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EDITORIAL

Organismal biology joins climate research: the example of ENSO

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El Niño Southern Oscillation (ENSO) is a climate oscillation affecting the Humboldt Current upwelling system off Pacific South America. ENSO constitutes the major intra-decadal climate variability along the upwelling system of Pacific South America and is known to be of global impact (Thiel et al. 2007). It represents an interannual variation between a warm phase (El Niño: EN) and a cold phase (La Niña: LN) occurring at intervals of 2–10 years. Both EN and LN are impacting the abundance and availability of distinct coastal marine resources off Pacific South America with often-catastrophic consequences for the socio-economy of the countries involved (Glantz 1984; Arntz and Fahrbach 1991). Some of the best data available on the impact of EN resulted from the EN 1982–83 (Barber and Chavez 1983; Arntz and Fahrbach 1991; Chavez et al. 1999; Tarazona et al. 2001). However, when trying to reveal the development and resilience potential of coastal marine communities, the lack or inaccessibility of information is a general concern (Thatje et al. 2007; Riascos et al. 2008). Most studies on the biology and ecology of organisms occurring in upwelling regions are of descriptive nature and underlying processes that are driven by ENSO are far from being understood (Criales-Hernández et al. 2008; Sotil et al. 2008), which hampers the development of (short-term) predictive or response-management of key resources (Taylor et al. 2008).

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During EN, the displacement of species over more than 10° of latitude (Arntz and Fahrbach 1991; Ashton et al. 2008), together with the incursion of exotic species (Tarazona and Arntz 2001), poses new challenges to artisanal fisheries. Changes in oceanographic features such as the variable intensity of upwelling during EN generate changes in the food web that, depending on the intensity of the event, can alter and restructure benthic communities (Wolff and Mendo 2000; Hidalgo et al. 2008; Moreno et al. 2008; Villegas et al. 2008) and populations (Riascos et al. 2008), species diversity and composition, as well as life history traits (Oliva et al. 2008), and ultimately lead to the collapse of entire populations. However, on microecological scale, effects of EN are not necessarily negative, but can foster community biomass of commercial key species (Arntz and Fahrbach 1991) due to decreasing hypoxia within the oxygen minimum zone (Escribano et al. 2004). In transitional biogeographic areas that are not within the primary impact area of EN, communities can seemingly remain unaffected at all, if oxygen limitation is not a general constraint (Laudien et al. 2007).

The project "Climate Variability and El Niño Southern Oscillation: Implications for Natural Coastal Resources and Management" (CENSOR) is funded within the FP6-INCO Programme of the European Commission. CENSOR targets the study of ENSO effects on near-shore coastal environments and related socio-economics along Pacific South America (Thatje et al. 2008). The present Special Issue of Helgoland Marine Research gives an overview of various scientific areas tackled within the project rather than aiming for an integrated view of the ecosystem and management problems associated with ENSO in Pacific South America (Taylor et al. 2008; Thatje et al. 2008). The compilation of ongoing work clearly marks the complexity of the Humboldt Current ecosystem in response to both EN and LN,

which complicates management solutions given the multiple demands on this coastal ecosystem by various societal groups, including different socio-economic systems of the adjacent countries (for discussion, see Nauen et al. 2006; Thatje et al. 2008). As a result, it becomes obvious that a management for sustainability of coastal areas within this upwelling system does rather depend on locally adapted and flexible small-scale management approaches; management approaches that cannot simply transfer experiences made with macro-economic management attempts [i.e. individual transferable quotas (ITQ) in fisheries]. Multidisciplinary studies centered on organismal research remain the key to our increased understanding of the response of coastal species of interest to artisanal resource users to ENSO. The impact of such studies for possible mitigation of climate effects on marine ecosystems and the analysis of options for the human communities affected tends to be underrated. Since the intensity and onset of EN and thus its impact on Pacific South America strongly varies (Arntz and Fahrbach 1991), management advice tailored to small-scale users is necessary (i.e. Taylor et al. 2008; Thatje et al 2008) to evaluate the variable responses of coastal ecosystems along Pacific South America to climate oscillation, particularly as they have much less destructive track records of resource use than industrial-scale operations, at least unless they are forced into direct competition.

Reviewers for volume 62(1)

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