

**Patterns of distribution and biology  
of the North Pacific oceanic squid  
*Berryteuthis anonychus*  
with implications for the species life cycle**



**Oleg N. Katugin and Gennadyi A. Shevtsov**  
Pacific Research Fisheries Centre (**TINRO-Centre**),  
4 Shevchenko Alley, Vladivostok, Russia

# *Berryteuthis anonychus*

## Immature adult

- Epipelagic low-boreal
- Mantle length up to 15 cm
- Muscular body and arm crown
- Small fin
- 7 rows of radular teeth
- Tentacles are present
- No hooks on tentacles
- It preys on Amphipoda, Euphausiacea, Copepoda, Pteropoda, Ostracoda, Siphonophora, Chaetognatha
- It is preyed on by pomfret, Pacific salmon, albacore, marine mammals (cetaceans and seals), sea birds (murre, shearwaters), other squids



Strict



# Phylogeny of the Gonatidae

7-rowed

5-rowed

Strict consensus topology  
of combined data  
analyses

(12S, 16S, COI)

*Berryteuthis anonychus*

# Objectives:

- To look into the species distribution
- To look into the species size structure
- To consider size-at-maturity specific features
- To suggest a hypothesis on the species life cycle
- To get money for research in the near future
- Not to worry very much about distant future



## *Berryteuthis anonychus*

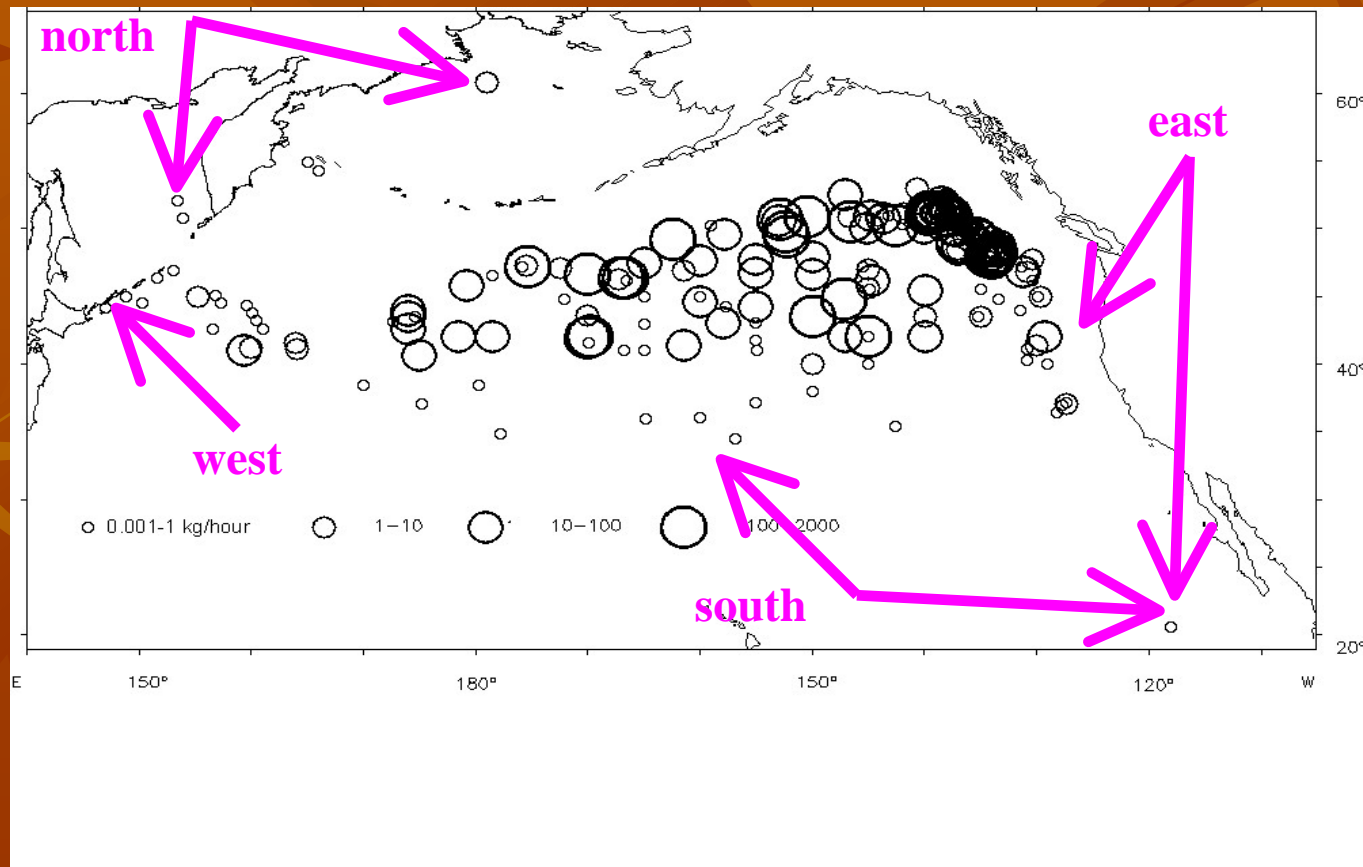
Research vessels, dates and regions for the squid collections in the North Pacific Ocean (CP – central; WP – western; EP – eastern)

Vessel	Date	Region
Birokan	April 1964	Off Mexico
Gissar	March-July 1984	CP, EP
Gnevnyi	May-June 1986	CP
Novodrutsk	July 1986	CP, EP
Pulkovskiy Meridian	July 1987	EP
Mys Tikhyi	November 1987 – January 1988	CP, EP
Poseidon	May-June 1988	CP, EP
Poseidon	July 1989	CP, EP
Novodrutsk	July 1991	EP
Darvin	December 1991	WP
Tankai Maru	August 1997	WP
Kaiyo Maru	July 2000	WP



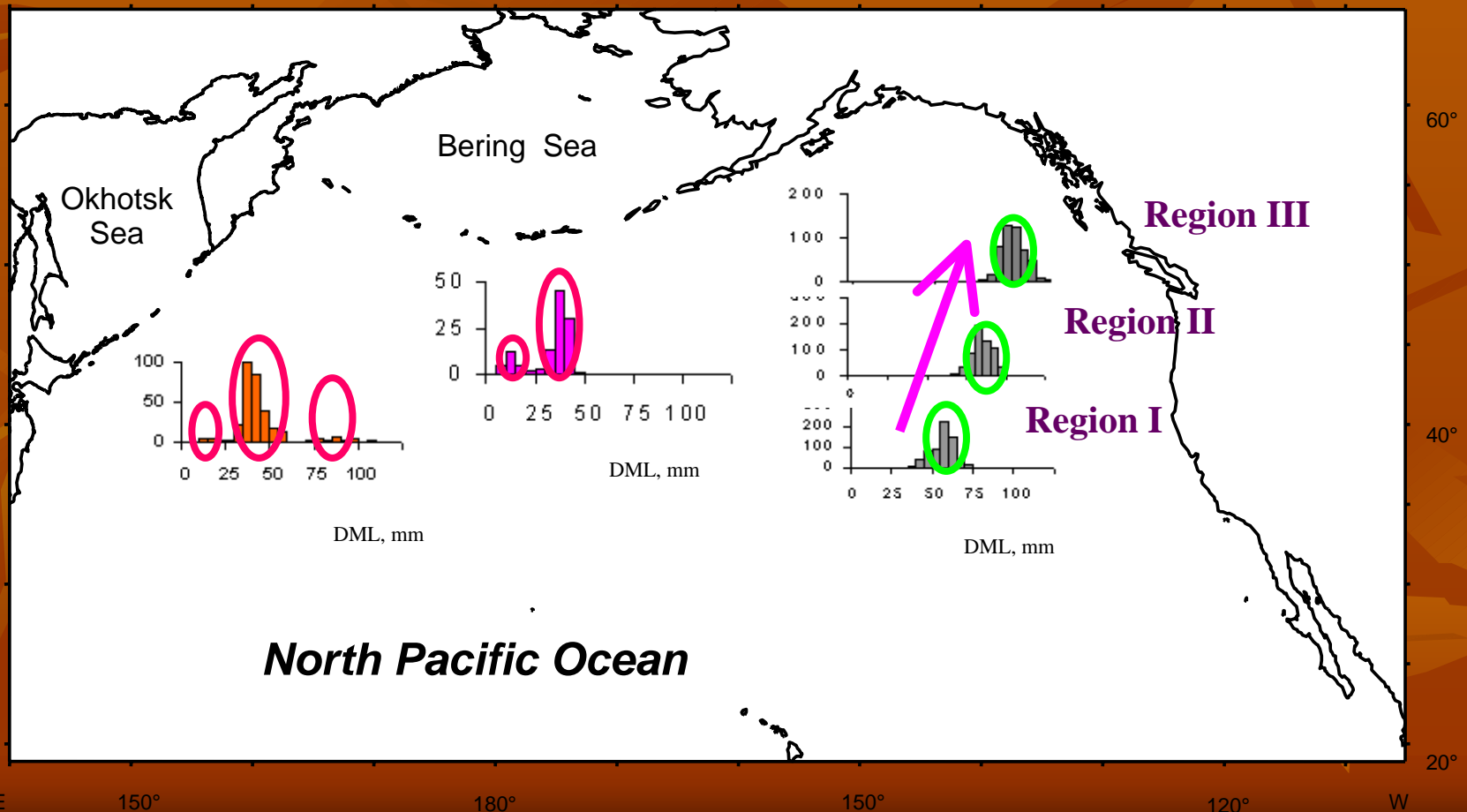
# *Berryteuthis anonychus*

Occurrence of the squid (catch in kg per hour trawling) across its geographical range in the North Pacific Ocean



# *Berryteuthis anonychus*

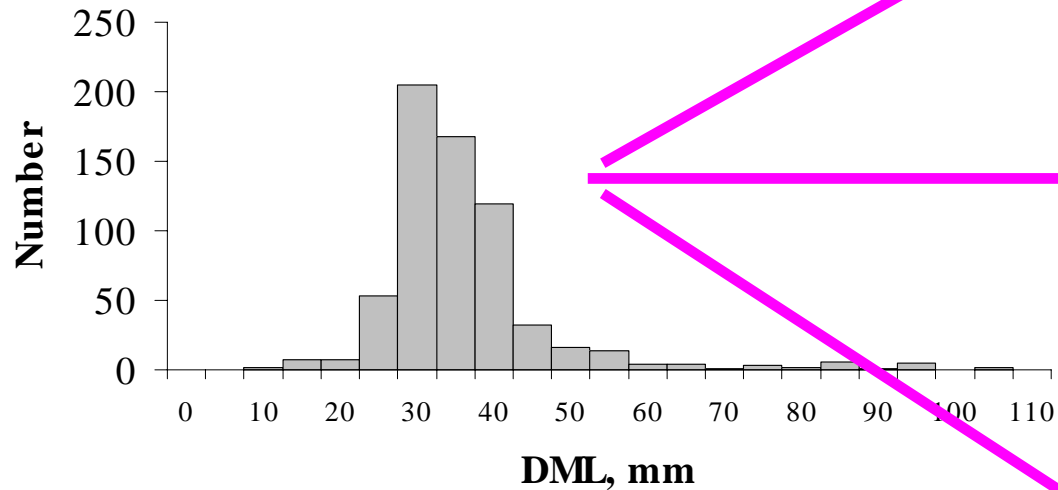
Frequency distribution for dorsal mantle length (DML) of the squid across its geographical range in the North Pacific Ocean



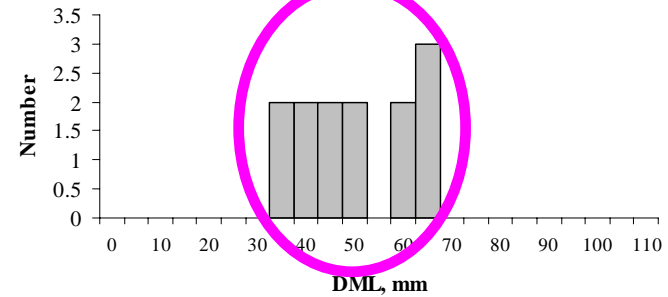
# *Berryteuthis anonychus*

## Size structure in the Northwestern Pacific Ocean

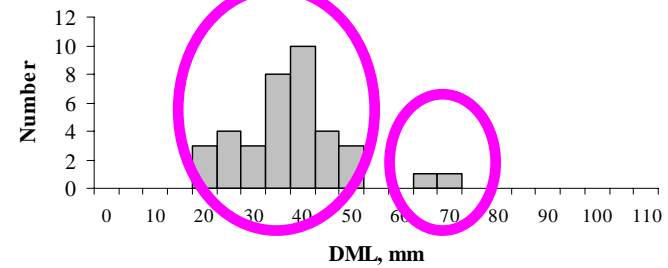
### Total



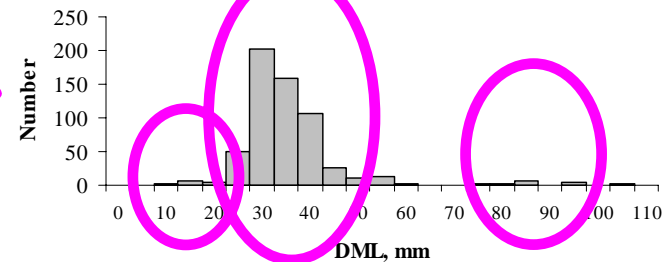
### Okhotsk Sea



### Pacific off Kurils



### Open waters

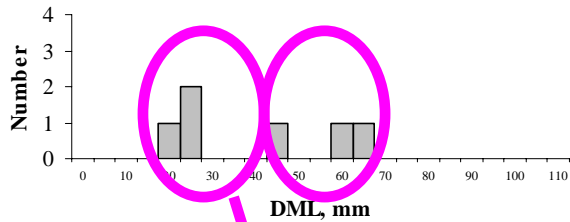




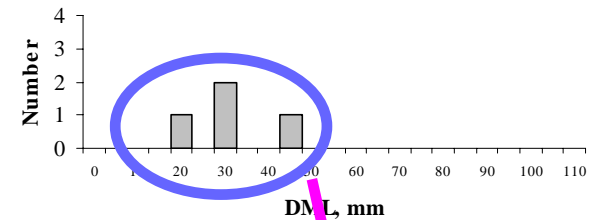
# *Berryteuthis anonychus*

## Monthly changes of the squid size structure in the Northwestern Pacific Ocean

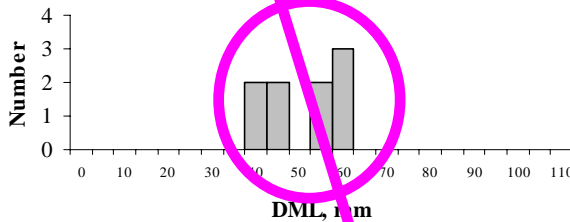
February



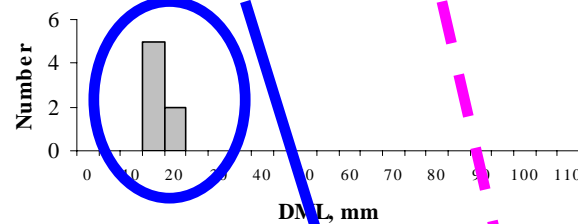
October



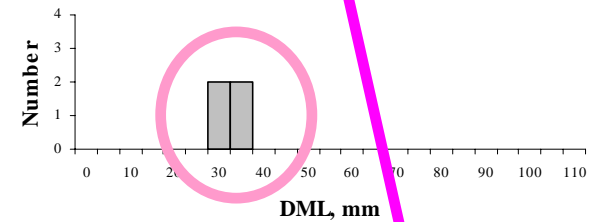
April



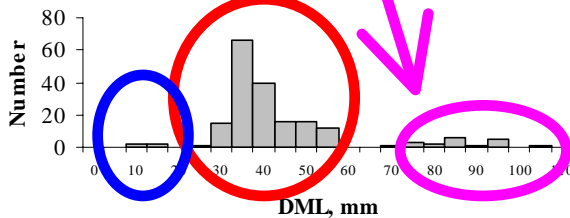
August



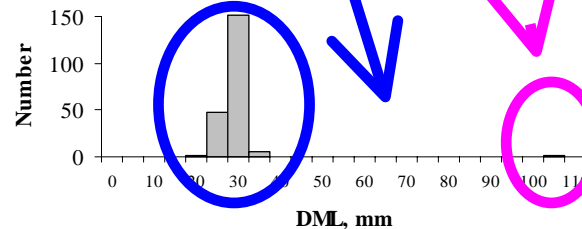
November



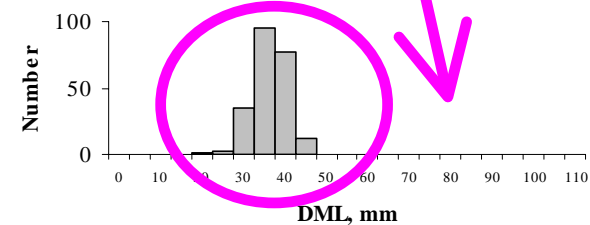
July



September

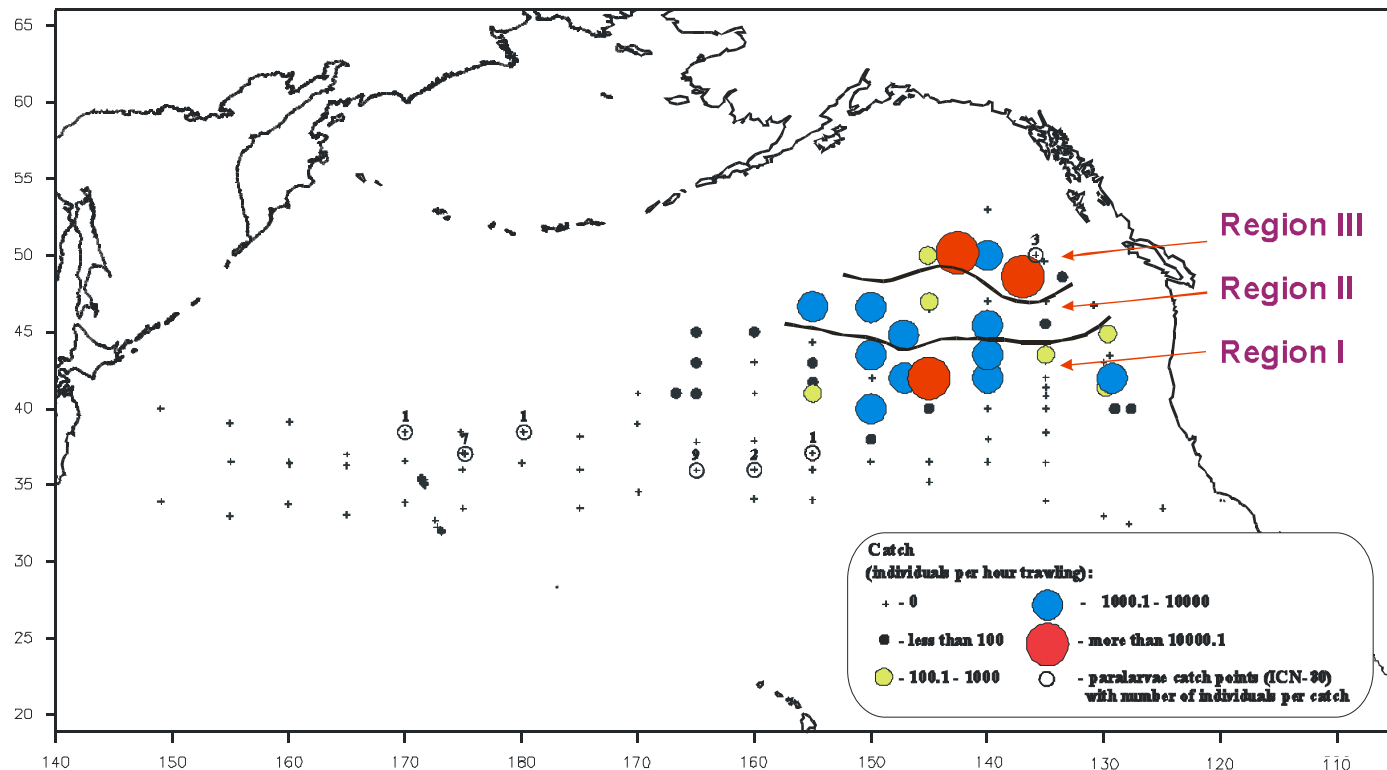


December



# *Berryteuthis anonychus*

Distribution of the squid catches basing on data collected during the survey on the research vessel "Poseidon" in the North Pacific Ocean in March-July, 1988



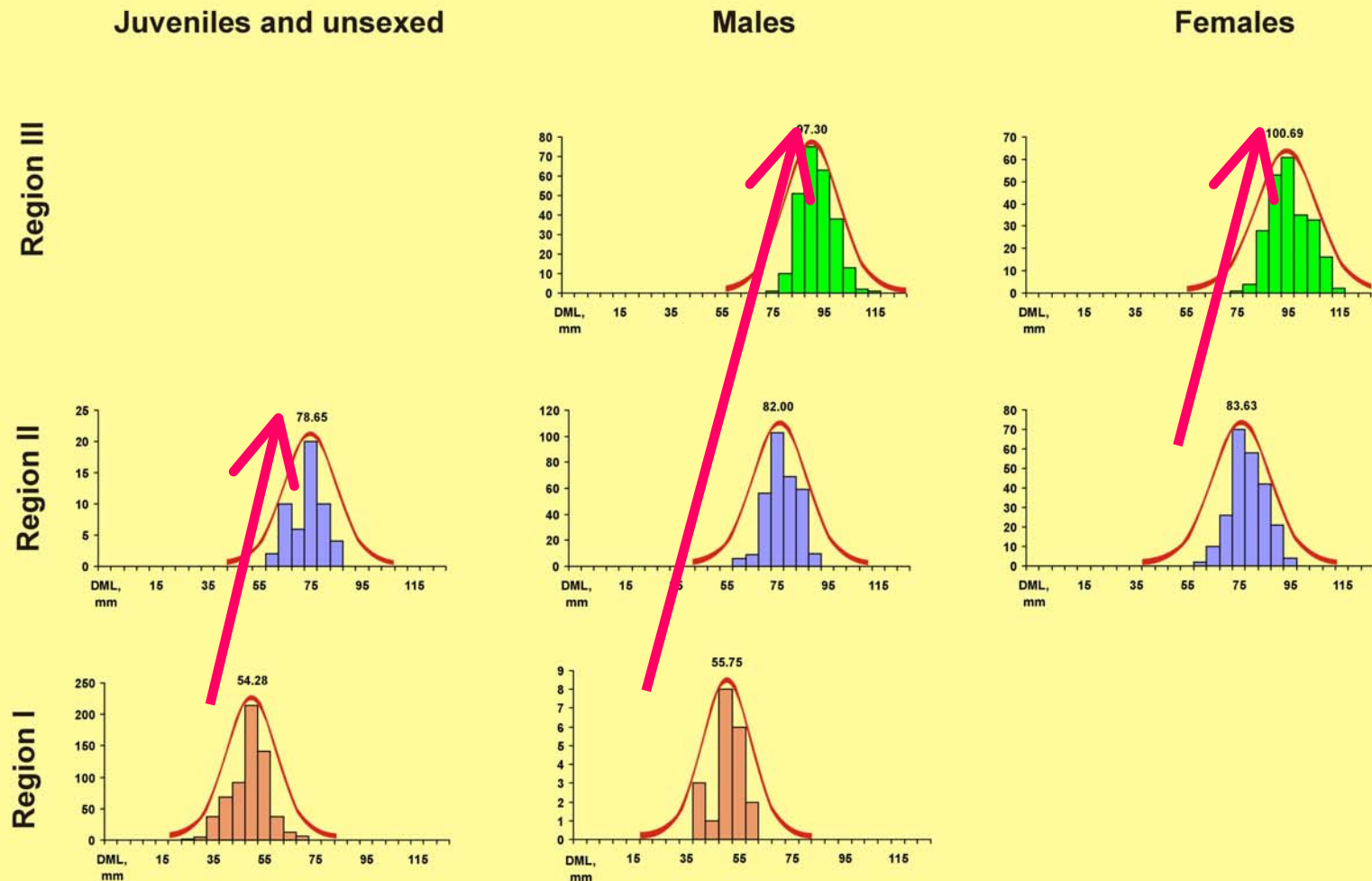
# *Berryteuthis anonychus*

## Biological characters of the squid in May-June, 1988, in the Eastern North Pacific Ocean

Group	Sex	Number	Mean DML, mm	Sexual maturity (%)			Sex Ratio
				Immature	Maturing	Mature	Females/Males
Southern	Juveniles	500	51.72	100	-	-	-
Central	Juveniles	19	75.59	100	-	-	1:1.28
	Females	181	81.32	100	-	-	
	Males	232	79.40	46.6	53.4	-	
Northern	Females	228	100.60	57.5	42.5		1:1.03
	Males	234	96.26	8.6	81.6	9.8	

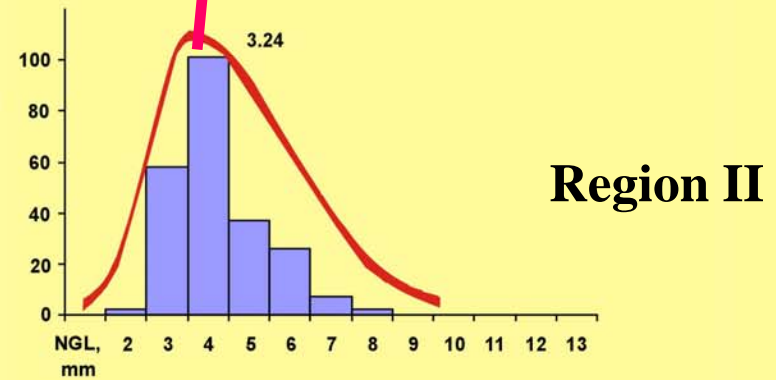
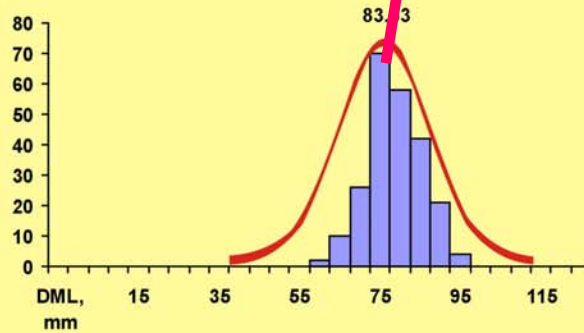
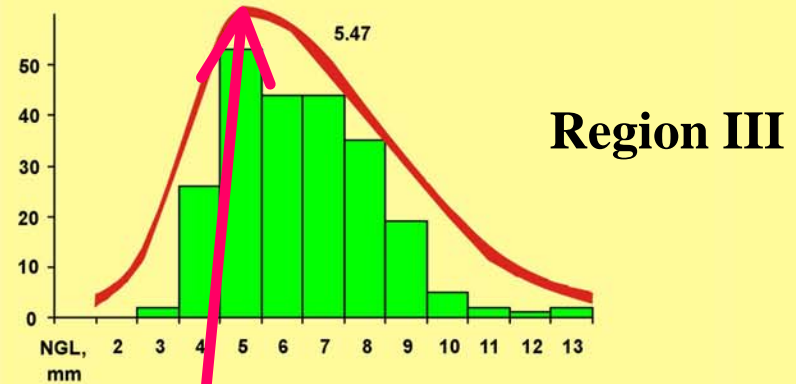
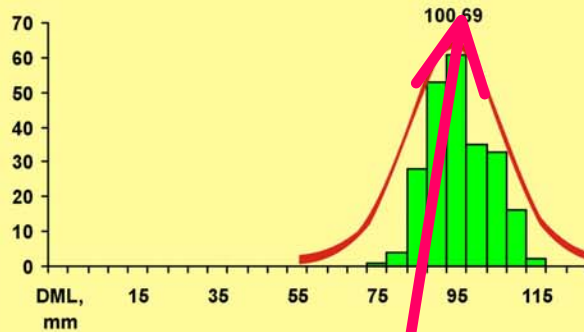
# *Berryteuthis anonychus*

## Size frequency distribution of the squid by sex and region in the eastern North Pacific Ocean



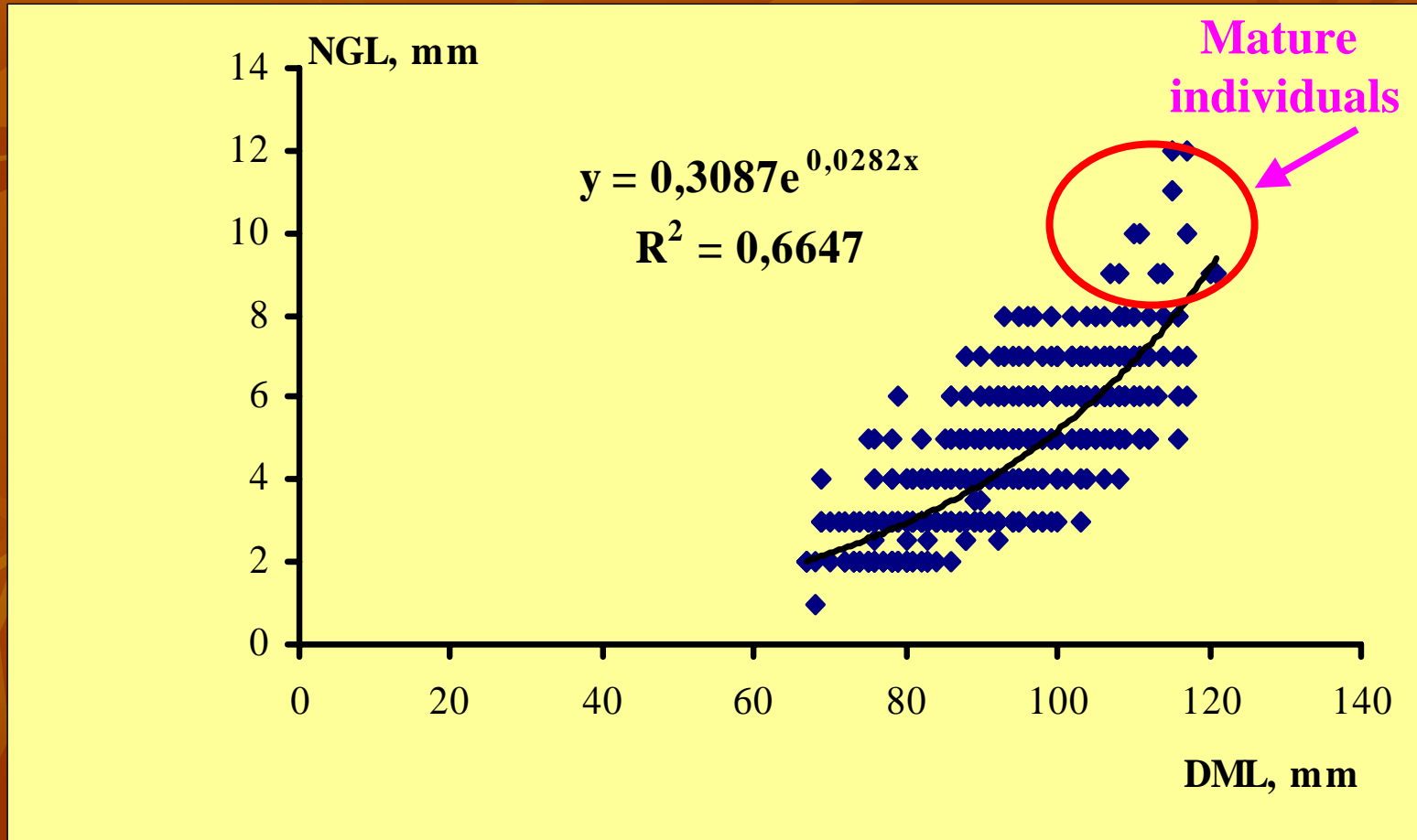
# *Berryteuthis anonychus*

Dorsal mantle length (DML) and nidamental gland length (NGL) distributions in females from two regions in the eastern North Pacific Ocean



# *Berryteuthis anonychus*

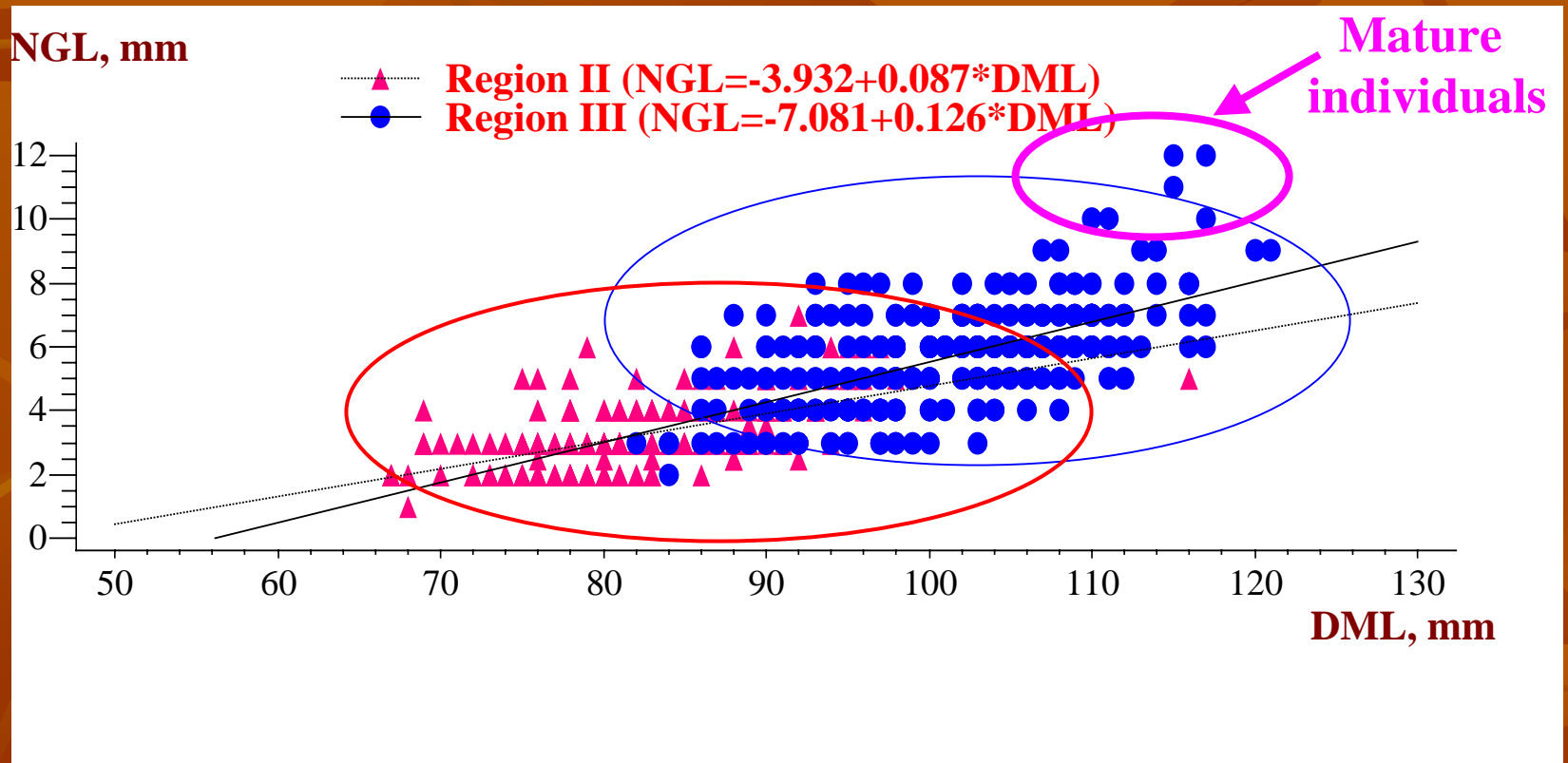
Relationship between body size (DML – dorsal mantle length) and a metric measure of sexual maturity (NGL – nidamental gland length)





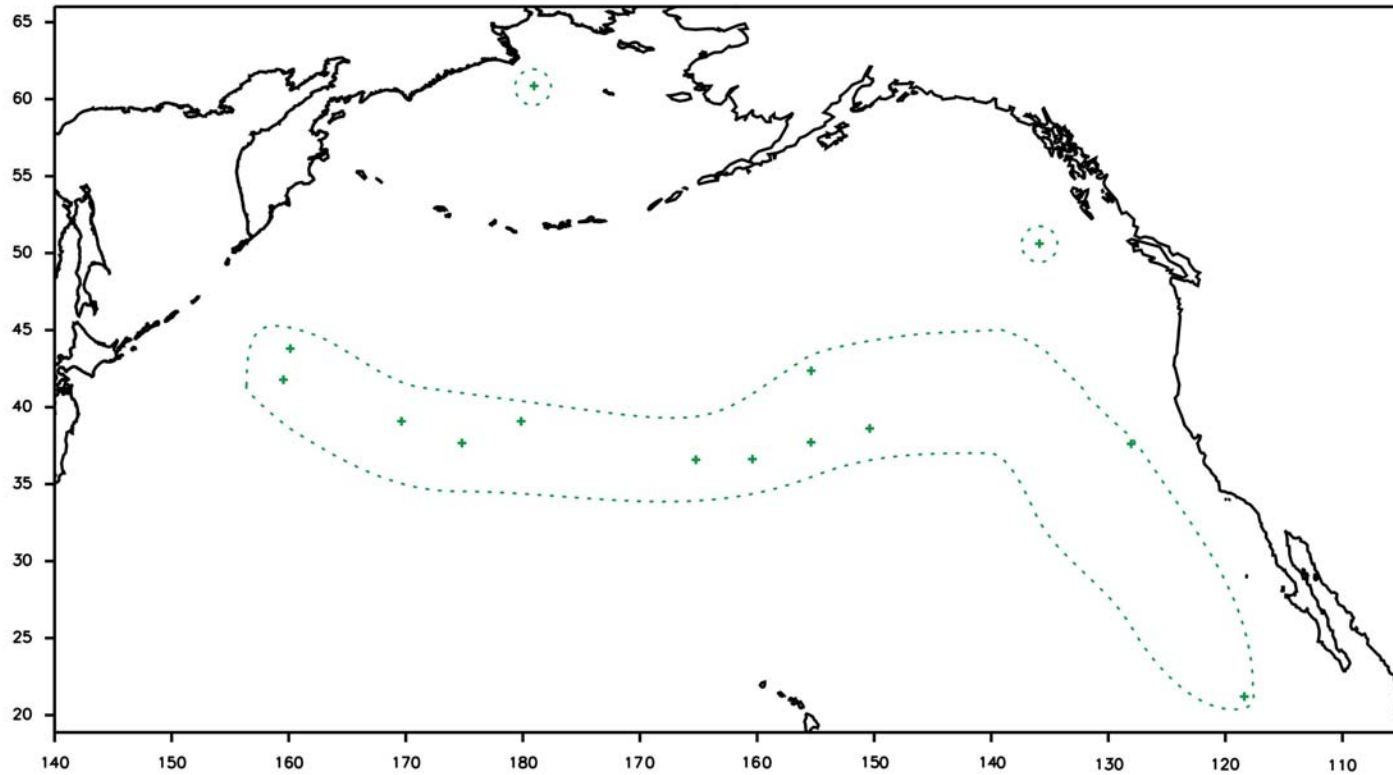
# *Berryteuthis anonychus*

Regression of nidamental gland length (NGL) on dorsal mantle length (DML) for females of the squid from the Regions II and III of the eastern North Pacific Ocean



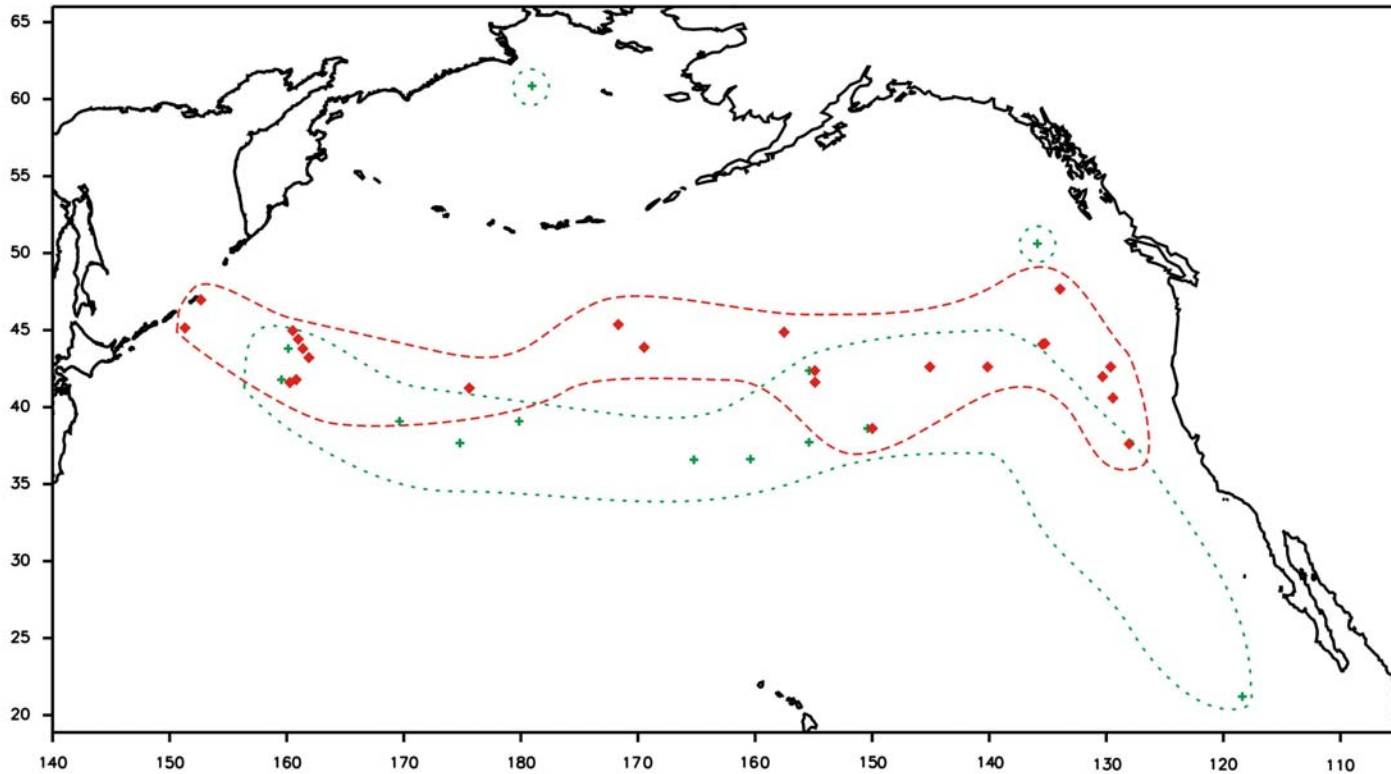
# *Berryteuthis anonychus*

Distribution of the squid successive ontogenetic stages across the species geographical range in the North Pacific Ocean (paralarvae)



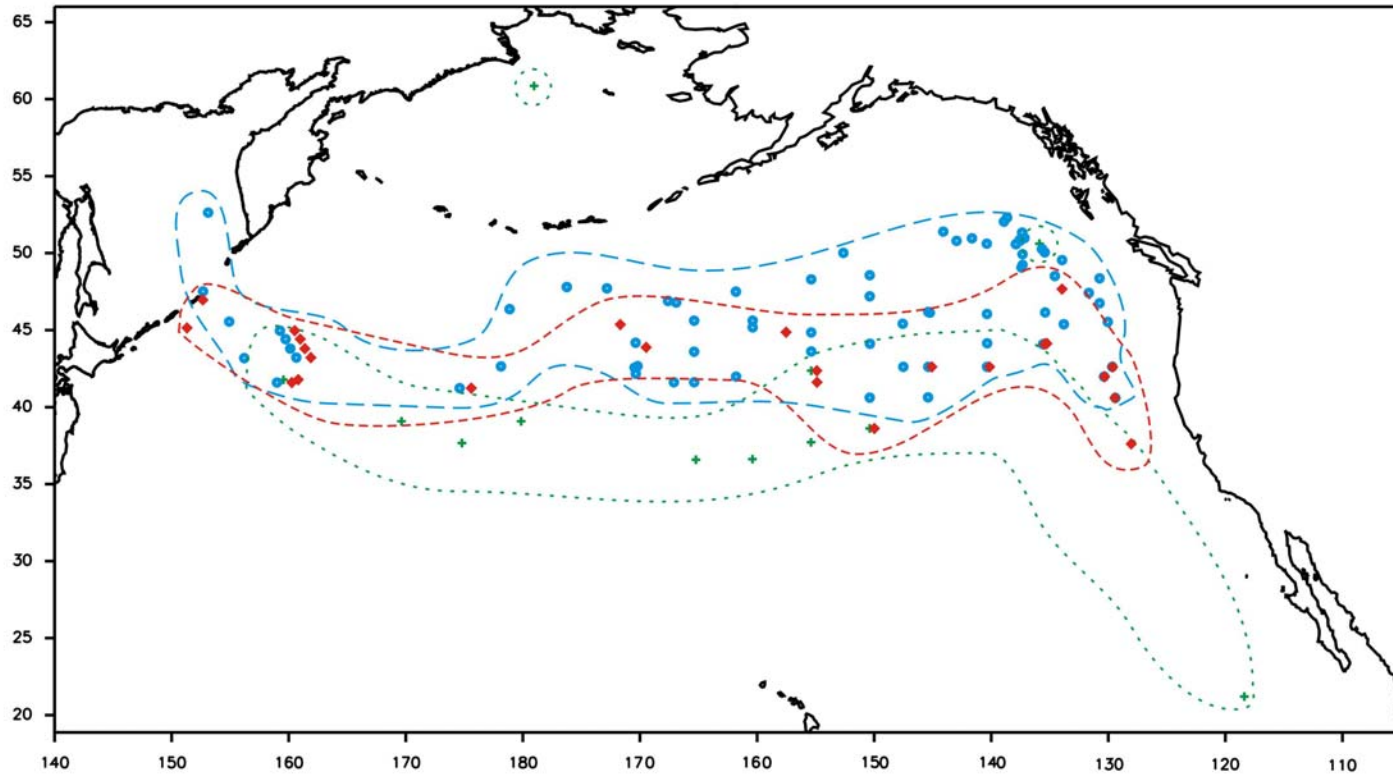
# *Berryteuthis anonychus*

Distribution of successive ontogenetic stages for the squid across its geographical range in the North Pacific Ocean (juveniles of up to 40 mm mantle length)



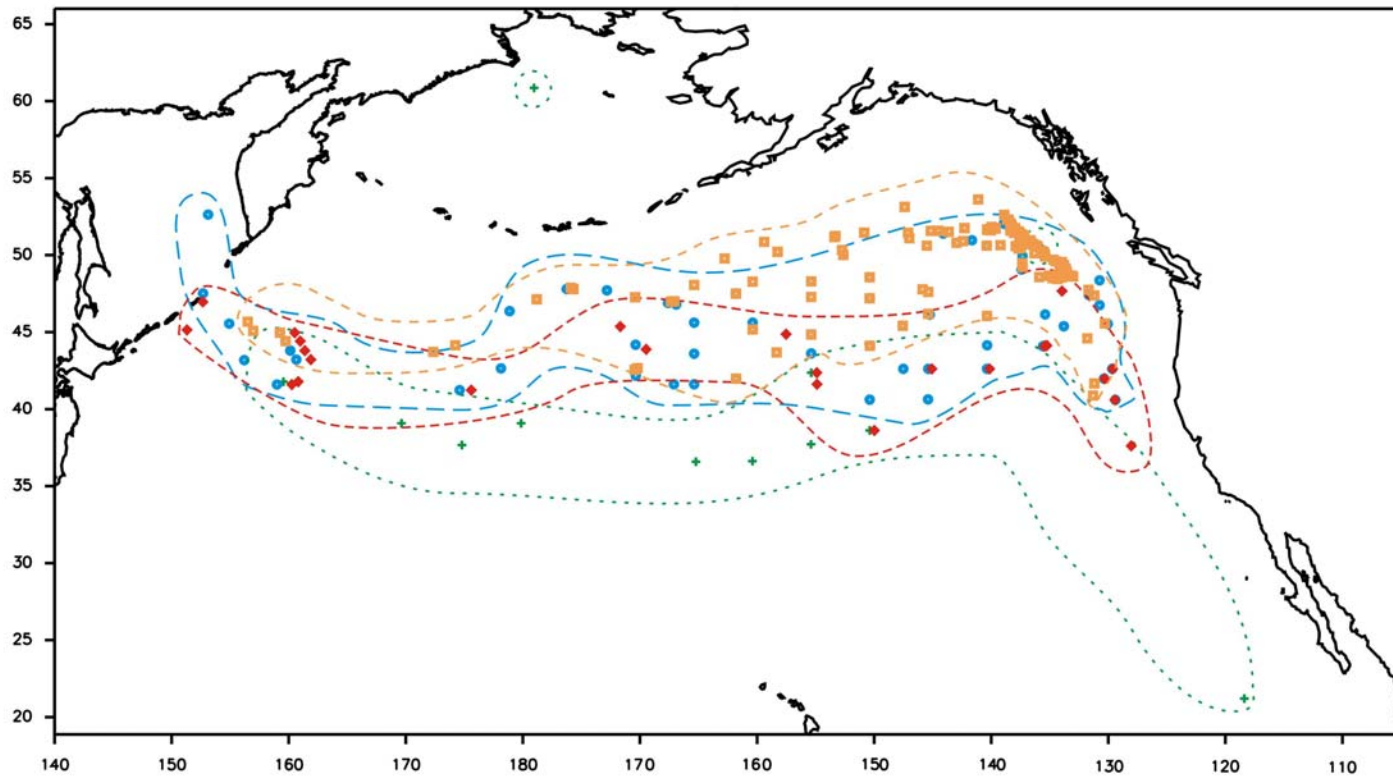
## *Berryteuthis anonychus*

Distribution of successive ontogenetic stages for the squid across its geographical range in the North Pacific Ocean (juveniles and immature adults of up to 80 mm mantle length)



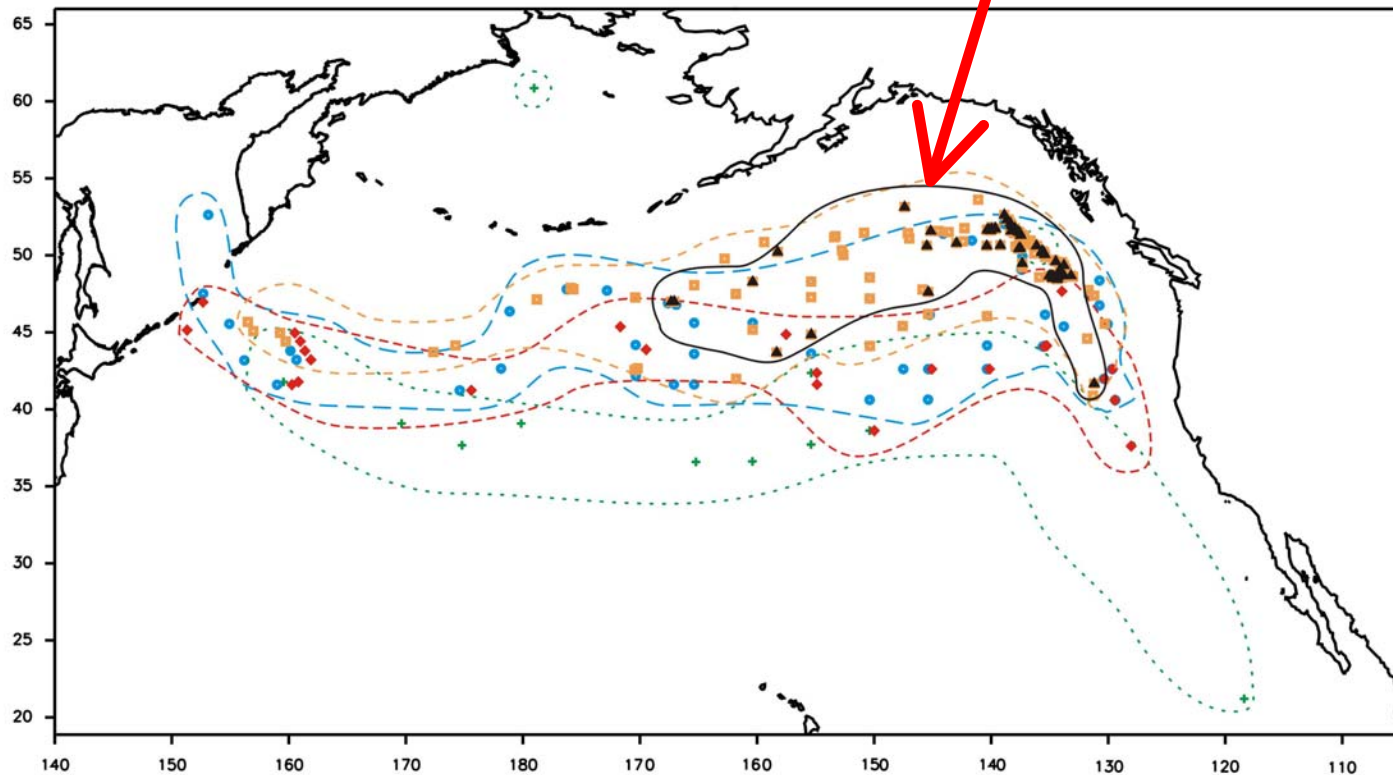
## *Berryteuthis anonychus*

Distribution of successive ontogenetic stages for the squid across its geographical range in the North Pacific Ocean (immature and maturing adults up to 110 mm mantle length)



## *Berryteuthis anonychus*

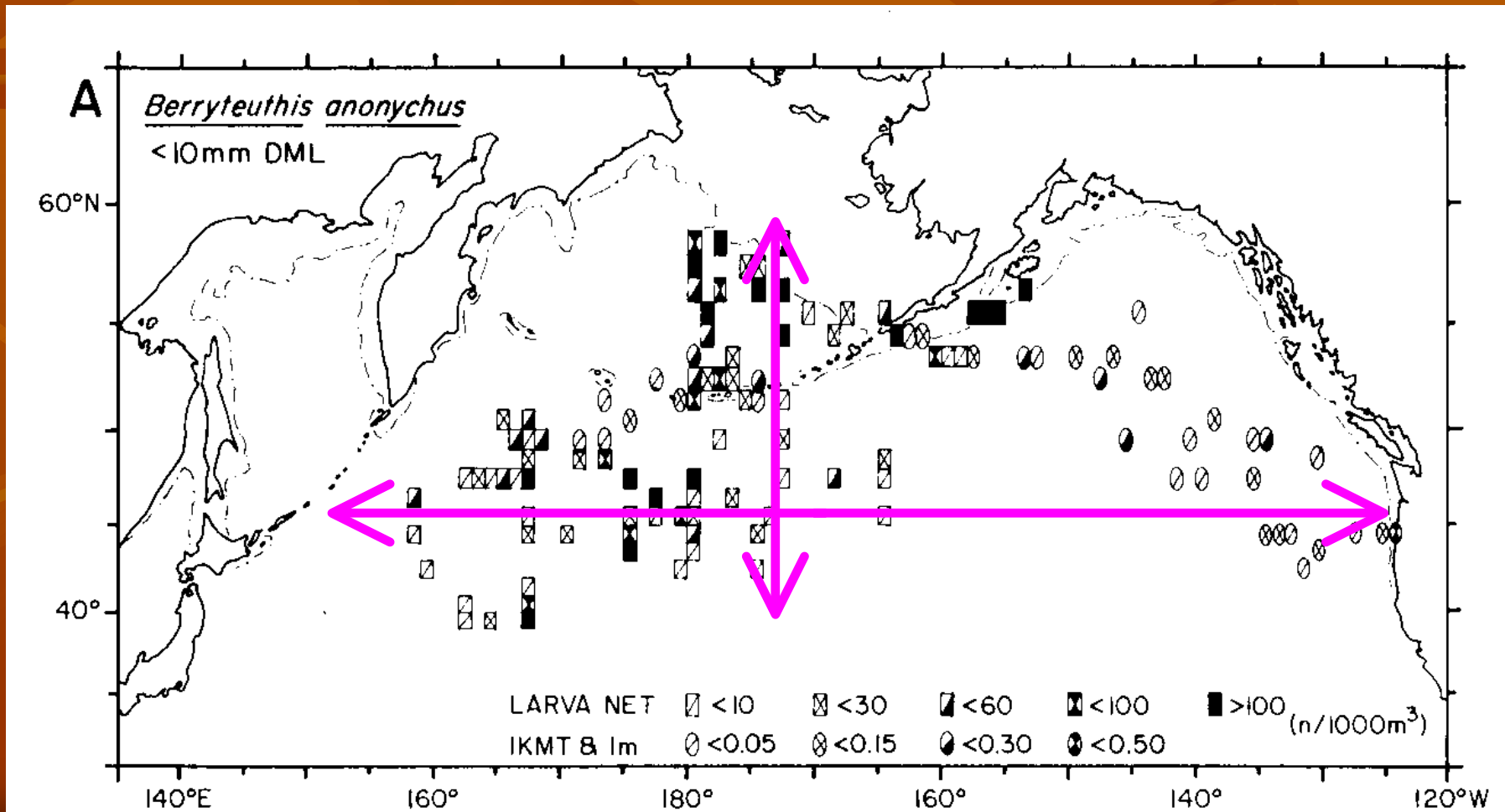
Distribution of successive ontogenetic stages for the squid across its geographical range in the North Pacific Ocean (all size classes, with those over 110 mm mantle length)





# *Berryteuthis anonychus*

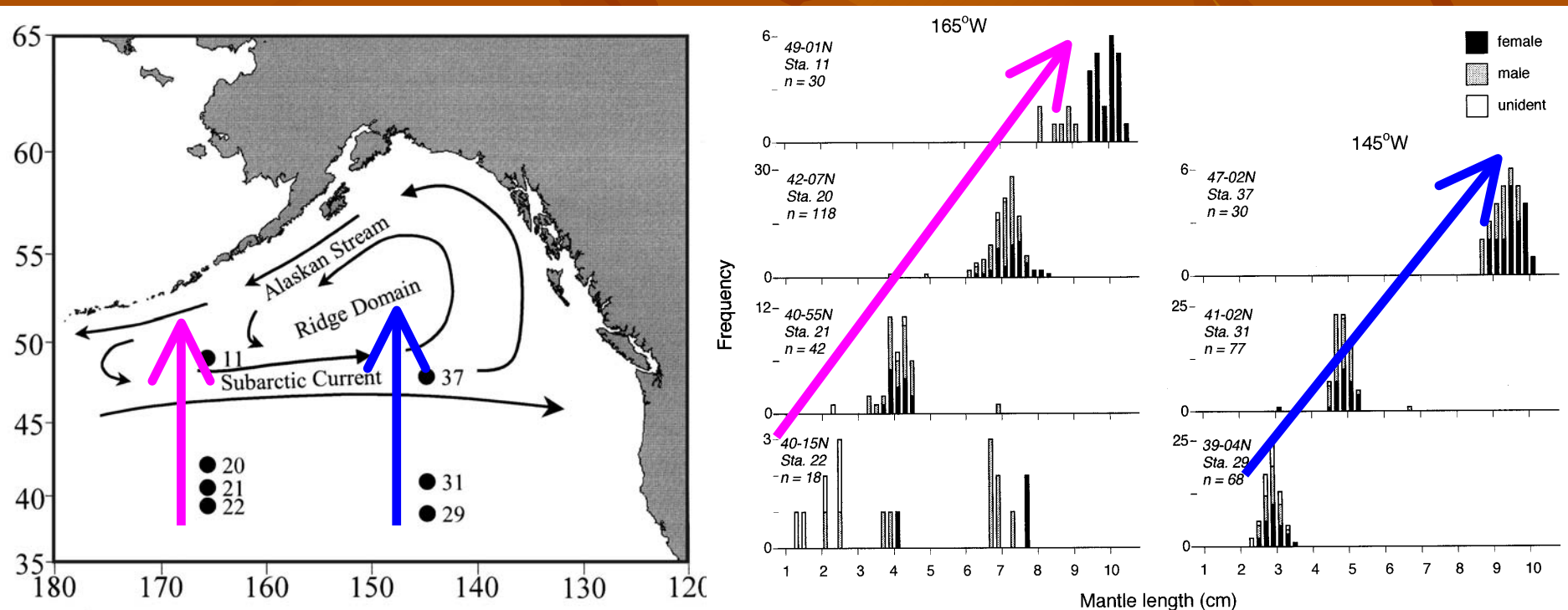
Distribution and abundance of the squid paralarvae caught in larva net and IKMT (from Kubodera and Jefferts, 1984)



# *Berryteuthis anonychus*

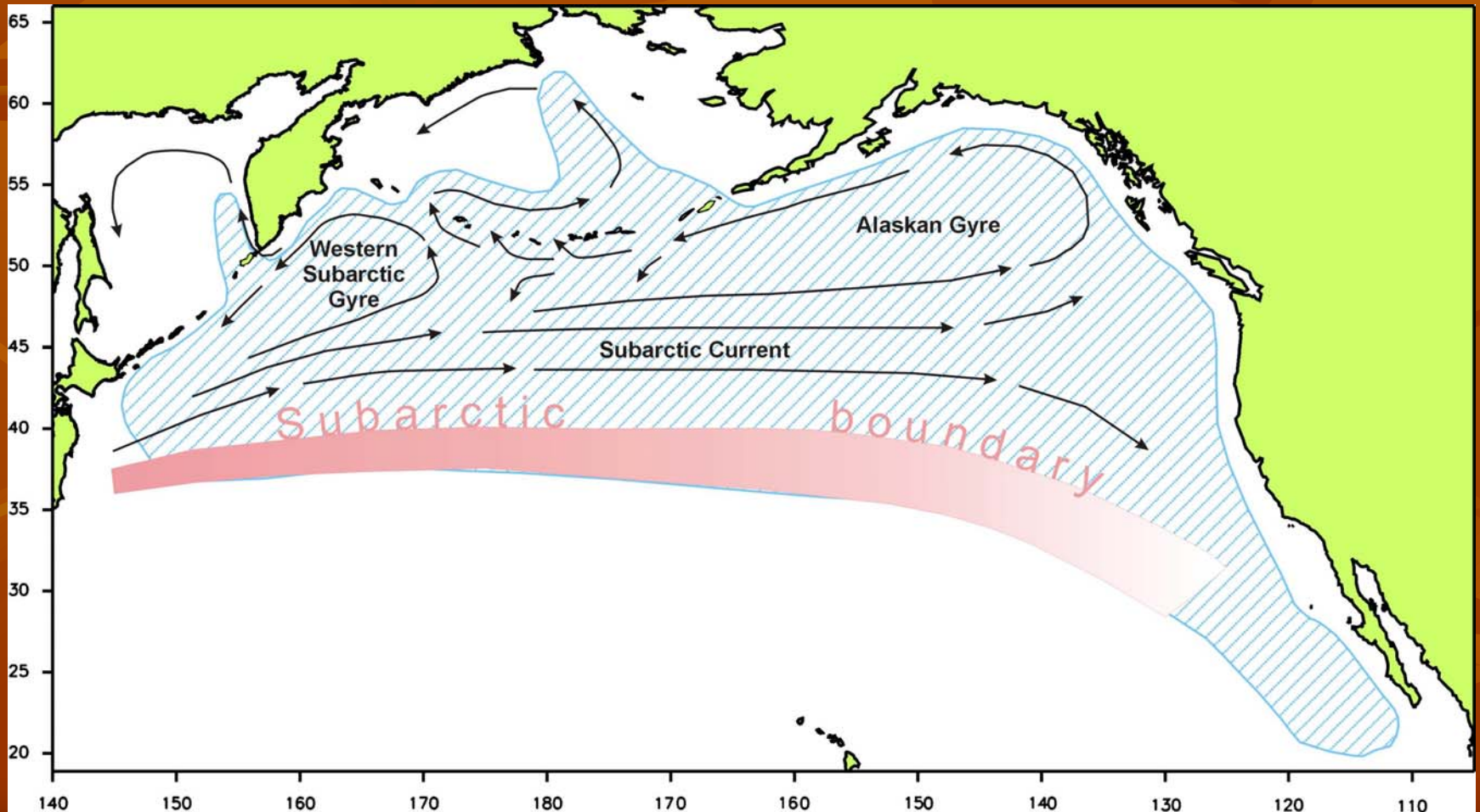
Data from Bower et al., 2002

“Latitudinal gradients in body size and maturation of *Berryteuthis anonychus* (Cephalopoda: Gonatidae) in the northeast Pacific” (The Veliger 45(4): 309-315)



# *Berryteuthis anonychus*

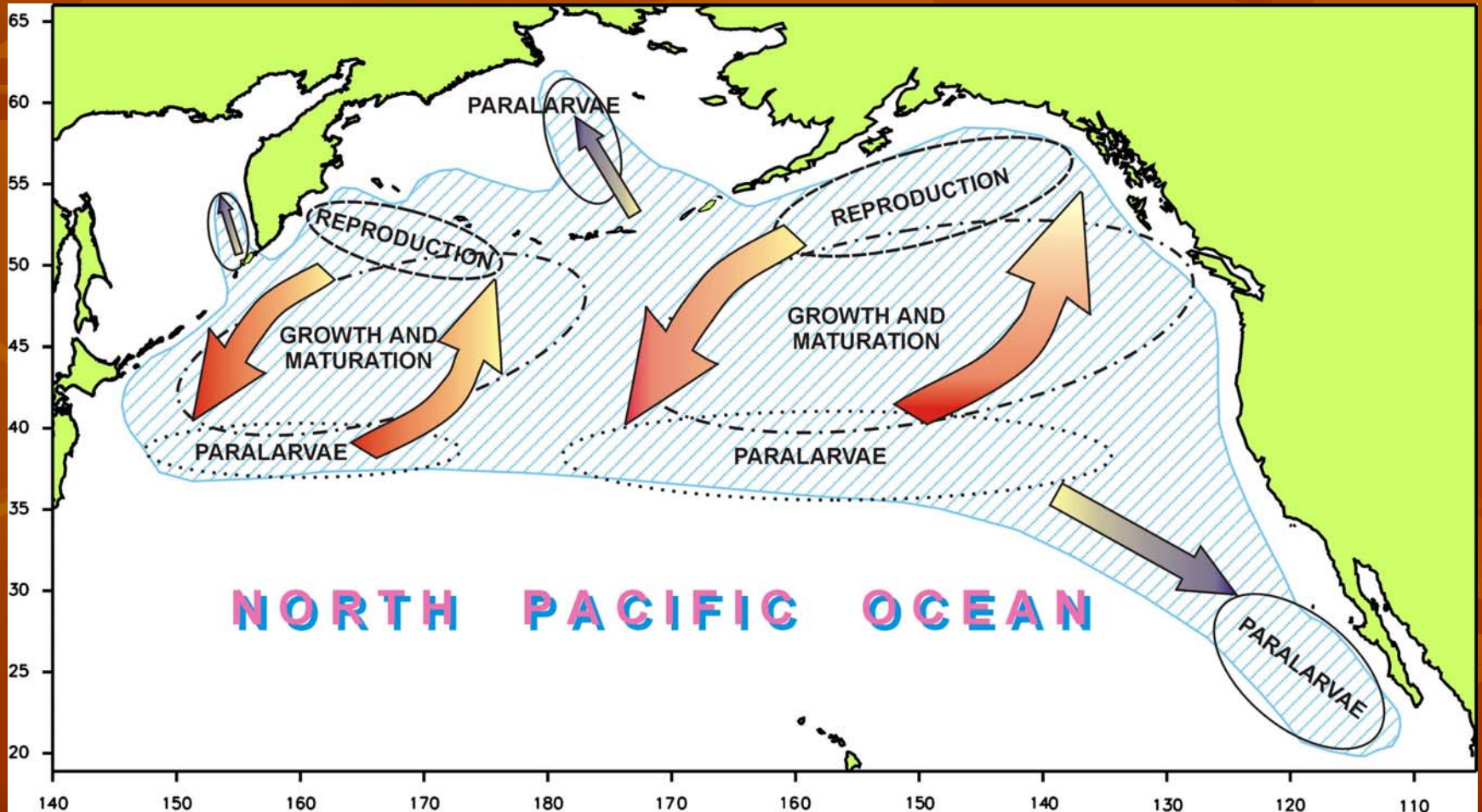
The species geographic range, and general scheme of currents in the North Pacific Ocean.





# *Berryteuthis anonychus*

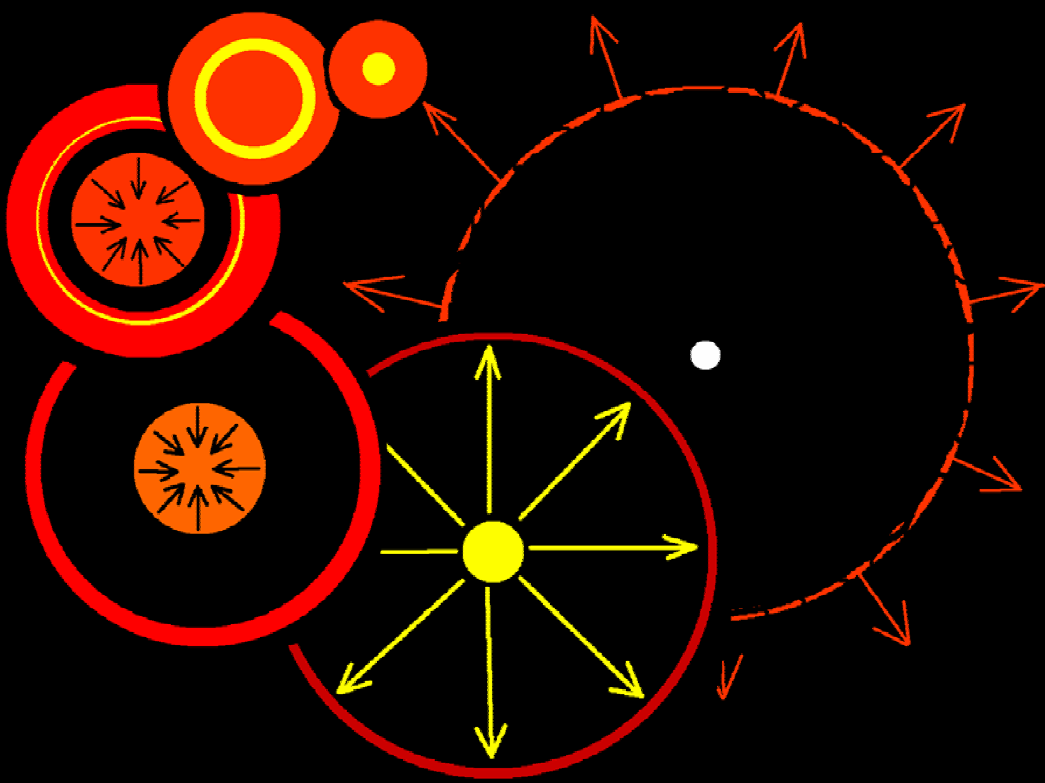
Functional structure of the species geographic range based on distribution patterns of life cycle stages.



# Results:

- the species range covers almost entire North Pacific Ocean to the north of the Subarctic Boundary, and also includes marginal basins (Bering and Okhotsk seas)
- polymodal size structure is related to size-at-maturity features and is observed in the western and central-eastern parts of the species range; certain seasonal changes in size structure have also been observed
- a hypothetical scheme of the species life cycle has been suggested
- Joint efforts of PICES countries should be applied in order to improve our understanding of this highly abundant species

# How about the distant future?



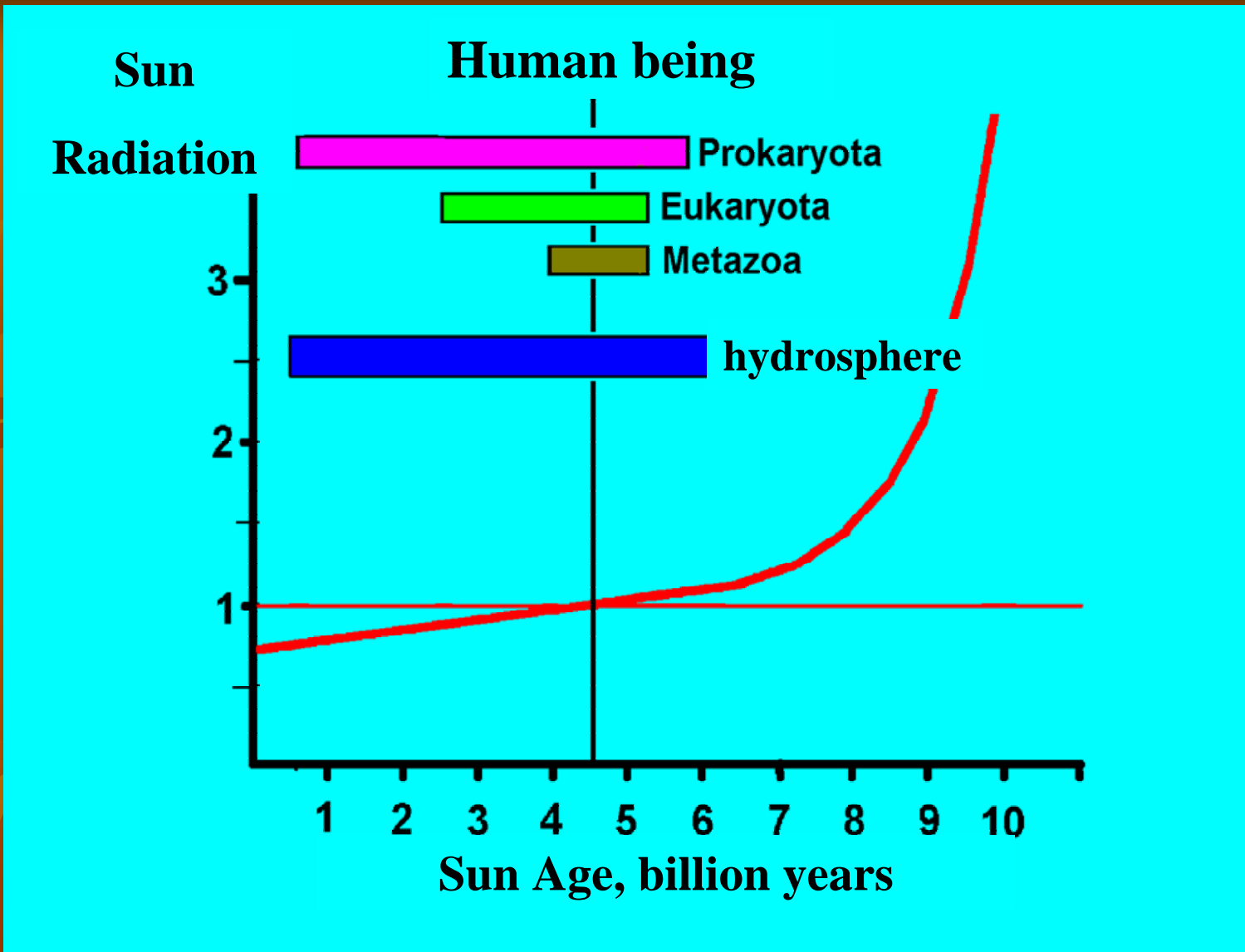
**Stony planet**  
**(the Earth)**

**White dwarf**  
**(the Sun)**



...long before the  
apocalyptical death of our  
planet and the Sun





**And after the mankind will become extinct...**

**but life on the Earth will go on...**

**Cephalopods will begin to invade the land ...**







And they will finally  
reign on our planet

in different habitats

...

Squibbon



... and in  
different forms

...



So why not to pay more tribute to them and study this group of marine (ICES, PICES) animals more scrupulously now, while **We** govern our mother Earth



**Thank you!**

