other key population parameters are used to construct food web models representing SB and SH during the following periods: pristine, moderate fishing exploitation and present (altered after heavy industrial fishing). Following Moloney et al. (2005), models are constructed using a standard structure in terms of number and type of functional groups and the Ecopath with Ecosim software (version 5.1). Each model includes the following functional groups: the fisheries, cetaceans, sea lions, marine birds, cephalopods, large-sized pelagic fish, medium-sized pelagic fish, small-sized pelagic fish, demersal fish, benthic invertebrates and other groups such as zooplankton, phytoplankton and detritus. Input data were gathered from published and unpublished (grey) literature.
Following Bundy (2004), an analysis of uncertainty was conducted to examine the effects of uncertainty on model estimates. Later, intra- and inter- system comparisons were conducted based on indices of community structure, trophic interactions and energy flows, which were calculated using network analysis routines incorporated in EwE. Changes that are robust to uncertainty are discussed in the light of ecosystem effects of fishing and the ecosystem approach to fisheries management in both systems.

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HCS124 - Analyzing recent and past changes in the southern Humboldt sub-system off Central Chile using ecosystem indicators

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Nowadays, managers, users and scientists, among other stake holders, agree on the principle that wider ecosystem considerations have to be formally implemented in fisheries management if fisheries are to be sustainable. Accordingly, the ecosystem approach to fisheries (EAF) has moved from the definition state to the action state. Indicators play a central role in any serious fisheries management system and, consequently, several fisheries agencies are implementing EAF as a gradual evolution from the current single-species indicators towards community- and ecosystem-based indicators. As no big input of monetary resources is expected for ecosystem scale research in the short-term, a practical step-by-step ecosystem approach is needed, i.e., to include metrics that can be calculated using available information, meanwhile more data on other ecosystem components, as well as insight about ecosystem mechanisms and processes are progressively gained. The starting point for an ecosystem-based management plan is the definition of a working list of ecosystem indicators.
In this paper, we select and calculate a working list of indicators based on the recommendations of the SCOR working group on quantitative ecosystem indicators for fisheries management. However, since the comparative approach plays an important role in validation, we also take into account whether selected indicators are being implemented in the analysis of other ecosystems around the world. The available data and ecological significance in the southern Humboldt system are also considered when selecting indicators. In this paper present ecosystem indicators that cover catch composition, biomass of the main target species, average size of the community, trophodynamics and environmental indicators, among others. Consequently, the aim of this paper is to understand the effects of fishing in the exploited community in the southern Humboldt ecosystem. The specific objectives are: i) Assess historical ecosystem trends and forcing using a list of ecosystem indicators (what is the history of the ecosystem?); ii) Determine the status of the ecosystem in the present (where is the ecosystem relative to where we want to be –or at least to the state we were before fishing?).
Results indicate that big mammals have disappeared from the catch and may present low abundances in the system. Long-term (decadal) fluctuations (biomass and catch) of the main exploited stocks are observed. An unusual and apparently high presence of jumbo squid has been recorded in the system in last years. Environmental factors indicate the presence of two main "conditions" in the system in terms of sea surface temperature and upwelling index (Fig. 1a). From 1970-1985 the system appeared to be characterized by a relatively warm period of reduced upwelling. From 1985-to early the 2000s the system appeared to be characterized by a relatively cold period with increased upwelling and PP. The switch between these two periods in the SH system occurred at approximately mid 1980s.
In terms of aggregated indicators, it is possible to say that, in the present state, the exploited community is dominated by species that present small body size, short life span, high turnover rate and low trophic level (Figs 1b to 1f). In addition, the system could have lost some food web attributes associated to maturity and

stability. This information leads to the hypothesis that in the present state, the system is less resilient to external forcing such environmental variability and fishing effort.
Finally, all this information is used to discuss deficient areas of knowledge about ecosystem process and mechanisms by which fishing (and environmental variability) have altered the exploited community in the southern Humboldt.

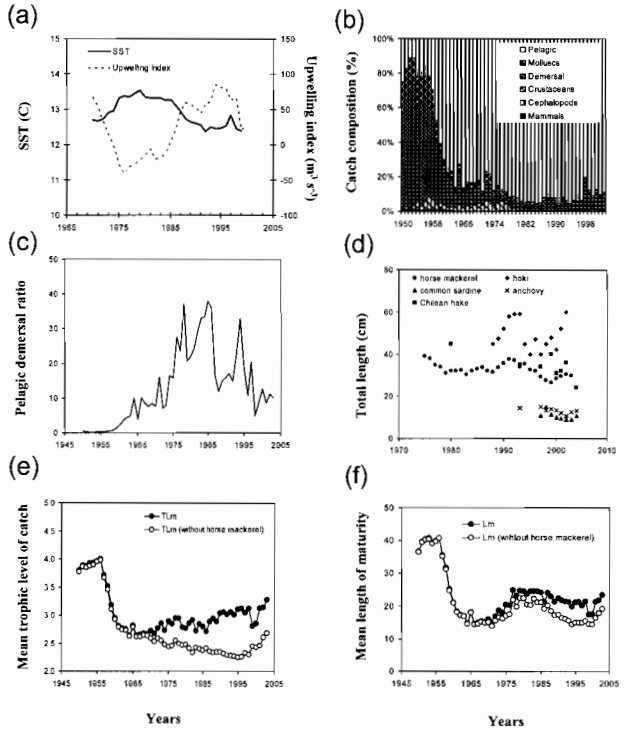

Figure 1. Ecosystem indicators calculated for the southern Humboldt system off Central Chile.

HCS011 - Pacific sardine shoaling behaviour related to tidal front dynamics and related to fishing activities in a coastal lagoon in the southern part of the California Current System

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Pacific sardine shoaling behaviour as inferred by acoustics and related to the dynamics of the pelagic ecosystem was investigated in a tidal dominated coastal lagoon in the southern part of the California Current during the summer of 2004. Observations were done during spring and neap tide using a split beam echosounder (Simrad EY-60, 120 kHz), underwater video-camera, several continuous sub-surface sensors (temperature, oxygen, fluorescence) and zooplankton samples. During spring tides, dense zooplankton aggregations concentrated along tidal fronts that separate the continental shelf mass from the bay's water mass. Pacific sardine and other predators gather to feed along the tidal fronts. During neap tides tidal fronts were less evident and the homogenization of water temperature, dissolved oxygen and fluorescence was observed. Acoustic data shows that during spring tides fish shoal density and fish shoal size increases. During neap tide Pacific sardine groups were smaller, scattered and they tend to swim closed to the sea bottom. However, total fish abundance as calculated by acoustics did no vary significantly. Accordingly, the hypothesis that fishing on these species would be more profitable during spring tides was established and tested using 2004 fishing statistics. Results show that daily fishing trips from the local sardine fishery increased from 30 to 150 when the interval between successive spring tides was minimum and tide range was at the maximum. Moreover, tidal status and spring tide occurrence were calculated for two decades (1990-2010). Results show that the occurrence of successive spring tides varies along the seasons and along the years. Discussion is focused on the significance of the timing of this 'window of opportunity' to the fishery related to the California Current variation and strength in the area along the years. We conclude that Pacific sardines adjust their behavior to the dynamics of tidal regime by modifying shoaling parameters and that these behaviors have a direct relation to fishing activities.

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