Plankton community structure down to the greater depths in the western North Pacific Ocean

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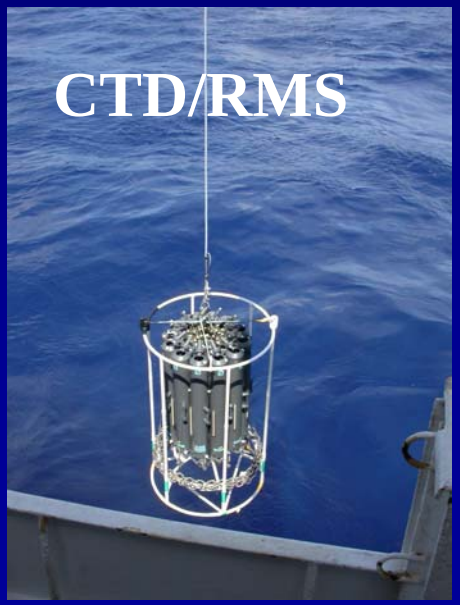
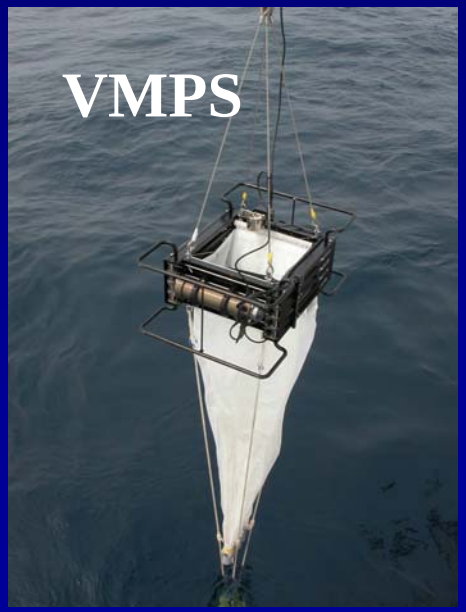




Sampling gears used in this study

Size and major taxa of plankton community

Metazooplankton — Medusae, Chaetognatha; Copepoda, Euphausiacea

Protozooplankton — HMF, Ciliates, Dinoflagellates

Phytoplankton — Cyanobacteria, AMF, Diatoms, A. Dinoflagellates

Heterotrophic Bacteria — H. Bacteria

µm	2		20		200		2000 (=2 mm)
Pico		Nano		Micro		Meso	Macro

Size

Methods

Net samples: NORPAC, VMPS

Water samples: CTD/RMS

Stereomicroscope

Medusae, Chaetognatha

Copepoda, Euphausiacea

Fluorescent microscope
& light microscope
Filtered through
3-10 µm Filter

HMF, Ciliates, Dinoflagellates

AMF, Diatoms, A. Dinoflagellates

Fluorescent microscope
Filtered through
0.2 µm Nuclepore Filter

Cyanobacteria,

H. Bacteria

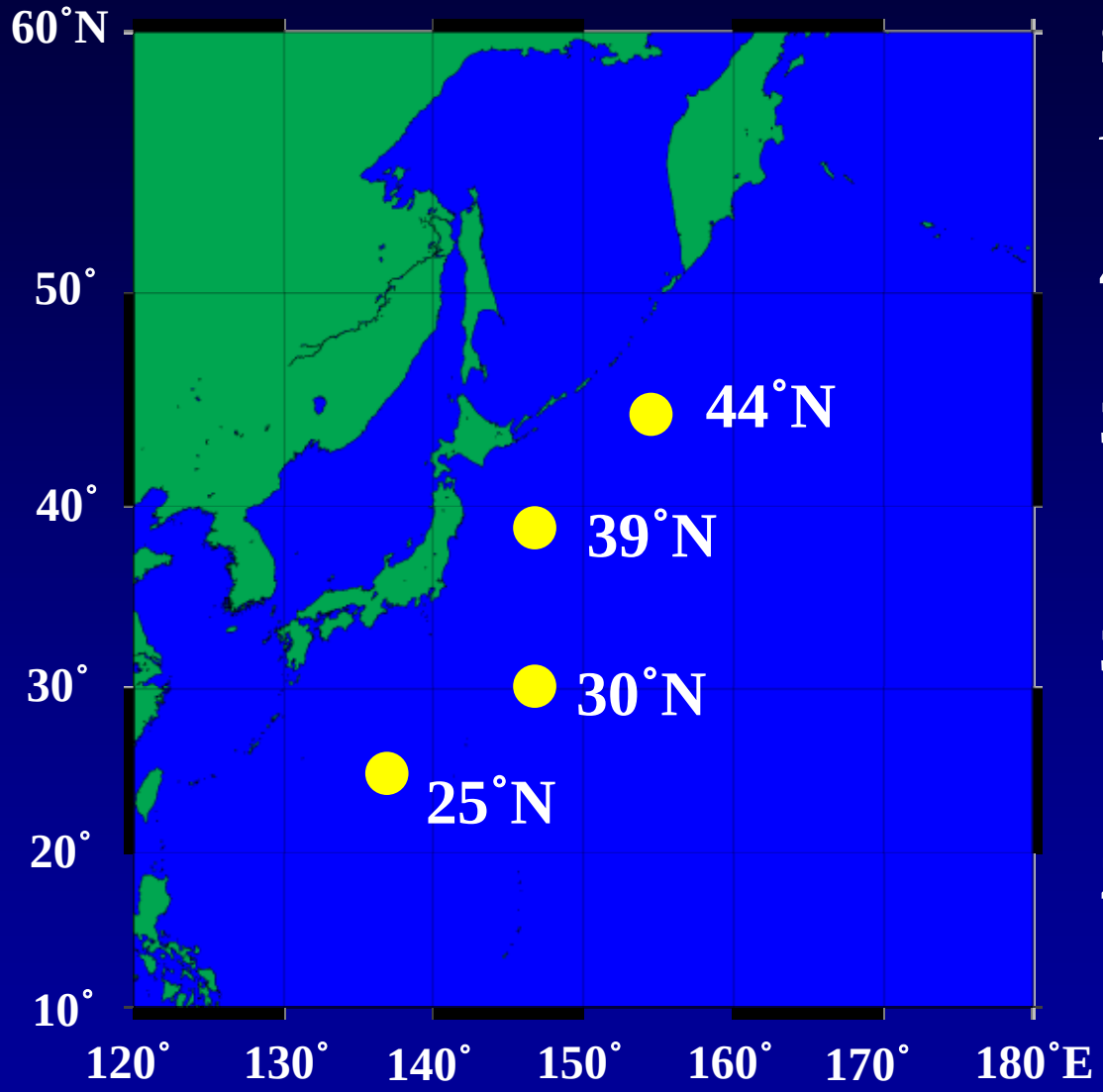
Size and biovolume measurement, and biovolume-carbon conversion

µm 2 20 200 2000 (=2 mm)

Pico | Nano | Micro | Meso | Macro

Size

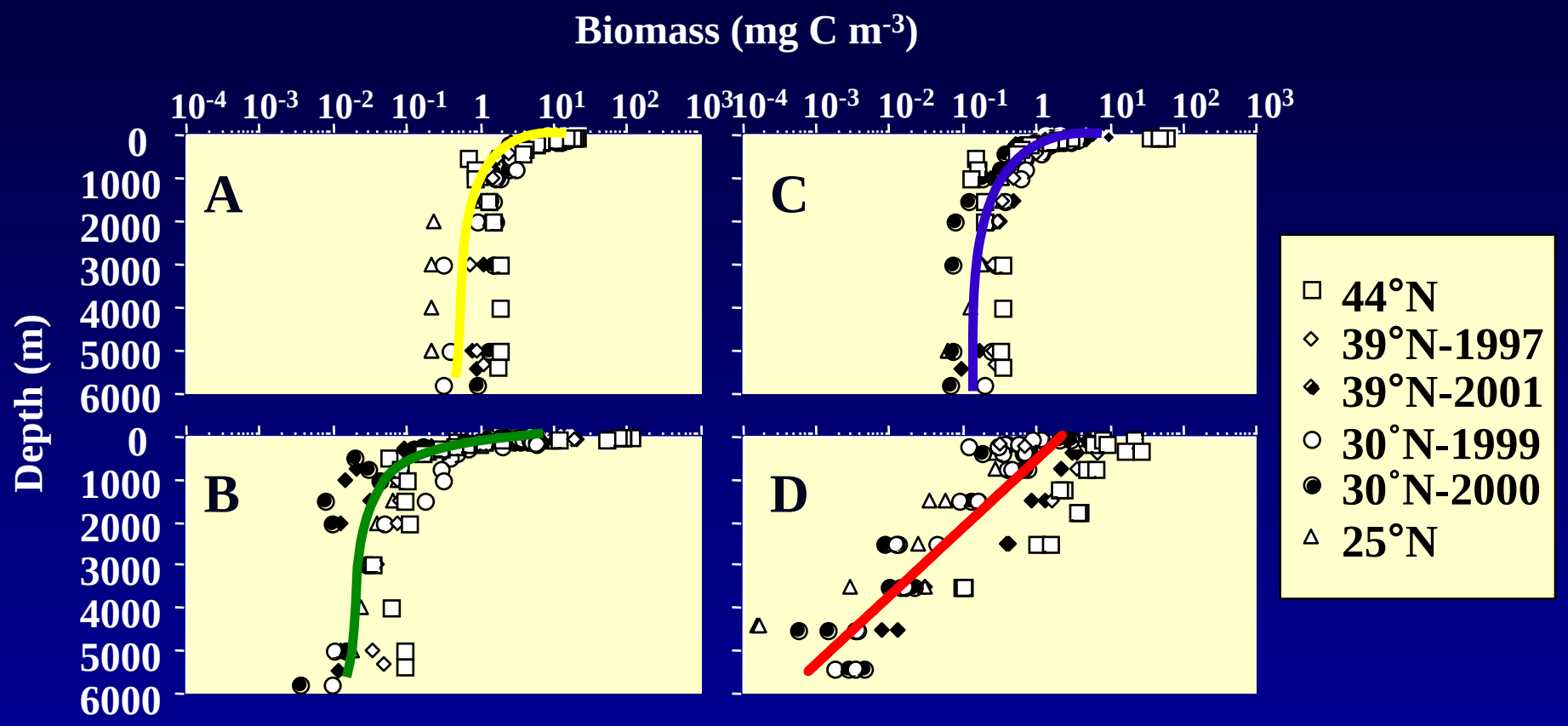
Sampling location



SEA-COSMIC (1st phase)
R/V Hakurei-Maru No. 2

44˚N, 155˚E
19 Aug. 1998 (0-4000 m)
39˚N, 147˚E
21 Nov. 1997 (0-2000 m)
15 Aug. 2001 (0-5000 m)
30˚N, 147˚E
4 Oct. 1999 (0-5800 m)
15 Oct. 2000 (0-5800 m)
25˚N, 137˚E
20 Sep. 1999 (0-4800 m)

Vertical distribution of planktonic biomass

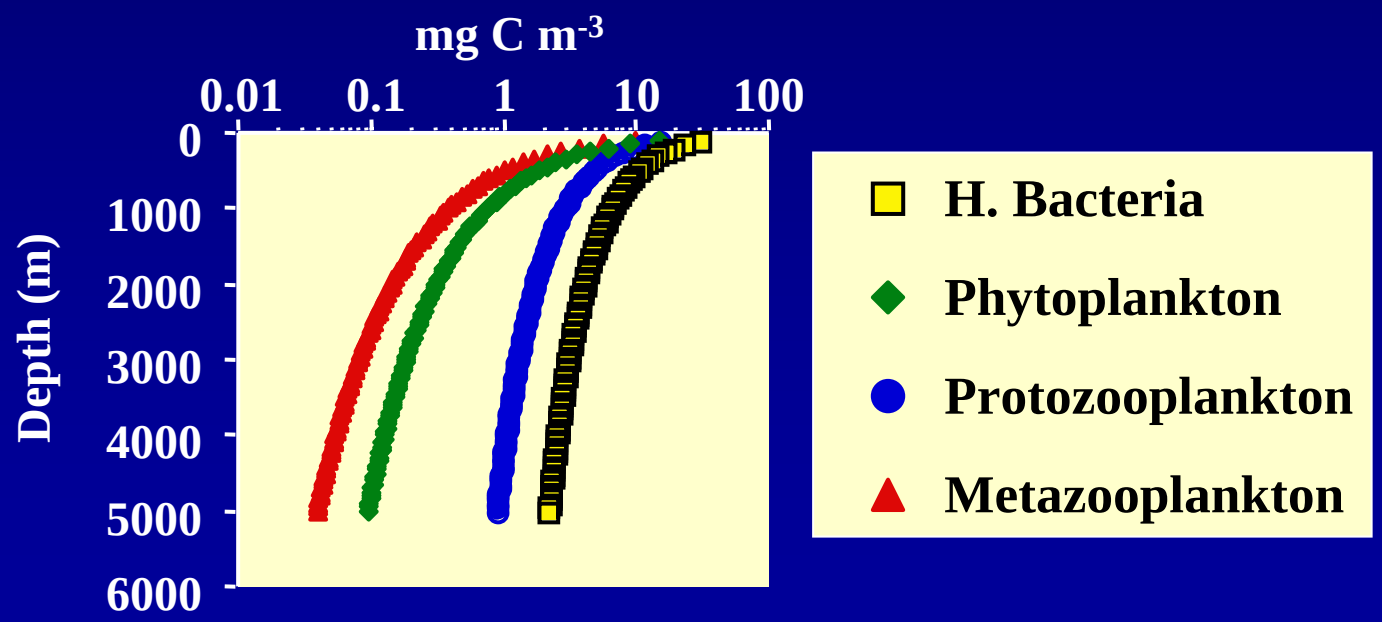


A: H. Bacteria, B: Phytoplankton,
C: Protozooplankton, D: Metazooplankton

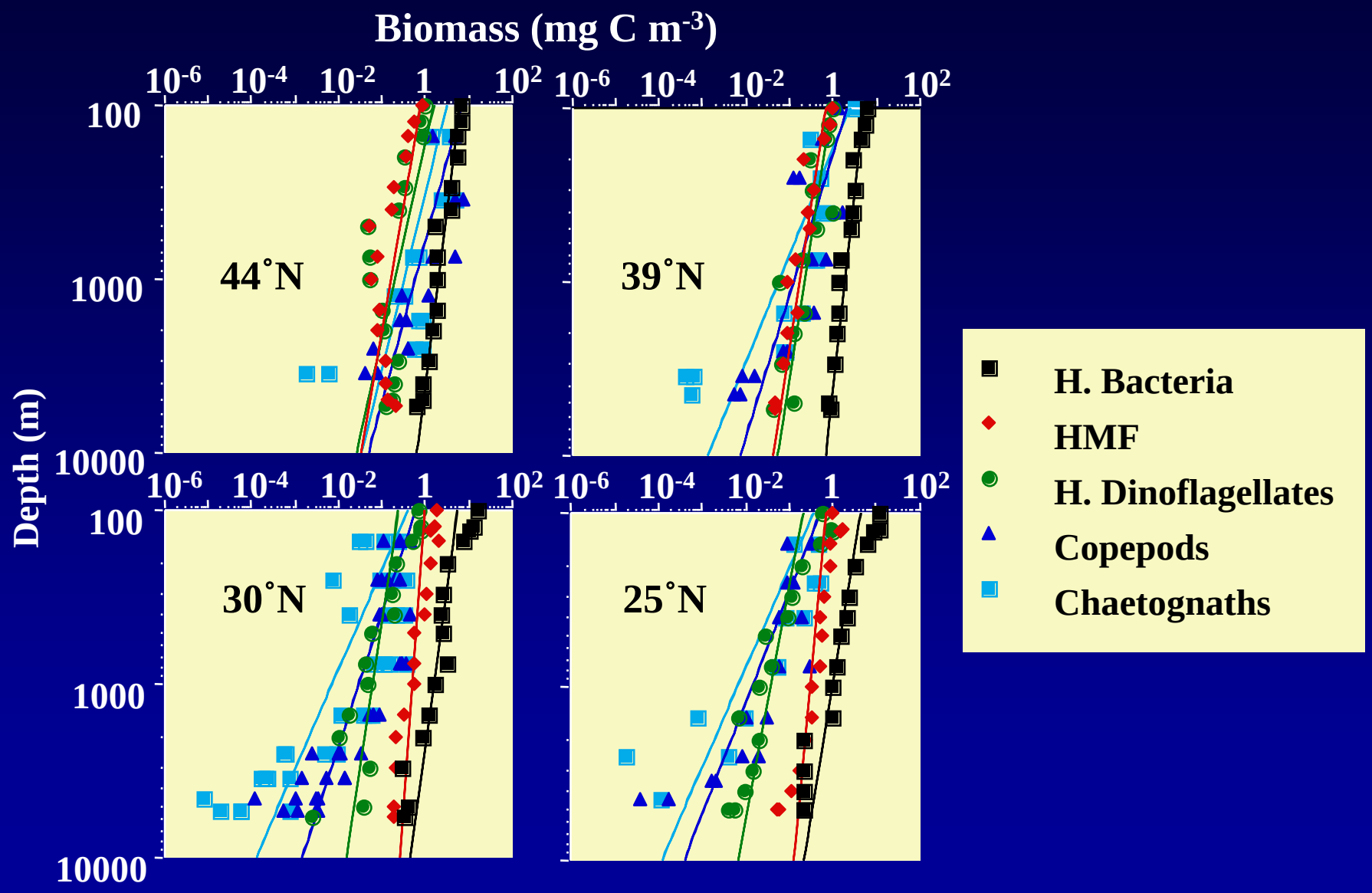
Biomass-depth regression

Table. Regression ($Y=B_{100}(X/100)^{-b}$) between planktonic biomass (Y: mg C m^{-3}) and depth (X: m). B_{100}: biomass at 100 m depth.

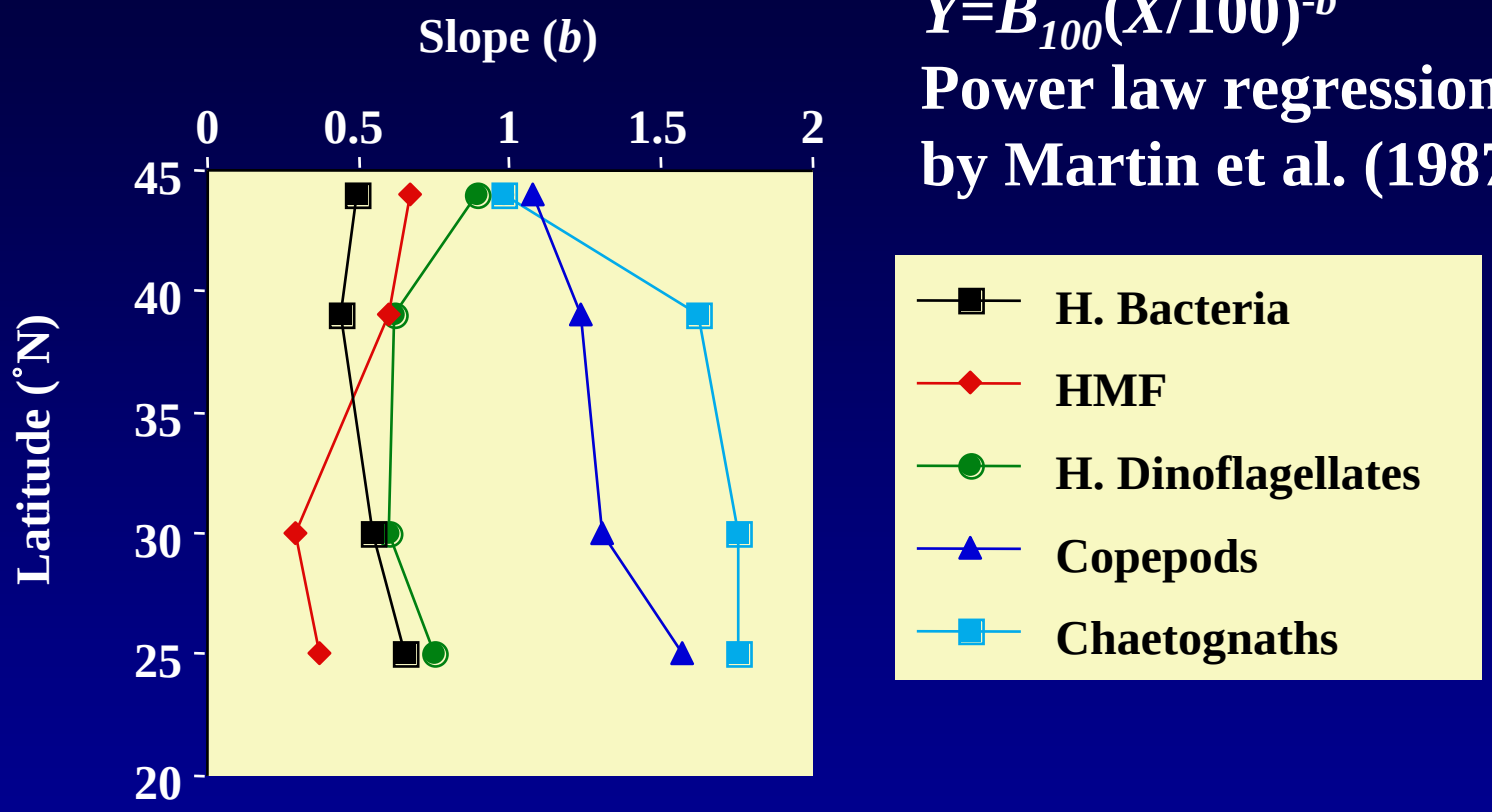
Taxon	Slope (b)	r^2	p
H. Bacteria	0.673	0.78	<0.0001
Phytoplankton	1.297	0.85	<0.0001
Protozooplankton	0.728	0.80	<0.0001
Metazooplankton	1.421	0.55	<0.0001



Biomass-depth regression-2 (with location)



Biomass-depth regression-3 (with location/taxon)

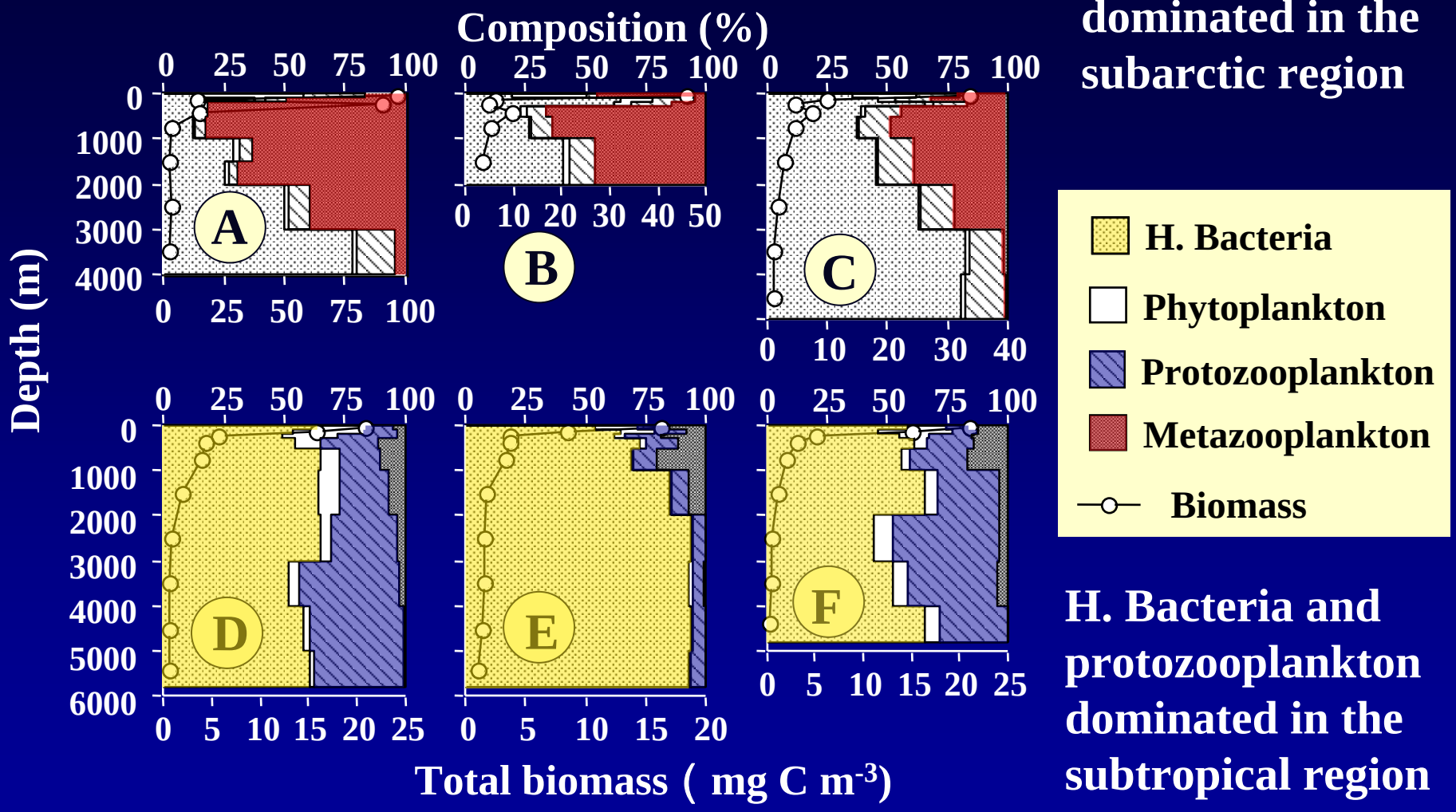


$Y=B_{100}(X/100)^{-b}$
Power law regression by Martin et al. (1987)

Regression ($Y=B_{100}(X/100)^{-b}$) between planktonic biomass (Y: mg C m^{-3}) and depth (X: m). B_{100}: biomass at 100 m depth. Exponent (b) of power law indicates slope of the regression.

Whole planktonic community structure

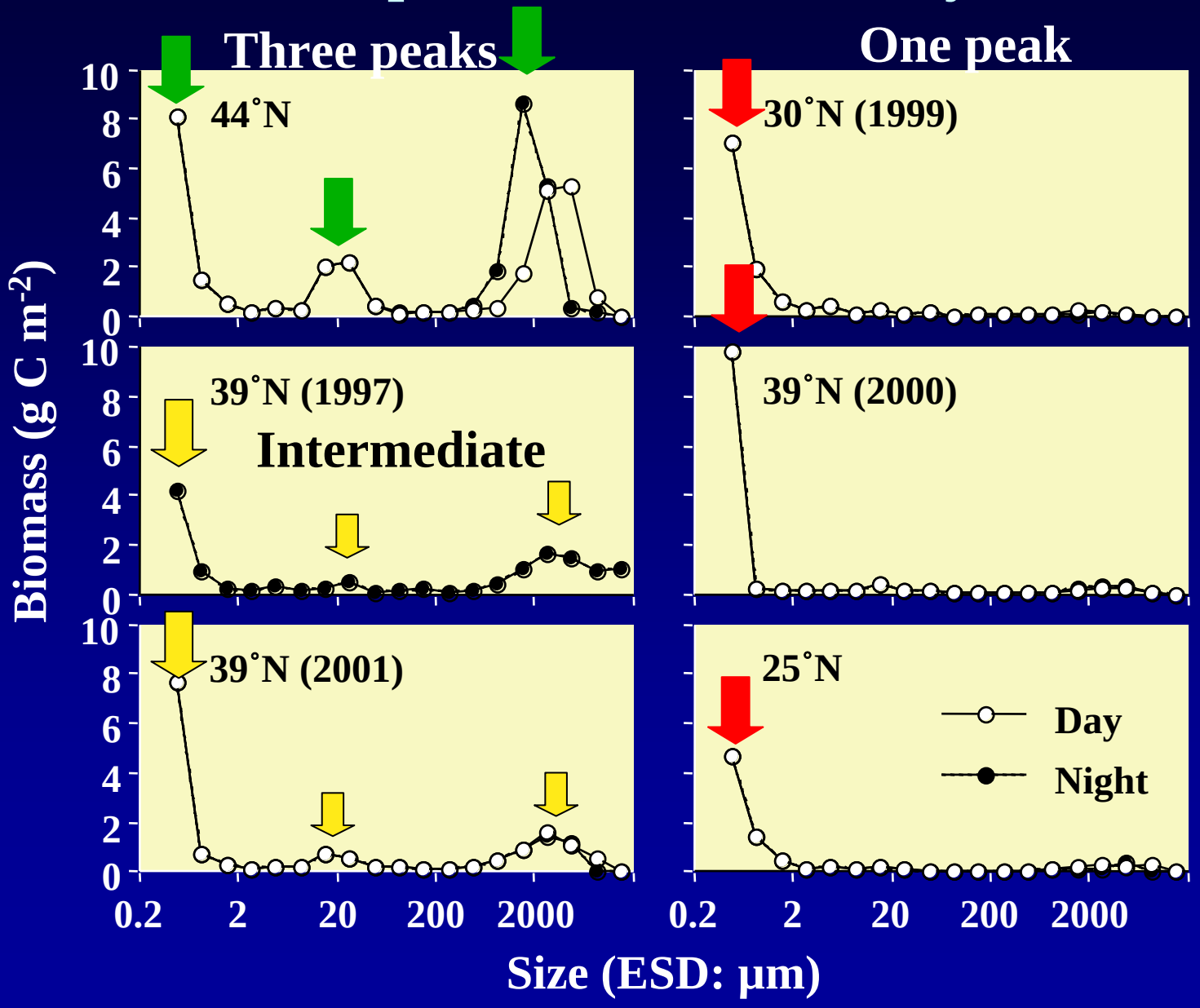
Metazooplankton dominated in the subarctic region



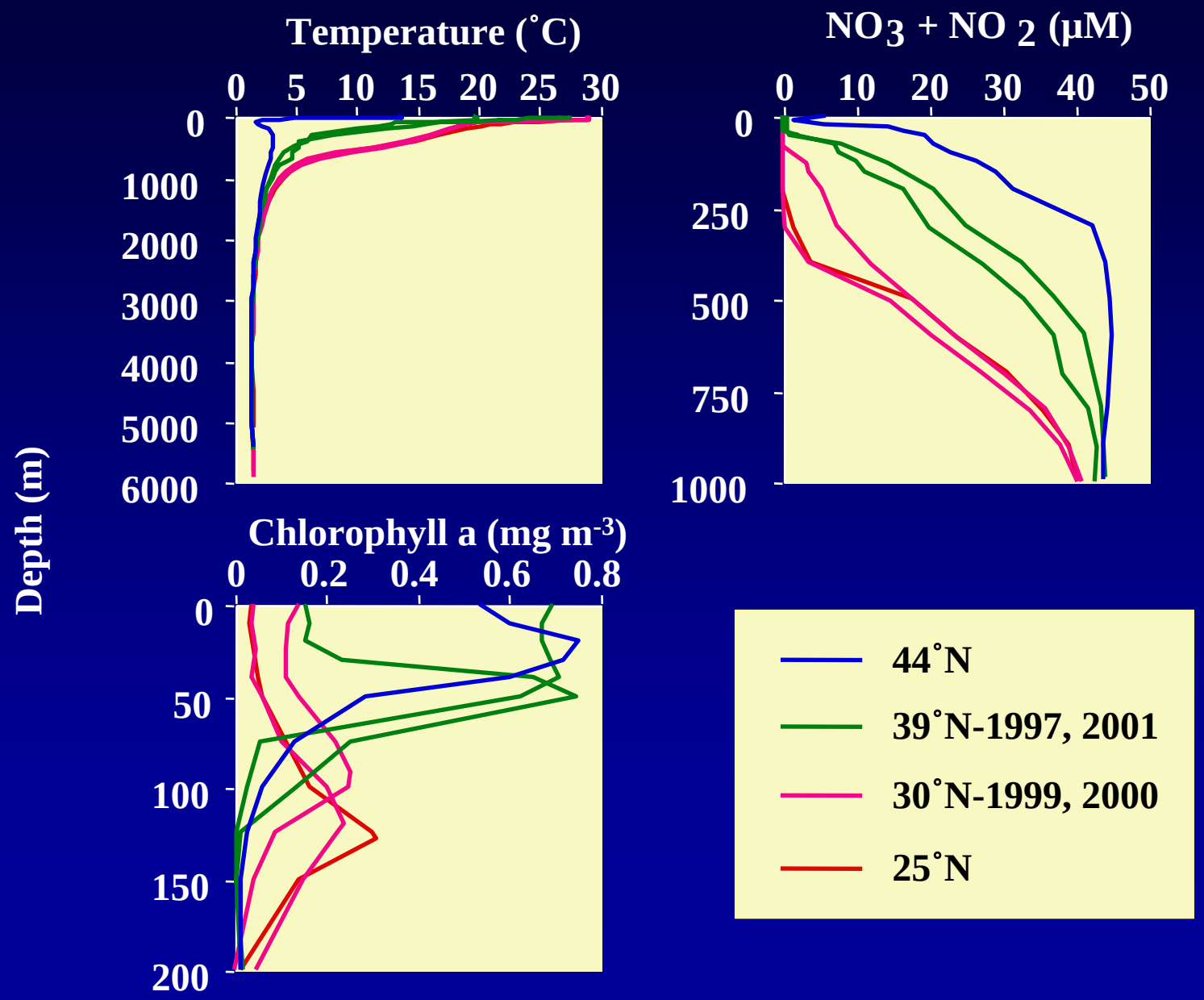
H. Bacteria and protozooplankton dominated in the subtropical region

A: 44˚N, B: 39˚N-1997, C: 39˚N-2001, D: 30˚N-1999, E: 30˚N-2000, F: 25˚N

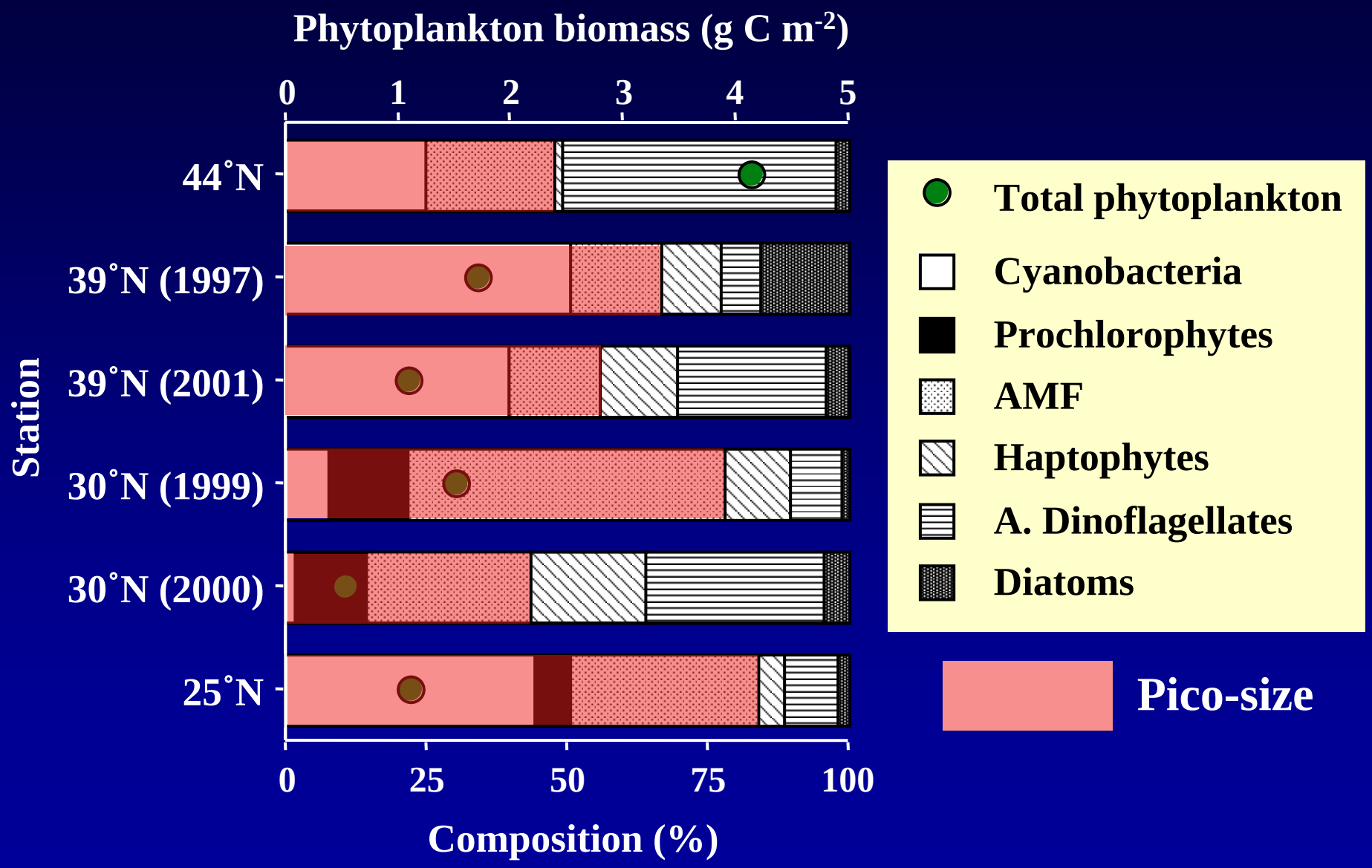
Size structure of planktonic community



Temperature, nutrient and chlorophyll a

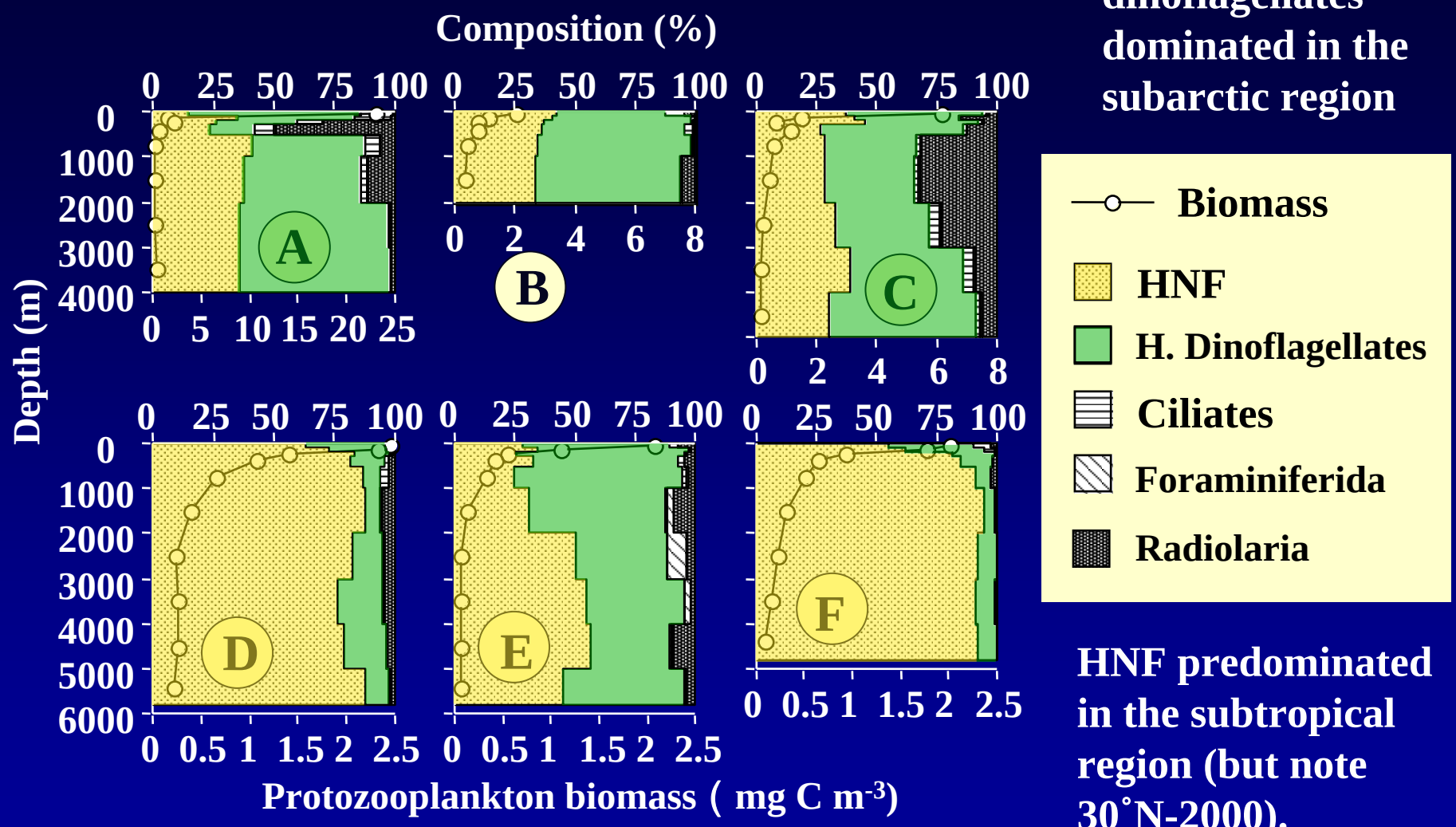


Phytoplankton community



Protozooplankton community

HNF and H. dinoflagellates dominated in the subarctic region

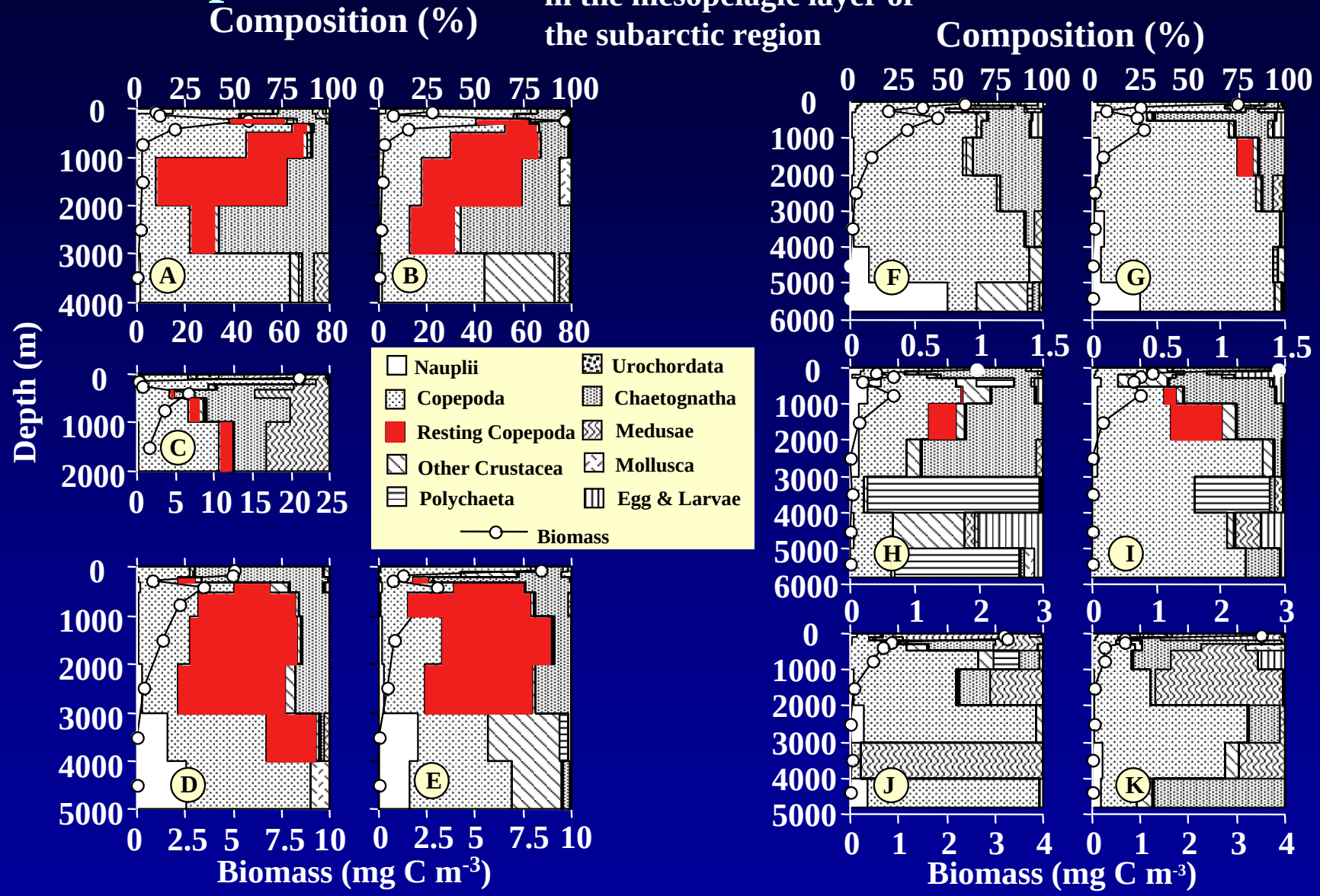


HNF predominated in the subtropical region (but note 30˚N-2000).

A: 44˚N, B: 39˚N-1997, C: 39˚N-2001, D: 30˚N-1999, E: 30˚N-2000, F: 25˚N

Metazooplankton

Resting Copepoda dominated in the mesopelagic layer of the subarctic region



A: 44˚N-D, B: 44˚N-N, C: 39˚N-1997
D: 39˚N-2001-D, E: 39˚N-2001-N

F: 30˚N-1999-D, G: 30˚N-1999-N, H: 30˚N-2000-D
I: 30˚N-2000-N, J: 25˚N-D, K: 25˚N-N

Summary

Magnitude of biomass decline with depth varied with taxa:

-H. Bacteria< Protozooplankton< Phytoplankton< Metazooplankton

Reflect of the degree of nutrition supply?

Taxonomic structure of plankton community varied with region:

-Metazooplankton dominated in the subarctic region.

Caused by the dominance of resting Copepoda

-H. Bacteria and Protozooplankton dominated in the subtropical.

Size structure of plankton community also varied with region:

-Three peaks (pico, micro, meso) at subarctic region, but only one peak (pico) at subtropical region.

Community structure was variable with year (30˚N):

-Plankton community structure throughout the water column showed great inter annual variation (30˚N), which may be brought about by the changes in phytoplankton community structure in the epipelagic zone.