Vertical distribution and population structure of large grazing copepods during spring phytoplankton bloom in the Oyashio region

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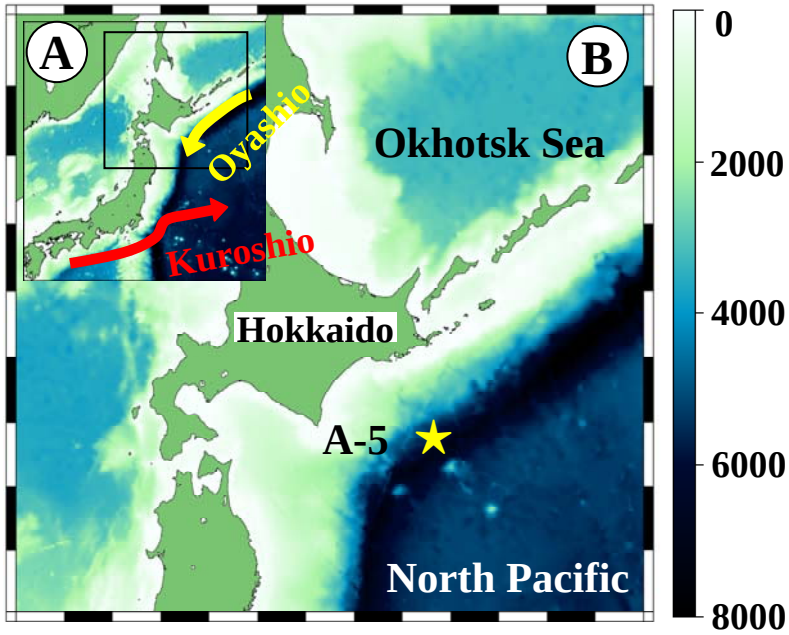
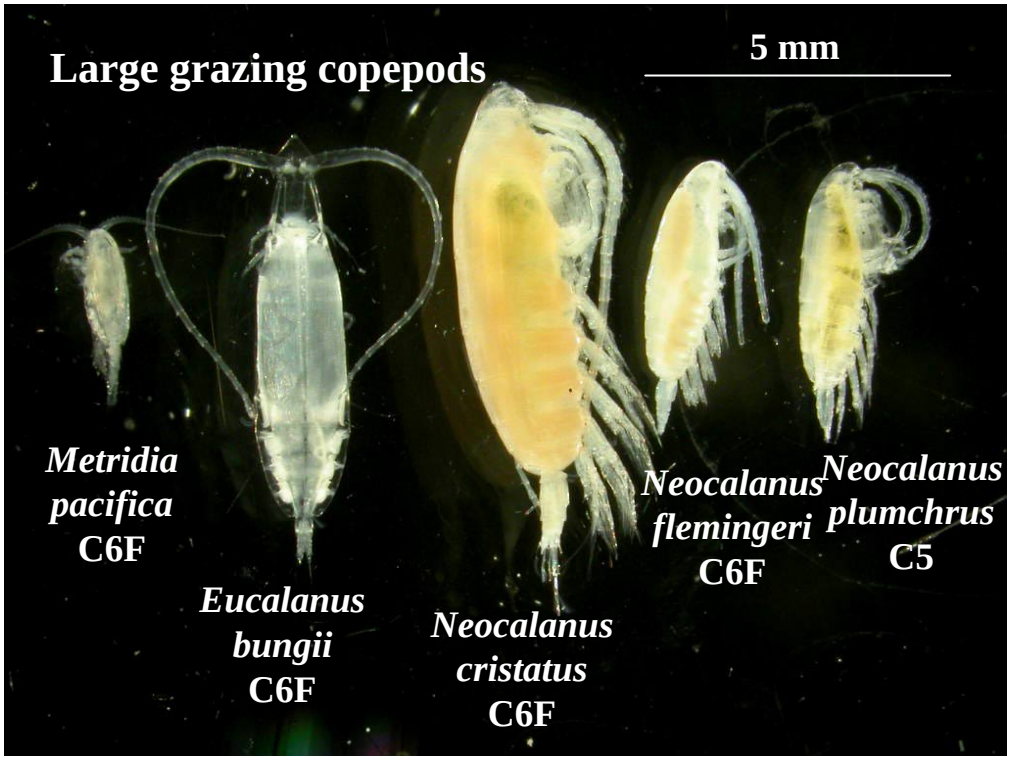
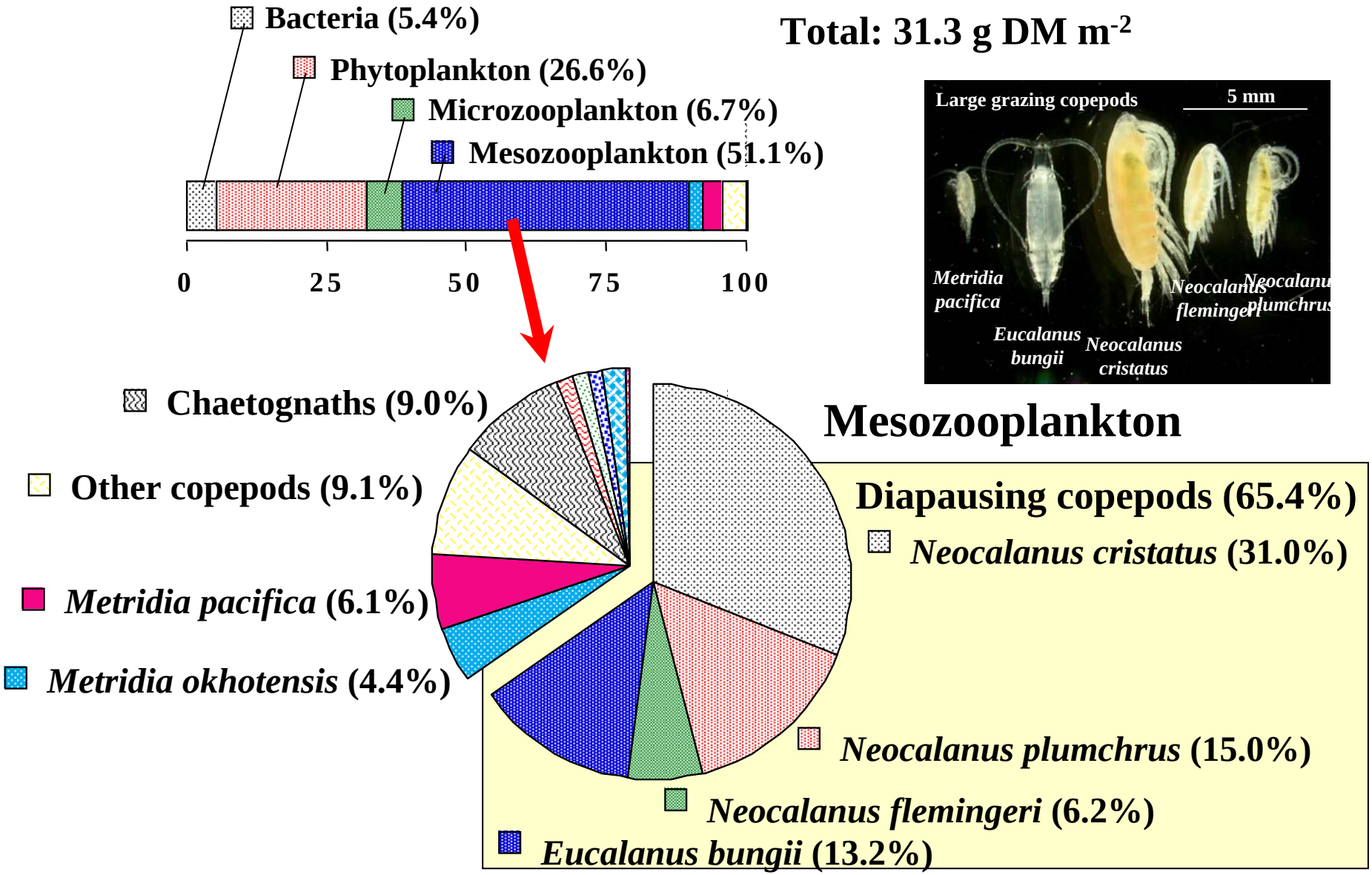


Location of station (A-line: A5)

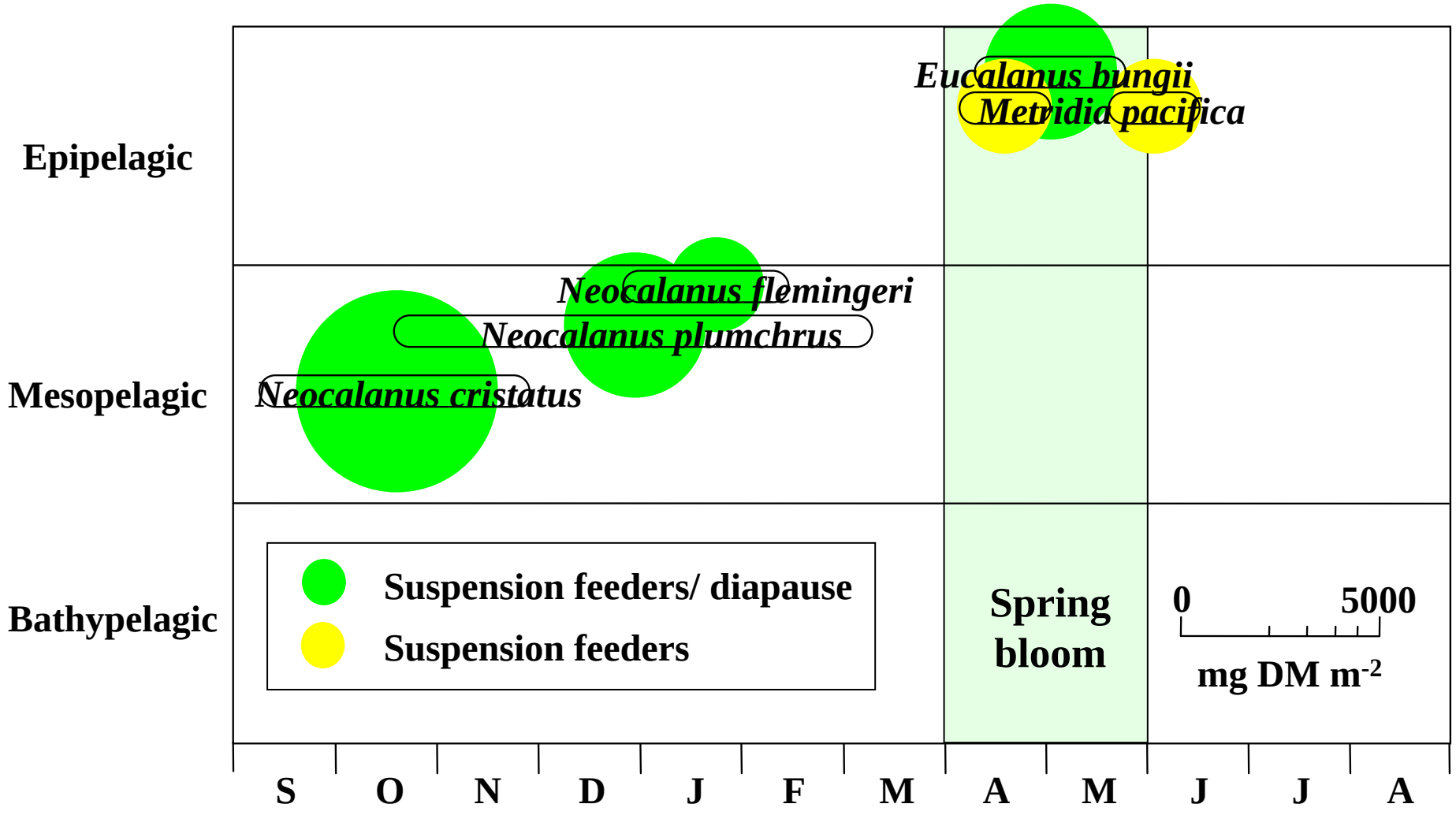


Dominant calanoid copepods in the Oyashio region

Role of large grazing copepods in the Oyashio region

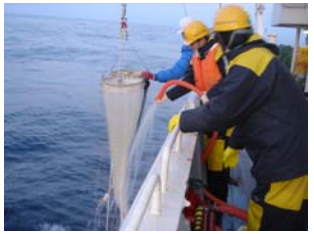


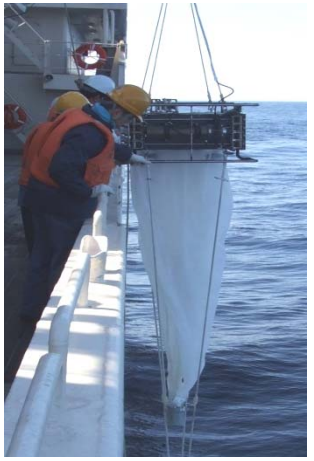
Reproductive timing of large grazing copepods: varied with species

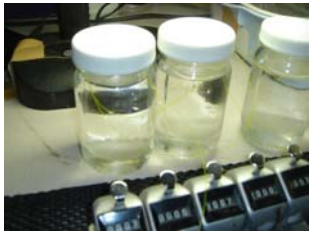


***Neocalanus* spp. utilize spring phytoplankton bloom as energy to growth, while *Eucalanus bungii* and *Metridia pacifica* utilize them as energy to reproduction.**

Studied parameters on copepods







Population structure: Enumerated with copepodid stages on the samples collected by NORPAC net (0-500 m). For Eucalanus bungii, gonad maturation of C6F and nauliar abundance were also enumerated.

Vertical distribution: Stratified VMPS tows (9 strata from 0-1000 m) were made, and depths of 25%, 50% and 75% of population resided were calculated with stages.

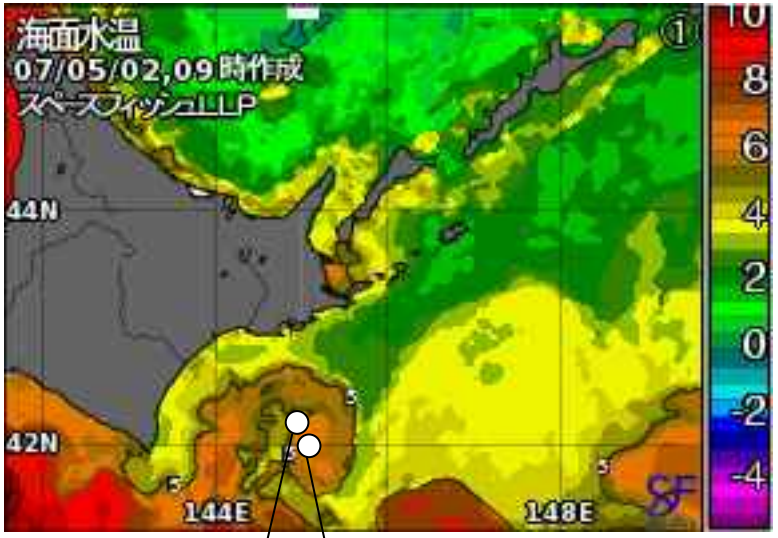
Gut pigment: Fresh specimens collected from 0-150 m in day and night were immersed in N,N-Dimethylformamide and measured with Turner-design fluorometer

Egg production: C6F of *Eucalanus bungii*, *Metridia pacifica*, *M. okhotensis* were reared in the filtered seawater with bottom-mesh equipped plastic chamber (to prevent cannibalism) one night. Hatching rates of eggs were also examined.

Chemical contents: Temporal changes in individual wet mass, dry mass, ash of *Neocalanus cristatus* C5 and *Metridia pacifica* C6F were evaluated.

Results: satellite image of SST and Chl. *a* during OECOS

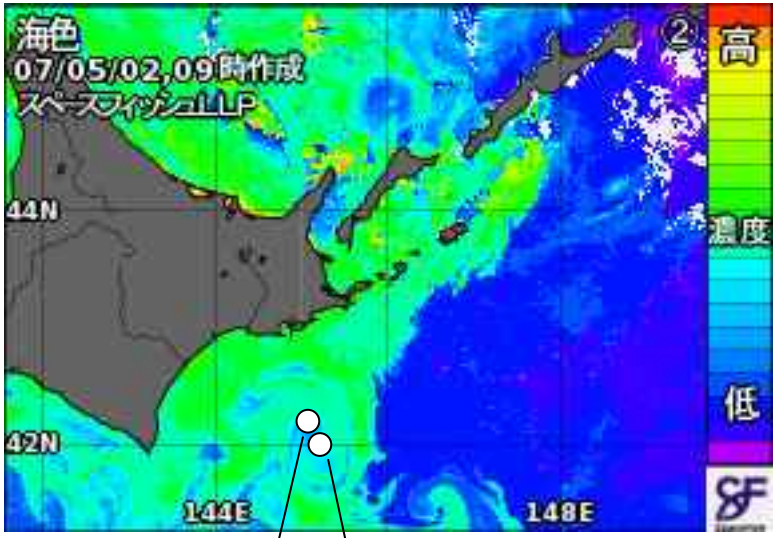
Temperature (˚C)



A-4

A-5

Chlorophyll *a*



High

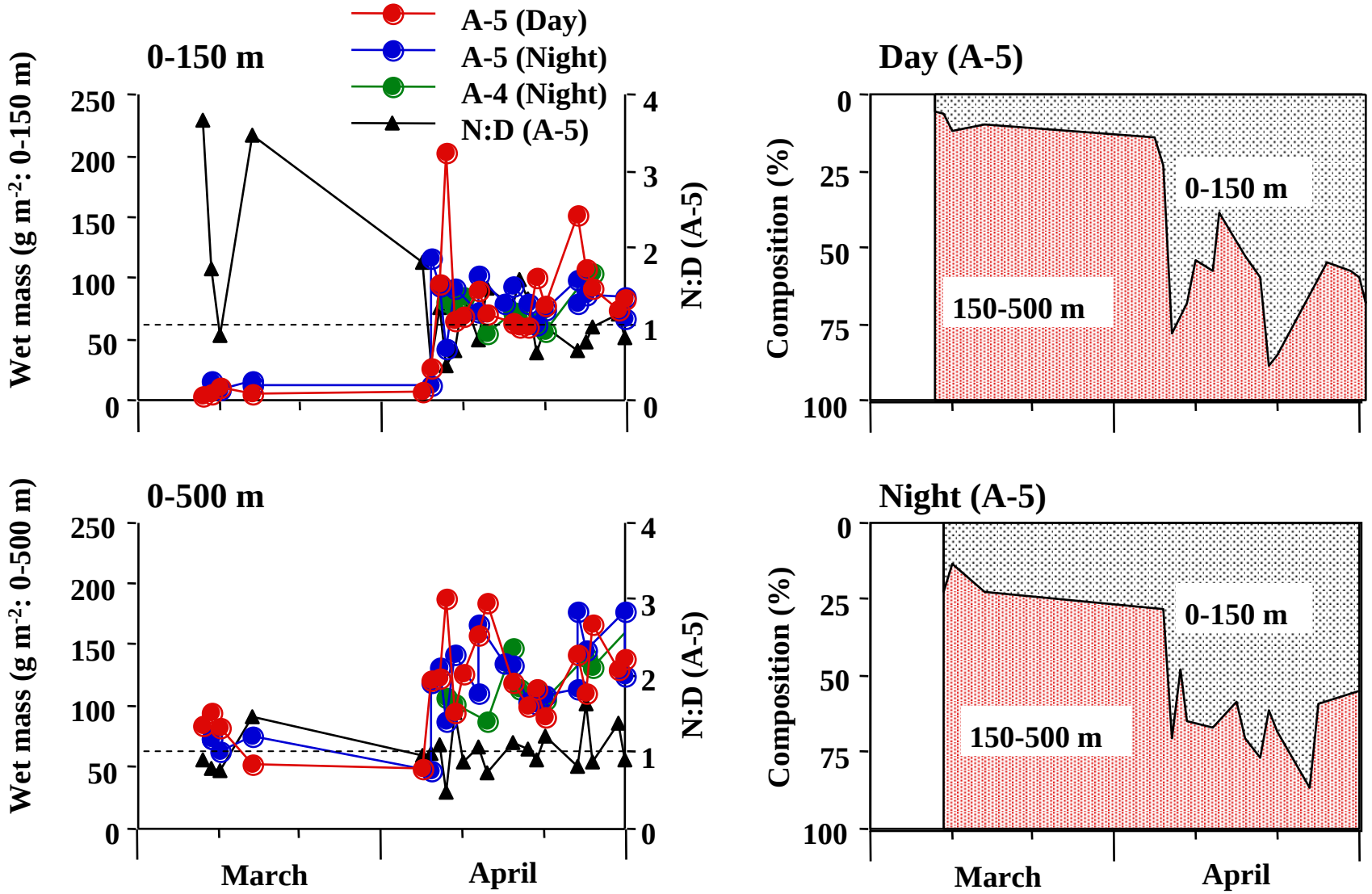
Low

A-4

A-5

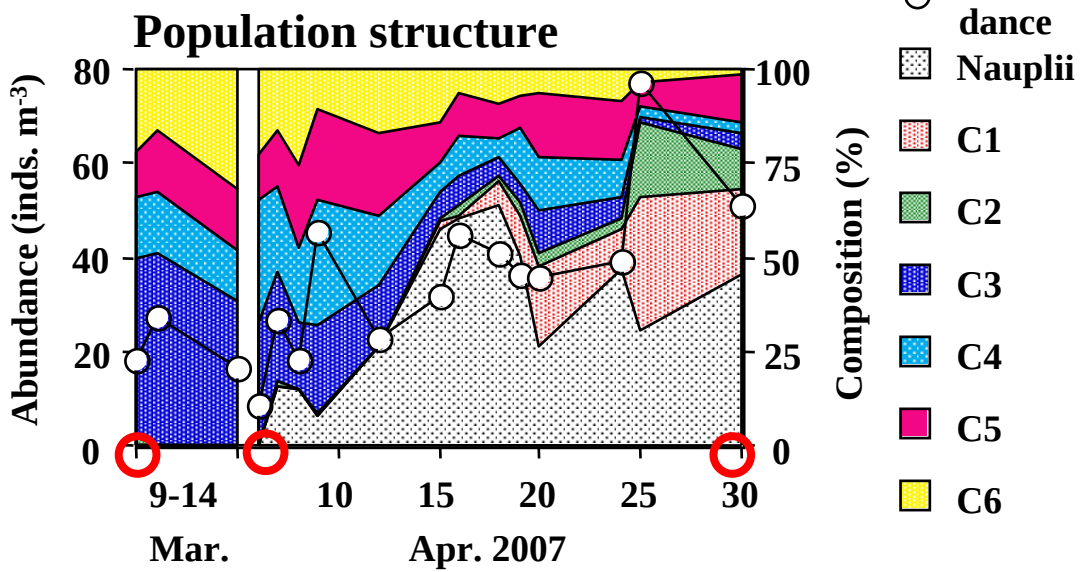
A-line (A-5: 42˚00’N, 145˚15’E; A-4: 42˚15’N, 145.07’E)
There observed clockwise warm water mass throughout the study period.
Chlorophyll *a* was higher in the coastal zone and warm water eddy, and had peak around 9 April 2007.

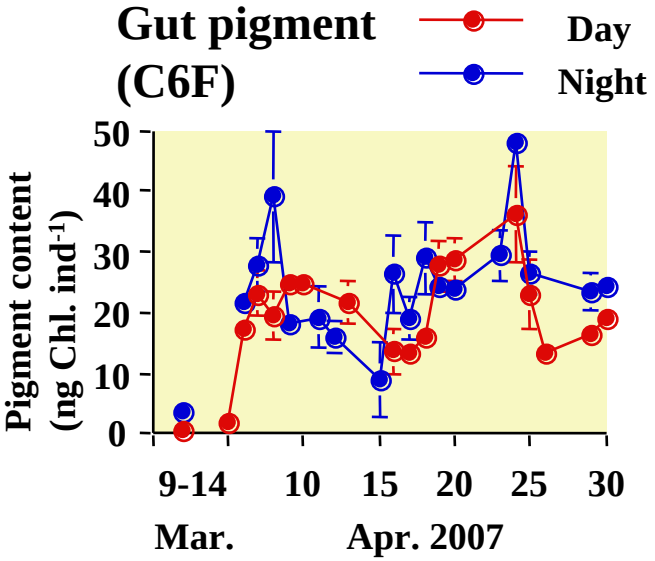
Temporal changes in whole mesozooplankton wet mass

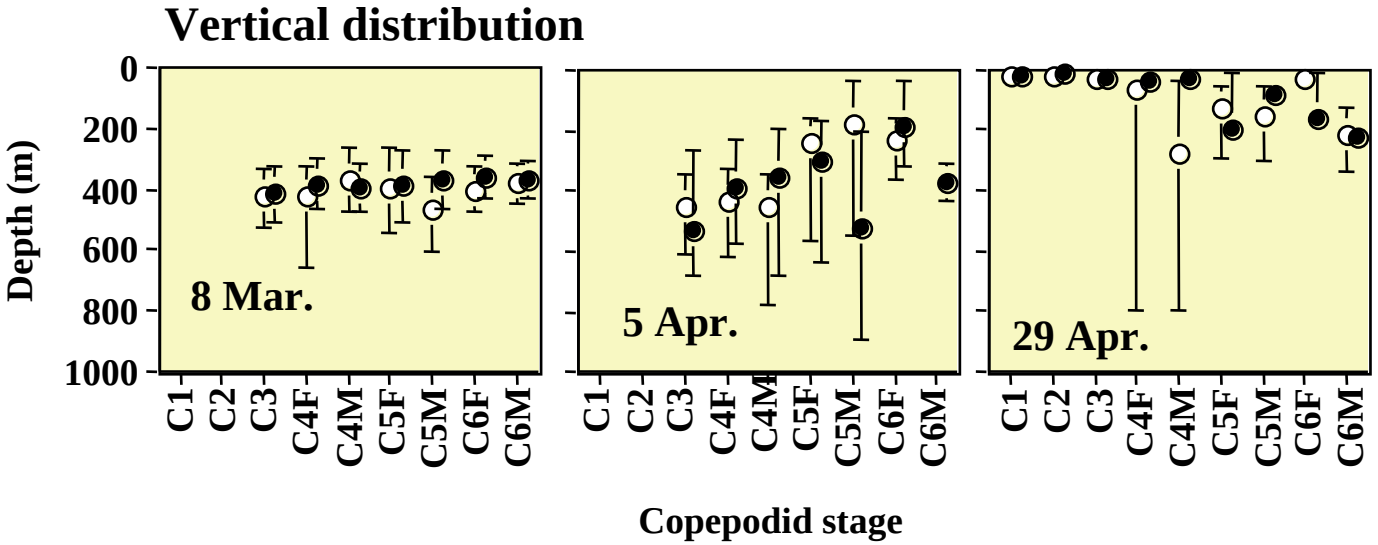


Distribution depths of mesozooplankton became shallower in April?

Eucalanus bungii

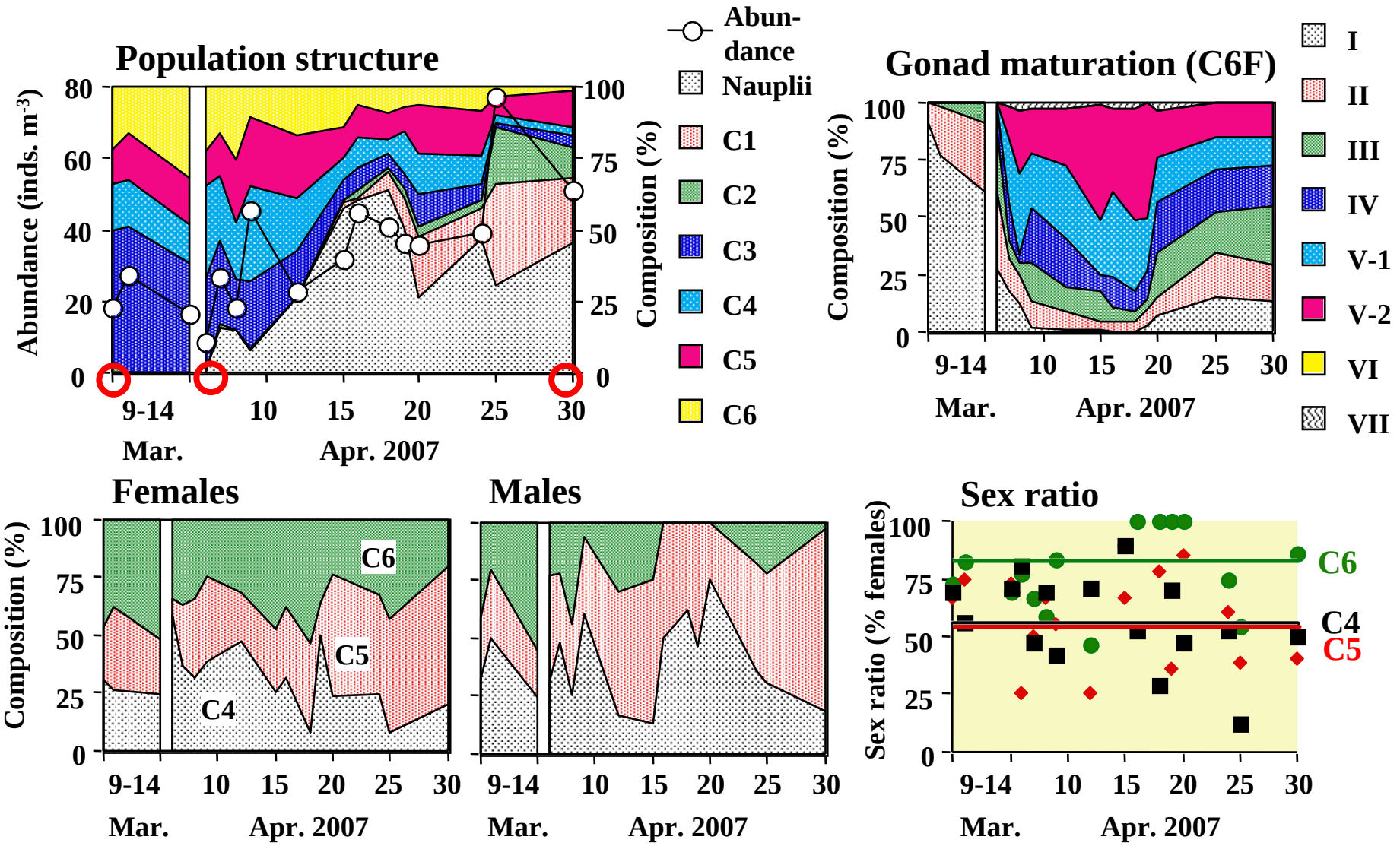






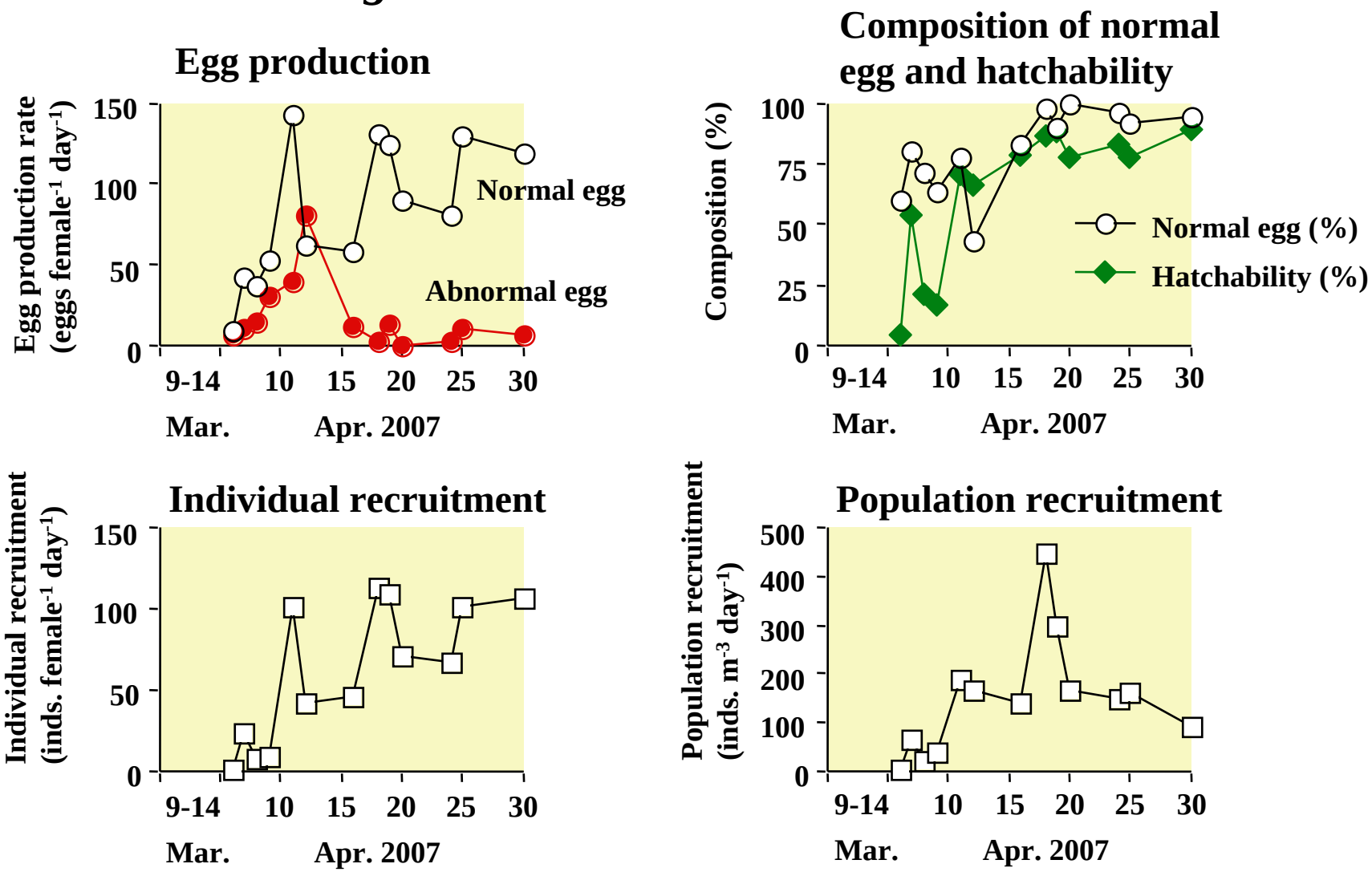
No DVM and distributed around 400 m in 8 March, started to awake in 5 April, and recruitment of new generation in 29 April.

Eucalanus bungii



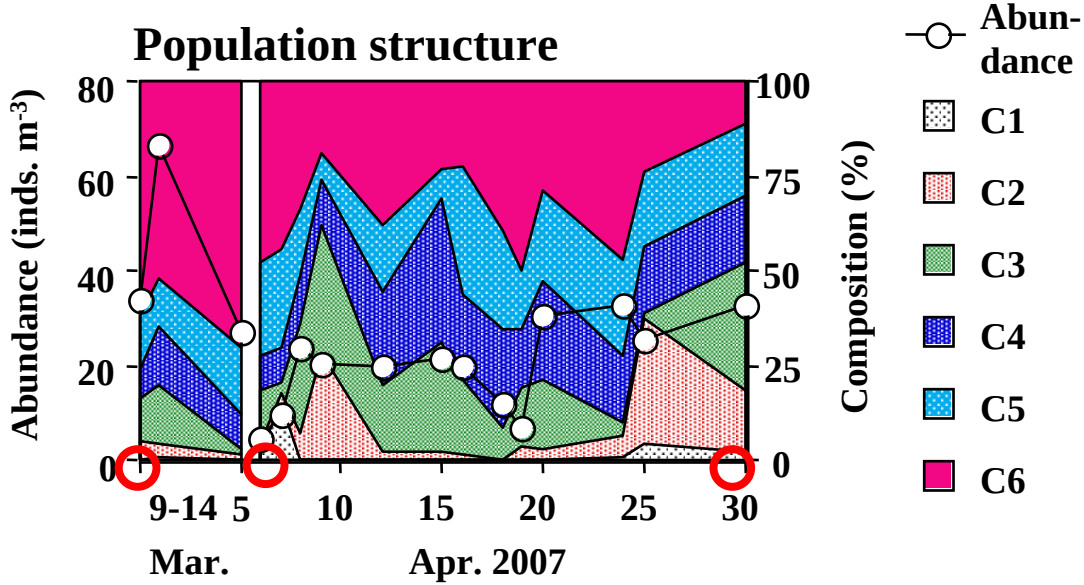
Recruit of adult male observed in March. Sex ratio skewed to females in C6. Gonad of adult females matured rapidly during 5-10 April. Reproductive female (V-1 and V-2) dominated during 10-20 April.

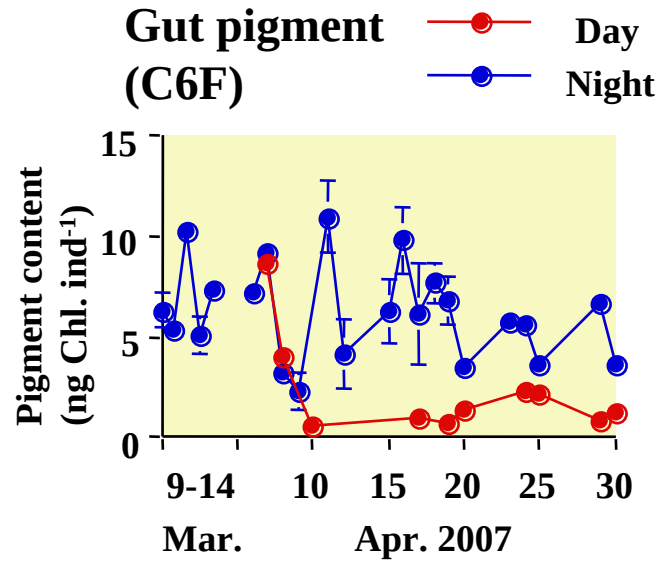
Eucalanus bungii

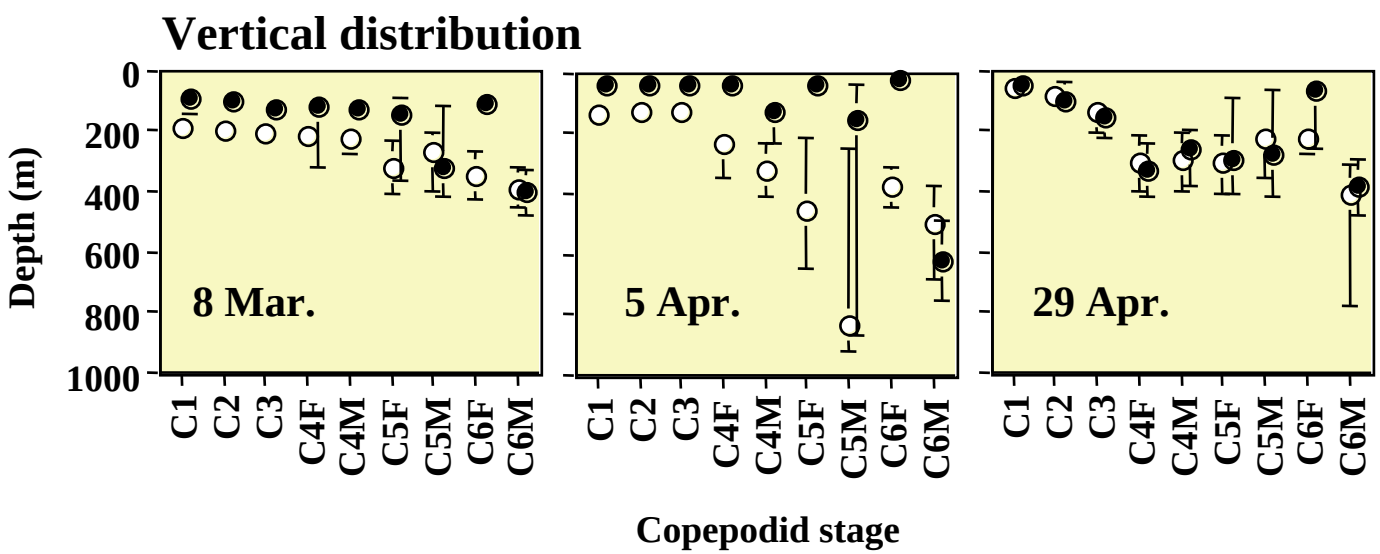


Before 10 April, proportion of normal egg and hatchability were both lower, while increased after 15 April. Estimated population recruitment was peaked during 15-20 April.

Metridia pacifica

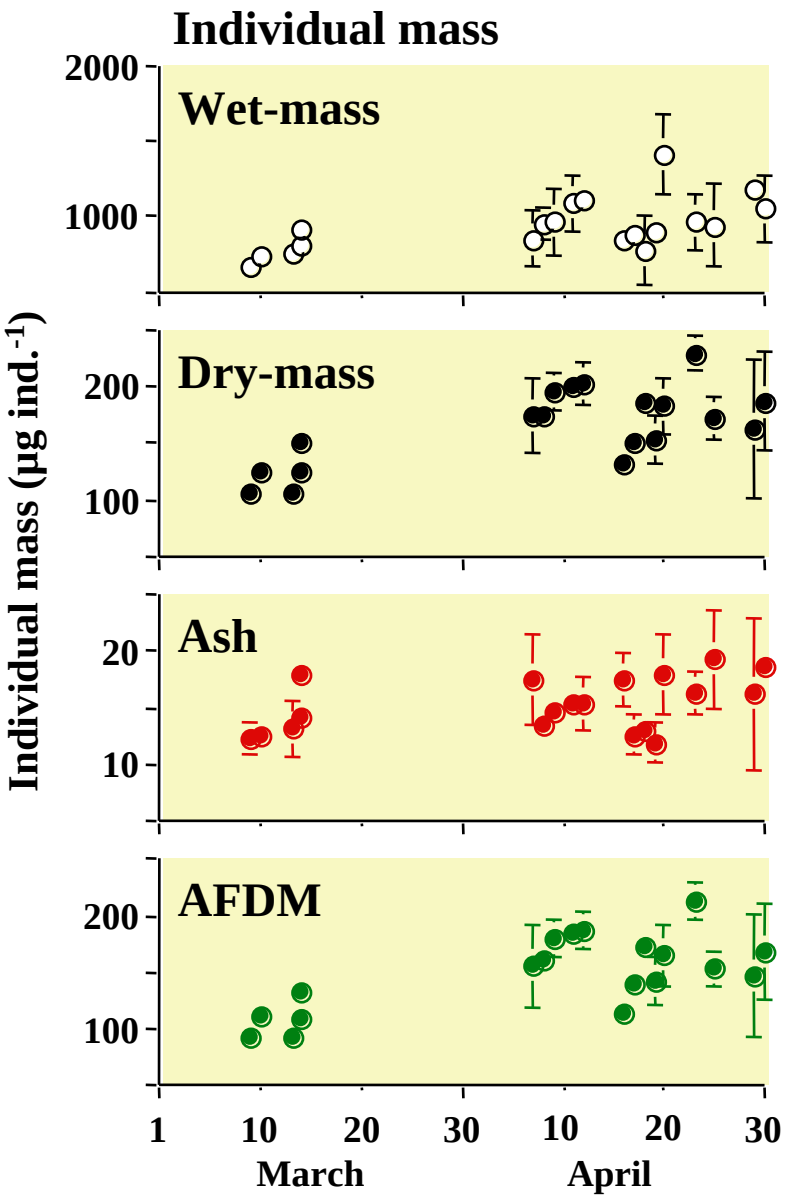


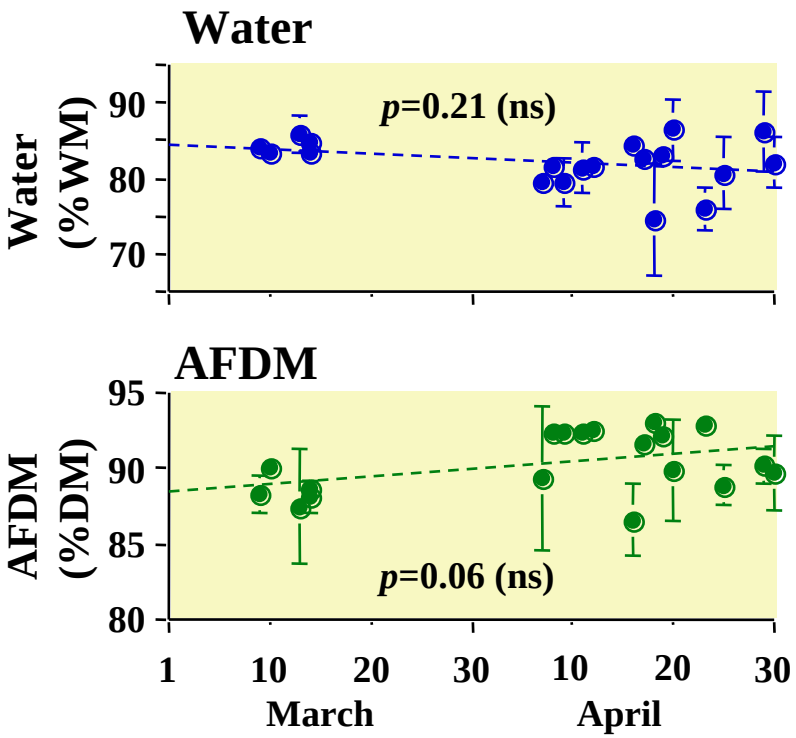




In the end of April (29 April), most of the stages (except C6F) ceased DVM and stayed daytime depth throughout the day.

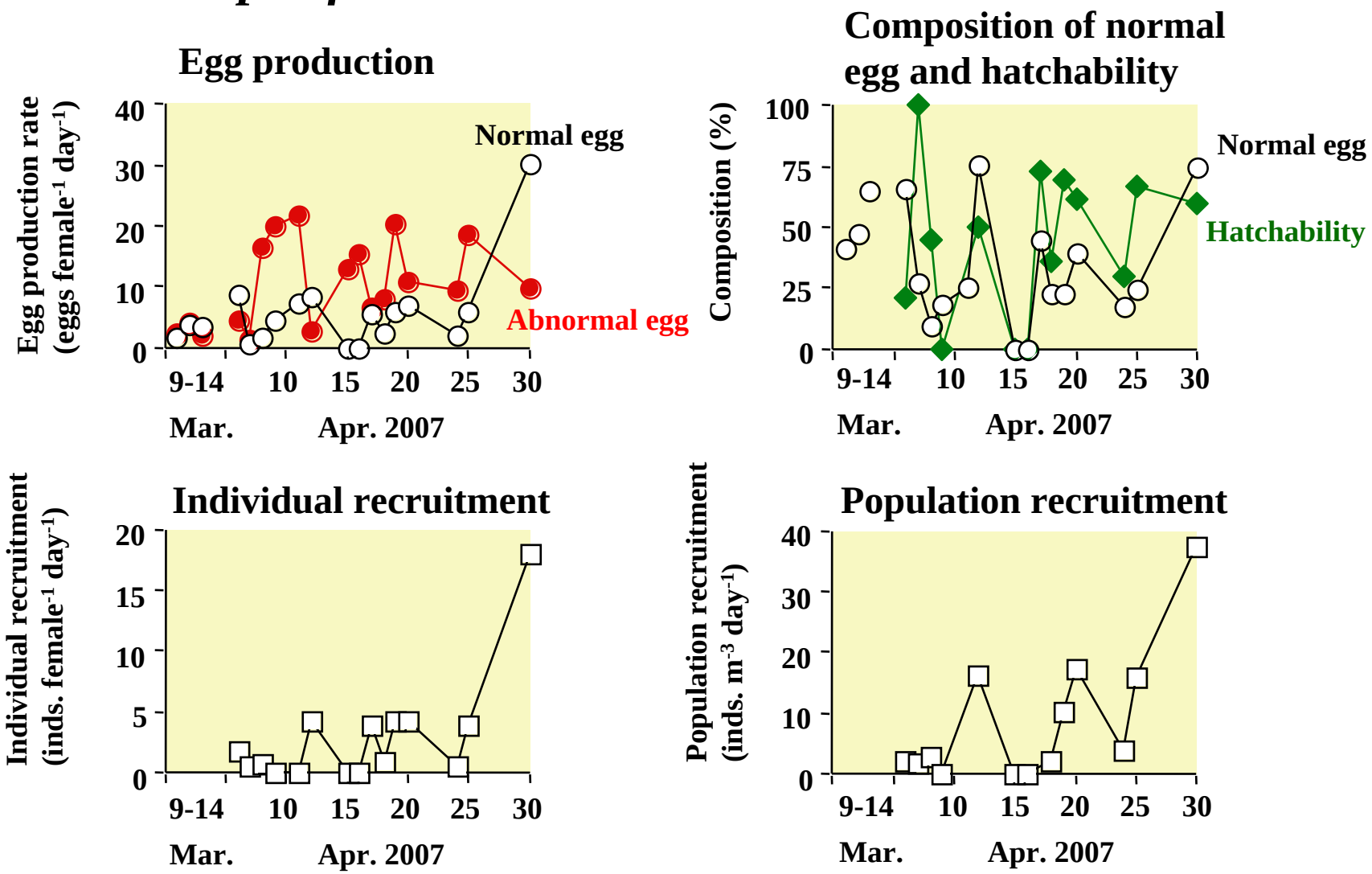
Metridia pacifica C6F





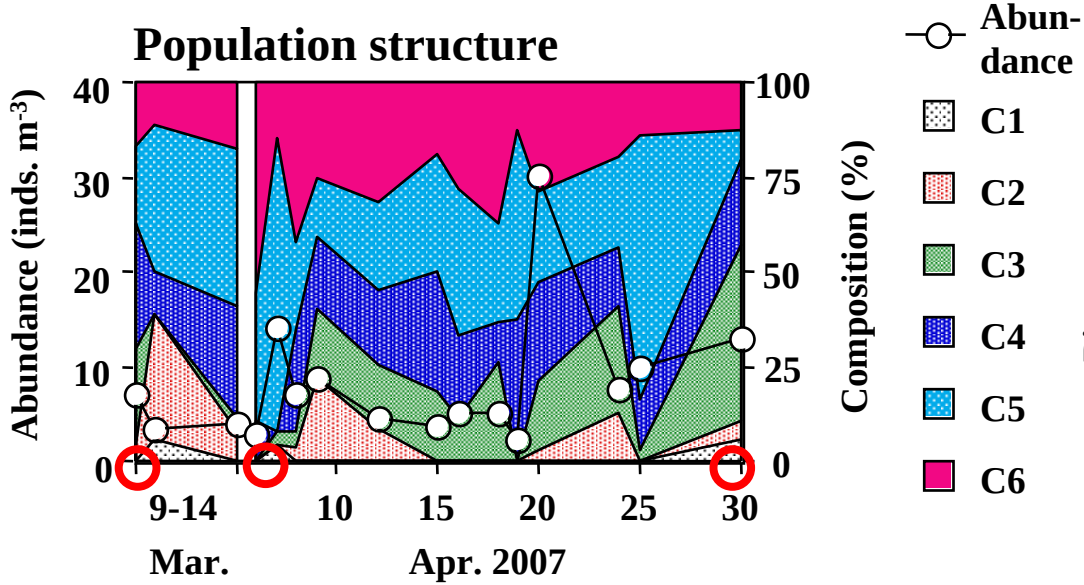
During March to April, water content and ash-free dry mass content were not varied.

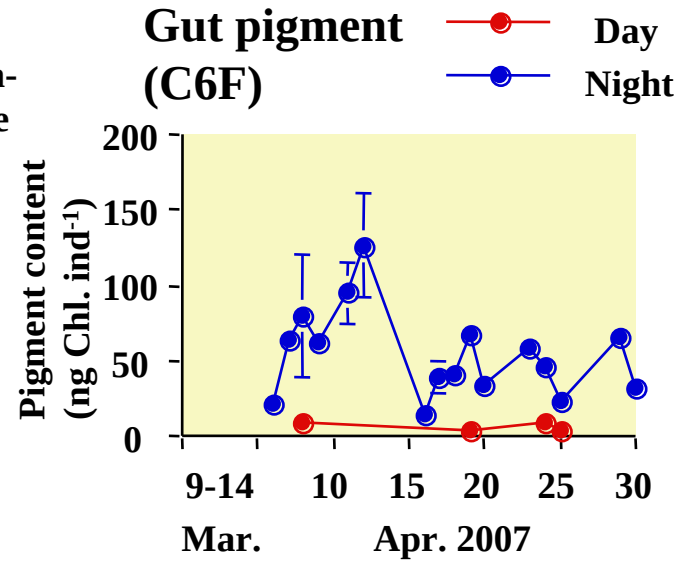
Metridia pacifica

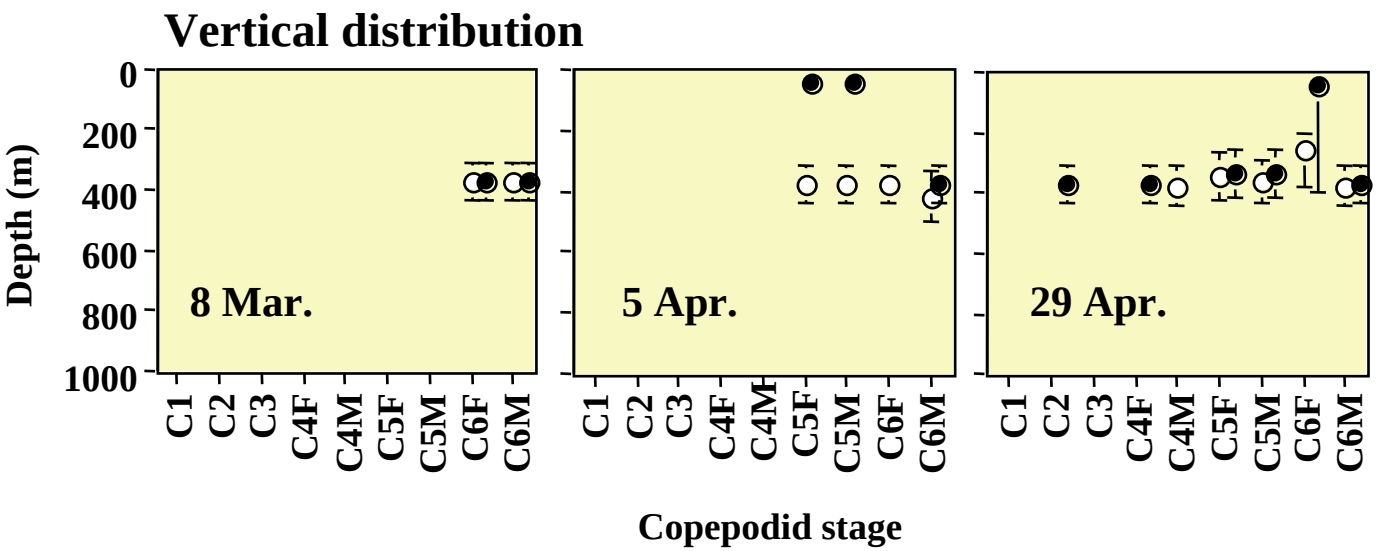


Egg production of normal and abnormal eggs fluctuated greatly, and there were no constant temporal trend detected. Estimated population recruitment was greater after 20 April.

Metridia okhotensis

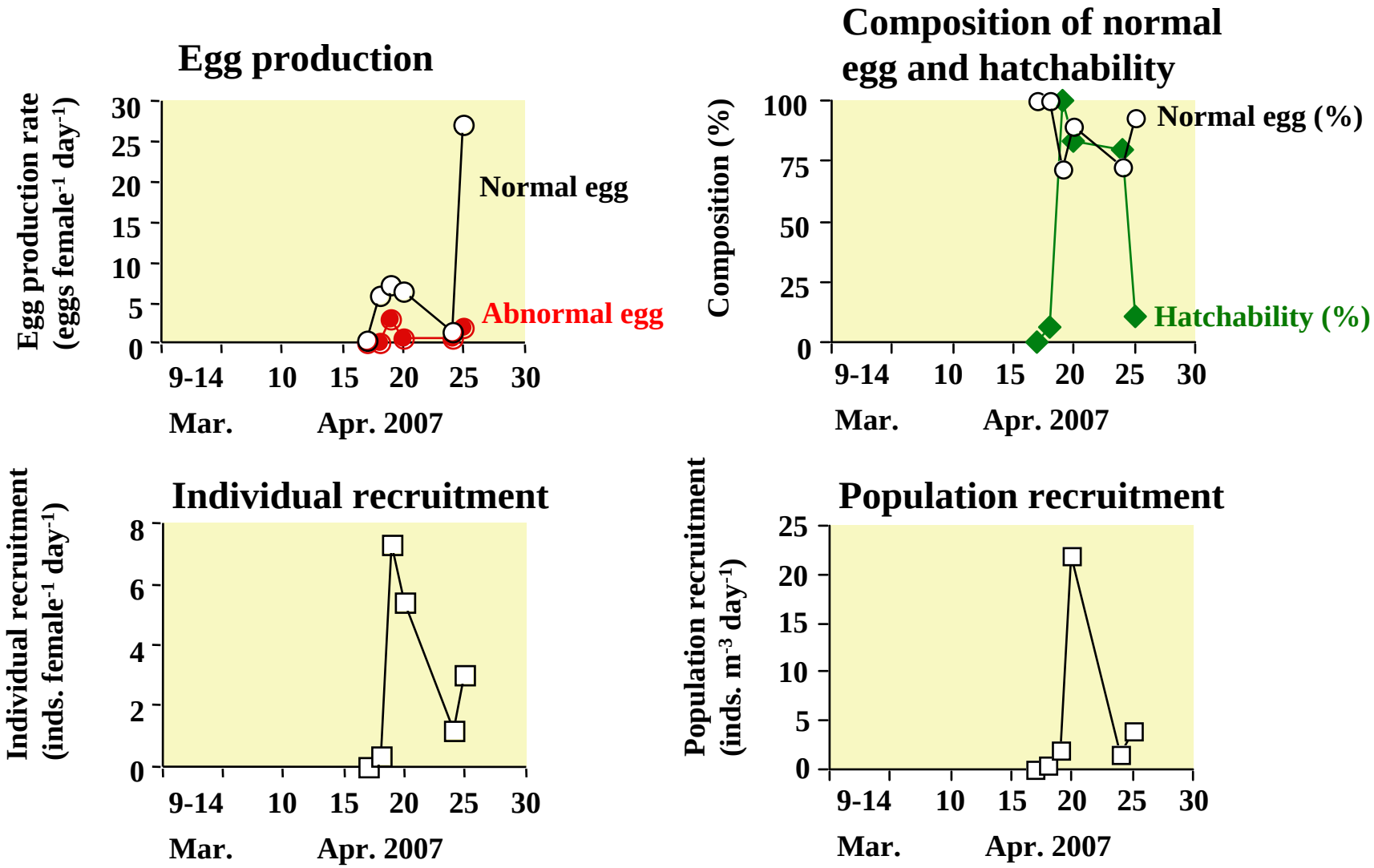






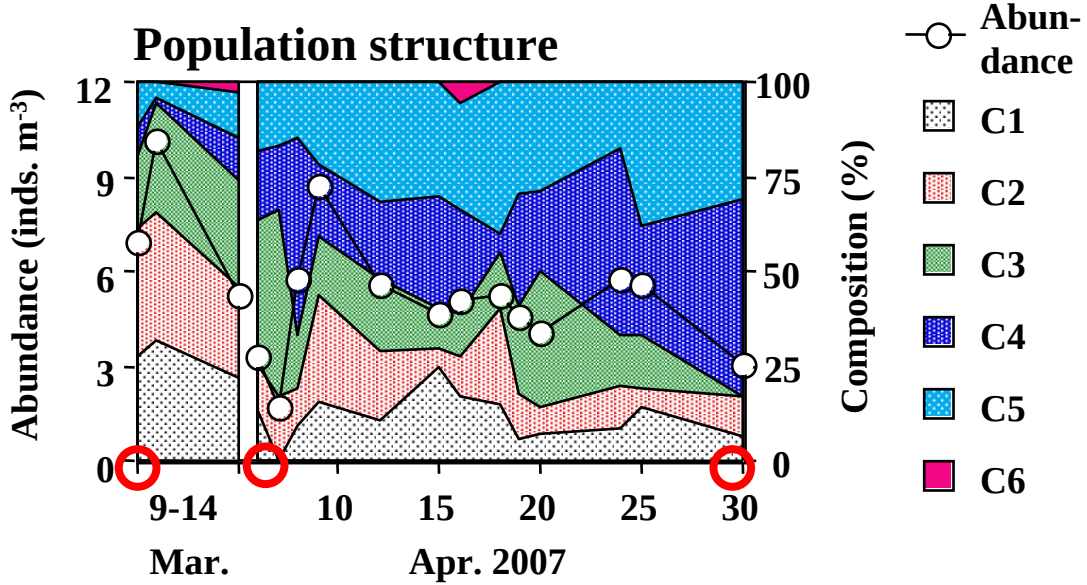
In March, they distributed around 400 m both day and night. In early April, C5F/M started DVM, while ceased DVM (except C6F) in the end of April.

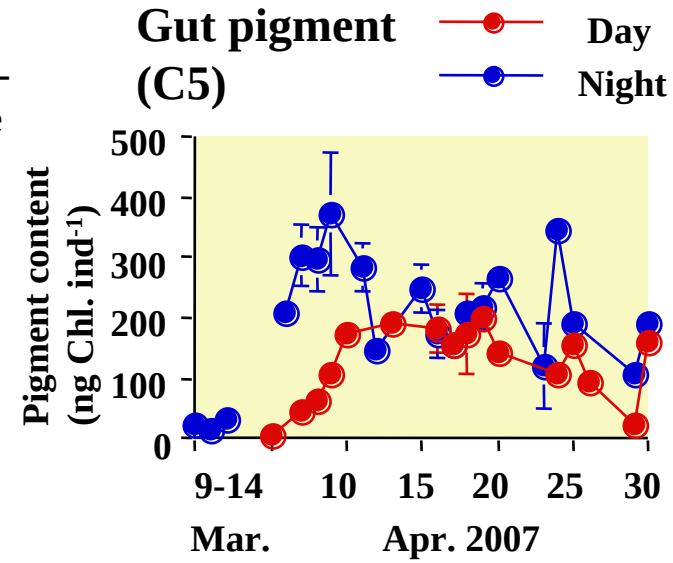
Metridia okhotensis

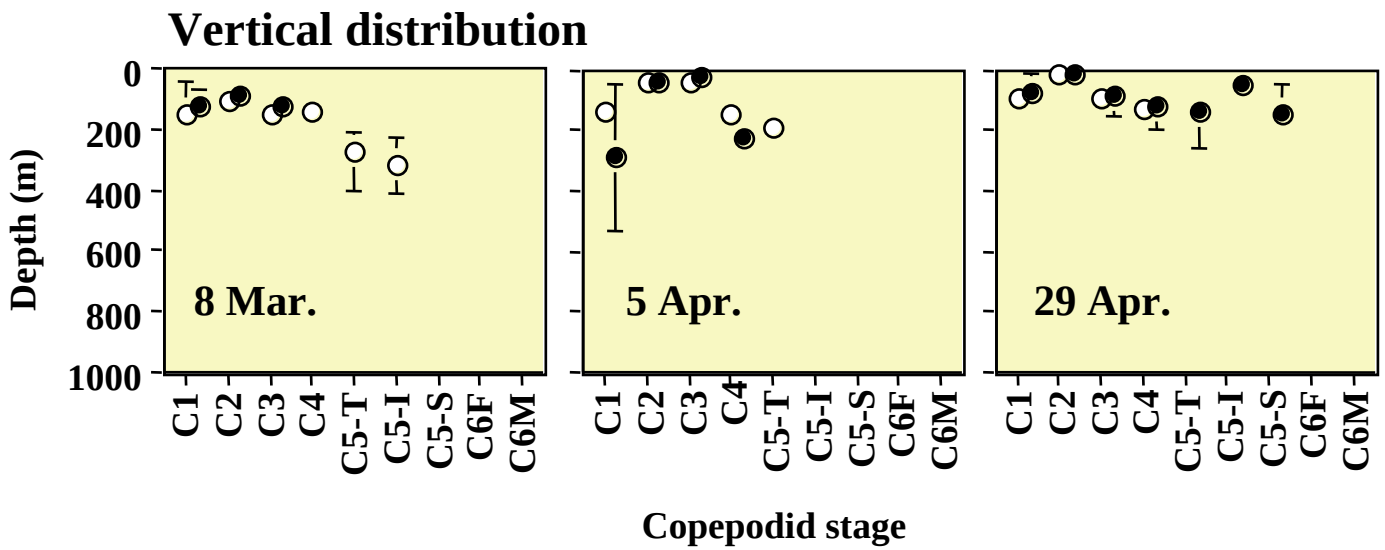


Egg production of *Metridia okhotensis* observed after 17 April. Composition of normal egg was high, while hatchability fluctuated. Population recruitment reached 20 inds. m^{-3} day^{-1}.

Neocalanus cristatus

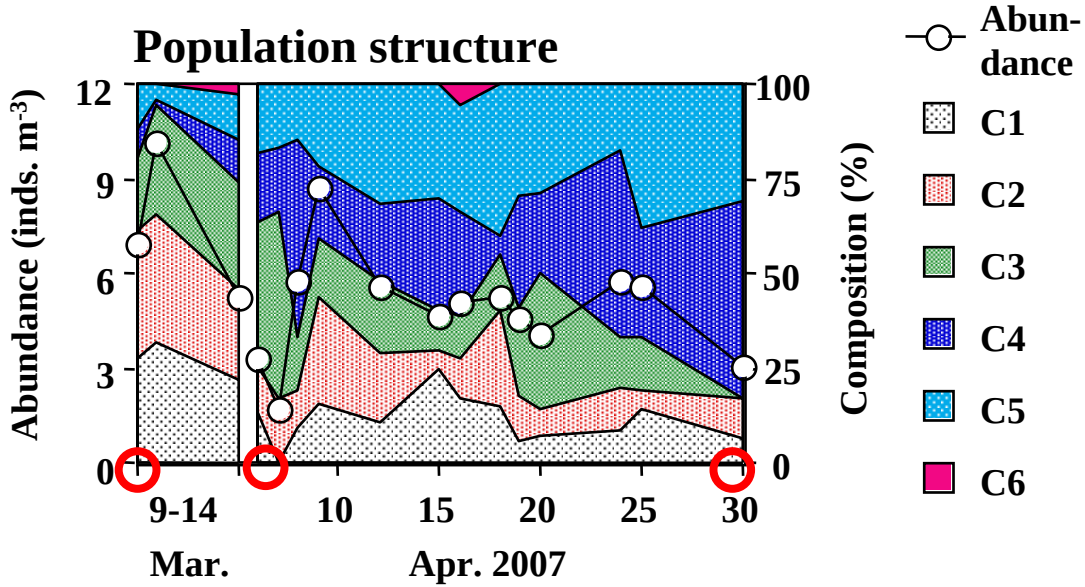


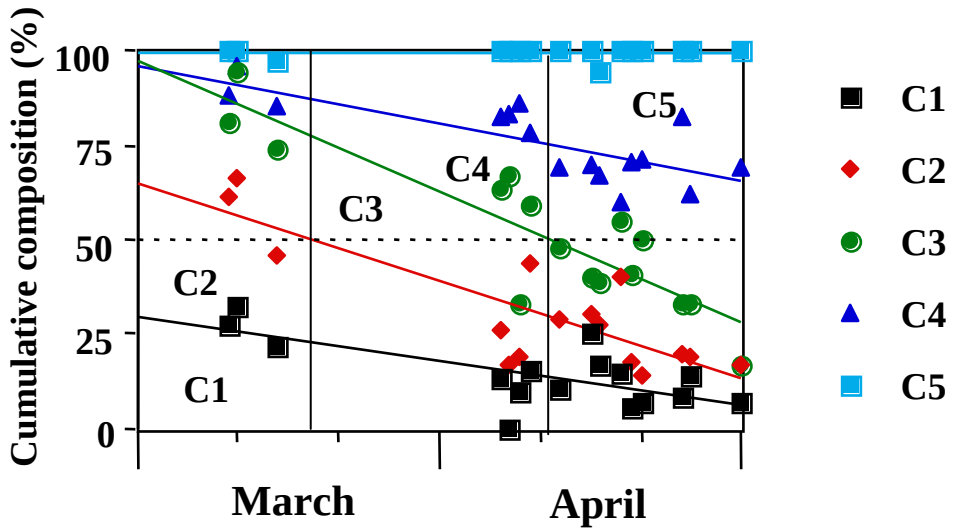




No apparent DVM for most of the stages. Gut pigment was not varied between day and night after 10 April.

Neocalanus cristatus

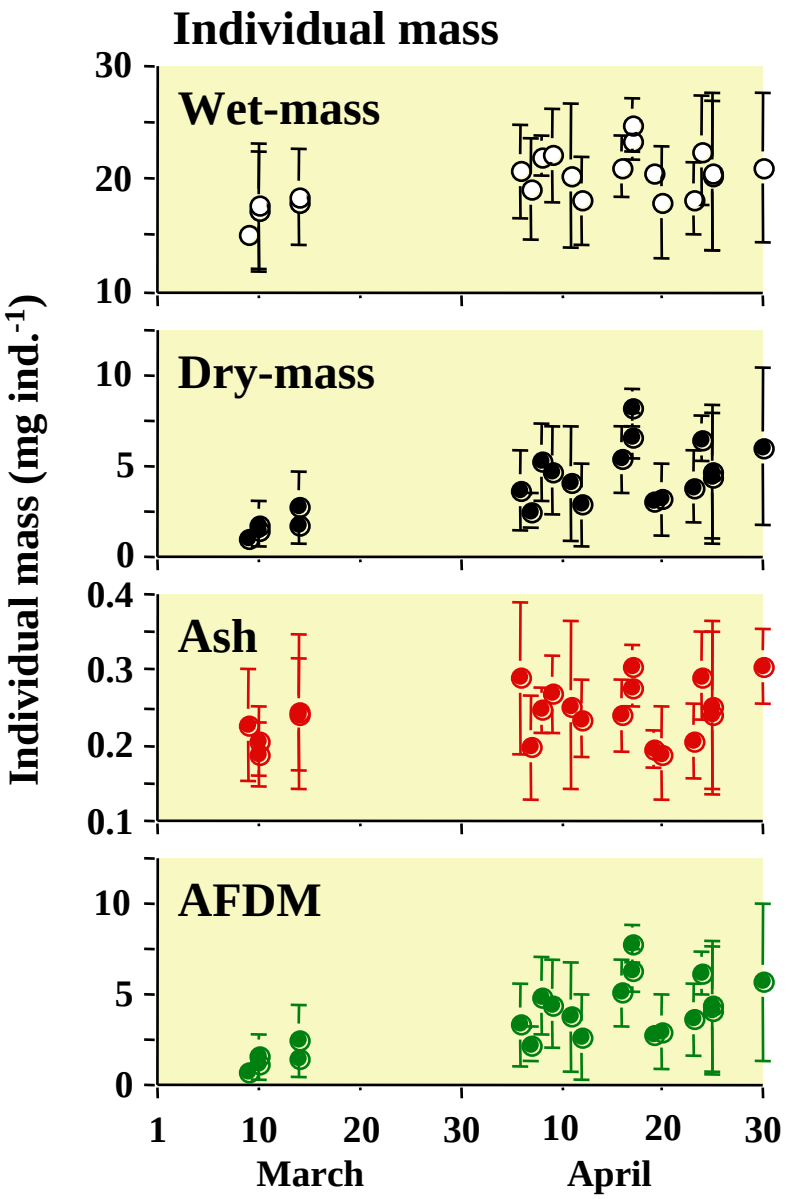


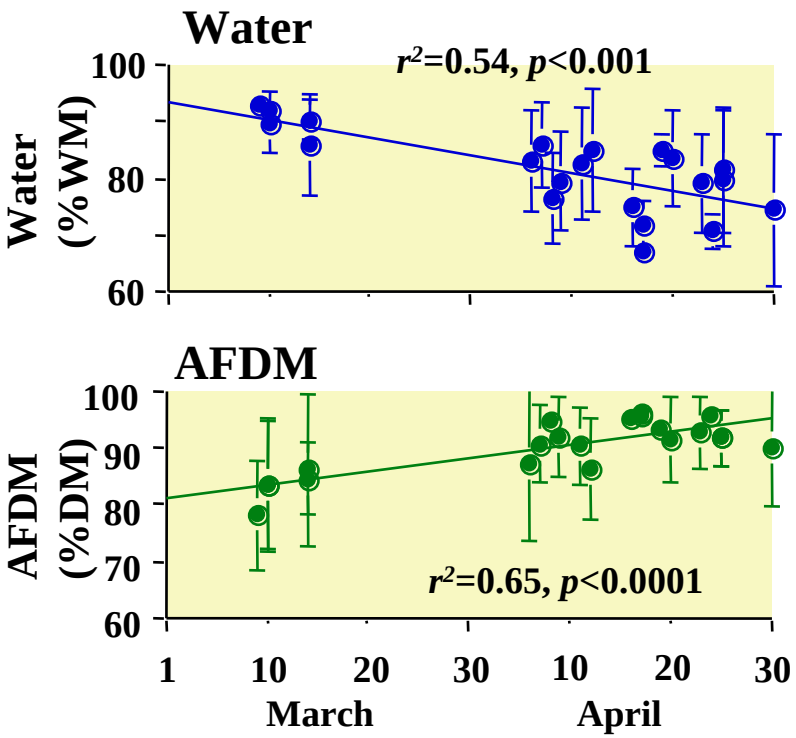


During March to April, *Neocalanus cristatus* developed from
C2 (-17 March)
C3 (17 March-11 Apri)
C4 (11 April-)

Stage duration of C3 was estimated to be 24 days.

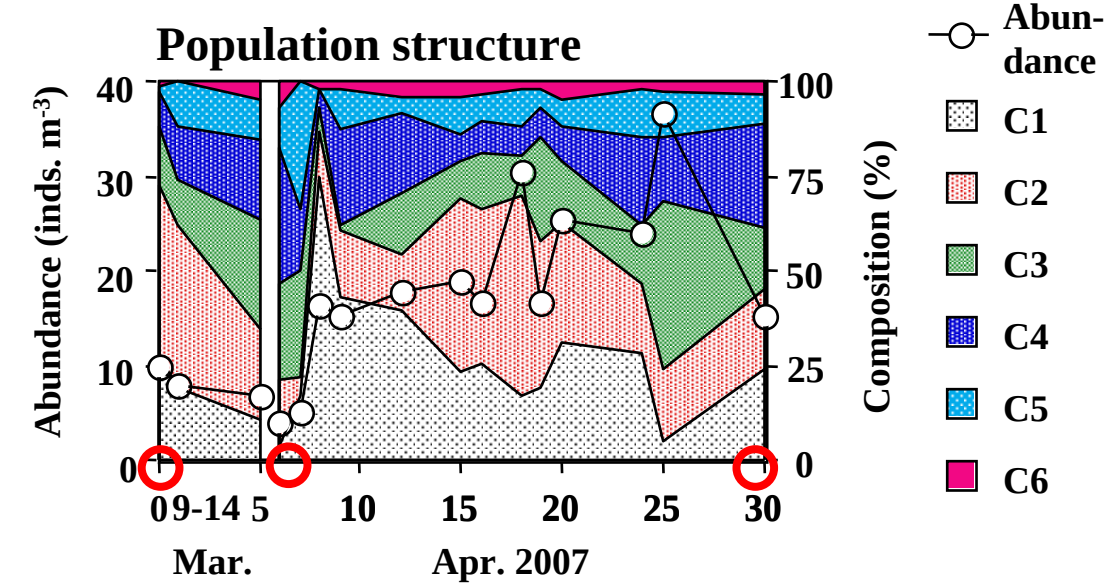
Neocalanus cristatus C5

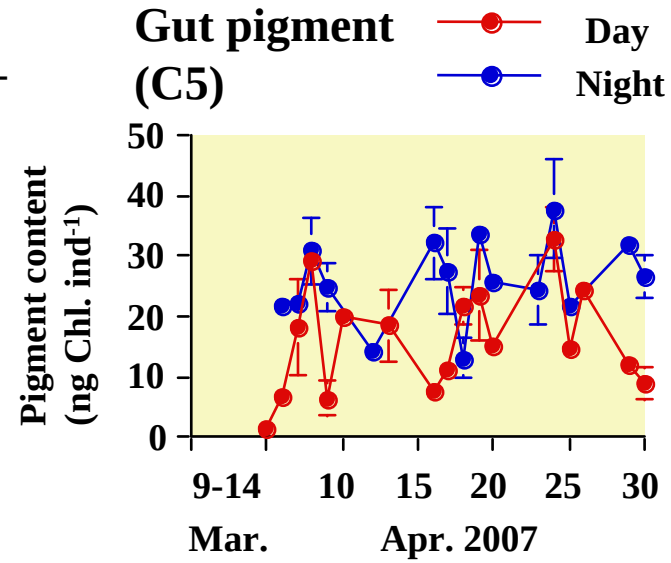


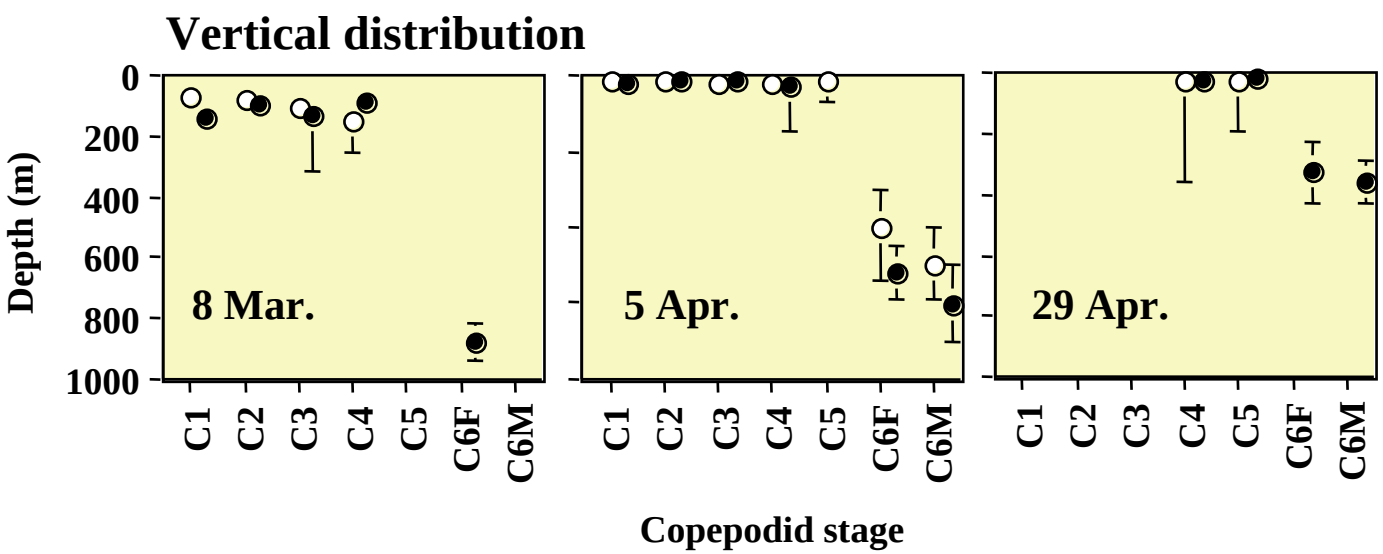


Through March to April, water contents decreased, while ash-free dry mass (=organic mass) increased.

Neocalanus flemingeri

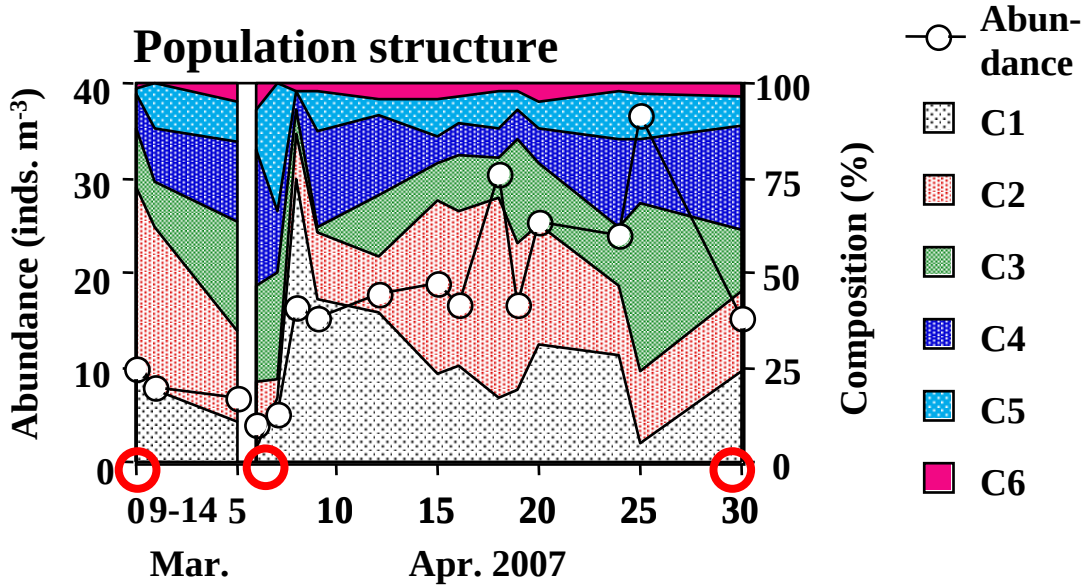


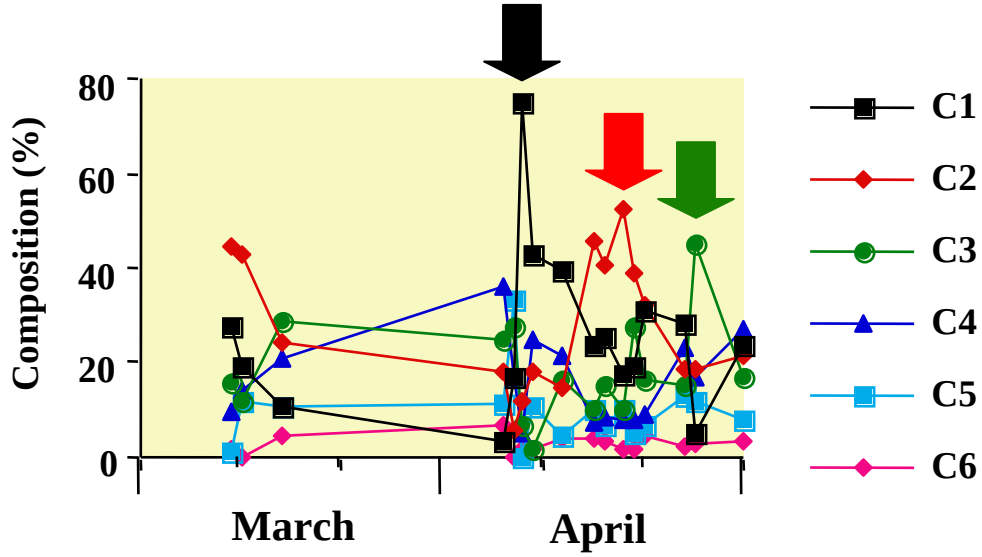




No DVM was observed. Gut pigment was also not varied between day and night.

Neocalanus flemingeri

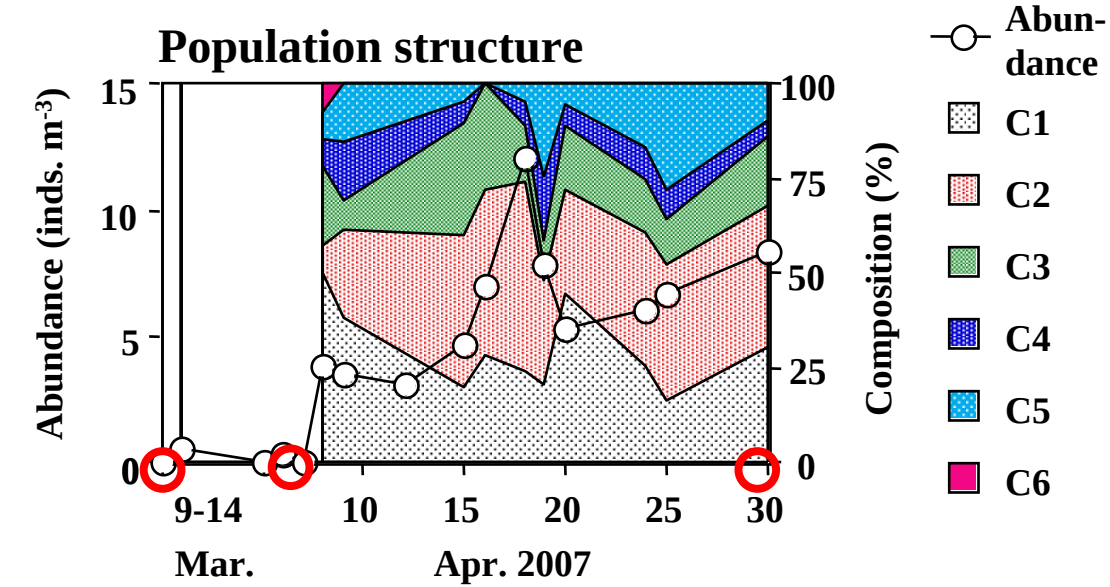




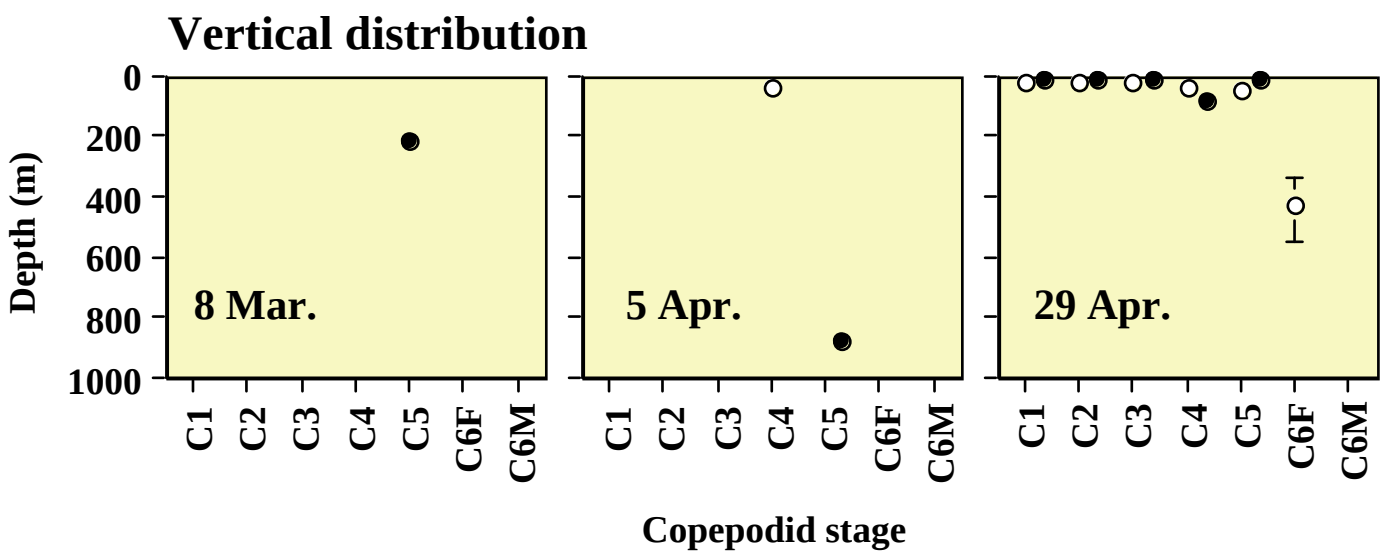
Through March to April, *Neocalanus flemingeri* developed from C1 (9 April- 18 April), C2 (18 April- 25 April) to C3 (25 April-)

Duration time of C1 was estimated to be 9 days, and that of C2 to be 7 days.

Neocalanus plumchrus



After 8 April, *Neocalanus plumchrus* occurred near surface layer.



Summary

Reproductive and developmental timing of large copepods during spring phytoplankton bloom was evaluated.