What do tuna look for in the deep sea?

SPC and the French Institute of Research for Development (IRD) joined forces to try to answer this question during the scientific cruise of the Nectalis 3. The cruise received support from the French Agency for Marine Protected Areas (AAMP).

The main objective of the cruise was to sample micronekton, the 2–20 cm-long fish, squids, crustaceans and gelatinous organisms that constitute part of the diet of tuna. Food availability is an important driver of the spatial distribution and quantity of tuna. Tuna move from one area to another in search of food to maintain their high energetic needs. Understanding where the tuna prey food is located will help understand the movements of tuna and the ups and downs observed in tuna catches from the fisheries.

A team of six scientists from SPC and IRD joined the IRD research vessel *Alis* for three weeks in November–December 2014 to explore the southwestern part of New Caledonia's exclusive economic zone (EEZ), where albacore tuna is the main tuna species exploited by New Caledonia commercial fishermen.

The physical data collected (e.g. temperature, currents) show that the northern part of the cruise took place in warm waters influenced by the equatorial warm pool and the southern part of the cruise was conducted in cooler waters characteristic of the return current of the East Australian Current. Several eddies were crossed along the track. Phytoplankton measurements show that the surface waters had low levels of phytoplankton while the maximum amount of phytoplankton was found at a depth of 100 m. Detailed analyses of collected physical data, nutrients, phytoplankton, zooplankton and micronekton still need to be conducted, but overall, it will allow us to understand how the physical and biological oceanography are connected, and the temperature and nutrient conditions needed for phytoplankton to multiply and allow the development of a food web constituting zooplankton, micronekton and tuna.

Micronekton was sampled using a large net towed in midwater depths between 16 m and 590 m, catching organisms that were frozen and that SPC taxonomist will identify in the coming months. Along the cruise track, the research team also used several acoustic sounders to record the signal sent by micronekton. The acoustics will give information on the spatial distribution of micronekton in the EEZ and within the water column. Preliminary results show that quantities of micronekton were higher in the southern part of New Caledonia's EEZ, and vertical profiles demonstrate the known daily vertical migration of micronekton from the surface at night, down to depths of over 400 m during the day.

Content of a micronekton net showing deep dark myctophid fish, transparent fish larvae, small squids with luminescent organs, and small shrimps, a delicacy for tuna (image: Elodie Vourey, SPC).

These data will allow us to identify areas of high and low micronekton productivity and biodiversity. The location of these areas will be further analysed to determine if they match the areas of high and low tuna catch per unit of effort. This information will be crucial for fisheries managers, both for identification of areas of interest for conservation and for tuna management.

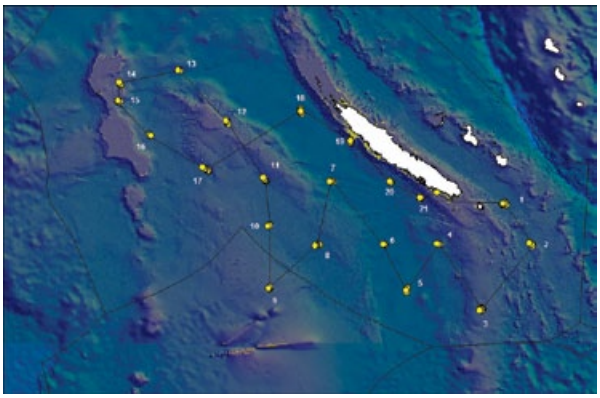
For more information:

Nectalis 3 daily logbook: www.spc.int/ocean-fish/en/ofpsection/ema/biological-research/nectalis/419-nectalis-3-journal-logbook

Results of previous Nectalis 1 and 2 cruises:

Hunt B.P.V., Allain V., Menkes C., Lorrain A., Graham B., Rodier M., Pagano M. and Carlotti F. 2014. A coupled stable isotope-size spectrum approach to understanding pelagic food-web dynamics: A case study from the southwest sub-tropical Pacific. Deep Sea Research Part II Topical Studies in Oceanography. doi:10.1016/j.dsr2.2014.10.023

Menkes C.E., Allain V., Rodier M., Gallois F., Lebourges-Dhaussy A., Hunt B.P.V., Smeti H., Pagano M., Josse E., Daroux A., Lehodey P., Senina I., Kestenare E., Lorrain A. and Nicol S.J. 2014. Seasonal oceanography from physics to micronekton in the south-west Pacific. Deep Sea Research Part II Topical Studies in Oceanography. doi:10.1016/j.dsr2.2014.10.026



Cruise track and location of sampling stations (yellow dots).

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Crew preparing the micronekton net for trawling (image: Florian de Boissieu, IRD).