coast, but strong variability was also observed, e.g. high fullness levels were observed in very coastal areas when anchovy was distributed close to the coast, particularly during the 1997-98 El Niño event. Finally, anchovy stomach fullness had a negative relationship with temperature (Fig. 1) and reached lower values around 22°C. However, the range of temperature varied seasonally, and its effect on stomach fullness can only be partially explained.

In contrast with previous studies, our results show that zooplankton (in particular euphausiids and copepods) is the major component of anchovy diet. Most previous studies concluded that diet of Peruvian anchovy was mainly based on phytoplankton or that phytoplankton and zooplankton played a similar role. However, these works were mainly based on qualitative descriptions of anchovy diet, frequency of occurrence, and percent by numbers rather than carbon content. In terms of diel feeding activity, our results differ from those from Pauly et al. (1989) and Jarre et al. (1991) for the period 1953 – 1982. This difference cannot be related to different methodology i.e., GAM vs. Sainsbury's method. Applying this last method to our data does not change the results.

In summary, the analysis of 21,203 stomach contents shows that zooplankton make up most of the energy for anchovy even though significantly more phytoplankton prey items are ingested. These results put into perspective our current knowledge on anchovy diet, its position in the trophic foodweb, and thus, the trophic models that were build in the HCS.

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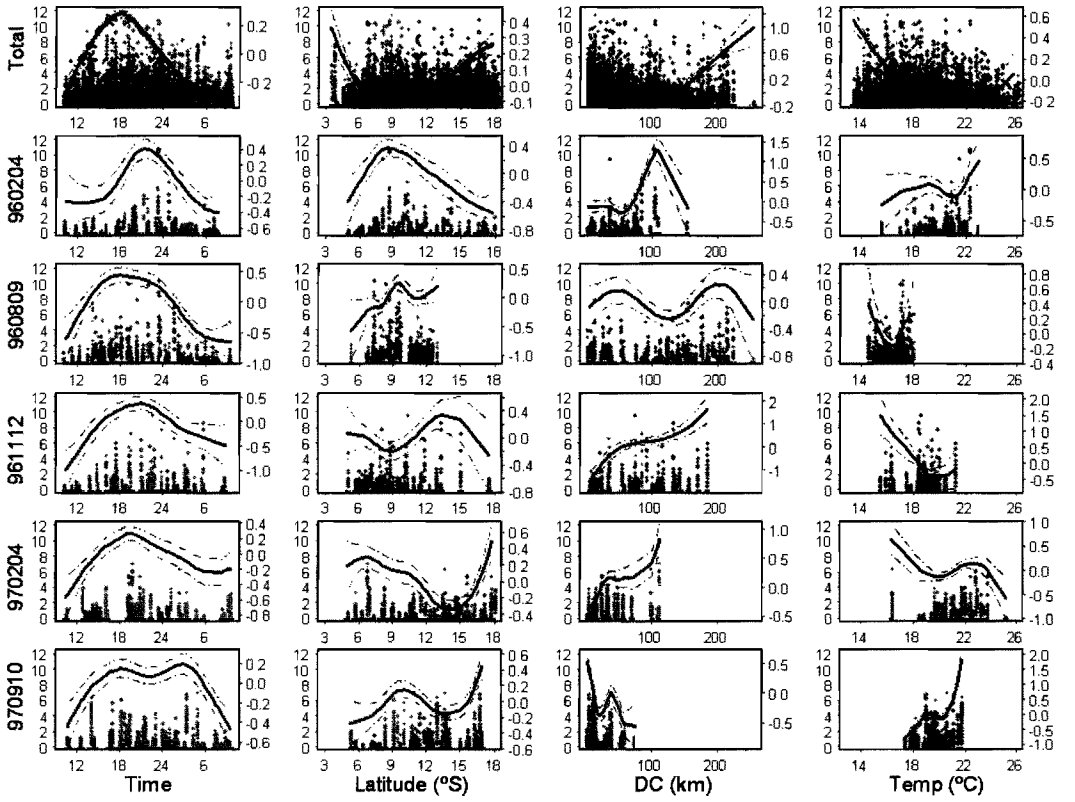

Figure 1. Scatter plot (grey dots) and cubic spline smoothers fits (black solid lines) of GAM models based on fullness on anchovy stomach fullness according to time of day, latitude, distance from the coast (DC) and sea surface temperature (°C) for the complete set of 21,203 stomach contents. Also shown are the fits for 5 of the 23 surveys from which stomach contents were analyzed. The black dotted lines show the 95% confidence limits of GAM models. Left y-axis shows stomach fullness in percent. The right y-axis are in relative scale, they correspond to the spline smoother that was fitted on the data, so that a y-value of zero is the mean effect of the variables on the response.

HCS093 - Comparative trophodynamics of small pelagic fish species in the Benguela Current and Humboldt Current upwelling Systems

Carl D. van der Lingen[1], Luis Cubillos[2], Pepe Espinoza[3] and Arnaud Bertrand[3,4]

[1] *Offshore Resources, Marine and Coastal Management, Private Bag X2, Rogge Bay 8012, Cape Town South Africa (Tel: +27 21 402 3168; Fax: +27 21 421 7406; E-mail: vdlingen@deat.gov.za)*

[2] *Departamento de Oceanografía, Universidad de Concepción, Concepción, Chile*
[3] *Instituto del Mar del Perú, Lima, Peru*
[4] *Institut de recherche pour le développement (IRD), c/o Instituto del Mar del Perú Callao, Lima - Peru*

Keywords: Benguela, Humboldt, small pelagic fish, trophodynamics

Abundant populations of co-existing small pelagic fish species that show periods of alternating dominance are a defining feature of upwelling ecosystems and have been the focus of considerable research, including that directed at investigating their trophodynamics and elucidating their respective trophic roles. In this presentation we compare the trophodynamics of some these co-existing species from the Benguela Current and Humboldt Current systems, and assess whether observed species alternations may be trophically mediated. Information collected from morphological, field and experimental studies is described, and species examined include anchovy (*Engraulis encrasicolus*) and sardine (*Sardinops sagax*) in the northern and southern Benguela; anchovy (*E. ringens*) and sardine (*Sardinops sagax*) in the northern Humboldt; and anchovy (*E. ringens*) and common sardine (*Strangomera bentincki*) in the southern Humboldt.
Aspects of trophic morphology compared include length-related changes in gape size of anchovy and sardine larvae in the northern Humboldt and in early anchovy and sardine juveniles in the southern Benguela; and length-related changes in the branchial basket structure of anchovy and sardine juveniles and adults in the northern Benguela. Comparative dietary studies are described for larvae, juveniles and adults of anchovy and sardine in the northern Humboldt; larvae, juveniles and adults of anchovy and common sardine in the southern Humboldt; and juveniles and adults of anchovy and sardine in the northern and southern Benguela. Experimental studies conducted to investigate the feeding behaviour of southern Benguela anchovy and sardine and anchovy and common sardine from the southern Humboldt are described, as are laboratory studies investigating energetic costs and assimilation efficiencies of southern Benguela anchovy and sardine. Energetics models for southern Benguela species developed from these experiments are also briefly described.
Consistent differences between anchovy and sardine (*Sardinops*) in the Benguela Current and northern Humboldt Current systems, such as a larger gape size at a given length for early stages of anchovy compared to sardine, and a higher contribution by phytoplankton and/or small zooplankton to the diet of sardine compared to anchovy, are indicative of resource partitioning between the two species. This, together with results derived from experimental studies and energetics models that suggest that sardine maximize their net energy gain when filter-feeding on smaller zooplankton whereas anchovy maximize their net energy gain when particulate-feeding on larger zooplankton, indicate that differently-structured food environments can favour anchovy over sardine, and *vice versa*, and suggest that species alternations between the two may be trophodynamically-mediated. In the southern Humboldt, anchovy and common sardine (*Strangomera*) exhibit a high degree of trophic overlap and resource partitioning between the two species is not obvious, although this may be due to a relative paucity of information and further research on this species pair is required.

HCS123 - Identifying trophic controls in the southern Humboldt system off central Chile

Sergio Neira[1,2], Philippe Cury[2], Coleen Moloney[1], Hugo Arancibia[2] and Luis Cubillos[3]

[1] *Zoology Department, University of Cape Town, Rondebosh 7701 Cape Town, South Africa [tel: +27-21-6503613; fax: +27-21-4479892; email: sneira@botzoo.uct.ac.za*
[2] *IRD Sète. France*
[3] *UDEC.Chile*

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Although fishing is considered the main threat to marine ecosystems, predation mortality is the main source of natural mortality and, in some cases, of total mortality for many stocks. Therefore, trophic relationships play a central role in the way ecosystems are self-organized. Information about who eats whom represents one of the first records of naturalists, however, this classic question been replaced by the more dynamic question of who controls whom in marine ecosystems. The traditional way in which trophic controls in marine food webs have been approached indicates that population dynamics are either controlled by predator's consumption (top-down control) or by resource availability (bottom-up control). However, an important characteristic of some marine food webs is the presence of "waists" where an individual taxon located in middle trophic position passes most of the energy from lower to all higher predators (Rice, 1995). Specifically, in upwelling ecosystems this position is occupied by small pelagic fish. This species are dominant in terms of biomass, and exert a trophic control on both their predators (through bottom-up control) and their zooplankton prey (through top-down control), while their own dynamics is not controlled by predator consumption or food availability, but by environmental forcing (Cury et al., 2000).
The southern section of the Humboldt system (SH) is one of the least studied upwelling ecosystems. Consequently, the existence of trophic controls as well as their effects on food web dynamic is still poorly understood. Consequently, the aim of this paper is to analyze available data series to identify i) possible waists in the system, and ii) main controls operating in the food web.
Following Cury et al. (2000), the number of species across important taxa inhabiting SH is analyzed,

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