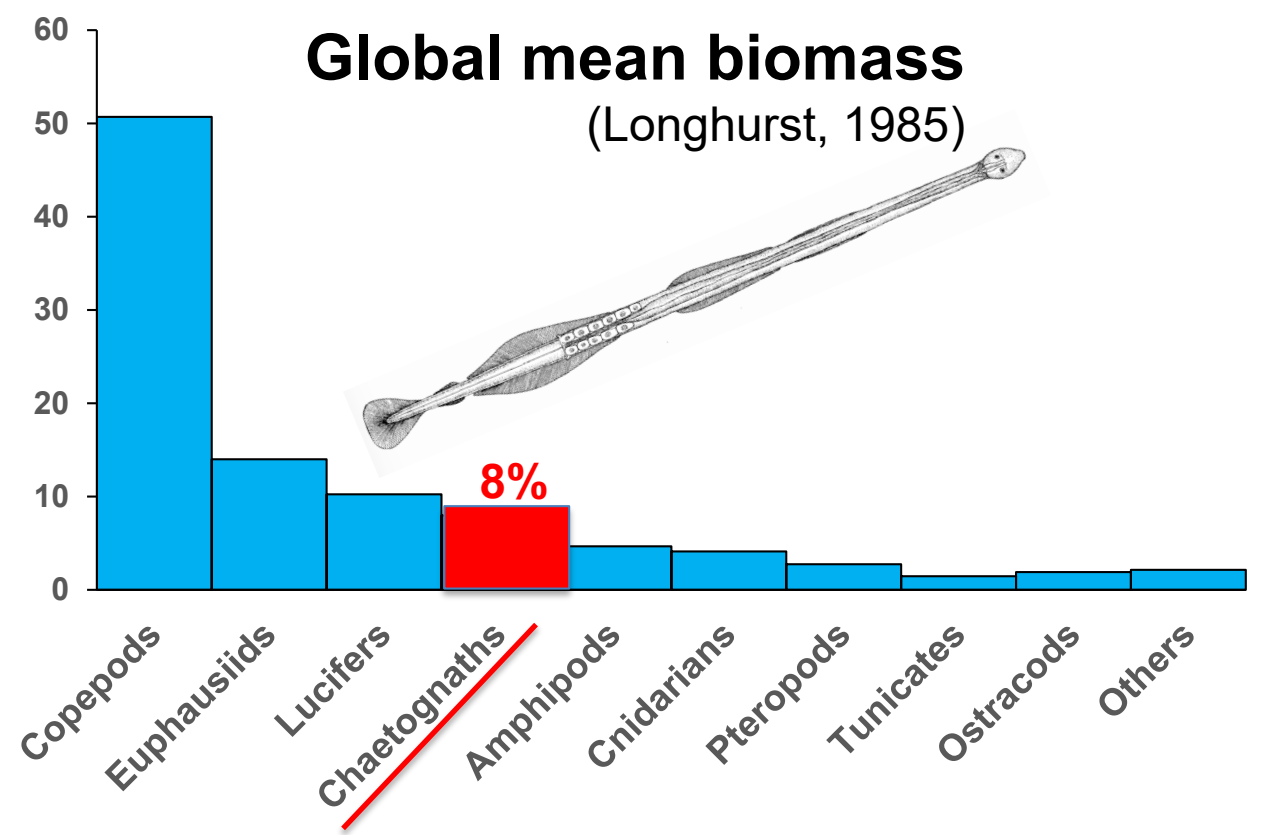
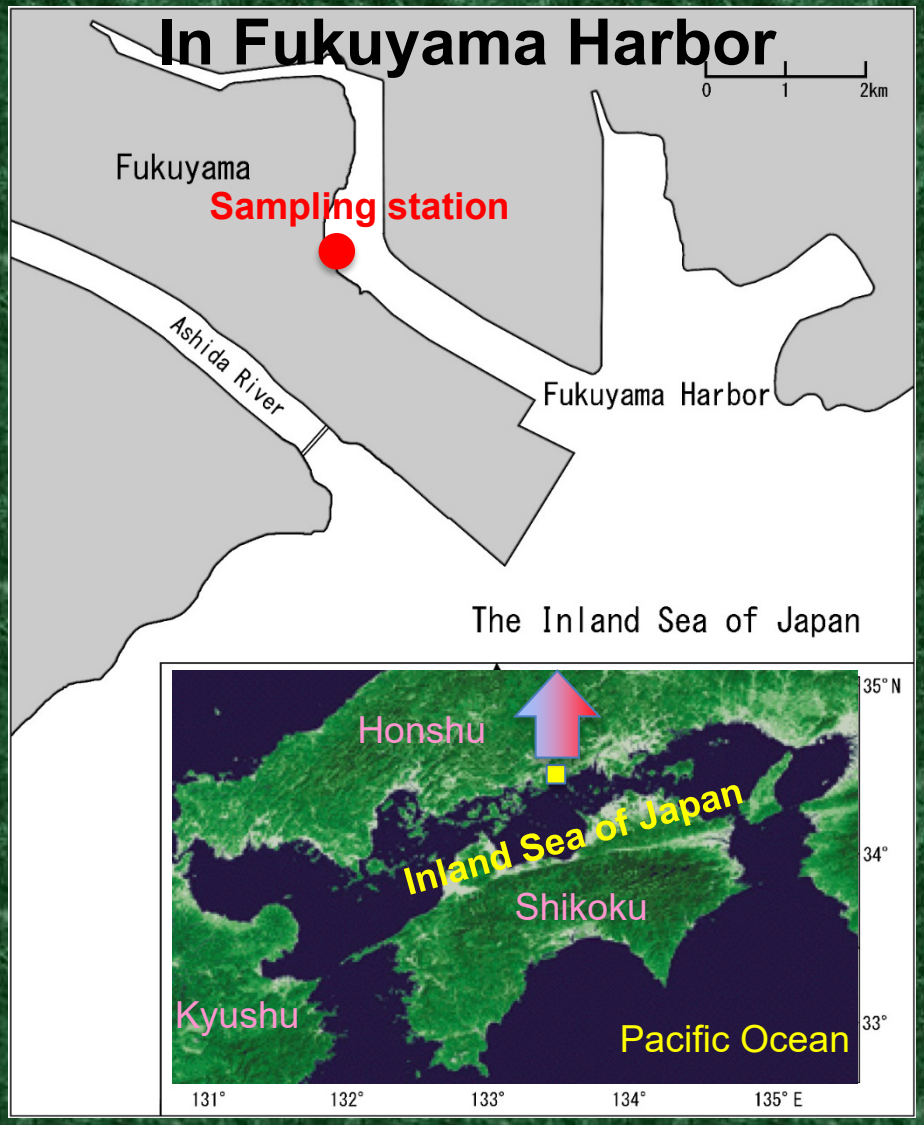
Seasonal population dynamics, biomass, production and feeding of the chaetognath *Aidanosagitta crassa* in a temperate eutrophic inlet

Shin-ichi Uye[1] and Liang Dong[2]
([1]Hiroshima University and [2]JC Environment LCC, Japan)



Sampling site and methods

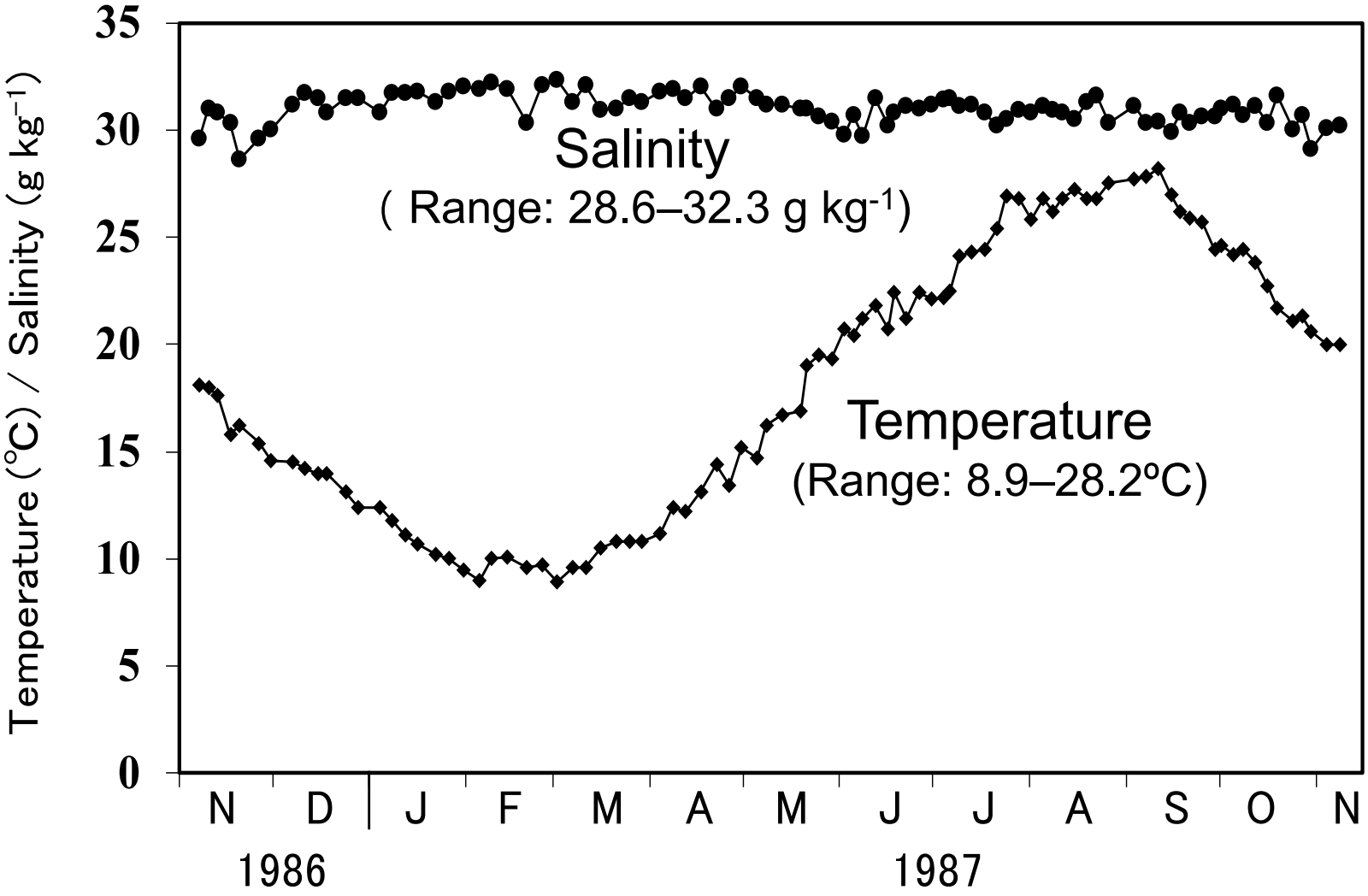


By oblique tows of a modified NORPAC net (mouth diameter: 45 cm, mesh opening: 62 μm) from the bottom (depth: 7-8 m) to the surface

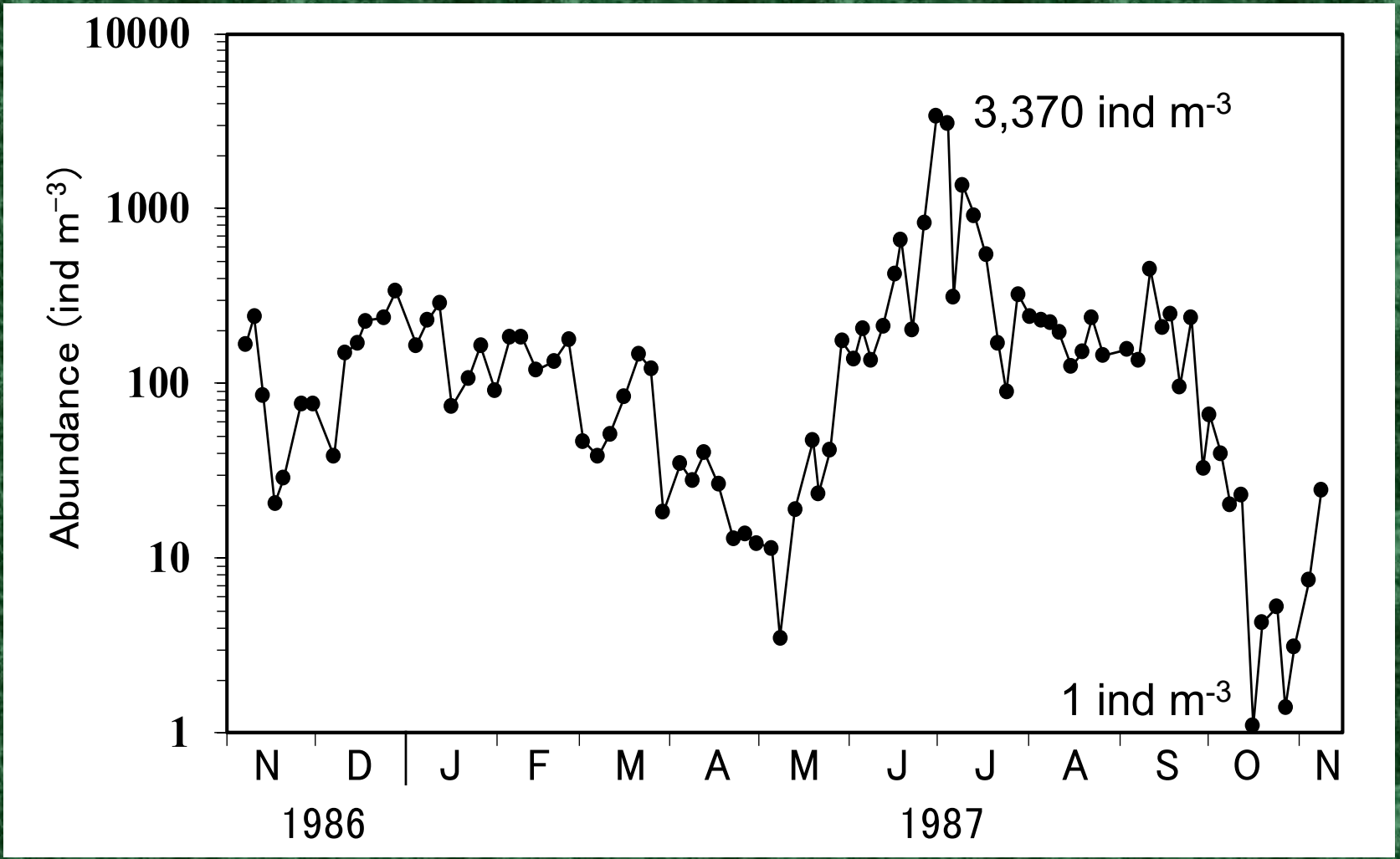
High frequency: 3-7 day internals from 7 November 1986 to 8 November 1987

At nocturnal high tide (local time: 17:00-07:00)

Surface temperature and salinity

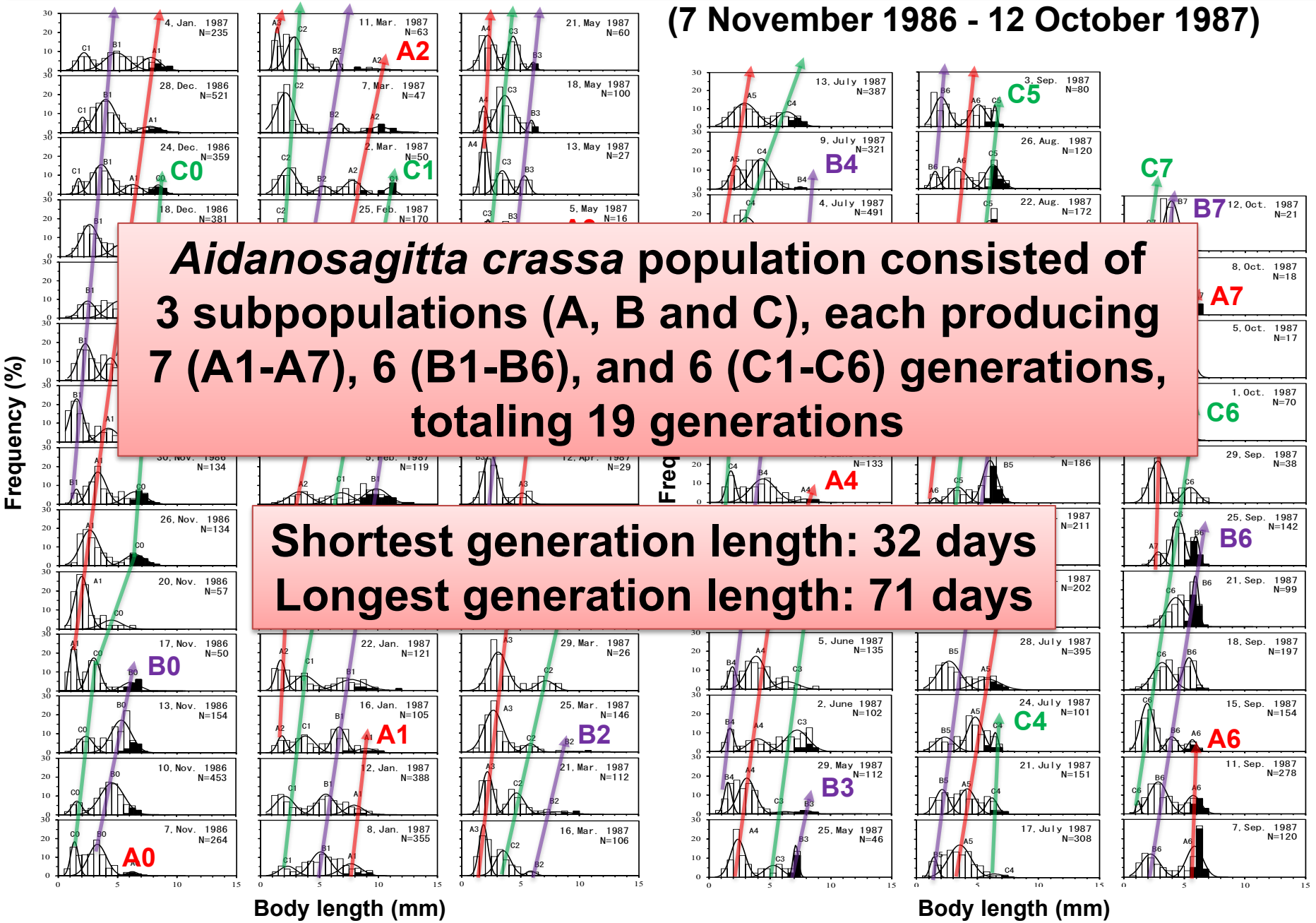


Seasonal variation in abundance of *Aidanosagitta crassa*



Body length frequency distributions for generation analysis

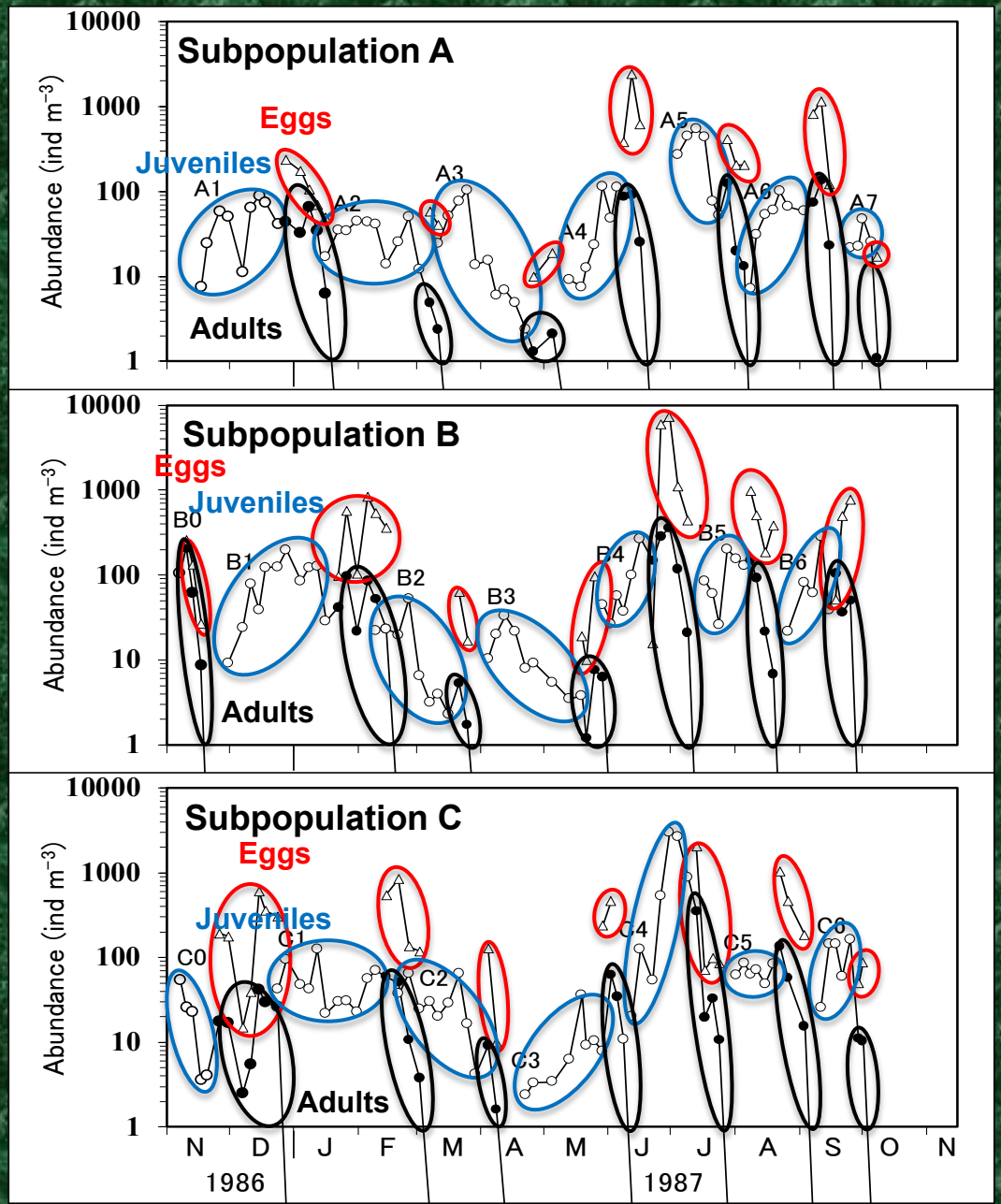
(7 November 1986 - 12 October 1987)

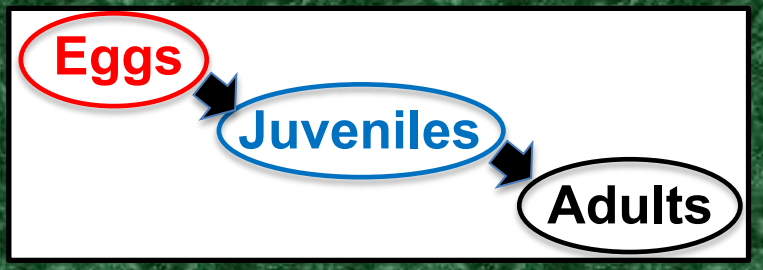


Aidanosagitta crassa **population consisted of 3 subpopulations (A, B and C), each producing 7 (A1-A7), 6 (B1-B6), and 6 (C1-C6) generations, totaling 19 generations**

Shortest generation length: 32 days
Longest generation length: 71 days

Stage-specific abundance: Survival curve



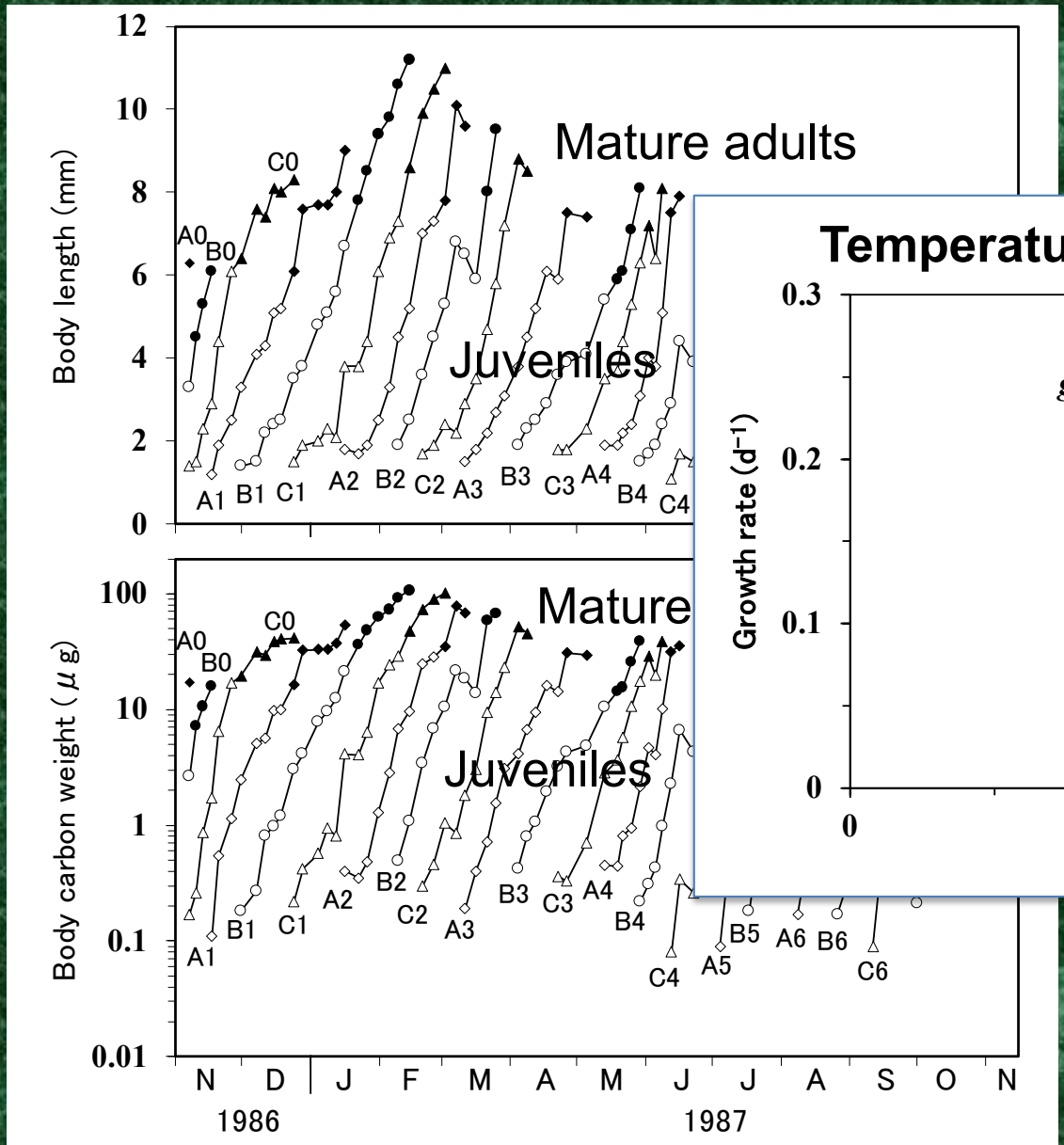


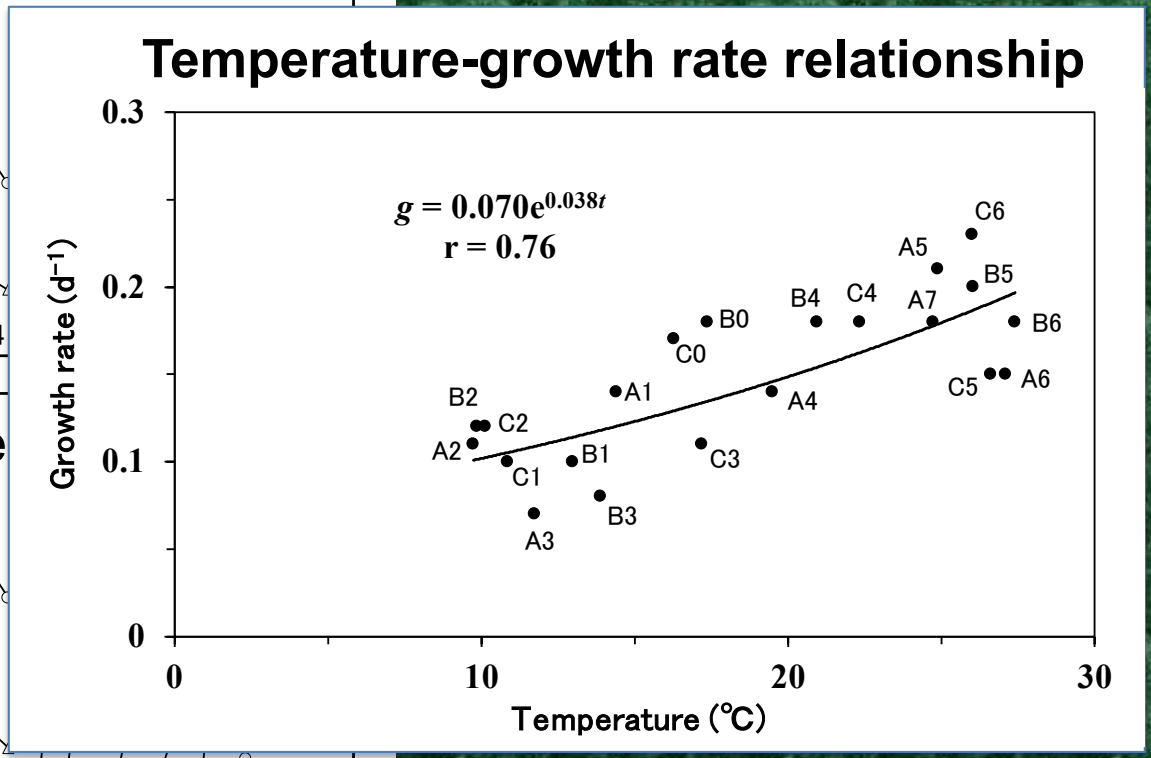
Egg densities were often one order of magnitude higher than juvenile densities → **High mortality in egg and larval stages**

Juvenile densities were relatively stable and often peaked before maturation → **Comparatively low mortality in juvenile stage**

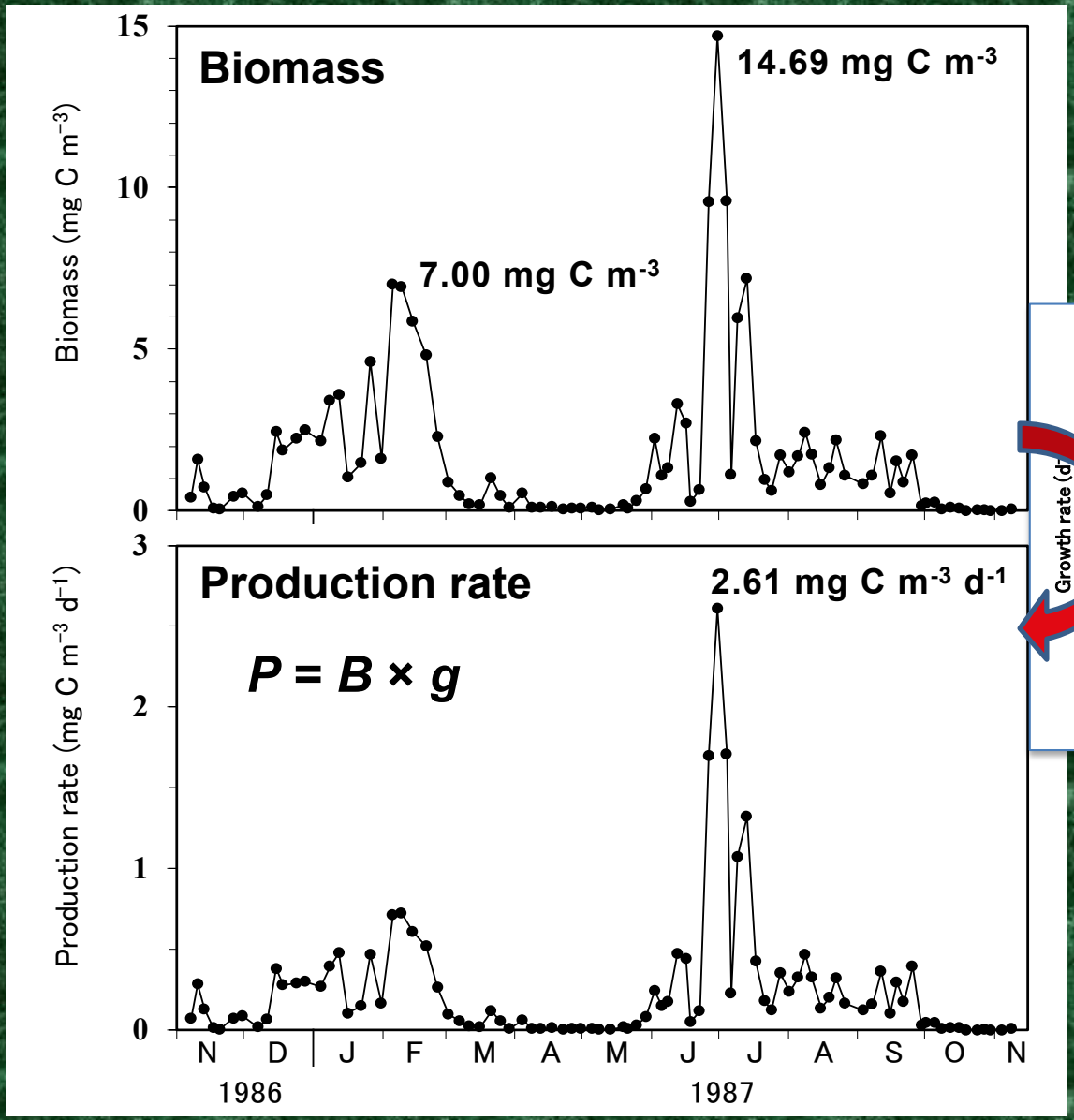
Adult densities declined rapidly → **High mortality in adult stage**

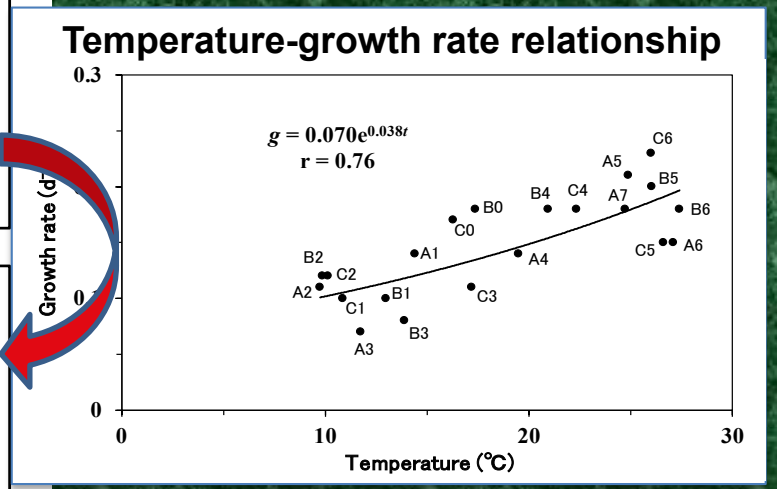
Seasonal variations in growth pattern, and a temperature-growth rate relationship





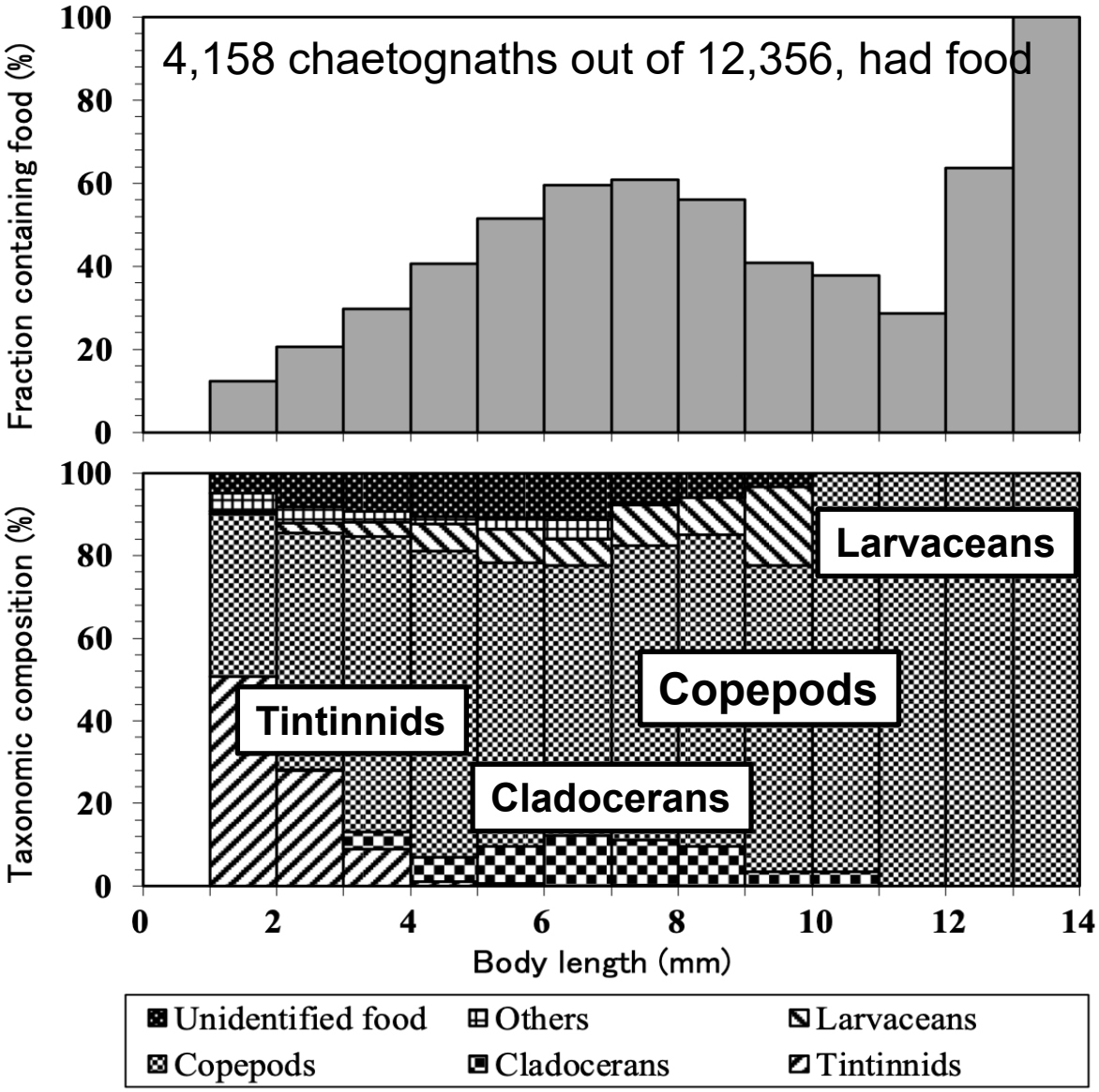
Seasonal variations in population carbon biomass and production rate





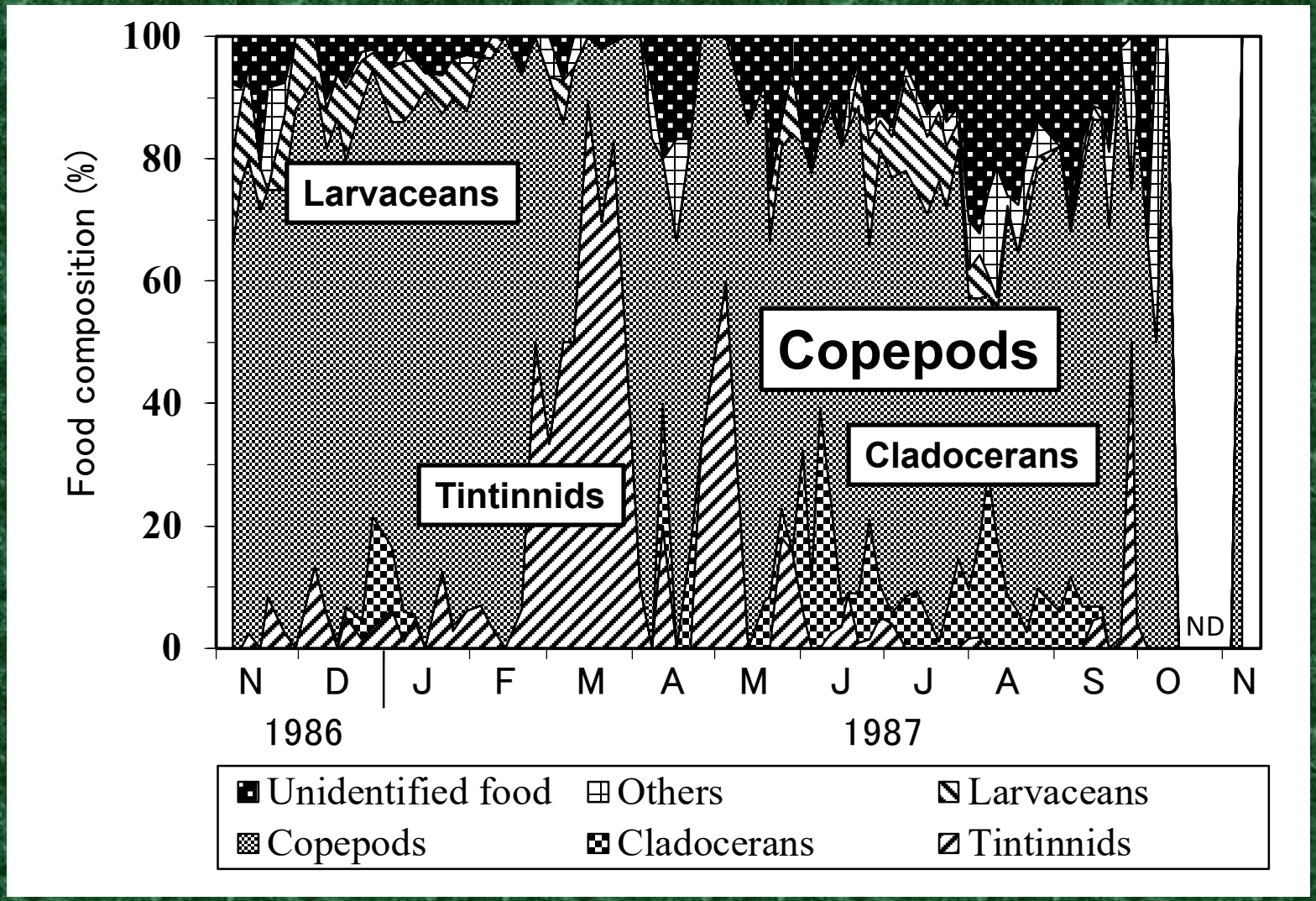
Annual production rate: 91.49 mg C m^{-3} y^{-1}

Fraction containing food and food taxonomic compositions in different body size classes

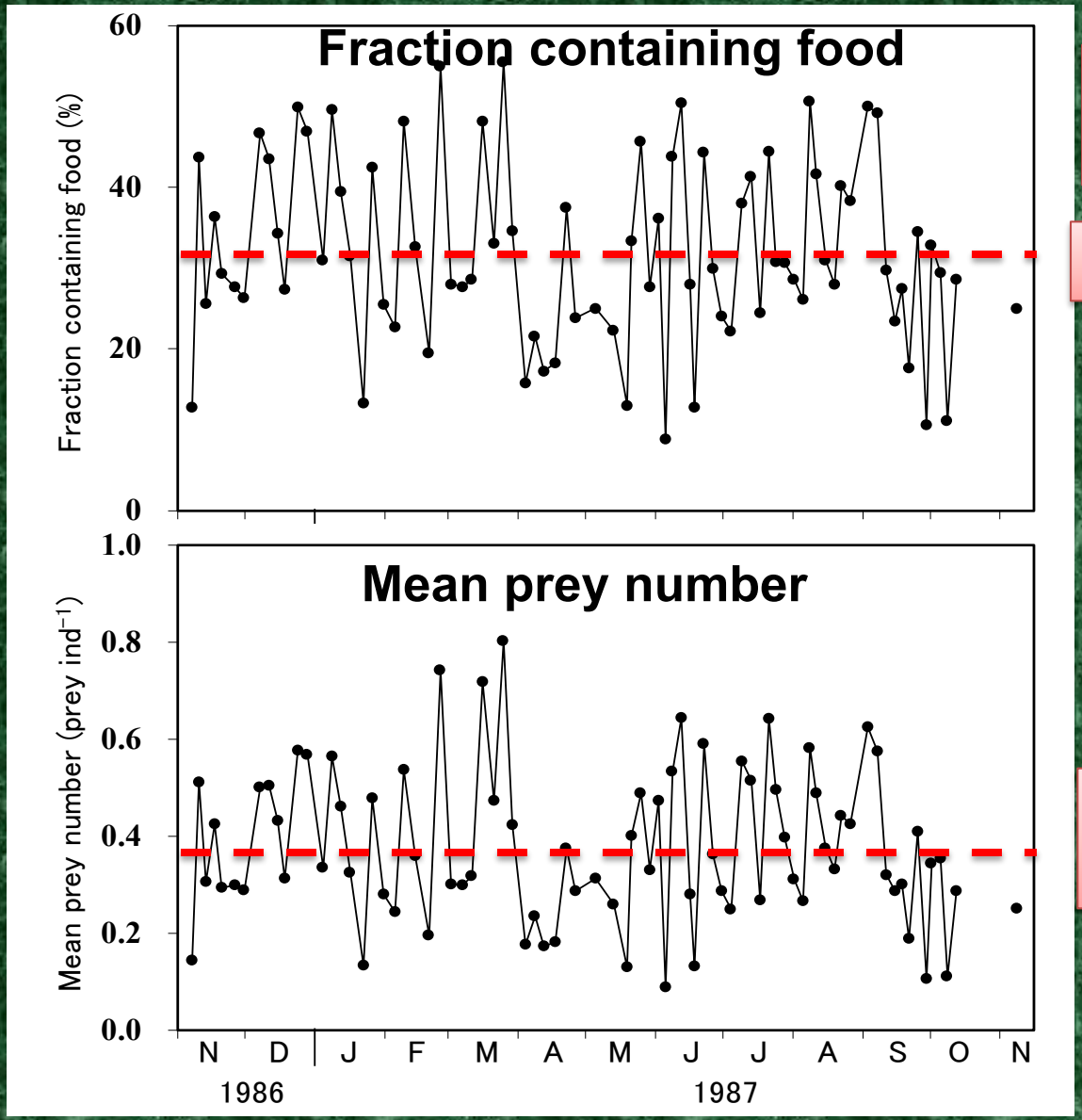


Overall mean:
Copepods: 67.4%
Tintinnids: 8.1%
Cladocerans: 6.7%
Larvaceans: 6.1%

Seasonal variation in major taxonomic groups of zooplankton preyed by *Aidanosagitta crassa*



Seasonal variation in fraction containing food and mean prey number

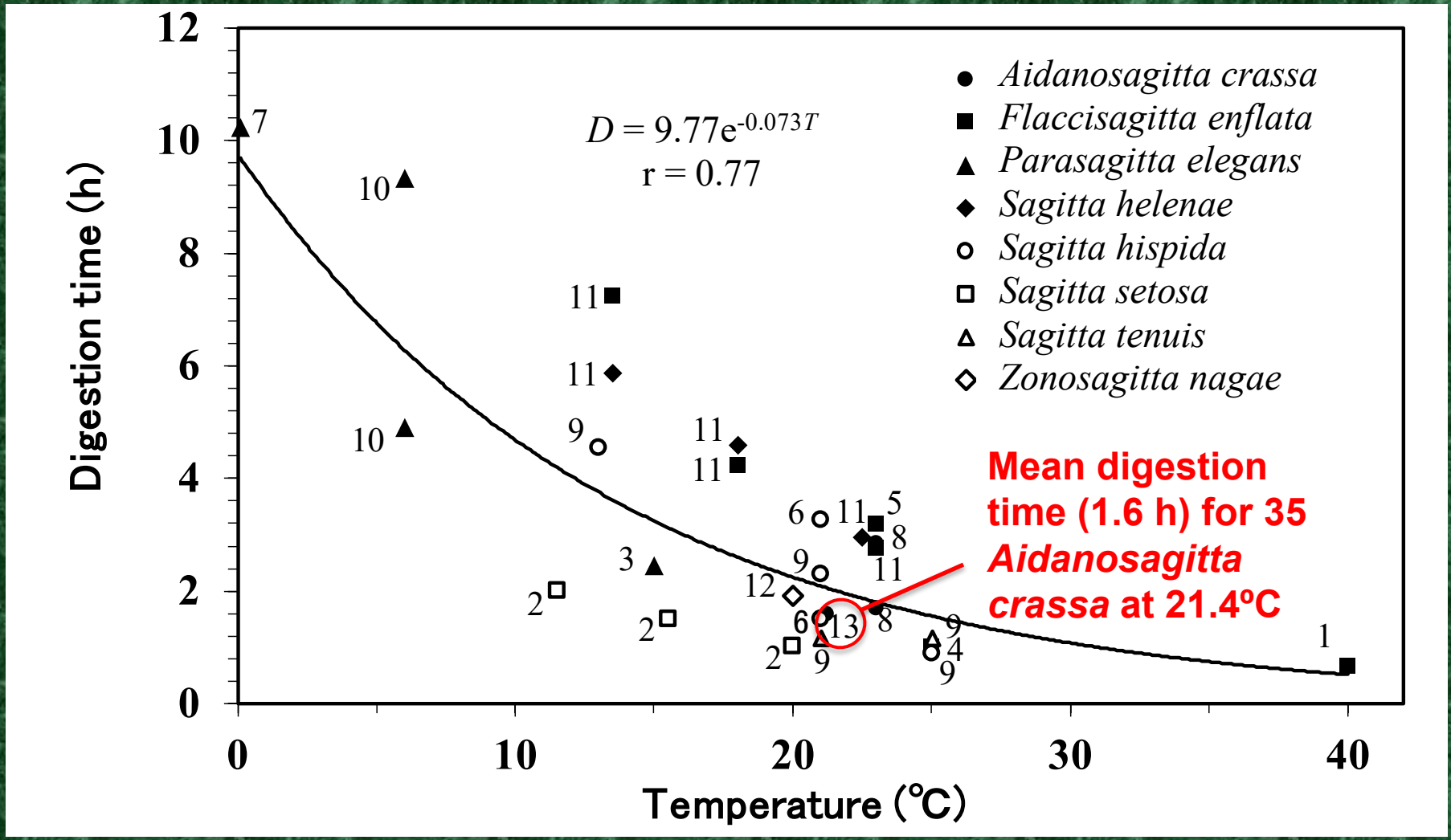


Variable at roughly 2-week intervals

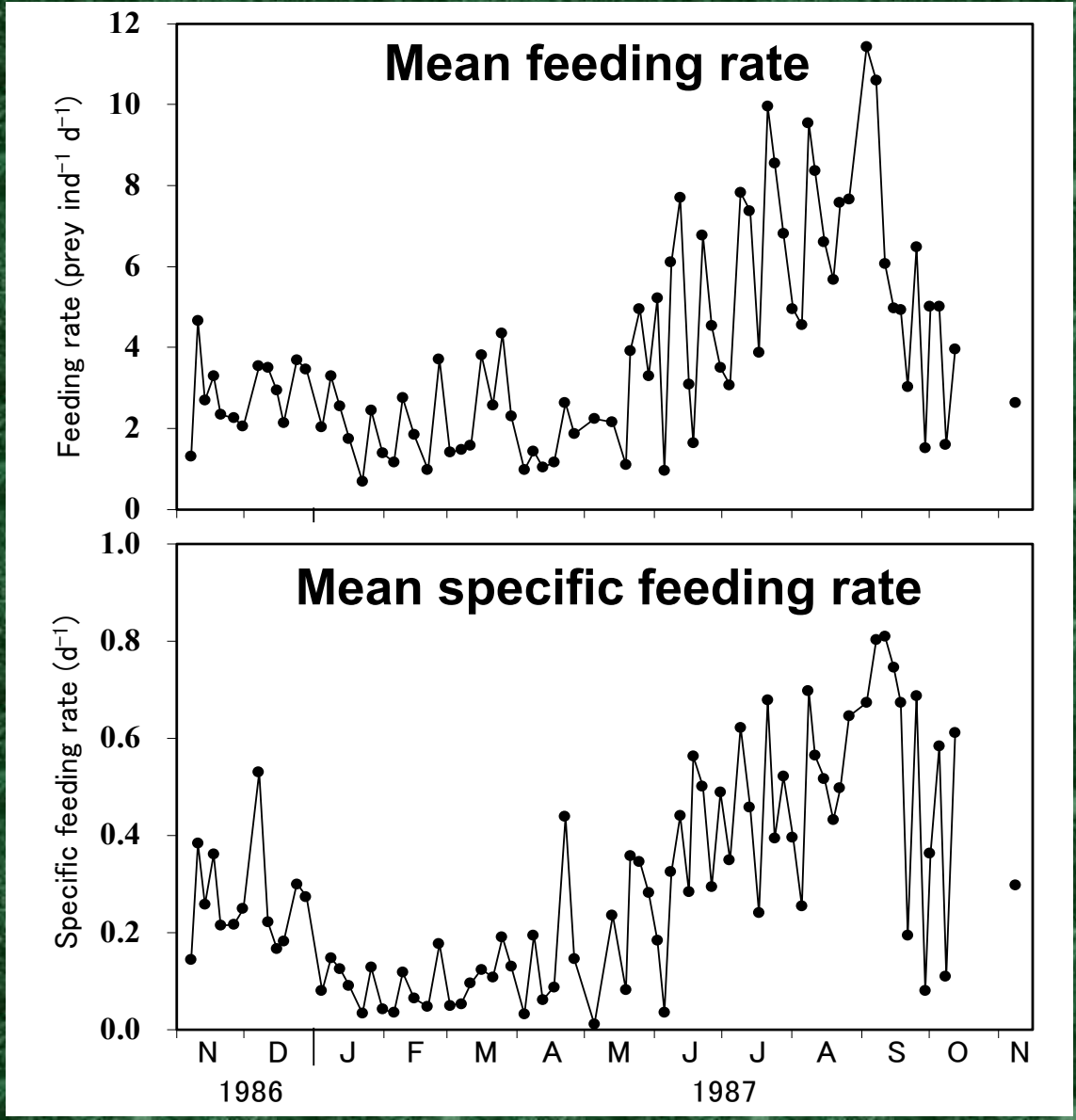
Annual mean: 31.9%

Annual mean: 0.37 prey ind^{-1}

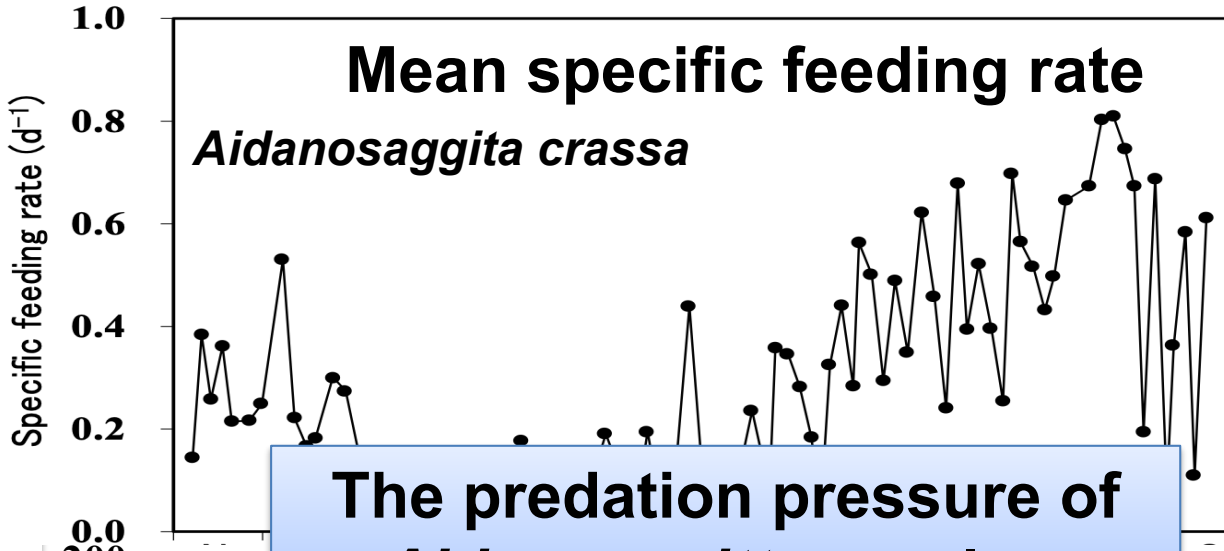
A composite relationship between digestion times and temperature for chaetognaths



Seasonal variations in mean feeding rate and mean carbon specific feeding rate



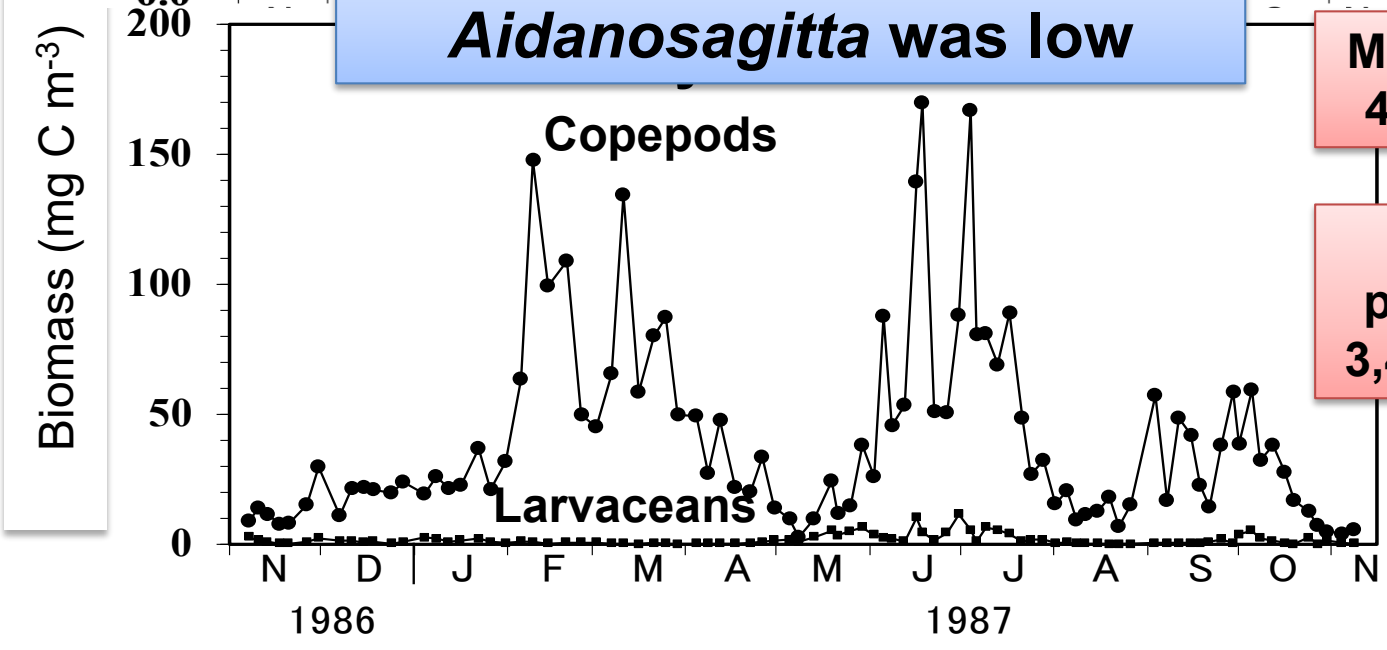
Specific feeding rate of *Aidanosaggita crassa* in relation to prey biomass



Mean biomass: 1.7 mg C m^{-3}

Annual production rate: 91.49 mg C m^{-3} y^{-1} (=2.6% of prey production rate)

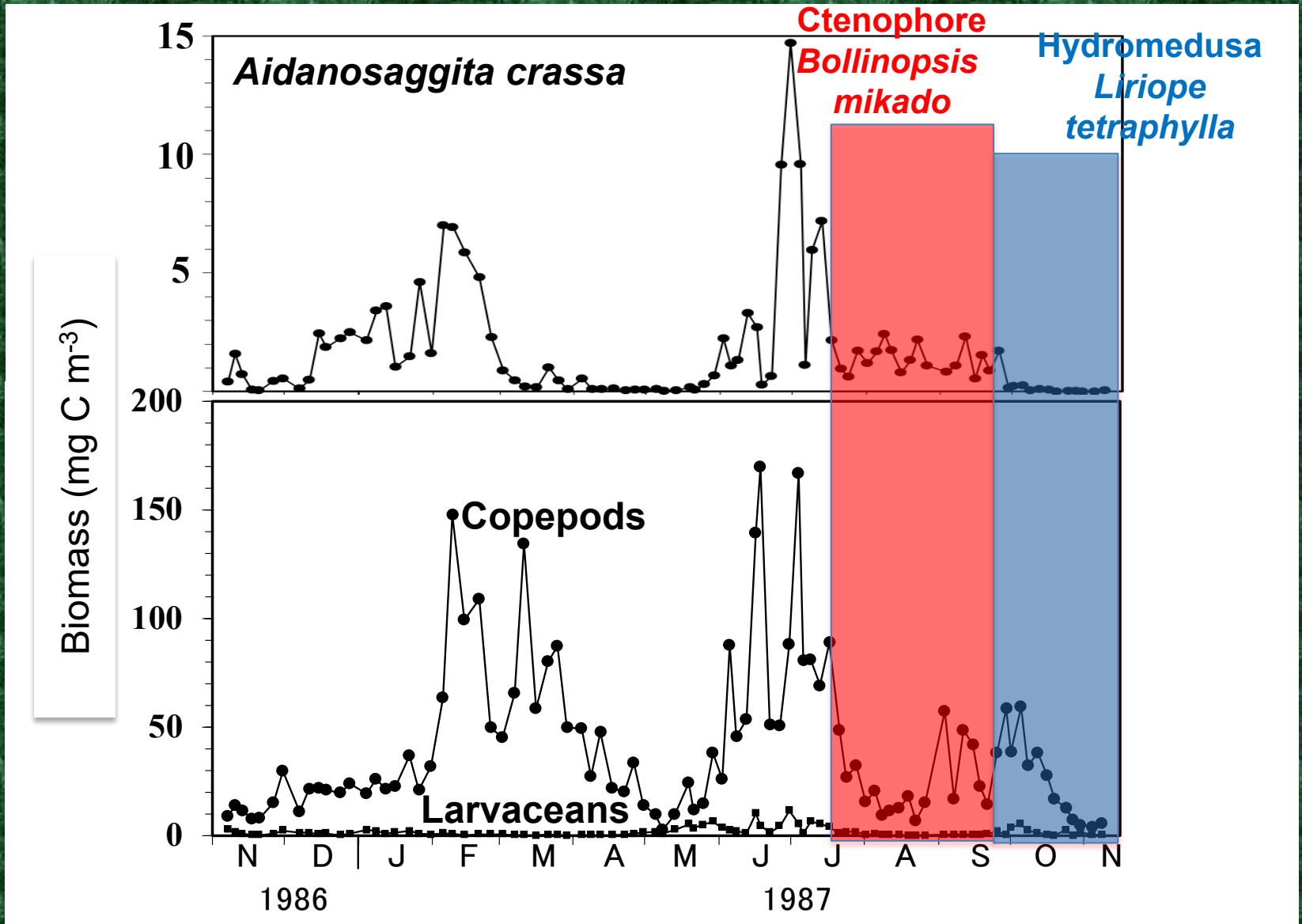
The predation pressure of *Aidanosagitta* was low



Mean biomass: 40.7 mg C m^{-3}

Annual production rate: 3,453 mg C m^{-3} y^{-1}

Population decline of *Aidanosaggita crassa* and copepods by gelatinous predators



Summary

- This is one of the most detailed field studies on chaetognath population dynamics and production rate.
- *Aidanosagitta crassa* appeared year round in Fukuayma Harbor, consisting of 3 subpopurations offset in age, each passing through 6-7 generations, a total of 19 generations.
- *Aidanosagitta* preyed on a wide variety of zooplankton, among which copepods numerically dominated (67.4%).
- The life spans (range: 34-96 d) and specific growth rates (range: 0.07-0.22 d^{-1}) of respective generations were temperature-dependent.
- *Aidanosagitta* population's annual production rate was 91.49 mg C m^{-3} y^{-1}.
- *Aidanosagitta* predation pressure on prey zooplankton (copepods) was minor.