

Importance of Squid As Prey for Large Pelagic Animals in the Western North Pacific

Hikaru Watanabe

Tsunemi Kubodera*

Taro Ichii

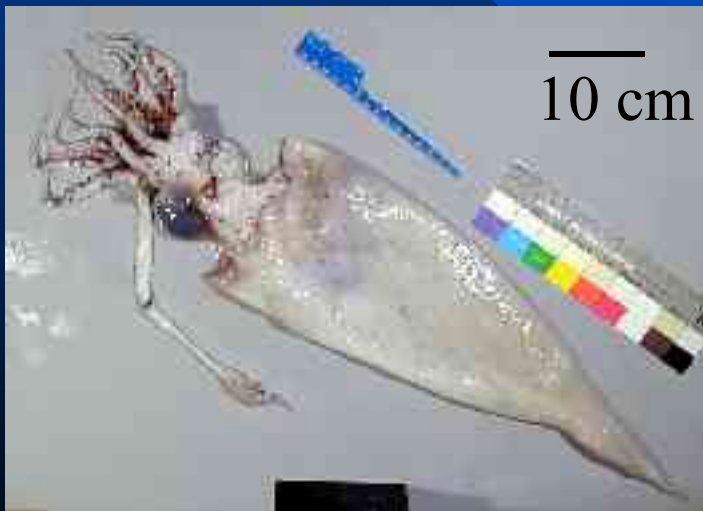
National Research Institute of Far Seas Fisheries, Japan

*National Science Museum, Japan

Objective

- Review of importance of squid as prey for large pelagic animals in the transition region of the western North Pacific based on the data of
 - (1) Diet of these animals
 - (2) Distribution of major squid prey

Major Squid Species



Mesopelagic gelatinous sp.

Large (30-50 cm DML)



Mid-sized (15-30 cm)



Small (< 10 cm)



Vertical migratory sp.

Major Squid Predator

Swordfish



Average size

184 cm EFL

Blue shark
(juvenile)



138 cm TL

Salmon shark
(juvenile)



130 cm TL

Neon flying squid (*O. bartramii*)



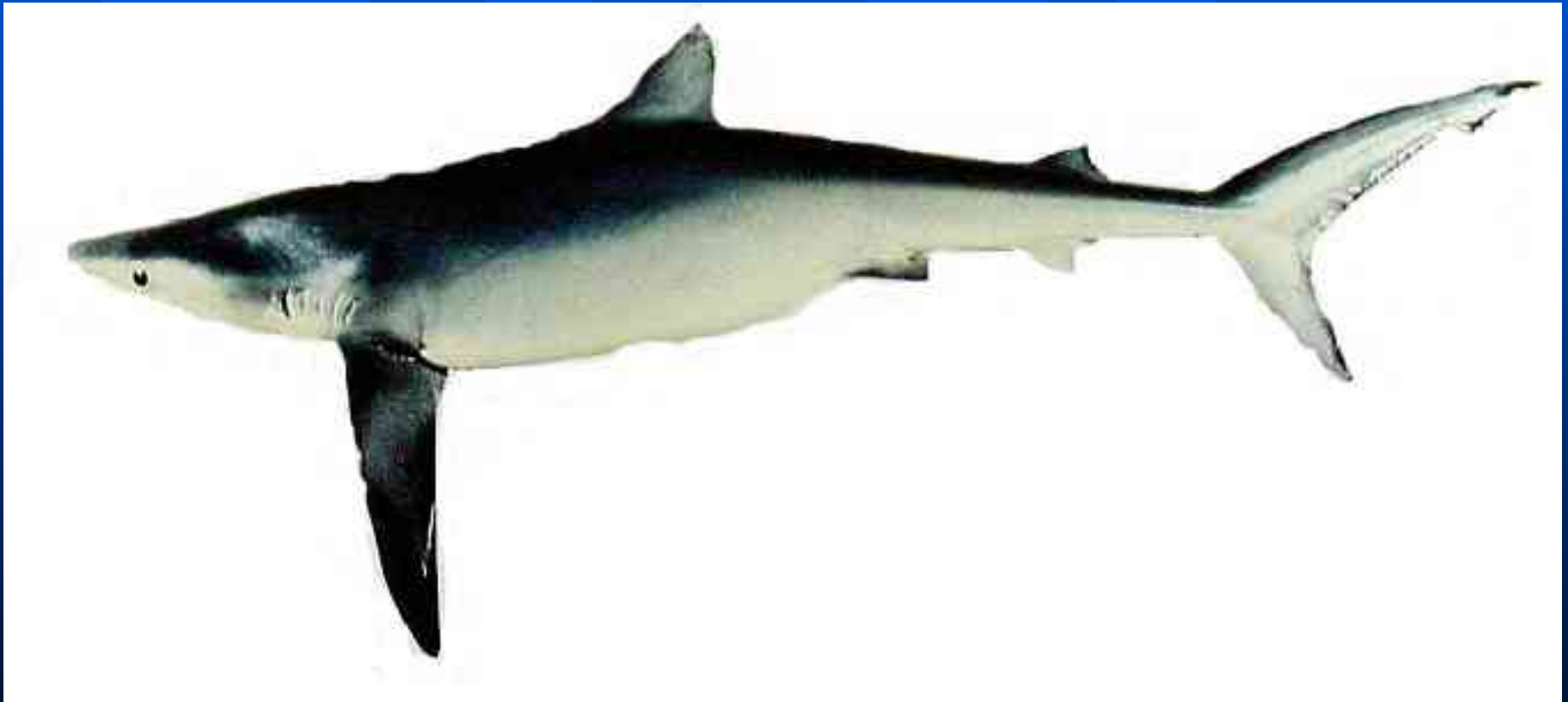
44 cm DML

Pacific pomfret (*B. japonica*)



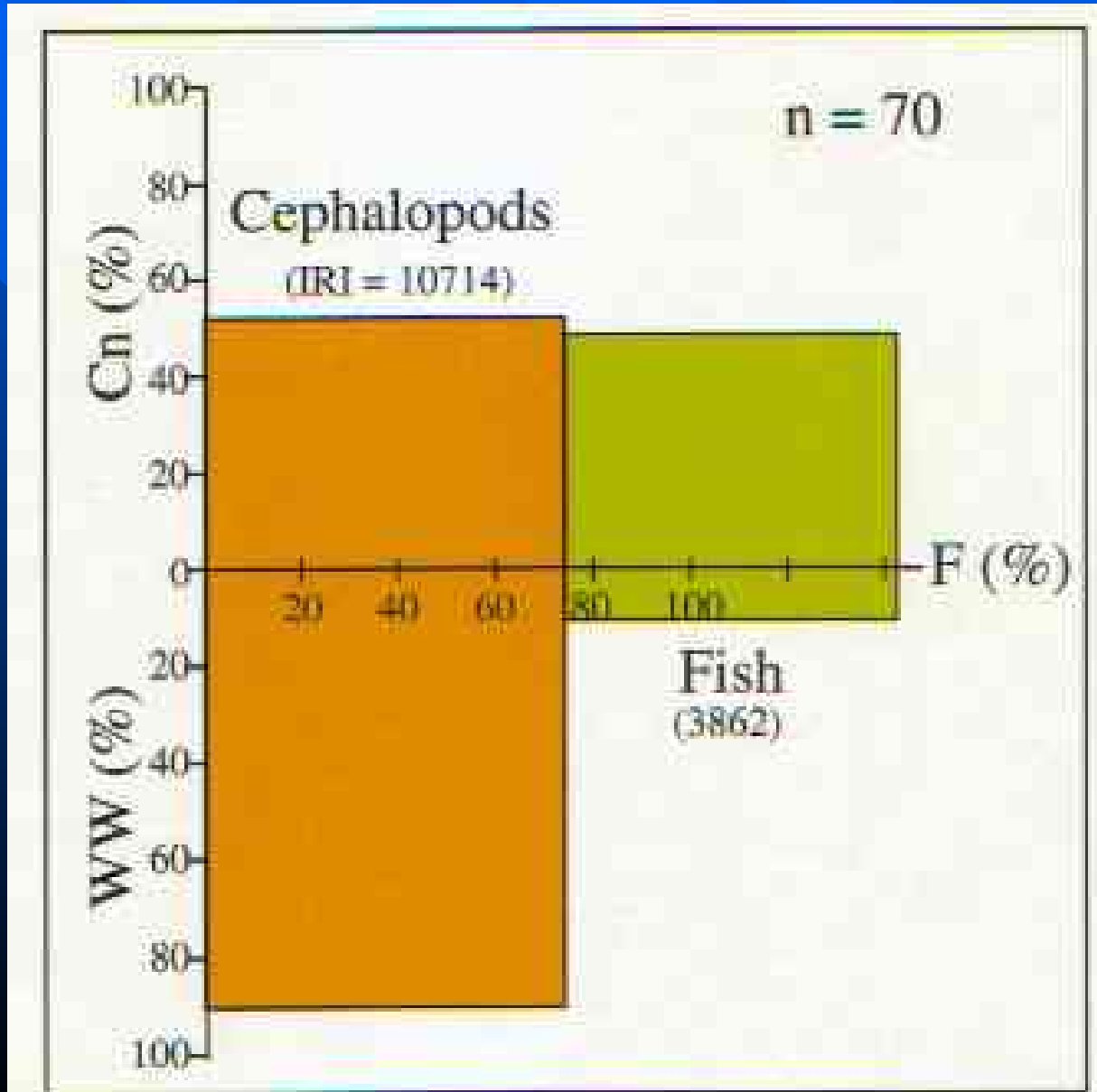
43 cm SL

1. Mesopelagic Gelatinous Squid Feeder



Juvenile Blue shark (avg. 130 cm TL)

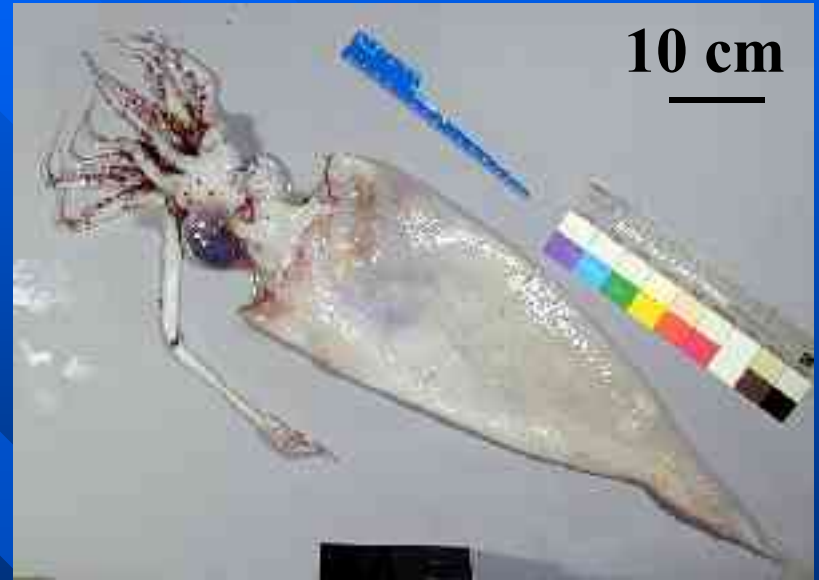
Prey of juvenile Blue Shark in May (n = 70)



Main Squid Prey of Juvenile Blue Shark



Chiroteuthis calyx



Belonella borealis

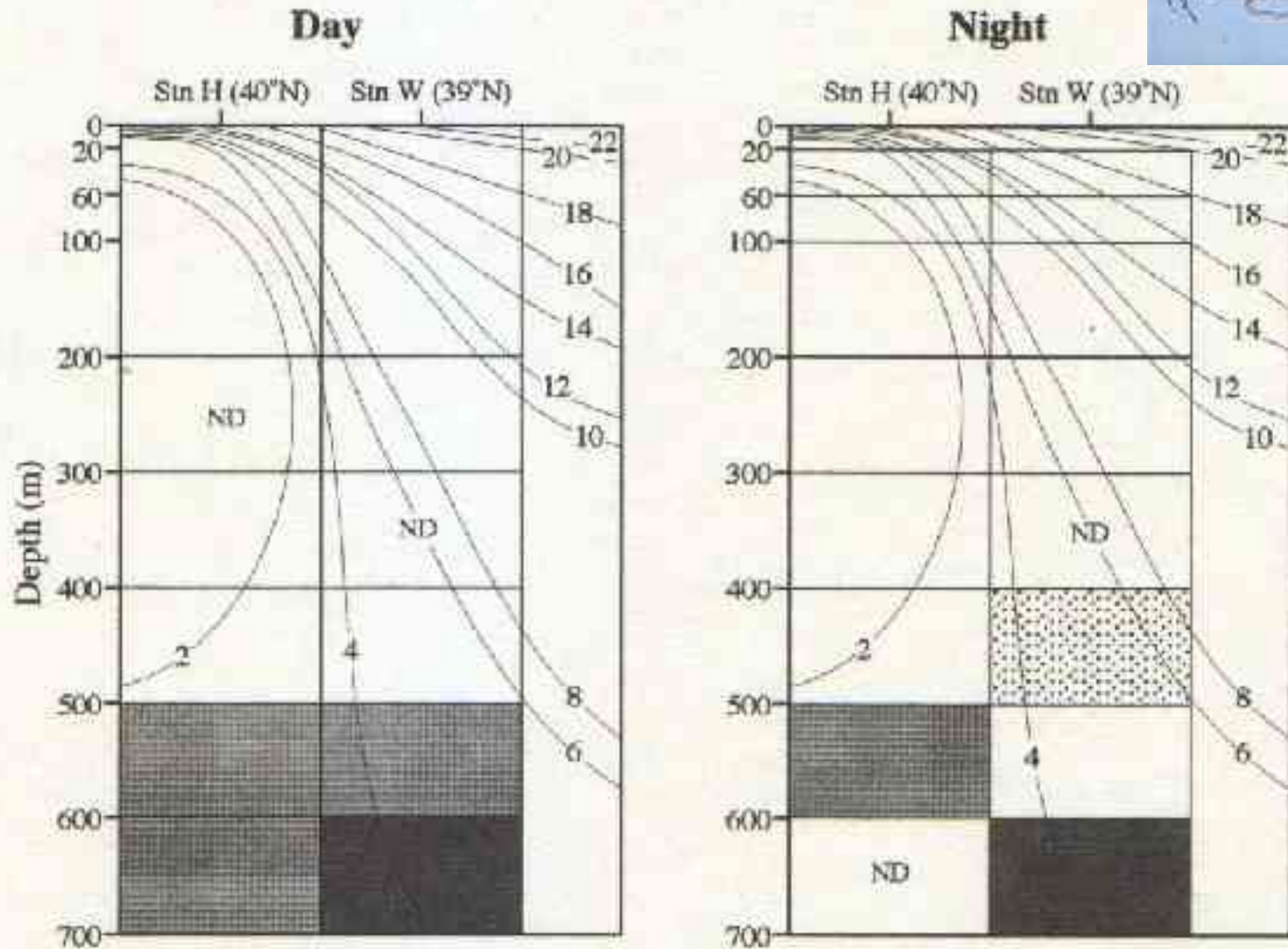
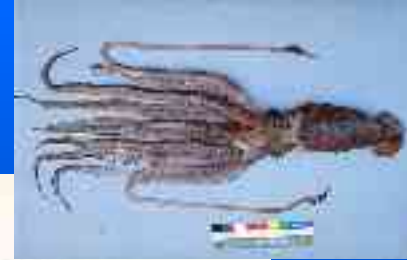


Histioteuthis dofleini

**Non-migratory
mesopelagic zone
species**



Vertical distribution of *H. dofleini*



CPUE



≥ 1 kg/h



≥ 0.1 kg/h

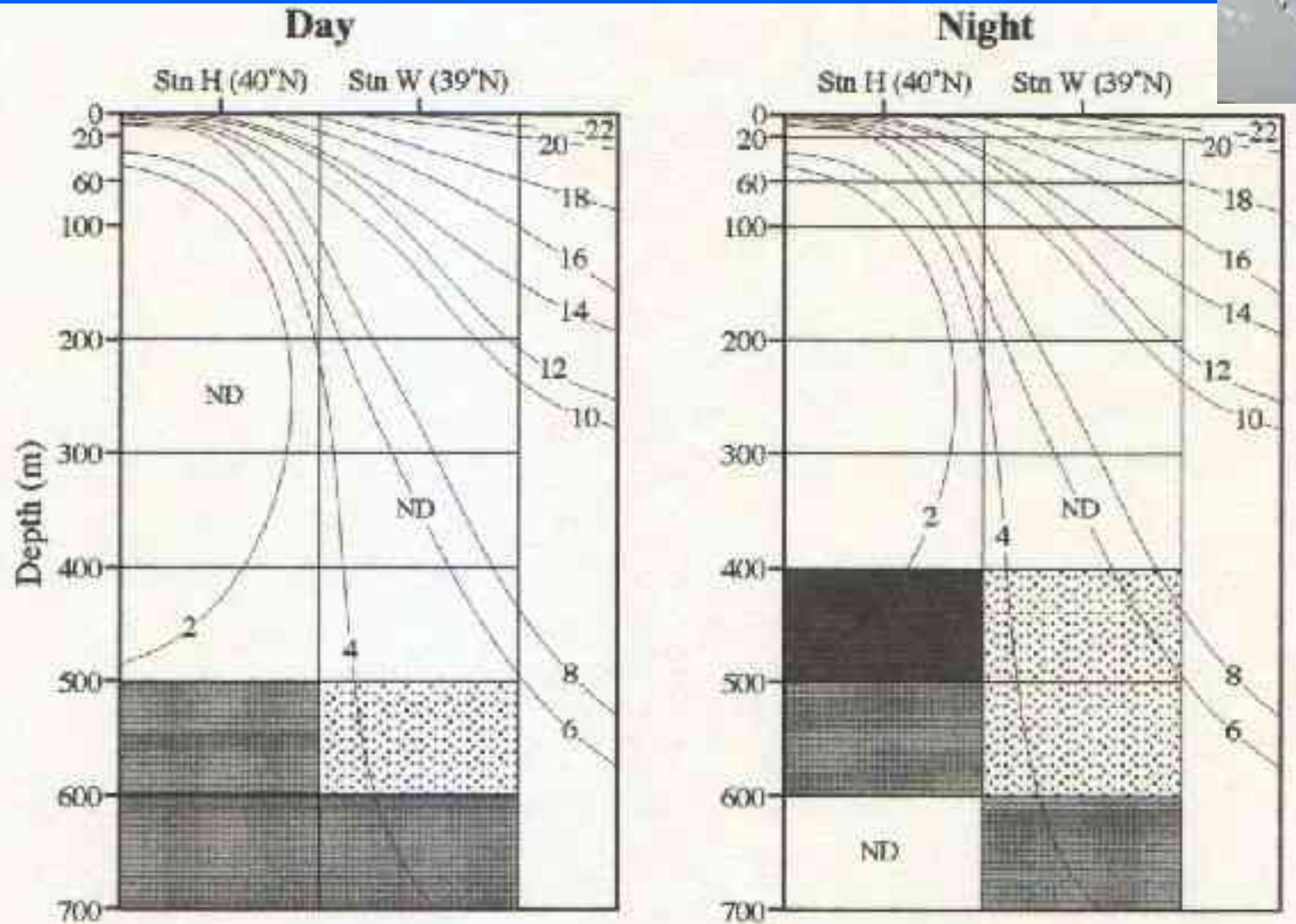


< 0.1 kg/h



= 0 kg/h

Vertical distribution of *B. borealis*



CPUE



≥ 1 kg/h



≥ 0.1 kg/h



< 0.1 kg/h



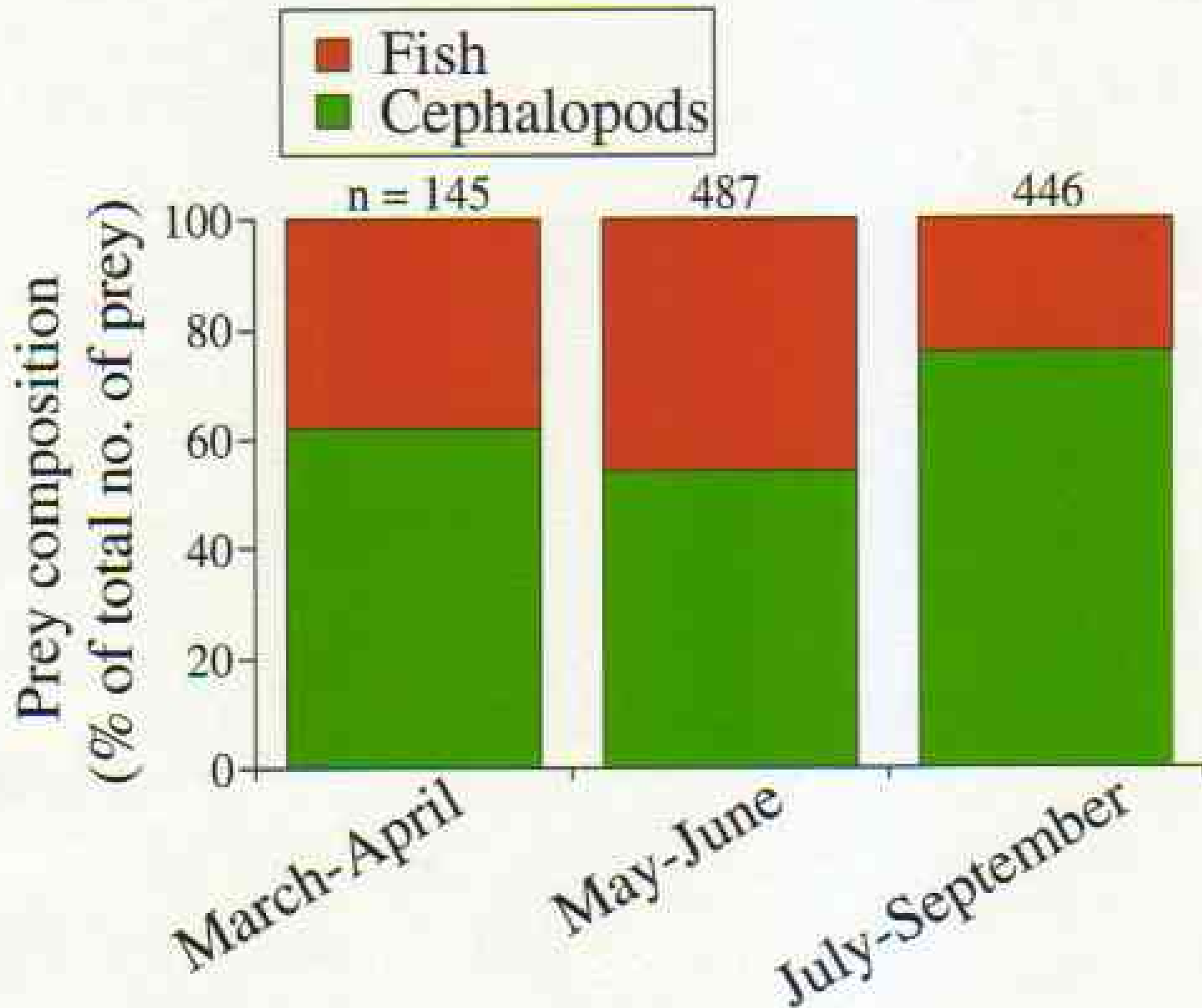
= 0 kg/h

1. Large and Mid-sized Vertical Migratory Squid Feeder



Swordfish (avg. 184 cm EFL)

Prey of Swordfish (n = 258)



Seasonal change in squid prey

Spring



Adult Neon
flying squid
(30-50 cm)

Summer



Juvenile
neon flying squid
(10-25 cm)



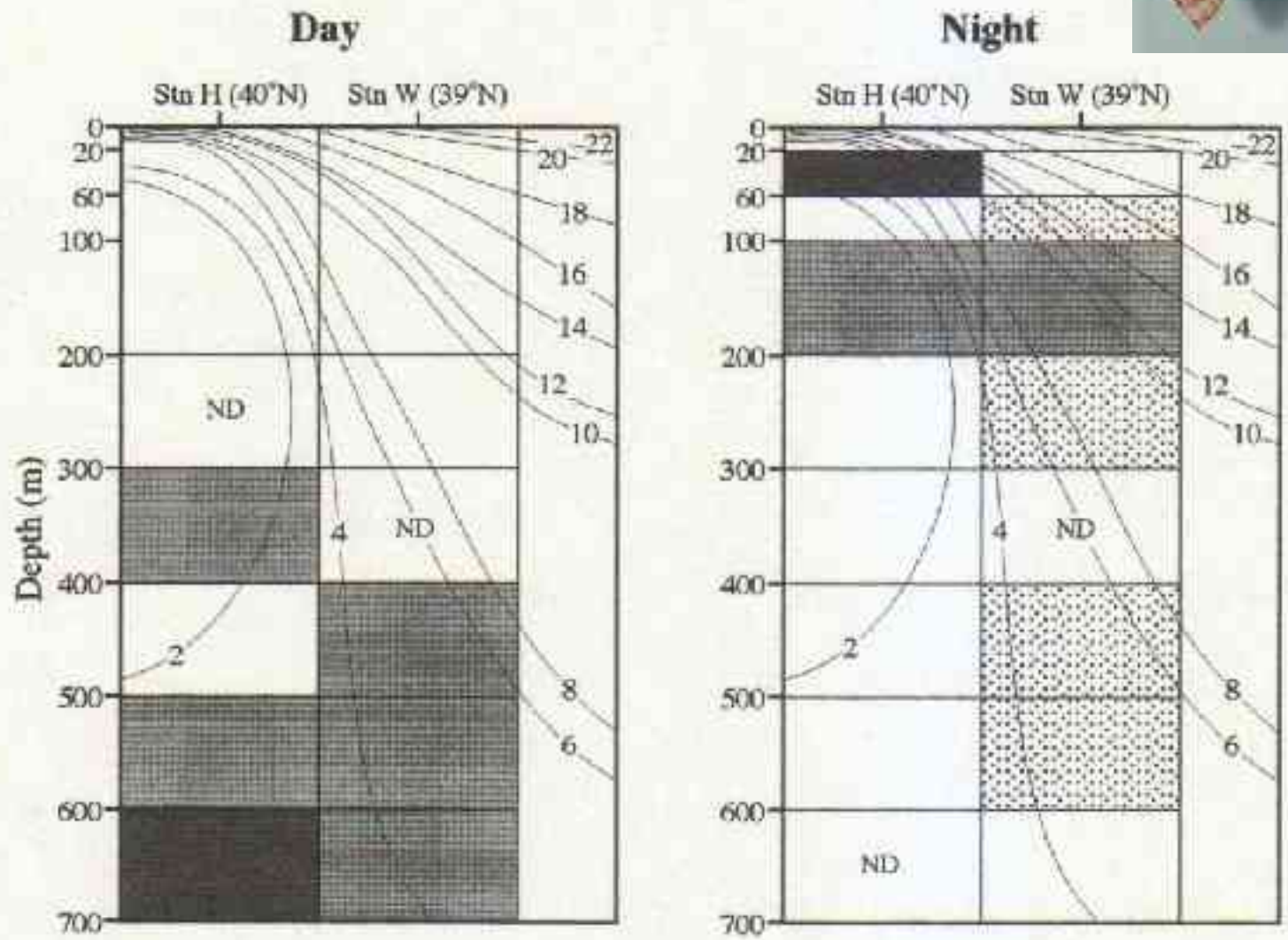
Gonatopsis borealis



Onychoteuthis borealijaponica

Adult
mid-sized squid
(20-30 cm)

Vertical distribution of *G. borealis*



CPUE



≥ 1 kg/h



≥ 0.1 kg/h

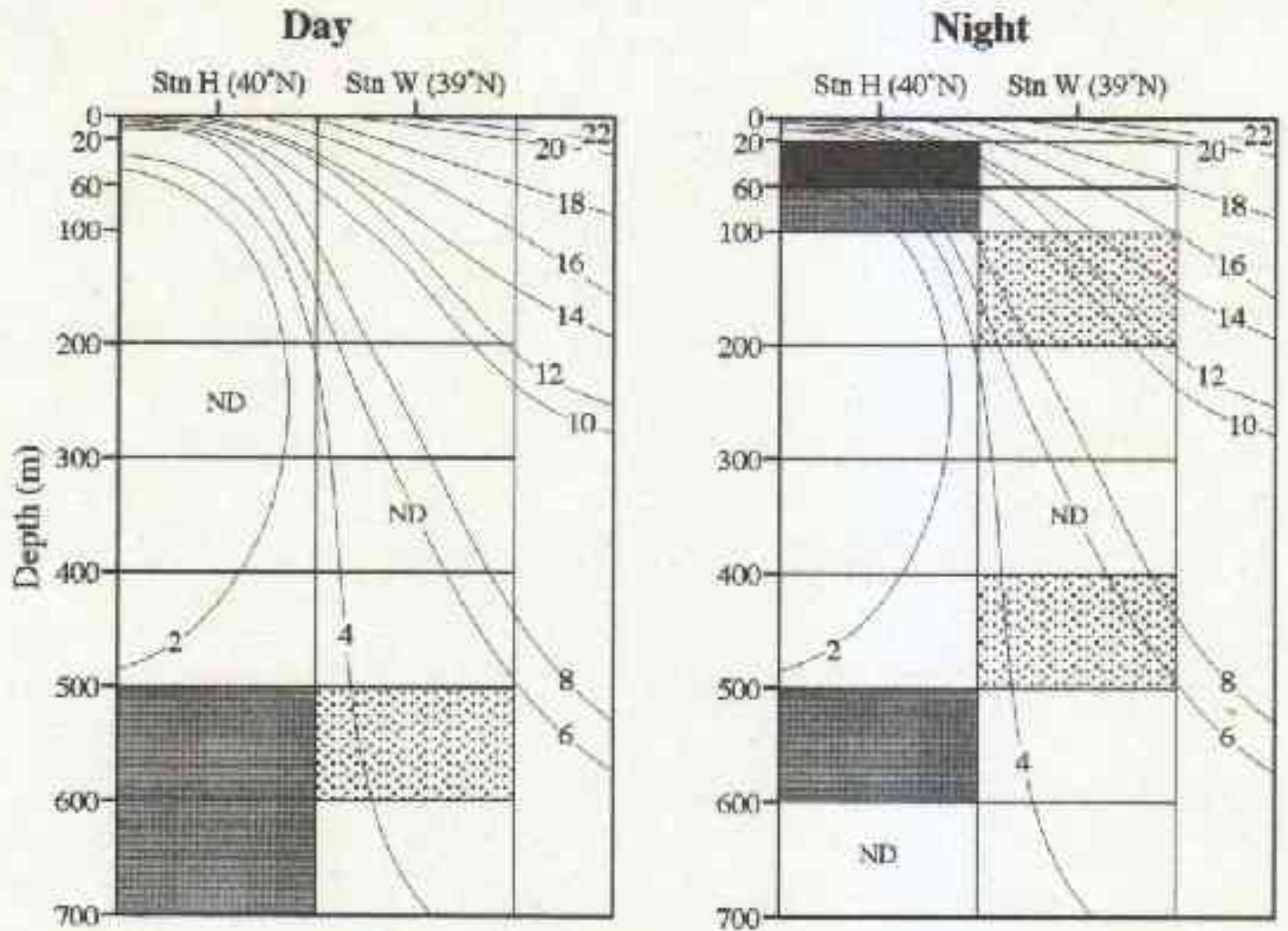


< 0.1 kg/h



= 0 kg/h

Vertical distribution of *O. borealijaponica*



CPUE



≥ 1 kg/h



≥ 0.1 kg/h



< 0.1 kg/h



$= 0$ kg/h

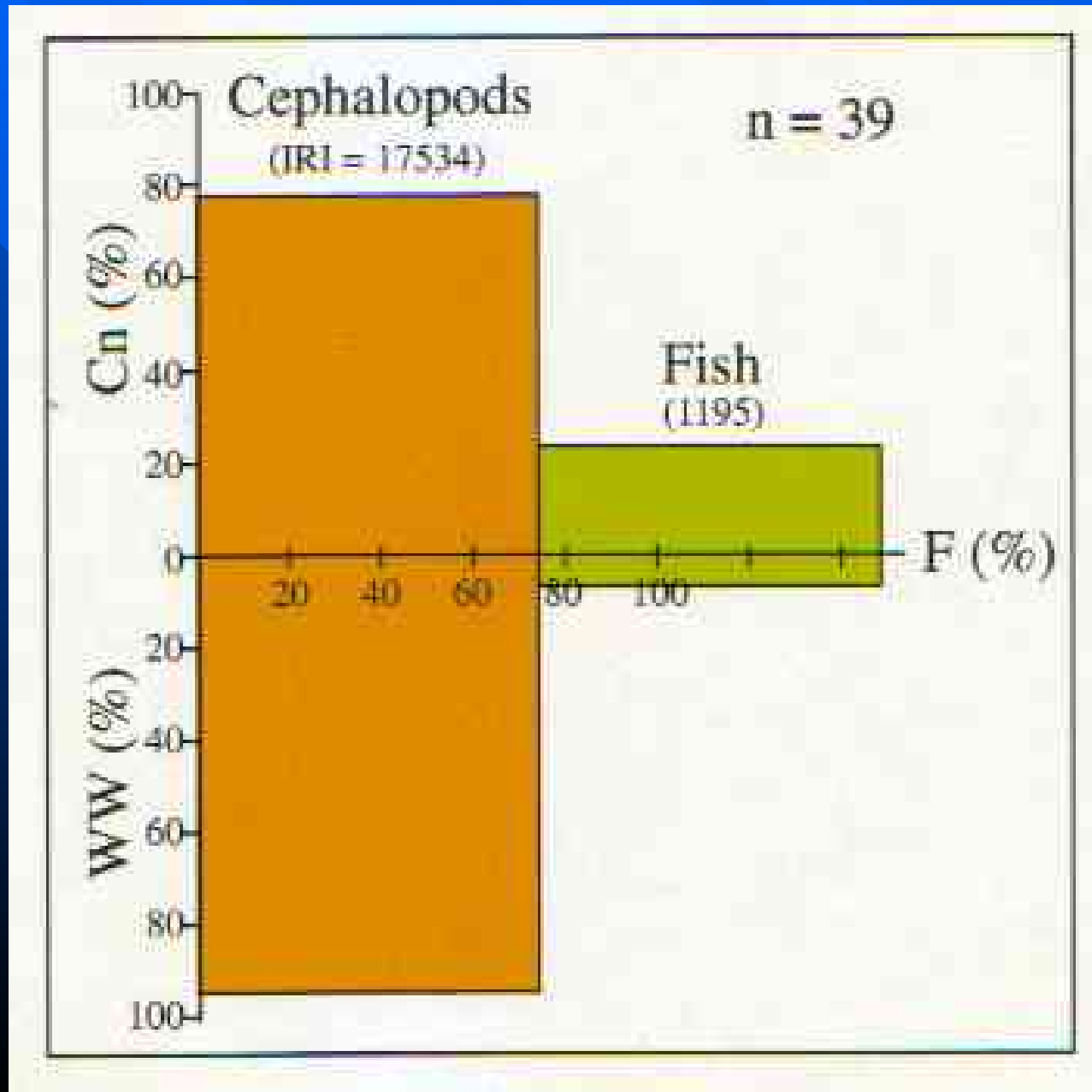


1. Mid-sized Vertical Migratory Squid Feeder

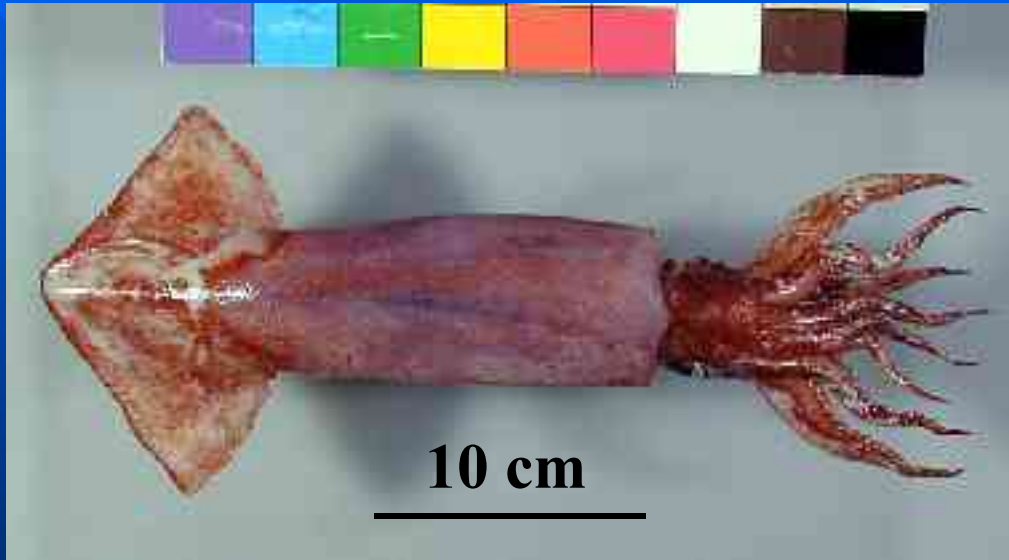


Juvenile Salmon shark (avg. 130 cm TL)

Prey of Juvenile Salmon Shark in May (n = 39)



Main Squid Prey of Juvenile Salmon Shark



Gonatopsis borealis



*Onychoteuthis
borealijaponica*

4. Small sized squid feeders

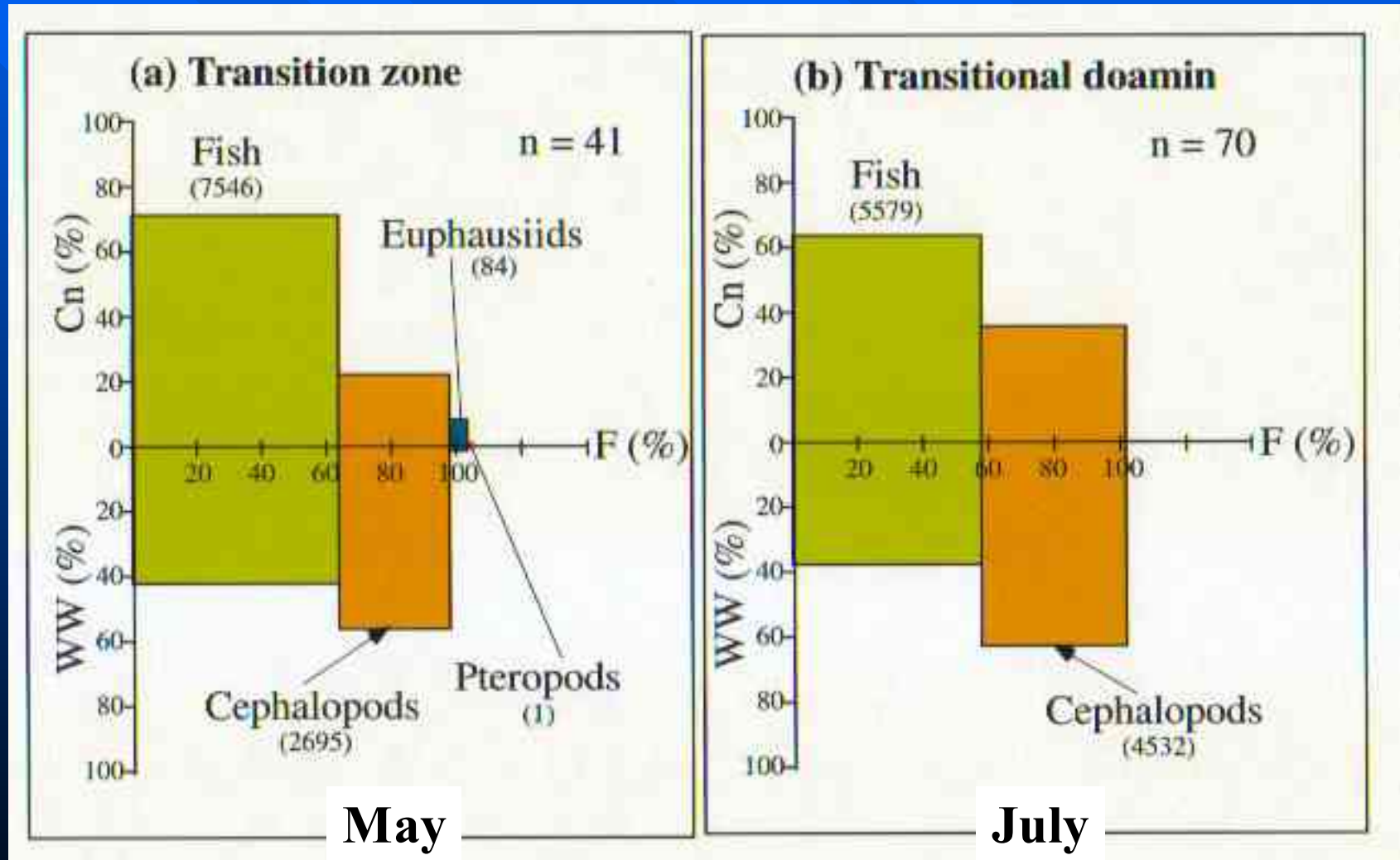


Neon flying squid
Ommastrephes
bartramii
(avg. 44 cm DML)



Pacific pomfret
Brama japonica
(avg. 43 cm SL)

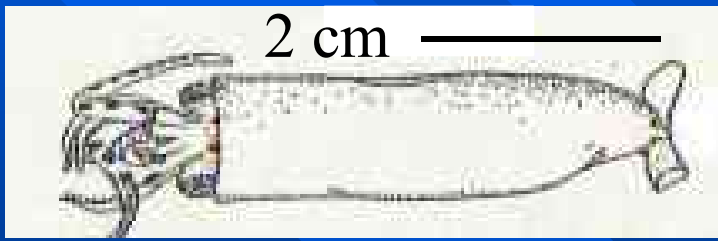
Prey of Neon Flying Squid (n = 111)



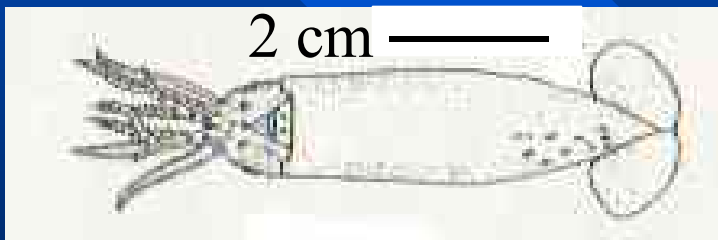
Main prey: Fish & cephalopods

**Watanabe et al.
(2004)**

Main Squid Prey of Neon Flying Squid in Both May & July



Gonatus middendorffi



Berryteuthis anonychus

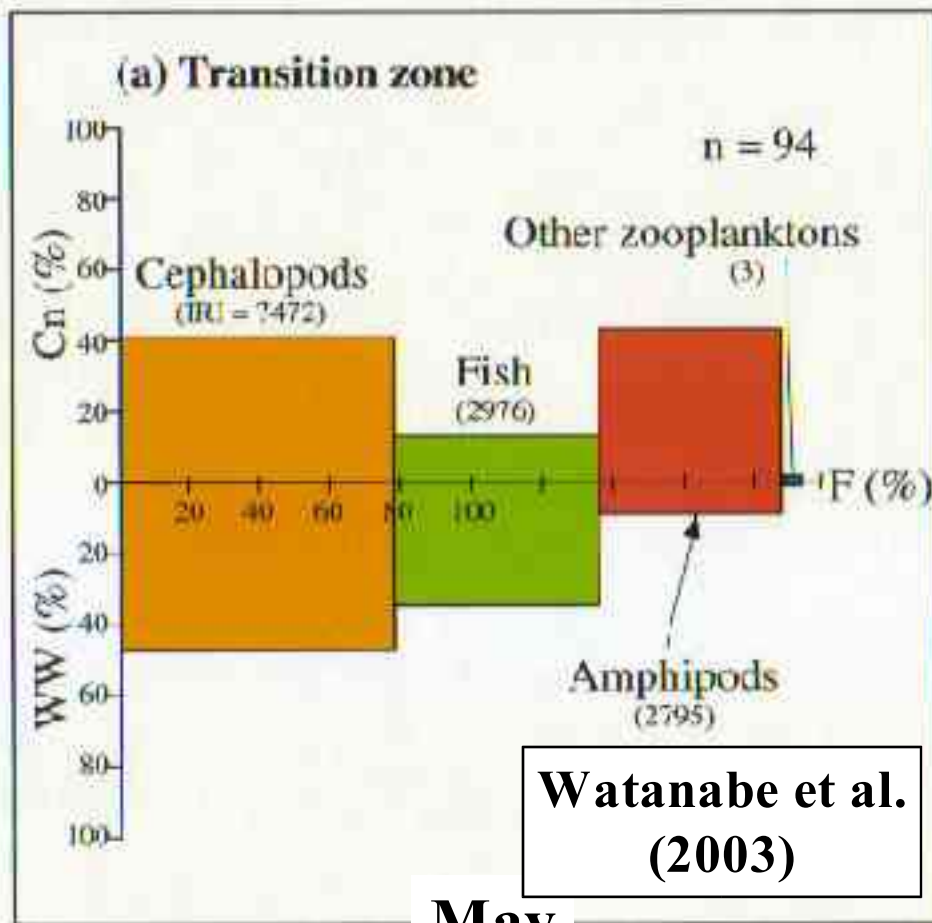


*Onychoteuthis
borealijaponica*

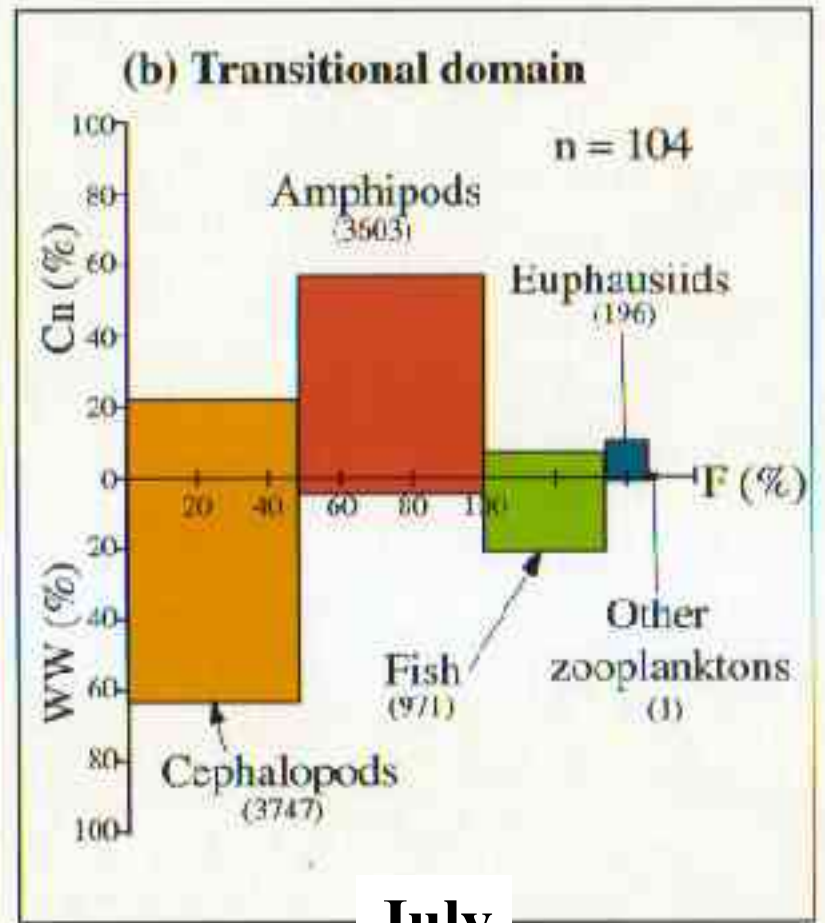
Juvenile of mid-sized squids
(< 10 cm DML)

Watanabe et al.
(2004)

Prey of Pacific Pomfret (n = 198)



May



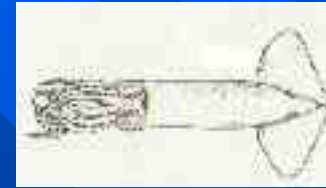
July

Main prey: Cephalopods, Fish, Amphipods
in both May & July

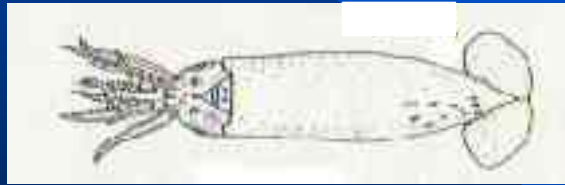
Main Squid Prey of Pacific Pomfret in Both May & July



G. middendorffi



G. borealis



B. anonychus



O. borealijaponica

Main squid prey of Pacific pomfret & neon flying squid are similar to each other in both May & July

Prey-predator Relationships in the Transition Region During Spring

Non-migratory mesopelagic squids



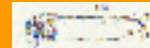
Large sized migratory squids (30-50 cm)



Mid-sized migratory squids (15-30 cm)



Juvenile of mid-sized squids (< 10 cm)



Acknowledgements

- Dr John Sibert
Invitation to the PFRP Pl meeting
- Ms Dodie Lau
Arrangement the travel for PERP Pl meeting
- Japan Marine Fishery Resource Research Center
Providing squid samples for DVM study
- Drs M Moku & T Wakabayashi
Discussion on ecology of prey cephalopods
- Drs M Sakai, T Tanabe, A Yatsu, & Mr K Uosaki
Discussion on predator's ecology