



Editorial

Biological-physical interactions in estuaries

Estuaries are an excellent example of the complex interactions that normally occur in coastal environments. A large number of factors (Perillo, 1995) interact simultaneously in a non-linear fashion, making rather difficult the exact prediction of even the simplest processes. The difference with other types of coastal settings is that this interaction occurs within the restricted space provided by the estuarine valley. Therefore, the local geomorphology becomes a dominant player. Tidal propagation, for instance, is affected by the geomorphology and wind action resulting in modifications of the symmetry of the tidal curve, duration and direction of the tidal currents and mixing of the waters. As these occur, sediment, nutrient and pollutant distribution are continuously changing, developing concentration zones (e.g., turbidity maxima) or modifying the residence time of the substances.

All of these processes also control the living conditions and evolution of the biota that employs the estuary for a part or totality of their life. Although the flora and fauna participating in an estuary are well adapted to such strong variability (e.g., changes in salinity, dry/wet periods, directionality of tidal currents, etc.), they suffer from artificial changes that are induced by the ever increasing human activities at and around estuaries, or even at hundreds or thousands of km inland. Artificial structures (i.e., harbors, jetties), dredging of navigation channels (including material disposal) or damming of the river are only examples of the physical conditions that have a large impact on the biological community. Further impact is produced by input of pollutants and loads of nutrients and fertilizers.

Although estuarine and coastal environments throughout the globe share these similar driving forces, substantial differences arise among major geographic regions. Climatic variations, different geomorphologic settings, particular past trends in relative sea level, and the biogeographic distribution of species can shape a wide diversity of ecosystem types, in terms of their structure and functions. In addition, the concentration of human activities near shorelines has also exerted profound changes, and a large number of natural coastal environments throughout the world have been radically modified over the past century. However, the processes of loss and degradation have been quite variable in space and time and have led to major regional differences in the extent and ecological integrity of coastal ecosystems.

Unfortunately, many of these key differences tend to be over-ridden by the uneven representation of different coastal regions in the international literature. While a large amount of contributions focus on the well-studied coastal systems of Europe and North

America, variations or departures from these relatively well understood environments are poorly described, and often missing from global reviews. In many cases, there is emerging knowledge on why these systems differ in species composition, productivity, and other ecological properties, but the available information does not necessarily represent the regional land cover or the ecological relevance of the described coastal complexes within a given area.

As we see scientific work presently, a fluid exchange between people with different backgrounds, and from different regions throughout the world is essential to perform research on a competitive basis. This thought was our key motivation during the 44th International ECSA Symposium "Science and Management of Estuaries and Coasts: a Tale of Two Hemispheres" organized by the Estuarine and Coastal Sciences Association and the Instituto Argentino de Oceanografía (IADO) in Bahía Blanca, Argentina, September 29–October 3, 2008. Keeping integration in mind, a total of 127 participants from 11 countries (Argentina, Australia, Brazil, Germany, Italy, Kenya, Portugal, South Africa, The Netherlands, United Kingdom and USA) have met in plenary and poster sessions where we shared our results and research progresses on several key topics related to estuarine and coastal environments.

Among the different issues covered during the conference, the biological and physical interactions occurring in estuaries deserved especial attention, given the large number of high quality contributions presented. A total of 16 papers which are directly related to these issues were selected for publication in the present special issue of Estuarine, Coastal and Shelf Science. Contributions come from a wide range of geomorphic and climatic conditions throughout the globe and cover study cases on the role of physical processes, local biota, and human activities in shaping unique ecosystems. Papers cover studies from population to ecosystem levels, and analyze natural patterns of variation, induced by environmental gradients and seasonality, as well as human induced changes, mainly through the effects of pollution. As part of the local organizing committee, we offer this compilation as a summary of some of the topics discussed in the conference, and we hope the diversity of scenarios shown here contributes to face the challenge of putting our own hypothesis in a wider context.

The meeting was supported by grants from CONICET, Agencia Nacional de Promoción Científica y Técnica, Universidad Nacional del Sur and Asociación Industrial Química de Bahía Blanca (all from Argentina). The authors wish also to thank the support by ECSA and all the members of the local organizing committee.

Reference

Perillo, G.M.E., 1995. Definition and geomorphologic classifications of estuaries. In: Perillo, G.M.E. (Ed.), *Geomorphology and Sedimentology of Estuaries*. Elsevier, Amsterdam, pp. 17–47.

Gerardo M.E. Perillo*
Instituto Argentino de Oceanografía, CC 804, B8000FWB Bahía Blanca, Argentina

Departamento de Geología, Universidad Nacional del Sur,
San Juan 670, 8000 Bahía Blanca, Argentina

* Corresponding author. Instituto Argentino de Oceanografía,
CC 804, B8000FWB Bahía Blanca, Argentina.
E-mail address: gmeperillo@criba.edu.ar (G.M.E. Perillo)

Paula D. Pratolongo
Instituto Argentino de Oceanografía, CC 804, B8000FWB Bahía Blanca, Argentina

Departamento de Biología, Bioquímica y Farmacia, Universidad
Nacional del Sur, San Juan 670, 8000 Bahía Blanca, Argentina

M. Elizabeth Carbone, M. Cintia Piccolo
Instituto Argentino de Oceanografía, CC 804, B8000FWB Bahía Blanca, Argentina

Departamento de Geografía, Universidad Nacional del Sur, 12 de
Octubre y San Juan, 8000 Bahía Blanca, Argentina

21 August 2009
Available online 4 September 2009