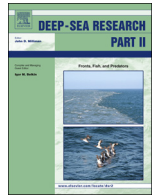




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Editorial

Fronts, fish, and predators



Ocean fronts play a key role in marine ecosystems. Fronts shape oceanic landscapes and affect every trophic level across a wide range of spatio-temporal scales, from meters to thousands of kilometers, and from days to millions of years. At some fronts, there is an elevated rate of primary production, whereas at others, plankton is aggregated by advection and by the behavior of organisms moving against gradients in temperature, salinity, light irradiance, hydrostatic pressure and other physico-chemical and biological factors. Lower trophic level organisms – phytoplankton and zooplankton – that are aggregated in sufficient densities, attract organisms from higher trophic levels, from planktivorous schooling fish to squid, large piscivorous fish, seabirds and marine mammals. Many species have critical portions of their life stages or behaviors closely associated with fronts, including spawning, feeding, ontogenetic development, migrations, and other activities cued to frontal dynamics. At different life stages, an individual species or population might be linked to different fronts. The nature and strength of associations between fronts and biota depend on numerous factors such as the physical nature and spatio-temporal scales of the front and the species and their life stages in question. In other words, fronts support many different niches and micro/macro-habitats over a wide range of spatial and temporal scales.

Studies of biological–physical interactions at fronts have a long history (Le Fevre, 1986) and there is a growing realization of the importance of fronts to marine ecosystems. Recent decades have seen a renaissance in frontal studies galvanized by new technologies, particularly satellite remote sensing and tracking of tagged and instrumented animals. The rapid proliferation of studies in this field has warranted the publication of this volume – the first-ever special volume on fronts and biota, with an emphasis on higher trophic levels. The nine papers comprising this volume are presented **trophically**, from copepods and gadoid fish larvae (Munk, 2014), to Pacific saury (Mugo et al., 2014; Tseng et al., 2014), sei whales (Murase et al., 2014), neon flying squid and skipjack tuna (Mugo et al., 2014), Alaska sablefish (Shotwell et al., 2014), southern bluefin tuna (Nieblas et al., 2014), North Atlantic albacore tuna (Sagarminaga and Arrizabalaga, 2014), and seabirds (Sabarros et al., 2014; Zamon et al., 2014). **Physically**, various types of fronts are covered: the water mass front of the Norwegian Current in the North Sea (Munk, 2014); the fronts of the western boundary currents in the Northwest Pacific (Mugo et al., 2014; Murase et al., 2014; Tseng et al., 2014); the Polar front in the North Pacific (Shotwell et al., 2014); the tidally-modulated Columbia River Plume front (Zamon et al., 2014); the Benguela upwelling fronts in the Southeast Atlantic (Sabarros et al., 2014); and diverse fronts in the Northeast Atlantic (Sagarminaga and Arrizabalaga,

2014) and tropical Southeast Indian Ocean (Nieblas et al., 2014). **Methodologically**, various techniques are applied to identify fronts and higher trophic level associations and to characterize the dynamics of fish and predators in ocean fronts; such techniques include automated front detection from satellite imagery (Nieblas et al., 2014; Sagarminaga and Arrizabalaga, 2014; Tseng et al., 2014); maximum entropy models (Mugo et al., 2014); a statistical catch-at-age fish stock assessment model integrated with a novel Ocean Domain Dynamic Synergy (ODDS) conceptual model (Shotwell et al., 2014); generalized additive models (Murase et al., 2014); advection tracking in frontal reference frame derived from oceanographic section analysis (Shotwell et al., 2014); 3-D physical-biological sampling of a thermohaline front (Munk, 2014); high-frequency GPS tracking of foraging sea birds combined with concurrent, collocated satellite imagery (Sabarros et al., 2014); fine-scale visual surveys of marine birds (Zamon et al., 2014); cetacean sighting surveys (Murase et al., 2014), and satellite remote sensing of night-light fisheries (Mugo et al., 2014). **Geographically**, four oceans – Atlantic, Pacific, Indian, and Southern – are represented as are both coastal and open ocean fronts.

Since each manuscript in this issue was the result of a multi-disciplinary study, the rigorous peer review of this volume required an unusually large number of reviewers (between five and seven per manuscript) and entailed a prolonged, grueling revision process and consequently a 50% rejection rate. Each manuscript was assigned to a different Associate Editor, who was solely responsible for decision-making. All Associate Editors are listed as co-authors of this editorial. Since the peer-review process was, by default, anonymous, we cannot thank individual reviewers by name but acknowledge here that this volume would have been impossible to complete without their professionalism and dedication. We extend our most sincere gratitude to all of them.

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