

■ The diet of tunas: A global comparison

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In October 2009, 14 scientists from research institutes in France, Australia, USA, Spain, and two Pacific regional organisations — SPC and the Inter American Tropical Tuna Commission (IATTC) — met in Sète, France for a one-week workshop on tuna diet.

The workshop was sponsored by the international programme Global Ocean Ecosystem Dynamics through its programme on Climate Impacts on Oceanic Top Predators (CLIOTOP). CLIOTOP is devoted to the study of top oceanic predators within their ecosystems, and is based on a worldwide comparative approach among oceans. The goal is to improve knowledge

and to develop a reliable predictive capacity for single species and ecosystem dynamics.

The workshop was one of the activities of the CLIOTOP working group on “trophic pathways in open ocean ecosystems”. Entitled “Feeding in tunas – a global comparison”, the aim of this meeting was to answer this question: “Can a comparison of top predator diets within and between the Pacific, Indian and Atlantic Oceans lead to an understanding of the effects of ocean warming in these predator communities?”

This workshop gathered seven datasets from tuna and other pelagic top predator diet studies covering the three oceans.

The information will enable a large-scale analysis to identify differences between oceans and regions. The data come from two studies in the Indian Ocean (one of them also covers the Atlantic Ocean), one from the eastern Pacific Ocean (IATTC), two from the western Pacific Ocean (including SPC), and two from the Atlantic Ocean. These data were collected between 1969 and 2009.

The focus was on eight species: bluefin (*Thunnus thynnus*), yellowfin (*T. albacares*), bigeye (*T. obesus*), albacore (*T. alalunga*), skipjack (*Katsuwonus pelamis*), swordfish (*Xiphias gladius*), lancetfish (*Alepisaurus ferox*), mahi-mahi (*Coryphaena hippurus*), and gathered a total of ~20,000 fish.

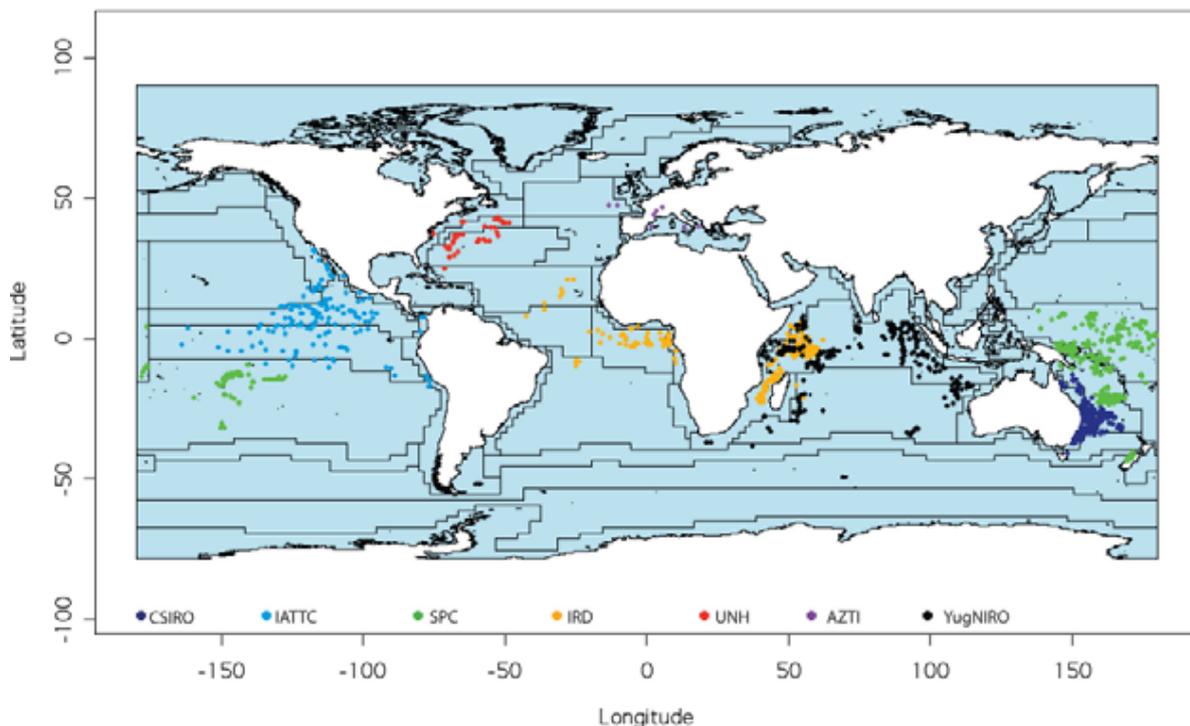


Figure 1. Stomach sample positions in relation to ocean and to Longhurst biogeographic zones (see footnote).

CSIRO: Commonwealth Scientific and Industrial Research Organisation; IATTC = Inter American Tropical Tuna Commission; SPC = Secretariat of the Pacific Community; IRD = Institut de recherche pour le développement; UNH = University of New Hampshire; YugNIRO= Institute of Marine Fisheries and Oceanography (Ukraine); AZTI = AZTI-Tecnalia, Centro tecnológico experto en Investigación Marina y Alimentaria (original map by Petra Kuhnert).

The first workshop objective was to assimilate and check data from stomach content datasets. This objective continued to be the major focus of the workshop, and many issues regarding data standardisation arose and were solved.

Initial examination of the database revealed a prey species list of ~600 taxa from ~300 families. Using these data, our major objective was to examine the relationship between latitude and prey composition. However, other environmental, physical and sampling variables were included in the multivariate regression tree analysis, such as Longhurst area,¹ year of collection, sea surface temperature, predator species, predator length and fishing gear.

The regression tree resulting from the overall comparison identified the Longhurst zone,

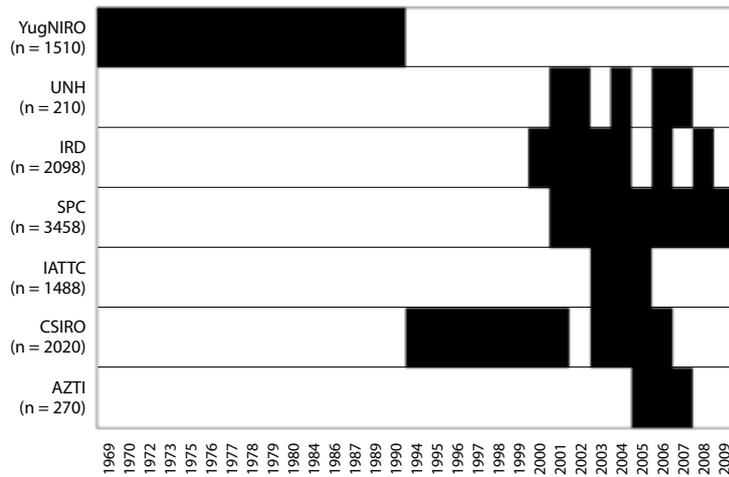


Figure 2. Stomach sample collections by project and year.

followed by predator species and fishing gear (linked to fishing depth), as the major variables of diet composition among top predators.

This work is still in progress and more analysis will be conducted during 2010 to try to improve our understanding of

trophic relationships in pelagic ecosystems.

1. Based on values and variability of parameters such as temperature, water masses and circulation, wind, nutrients, primary production, ecosystem functioning, Longhurst divided the oceans into biogeographic provinces characterised by specific ecosystems (see Figure 1).



From left to right: Robert Olson (IATTC, USA), Frédéric Ménard (IRD, France) and Jock Young (CSIRO, Australia), the three scientists who coordinated the workshop on tuna diet.