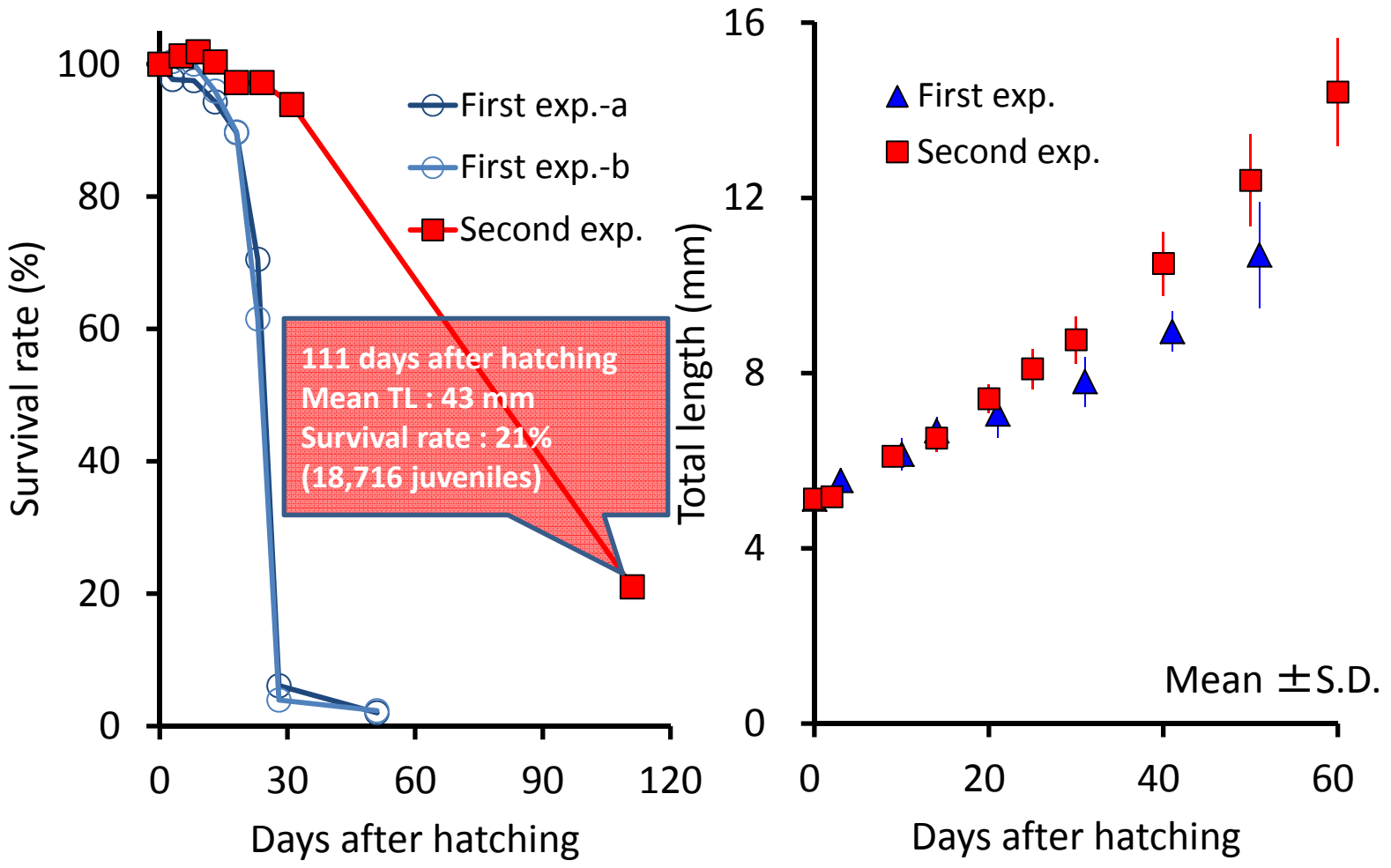
☐ Rotifers (enriched with n-3 HUFA rich oil before fed)
10 rotifers/mL : 5-14 mm TL

☐ *Artemia franciscana* nauplii : 7-40 mm

☐ Frozen copepod : 14-65 mm

☐ Artificial dry diet : 20 mm-

Survival and growth of larvae at 5˚C



- Growth and survival of larvae were much improved

n-3 HUFA content of rotifers

	Rt-1	Rt-2	Rt-3
Total lipid (%, d.b.)*	9.7	13.3	15.1
EPA (%, d.b.)*	0.8	1.1	1.3
DHA (%, d.b.)*	1.0	1.7	2.4
Σn- 3 HUFA (%, d.b.)*	2.5	4.0	5.0

* On dry matter basis

Rt-1 : Rotifers used in **small tanks** of **first** experiment (reconstruction)
Rt-2 : Rotifers used in **large tank** of **first** experiment
Rt-3 : Rotifers used at **second** experiment

- Over 4.0% dry weight of n-3 HUFA is needed for good larval growth and survival

Conclusion

- We succeeded in rearing larvae under the temperatures which wild larvae will be exposed
- n-3 HUFA content of feed is important for growth and survival of larvae
- We can conduct a variety of experiments by using the rearing system established in this study

Thank you for your attention

We thank Dr. H. Tanaka for wonderful photos

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