



# VERTICAL DISTRIBUTION OF *EUPHAUSIA PACIFICA* OFF THE CENTRAL OREGON COAST



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## Introduction

During summer upwelling off Oregon, water flows offshore above 20m and onshore below 20m over most of the continental shelf. Therefore, vertical distribution of animals will affect their horizontal distribution and their ability to retain themselves in the system. Ontogenetic differences in vertical distribution may play an important part in the cross-shelf zonation of animals.

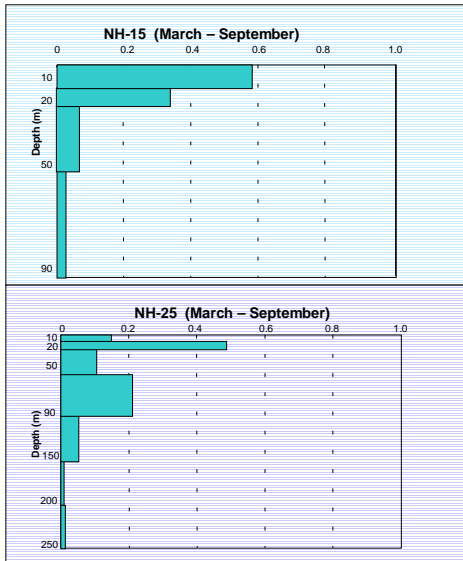
As part of the GLOBEC NEP LTOP and Mesoscale/Process studies, we have been studying euphausiids to learn more about their vertical distributions and population dynamics. *Euphausia pacifica* is the dominant euphausiid in oceanic waters off Oregon. It is an important prey species for many fishes, birds, and whales, but little is known about its life history off the Oregon coast. The life history of *E. pacifica* includes a pelagic egg, 3 naupliar stages, 3 calyptopis stages, 7 furcilia stages, and a juvenile stage, before reaching adult.

We use a MOCNESS (335µm mesh) to collect vertically-stratified samples at stations across the continental shelf. In the laboratory, samples are sorted for euphausiids, *Neocalanus* copepods, amphipods, siphonophores, chaetognaths, pteropods, and ctenophores. All animals are counted and measured for trawling of acoustical measurements; euphausiids and *Neocalanus* are sorted by sex, species, and life-history stage to examine ontogenetic differences in vertical distribution.

Here we examine the ontogenetic differences in vertical distribution of *E. pacifica* at an on-shelf station (NH-15, 90m water depth) and an off-shelf station (NH-25, 295m water depth) from the Newport Hydrographic Line (44.7°N) from 5 cruises conducted during 2000. (An additional June cruise was conducted in 2000, but it is not presented here because the zooplankton was dominated by salps and virtually no euphausiids were collected.) Unfortunately, NH-15 was always occupied during day whereas NH-25 was always occupied at night, so cross-shelf comparisons with these samples is difficult.

## Euphausiid eggs

Expressed as mean proportion of eggs found at each depth.



## Conclusions

•Ontogenetic differences in vertical distributions of *E. pacifica* were seen:

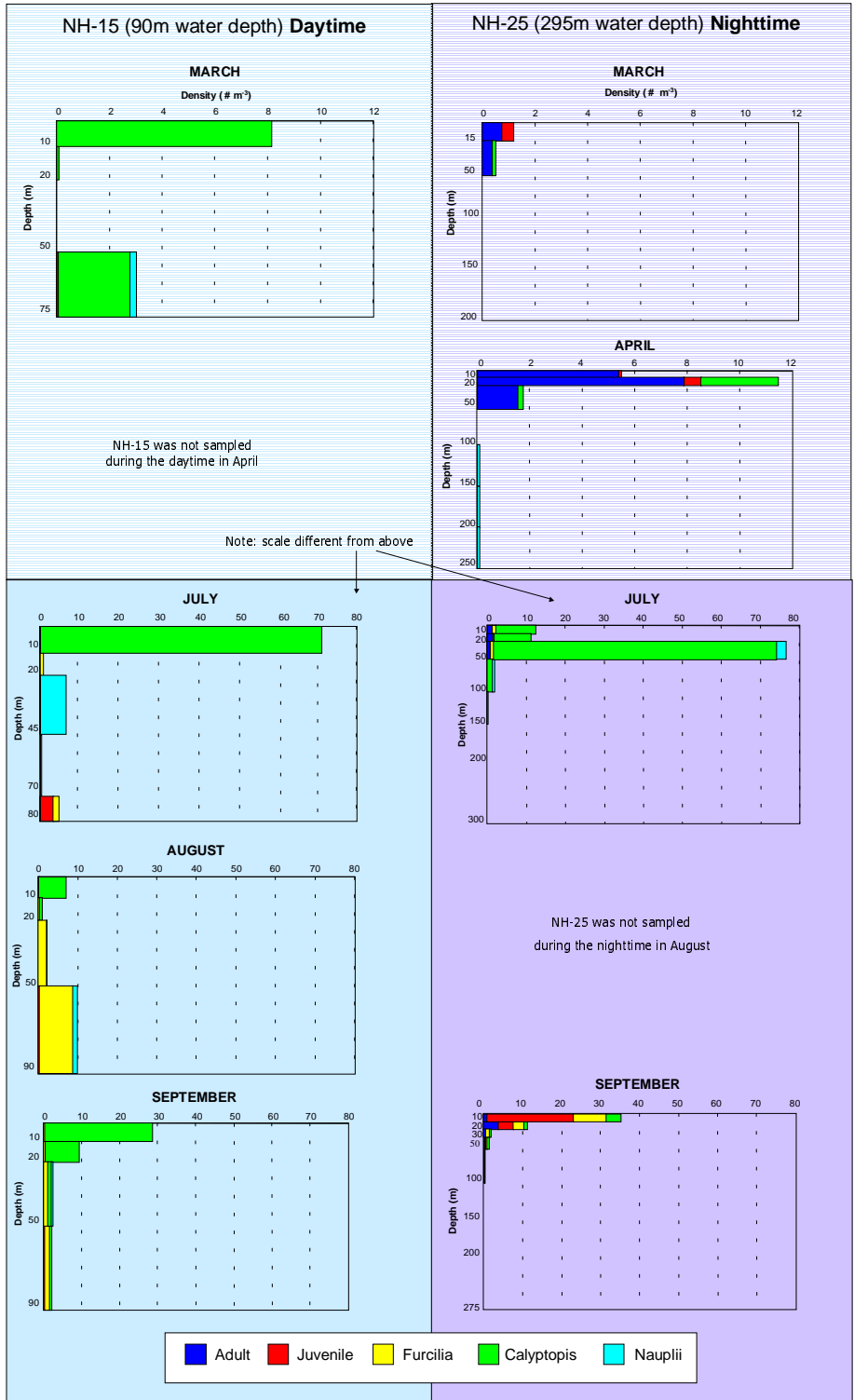
- Eggs tended to be in highest density near surface.
- Nauplii were rarely collected in high numbers, but when they were, tended to be at mid-depths.
- Calyptopes were often the most abundant stage collected. They tended to be in the upper 10m, but their distribution was somewhat variable (see March NH-15).
- Furcilia are the first stage to show evidence of diel vertical migration: they were found in the mid and low depths during day (NH-15 samples) and near surface during night (NH-25 samples).\*
- Juvenile *E. pacifica* were rarely collected. When seen, they were near-bottom during day and near-surface at night.\*
- Adult *E. pacifica* were not collected at NH-15 during daytime, possibly because they were too close to bottom to be sampled by MOCNESS. At NH-25 at night, adults were in highest density in the upper 20m.\*

\*We hypothesize that relative depth distributions are the effect of diel vertical migration, but because NH-15 was only sampled during daylight and NH-25 was only sampled at night, we are not able to conclusively separate diel differences from cross-shelf (depth) differences with these samples.

•Seasonal patterns were observed: All pre-adult stages were more abundant in the summer than in the spring:

- Calyptopes were most abundant in July.
- Furcilia were most abundant in August.
- Juvéniles were most abundant in September.

•Cross-shelf differences in abundances and vertical distributions could not be evaluated with these samples because NH-15 was only sampled during daytime whereas NH-25 was only sampled at night.



## Future directions

- Examine and compare stations sampled during both day and night for better evidence of diel differences in vertical distributions.
- Identify sets of cross-shelf samples collected consistently during day or night to compare cross-shelf densities and vertical distributions without the complication of diel differences in both catches and distributions.
- Attempt to sample more consistently across the shelf during either day or night from now on.
- Examine samples from south of Cape Blanco to investigate north/south differences in distributions.
- Examine other species (such as *Thysanoessa spinifera* and *T. raschata*).
- Examine the relative age of eggs collected near-surface compared to those collected deeper to determine if eggs are spawned near-surface and sink as they age or if eggs are sometimes spawned at depth.