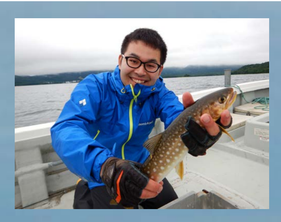
Why the body size of walleye pollock larvae in Funka Bay and the adjacent waters, Hokkaido was large in 2016?



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Introduction

The Japanese Pacific stock of **walleye pollock** *Gadus chalcogrammus*

- Eggs are spawned from Dec. to Mar. in and around **the Funka Bay**.
- Larvae are distributed in these waters until May.
- The body size of larva is considered as a key factor for survival.

➜This study aims to explain the variation of larval size in April by the marine environment around spawning ground in winter.

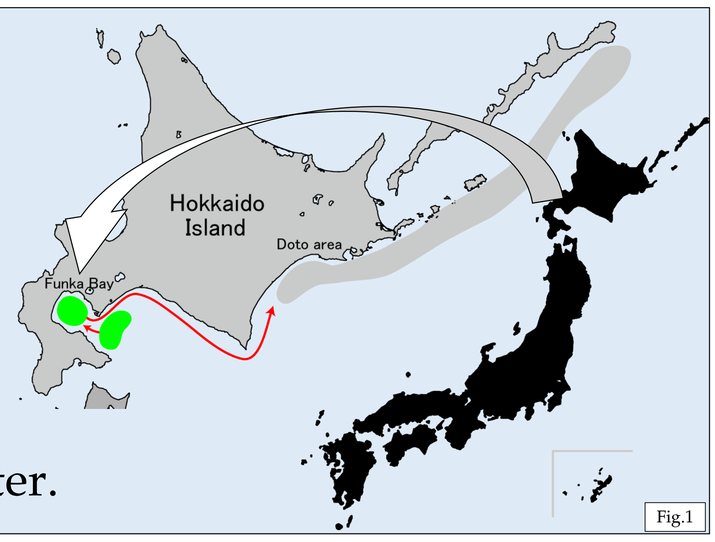

Fig.1

Eggs sampling

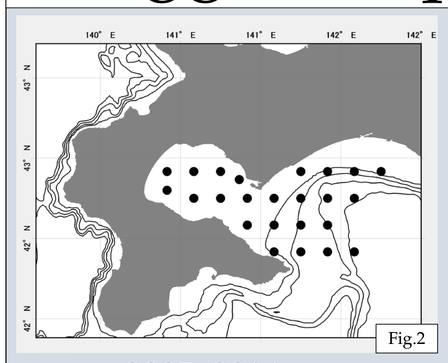

Fig.2

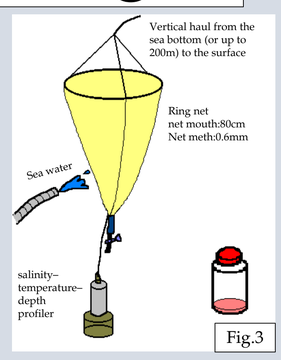

Fig.3

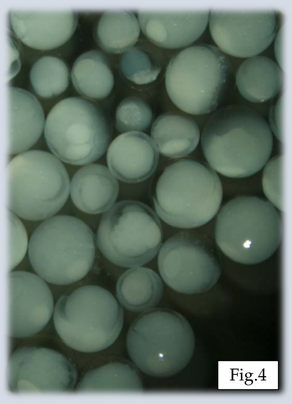

Fig.4

- **Year:** 2005–2016
- **Month:** Dec.–Mar. (or Jan.–Mar.), every month
- **Area:** in and around the Funka Bay (Fig.2)
- **Sampling:** Ring net (Fig.3),
- **Count:** eggs (Spawn to Blastula stage, Fig4) and larvae (Fig.4)
- **Environments:** sea surface water temperature (SST)
- **Sampling and observation station:** 24 stations
- **Abundance of eggs:** calculate by the density (number/m^2) or estimate from abundance of larvae in Jan. (in Dec. 2005-2009)

⇒**Monthly abundance proportion of eggs** as index of spawning season

Larvae sampling

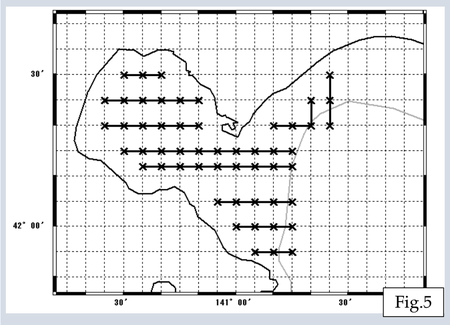

Fig.5

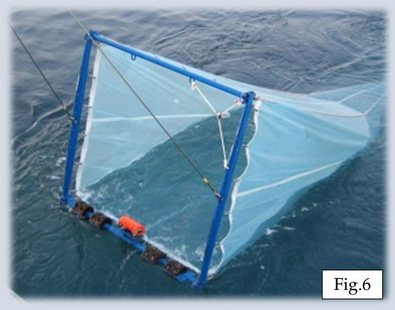

Fig.6

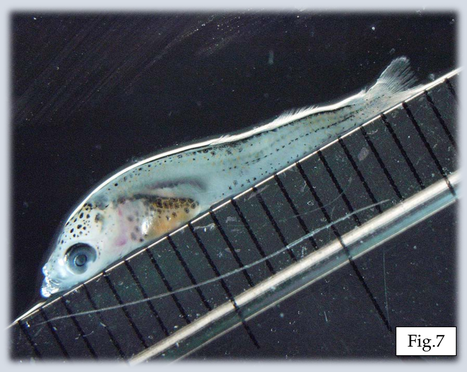

Fig.7

- **Year:** 2005–2016 (except 2011)
- **Month:** April
- **Area:** in and around the Funka Bay (Fig.5)
- **Sampling:** Framed Midwater Trawl (Fig.6), mouth opening 2×2m, mesh size of cod end 526μm, horizontal tow, where acoustic signs were observed
- **Vessel speed and time:** 2.0–3.0 knots for 15min
- **Measure:** Standard length (SL) are measured (Fig.7)

Table1

Year	Times of trawl	Measured number
2005	21	1532
2006	24	2005
2007	18	1606
2008	16	1270
2009	18	1676
2010	17	1497
2012	18	1644
2013	23	2221
2014	13	1025
2015	6	596
2016	5	500

Results

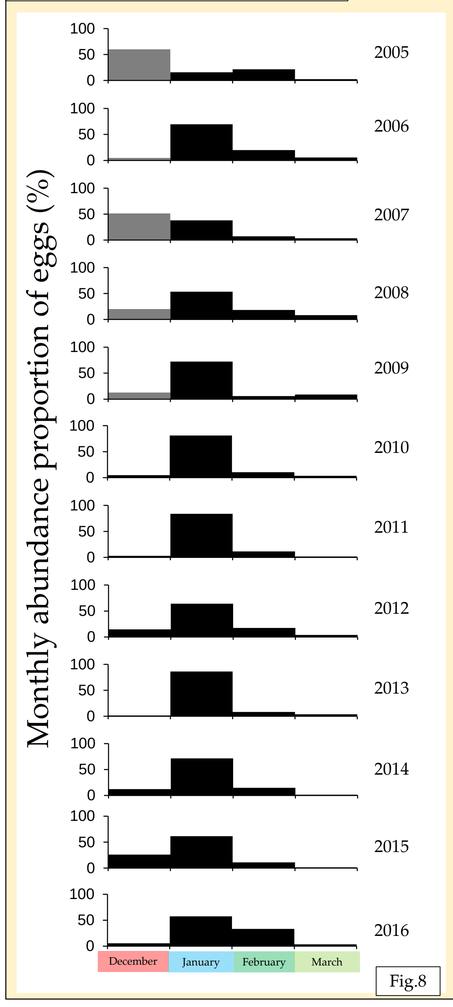

Fig.8

✓Spawning season mainly peaked in Jan., and were similar after 2008. (Fig.8)

✓Since 2005, SST in Jan.–Mar. was highest in 2016, and lower in 2010-2014. (Fig.9)

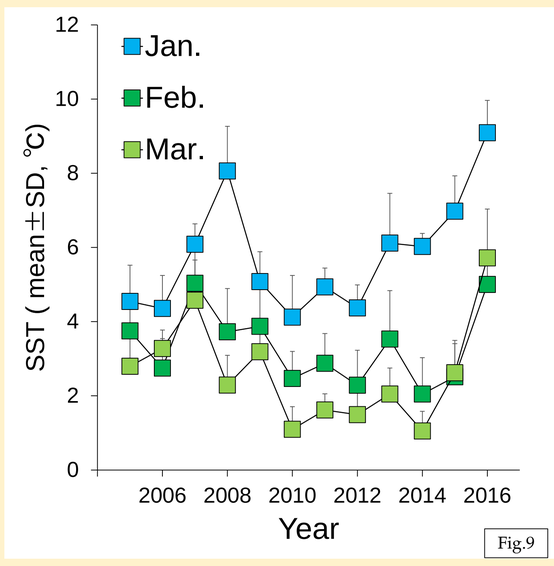

Fig.9

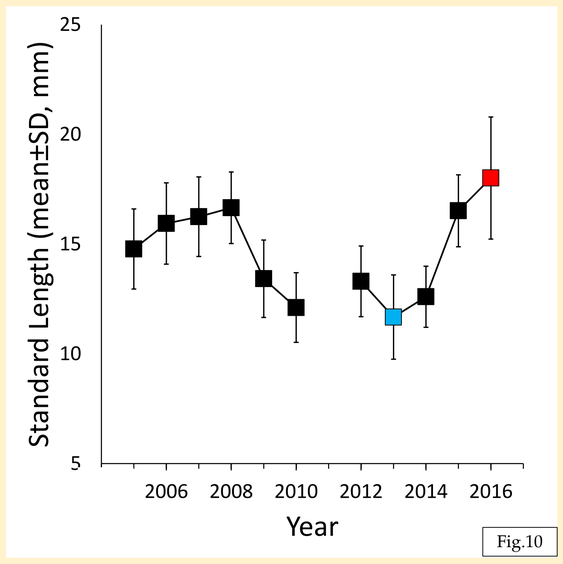

Fig.10

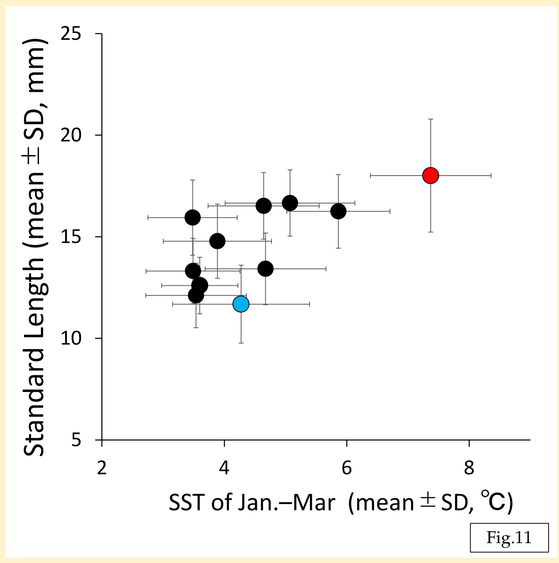

Fig.11

✓The mean SL of larvae varied from 11.7 to 18.0 mm interannually, larvae were the largest in 2016 and the smallest in 2013. (Fig.10)

✓A positive correlation was found between SST and body size.（p=0.018, r=0.69） (Fig.11)

Discussion

- It was suggested that the largest size of larvae in 2016 was caused by the exceptionally highest water temperature.
- In the next step, we will examine the effect of the body size of larvae on predation mortality of them.

Warm ocean → **Large Body size** → ? → **Survival under Predation**

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