Oceanic Fisheries Programme embarks on a new adventure

The Ecosystem Management and Analysis Section of SPC's Oceanic Fisheries Programme and the French Research Institute for Development (IRD) are studying mid-trophic level pelagic zooplankton and micronekton. The project's name, NECTALIS, comes from "nekton", the aquatic organisms that actively swim in the water column (in contrast to plankton that passively drift), and "Alis", the name of IRD's research boat based in Noumea, New Caledonia.

Project goal

Outcomes of this research cruise will be particularly important for Pacific Island countries and territories (which exploit tuna resources), by bringing more confidence to model-derived predictions of tuna movements and fishing and environmental impacts on pelagic ecosystems. Models are important in providing information to fisheries managers. Our goal is to improve our understanding of spatio-temporal distribution and behaviour of tuna prey species (zooplankton and micronekton) to better understand the relationships among tuna, environment and fishing.

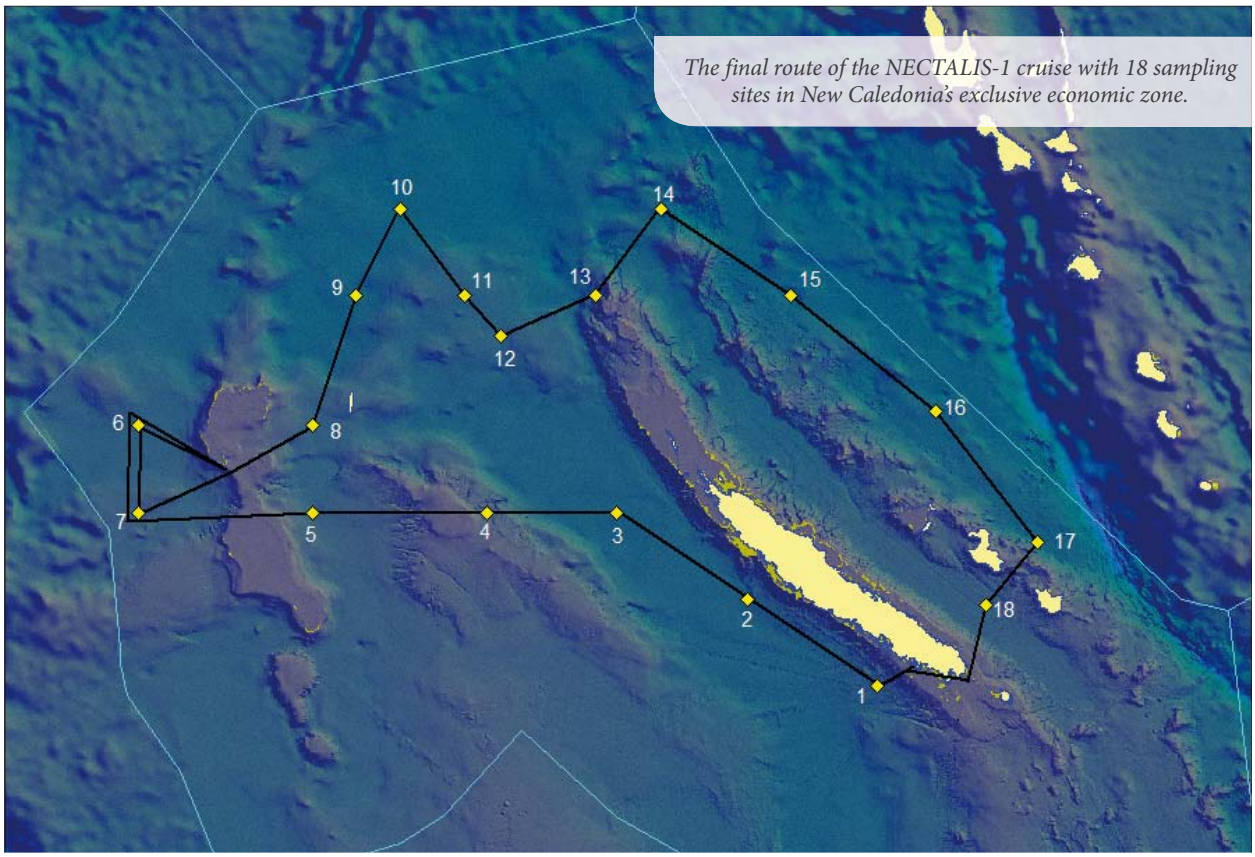
Zooplankton and micronekton are the link between the physical and chemical factors of seawater (which influences their distribution and abundance) and tuna (which prey on them). Zooplankton and micronekton components of ecosystem models are particularly uncertain, mainly because very little direct observations exist to validate the models. During the NECTALIS cruises, we hope to fill this gap in observation to help validate ecosystem models.

The cruises

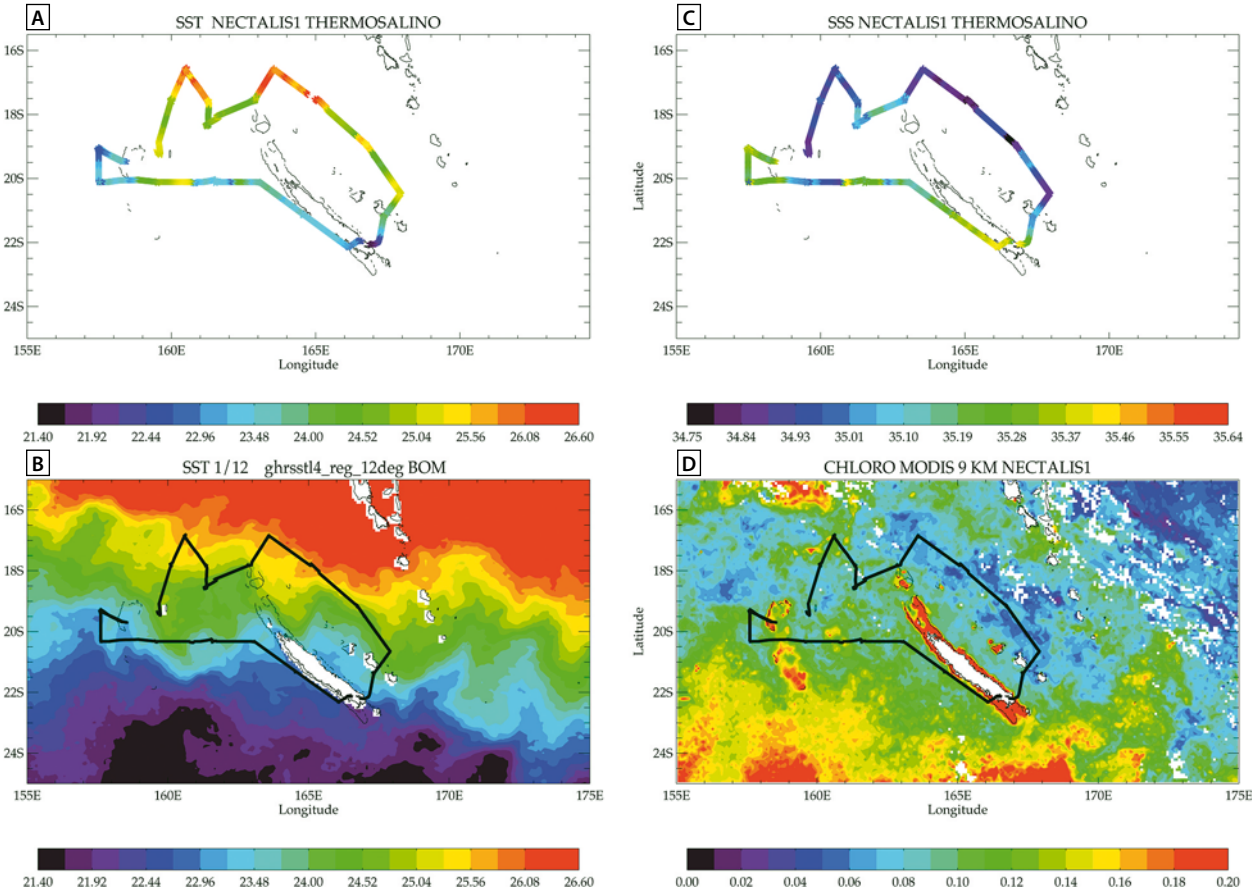
We will be conducting two multidisciplinary cruises to collect physical and chemical seawater data as well as data on zooplankton and micronekton. The two cruises will occur during the Southern Hemisphere's cooler months (July to August), and warmer months (November to December) when environmental conditions are different.

To characterise physical and chemical conditions and primary production, we will measure temperature, salinity, oxygen, fluorescence, light, currents, nutrients, photosynthetic pigments, phytoplankton abundance, primary production and phytoplanktonic communities. Secondary production (zooplankton and micronekton) will be measured with acoustic and net sampling of zooplankton and micronekton.

The first cruise, NECTALIS-1, departed on 30 July from Noumea, New Caledonia onboard the research vessel *Alis* for a three-week campaign in New Caledonia's EEZ with 29 sampling sites scheduled.



The final route of the NECTALIS-1 cruise with 18 sampling sites in New Caledonia's exclusive economic zone.



Data recorded during the ship's cruise:

A: Sea surface temperature (SST) in °C (recorded from the ship);
B: Sea surface temperature (SST) in °C (satellite image);
C: Sea surface salinity (SSS) in ‰ (recorded form the ship);
D: Chlorophyll in mg m^{-3} (satellite image).

The team

The research team consists of specialists (from different research institutions) in acoustics, biogeochemistry, oceanography, biology and fisheries who will collect, analyse and model observations on mid-trophic level zooplankton and micronekton.

Dr Valerie Allain, fisheries research scientist (ecosystem analyses) with the Ecosystem Monitoring and Analyses section of SPC's Oceanic Fisheries Programme and Dr Christophe Menkes from IRD were the cruise leaders.

Scientist	Working area	Institution
Valerie Allain	Micronekton	SPC
Christophe Menkes	Physical oceanography	IRD
Martine Rodier	Chemistry and phytoplankton	IRD
Houssem Smeti	Zooplankton	IRD
Erwan Josse	Acoustics	IRD
Francis Gallois	Electronic equipment	IRD

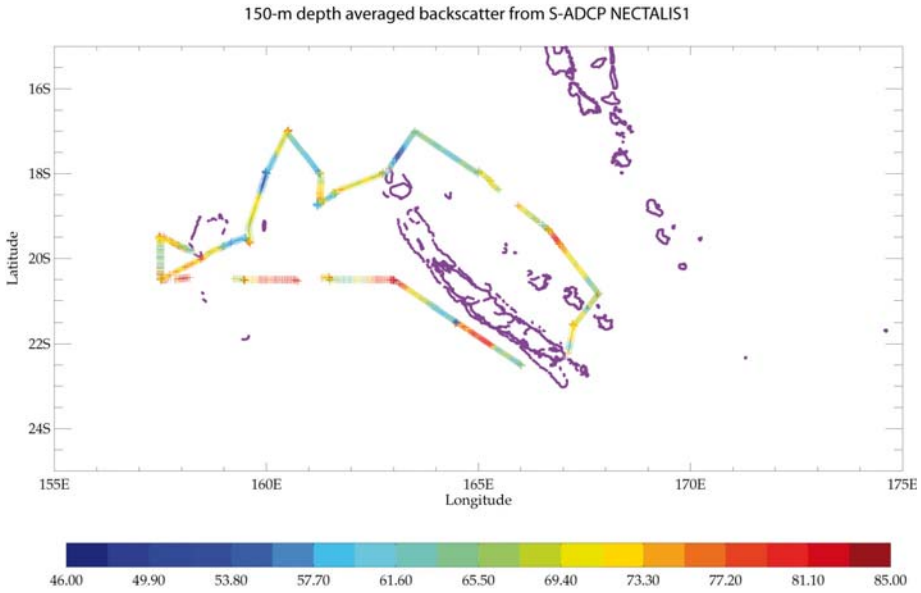
Beyond the cruises

The cruises will be complemented by physical, chemical and biogeochemical modelling; tuna diet studies; and modelling of pelagic ecosystems, including several sub-models that involve a large team of scientists from SPC and IRD.

Initial results

The first cruise finished in mid-August and scientists returned with considerable data and samples for analyses. The original cruise plan was modified due to rough weather and various logistical problems, and the number of sampling stations visited had to be reduced to 18. Most of the data collected will need to be processed and analysed thoroughly before providing results, but some interesting information has already been identified, as detailed below.

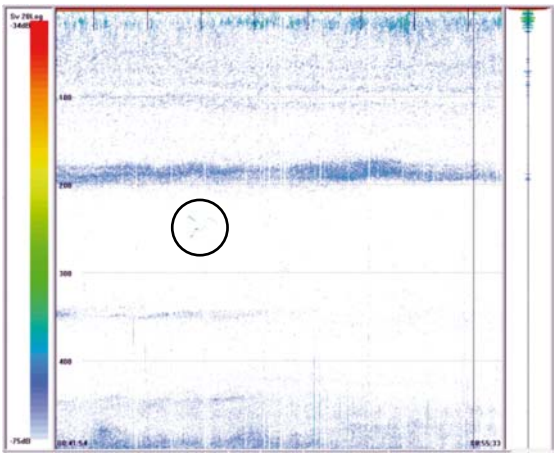
Examining temperature and salinity recordings taken at the surface (0–3 m depth) during our cruise, we found that there was a warmer and fresher (i.e. lower salinity) water mass in the north, while in the south, the water mass was colder and saltier (i.e. higher salinity). A warmer and fresher water mass is



Acoustic backscatter anomalies (daytime data minus daytime mean; night-time data minus night-time mean to remove the daily cycle) averaged over 0–150 metres depth.

characteristic of tropical waters, while a colder and saltier water mass reflects the northward seasonal migration of subtropical waters. A clear front exists between these water masses. In the two regions, the backscatter from one of our acoustic gear — which can be interpreted as a relative biomass of mesozooplankton and micronekton — shows that, at 0–150 m depth, there are fewer organisms in northern waters than there are in southern area waters.

The echosounder is a very important tool on the cruise as it makes it possible to establish the vertical distribution of micronekton and to estimate its relative biomass. It can also detect large animals. On the EK60 echogram image below, we can see a layer of micronekton between 180 m and 200 m depth. Just below this deep layer, at around 250 m depth, an isolated signal (see black circle in figure below) was interpreted as a group of at least two tunas, about 100 cm long, based on the signal's strength.



Screen shot from the EK60 echogram

Micronekton comprises organisms (e.g. lanternfish, hatchetfish, deep shrimps, small squids, and gelatinous animals) that live at different depths and which migrate vertically in the water column. Some of these animals move from great depths toward the surface at dusk, and will stay there all night before diving down to deeper depths at dawn. During our cruise, we collected micronekton samples with a large pelagic net, targeting layers observed on the echosounder.

Micronekton specimens: a mix of small fish, squids and crustaceans. These constitute the daily meal of tunas and other large pelagic predators.

For more information:

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