



2016 RESEARCH FINDINGS

in the School of **VETERINARY & LIFE SCIENCES**



(Photo: Uwe Kils)

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Krill — more than just whale food!

What are krill?

Krill, or euphausiids, are small crustaceans of the order Euphausiacea that spend their entire life as part of the plankton. They look similar to prawns, but have external fluffy gills.

There are 86 species of krill occurring in the world's oceans; they are found from polar waters to the tropics, and from shallow to deep oceanic waters.

Knowledge of krill diversity, distribution and abundance is important given that the west coast of Australia supports southern blue fin tuna, migratory baleen whale populations and globally important colonies of seabirds, all of which are known consumers of krill.

Where were krill investigated off WA?

The horizontal and vertical structuring of krill assemblages were studied from a series of plankton surveys with concurrent physical oceanographic sampling along the west and north-west coasts of Australia

(Figure 1). Krill were collected using a depth-stratified, opening-closing EZ net, and a Bongo net, which is towed obliquely through the water column (Figure 2).

How many krill species occur off WA and where are they distributed?

In total, 34 species of krill were found off WA; this is almost 40% of the world's total number of species! They included a mix of tropical, subtropical and temperate species, and five new records for the south-east Indian Ocean were discovered off WA. The dominant krill species off WA are *Euphausia recurva* (Figure 3), *Pseudeuphausia latifrons* and *Stylocheiron carinatum*. Tropical krill species can occur as far south as 34°S because of the southward flowing Leeuwin Current.

The number of species of krill increased further offshore, although total abundances tended to be higher in shelf waters. This was a pattern observed for all locations

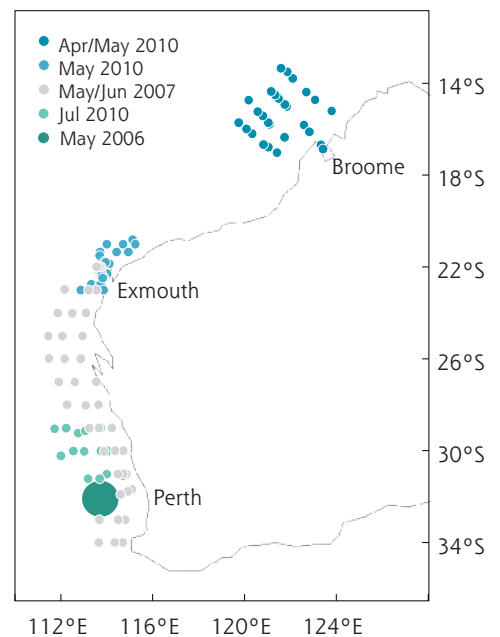


FIGURE 1 Plankton surveys off Western Australia used in the krill study

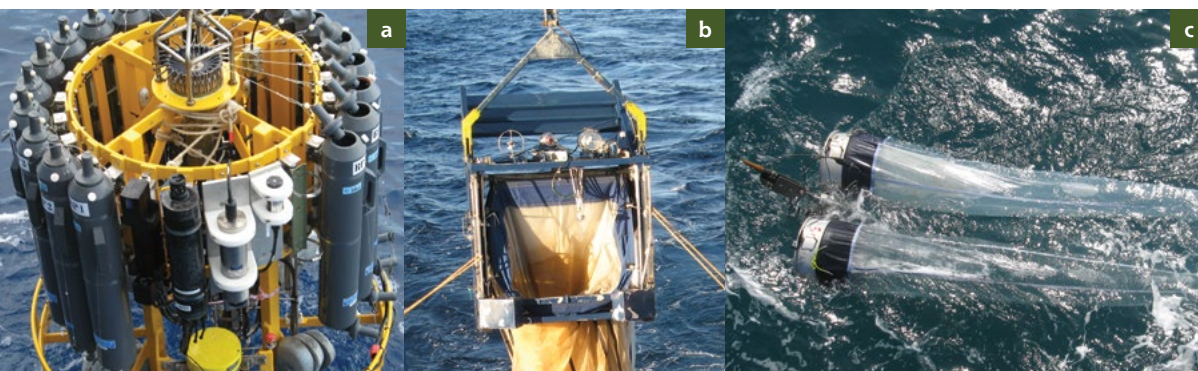


FIGURE 2 Sampling equipment used at sea to collect oceanographic data and zooplankton, such as krill
(a) Conductivity-temperature-depth (CTD) instrument and Niskin bottle rosette
(b) Multiple opening-closing EZ net
(c) Bongo net



FIGURE 3 *Euphausia recurva*, a dominant krill species in the south-west of Australia (Photo: A. Sutton)

surveyed between the north-west and south-west of Australia.

In total, 25 species were identified from the north-west, and across the latitudinal range of the Leeuwin Current (22°S – 34°S), 27 species were found. More subtropical and temperate water species were found in the southern reaches of the Leeuwin Current.

What is the Leeuwin Current and how does it influence krill?

The Leeuwin Current is an anomalous, poleward-flowing, eastern boundary current that transports warm, low salinity Tropical Surface Water southwards along the WA coast. The current is strongest during autumn and winter and, as the current flows south, it becomes cooler and more salty (Figure 4).

The change in temperature, salinity, and thus, density, of water along the WA coast also causes a change in the krill assemblages. Physical properties of the water masses were found to be the most important drivers of variability in krill assemblages across the WA coast.

What other environmental factors influence krill of WA?

The west coast of WA is generally nutrient poor, with limited upwelling during the winter months because of the strength of the Leeuwin Current. However, some sporadic and seasonal upwelling causing increased phytoplankton abundance does occur. At some places along the shelf, this coincides with an increased abundance of krill, particularly the coastal species, *P. latifrons*. Similarly, amounts of small

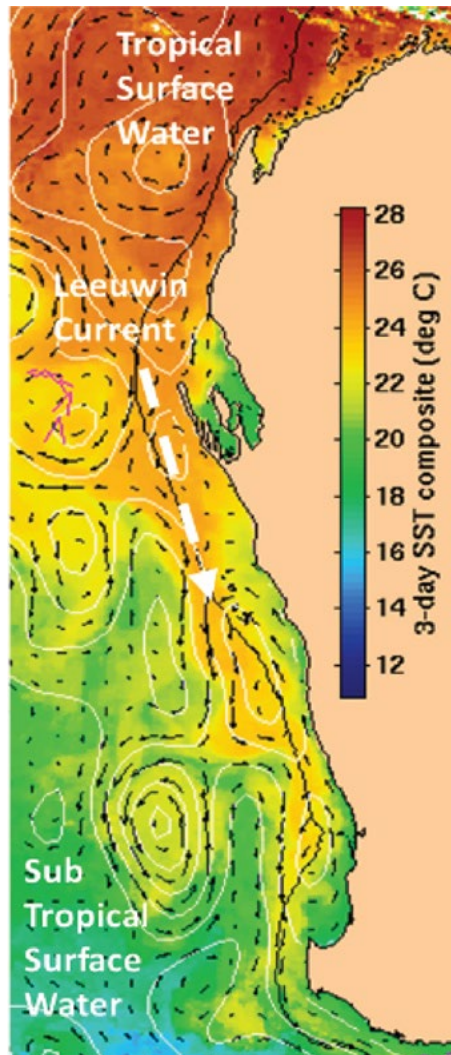


FIGURE 4 A sea surface temperature map showing the Leeuwin Current and dominant water masses during May 2011. From IMOS Ocean Currents

mesozooplankton prey also correlate with krill diversity, abundance and distribution. Some krill are adapted for predation on mesozooplankton, while others filter feed on phytoplankton, although a strong correlation with chlorophyll a was not evident.

Additional research on krill off WA includes the vertical structuring of krill assemblages across a temperature and salinity front, between two water masses, down to 200m depth.

The position of dominant krill species in the marine food web of the Perth Canyon was also investigated. Fatty acids and stable isotopes were used to link krill with prey items in the plankton, as well as their predators. ■

More information

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Publications

- 1 Sutton, A.L., Beckley, L.E., 2016. Influence of the Leeuwin Current on the epipelagic euphausiid assemblages of the south-east Indian Ocean. *Hydrobiologia*, DOI 10.1007/s10750-016-2814-7.
- 2 Sutton, A.L., Beckley, L.E., Holliday, D., 2015. Euphausiid assemblages in and around a developing anticyclonic Leeuwin Current eddy in the south-east Indian Ocean. *Journal of the Royal Society of Western Australia*, 98, 9–18.



FIGURE 5 Researcher, Dr Alicia Sutton, identifying krill specimens at the microscope (Photo: N. Dybing)



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