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Editorial

Transitional waters: A new approach, semantics or just muddying the waters?

Abstract

Estuarine, Coastal and Shelf Science has throughout its history considered a diverse range of habitats including estuaries and fjords, brackish water and lagoons, as well as coastal marine systems. Its articles have reflected recent trends and developments within the estuarine and coastal fields and this includes the changing use of well-accepted terms. The term ''transitional waters'' first came to prominence in 2000 with the publication of the Water Framework Directive of the European Communities [European Communities, 2000. Directive 2000/60/EC of the European Parliament and of the Council of 23 October 2000 establishing a framework for Community action in the field of water policy. Official Journal of the European Communities 43 (L327), 75 pp.], where ''transitional waters'' are defined as ''bodies of surface water in the vicinity of river mouths which are partially saline in character as a result of their proximity to coastal waters but which are substantially influenced by freshwater flows''. The inclusion of the term transitional waters in our own aims and scope reflects the evolution of language in this subject area, encompassing tidal estuaries and non-tidal brackish water lagoons. This article reflects on some of the difficulties posed by the use of the term and its attempts to be inclusive by incorporating fjords, fjards, river mouths, deltas, rias and lagoons as well as the more classical estuaries. It also discusses the problems of including in the term river mouths discharging either into predominantly brackish areas such as the Baltic Sea, or into freshwater-poor areas bordering the Mediterranean.

Keywords: transitional waters; estuaries; brackish waters; coastal waters; definitions

1. Introduction

Regular readers of Estuarine, Coastal and Shelf Science may have noticed that the term ''transitional waters'' has recently been added to the list of research areas included in the aims and scope of the journal. The term ''transitional waters'' first came to prominence in 2000 with the publication of the Water Framework Directive of the European Communities (European Communities, 2000) as a means of completing the continuum between freshwaters and coastal waters. It is assumed here that the term was coined in order to retain a simple distinction of surface waters into freshwaters, intermediate waters and coastal waters.

The Water Framework Directive (WFD) provides an integrated Europe-wide policy to improve the ecological quality in Community surface waters. The Directive has the aim of providing common principles and an overall framework for action throughout the member states of the European Community, and of improving the aquatic environment in the Community. This requires that the development of measures for ensuring good quality be established within a scheme for integrated river basin management (e.g. DEFRA, 2005). To achieve these aims, common definitions on the chemical and biological status of water in terms of quality should be established and environmental objectives need to be set to ensure that good status is achieved throughout the Community. Pollution from various sources is to be controlled and monitored and hydro-morphological changes are to be determined and where possible remedied with the aim of maintaining or where necessary improving water body status. The main goal of the WFD is to achieve good ecological status and good chemical status across European waters by 2015. By taking such a wide-ranging approach, the Ecosystem Approach will be implemented for European waters which will include an analysis of drivers and pressures affecting each water body (Apitz et al., 2006; Borja et al., 2006), hence the importance of correctly defining a water body and determining the natural and anthropogenic characteristics of that water body.

The Directive recognises the different characteristics of different water bodies and so the first challenge was to define the

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different types (or in WFD language, erroneously, typologies), to then set reference conditions for each type and then bring in programmes of measures to ensure that the water body has reached or can be managed to reach those good status conditions. In this process, the WFD somewhat mirrors the implementation of the Clean Water Act in the US (McLusky and Elliott, 2004). Accordingly, this whole sequence relies on the adequate definition of the types of water bodies and the placing of each geographic area into a given typology.

The WFD defines ''transitional waters'' as ''bodies of surface water in the vicinity of river mouths which are partially saline in character as a result of their proximity to coastal waters but which are substantially influenced by freshwater flows'' (European Communities, 2000). For completeness, ''coastal waters'' are defined as ''surface water on the landward side of a line, every point of which is at a distance of one nautical mile on the seaward side from the nearest point of the baseline from which the breadth of territorial waters is measured, extending where appropriate up to the outer limit of transitional waters''.

As far as can be seen, the term transitional waters has not yet entered the water management, administration and legislation of areas other than the European Union. While US and Australian legal acts and documents talk about wetlands and waters which are transitional, they do not use this term. The US Federal Water Pollution Control (Clean Waters) Act 1977 and the Estuaries and Clean Waters Act 2000 tend to merely refer to estuaries. The latter are then simply defined as ''that part of a river or stream or other body of water having unimpaired connection with the open sea, where the sea water is measurably diluted with fresh water derived from land drainage. The term includes estuary-type areas of the Great Lakes'' (US Code Collection, 2006). South Australia, an area with arguably as complex a set of estuarine areas as anywhere else, also avoids the use of the term transitional waters and keeps to the definition of an estuary as ''A partially enclosed coastal body of water, including its ecosystem processes and associated biodiversity, which is either permanently, periodically, intermittently or occasionally open to the ocean within which there is a measurable variation in salinity due to the mixture of seawater with water derived from on or under the land'' (DEH-GSA, 2006).

The obvious first question to Estuarine and Coastal Scientists is, are transitional waters the same as or different from estuaries and how does the definition cope with lagoons which are clearly not open coastal waters but at the same time may not be measurably diluted by freshwater run-off? The principal definitions of estuaries, as we reviewed earlier (Elliott and McLusky, 2002), have all emphasised the dilution of seawater by freshwater, and in most cases have emphasised the role of the tides. Fairbridge's definition, for example, defines an estuary as ''an inlet of sea reaching into a river valley as far as the upper limit of tidal rise…'' (Fairbridge, 1980). Other definitions, such as the Venice System (1958) on the classification of brackish waters have covered all brackish waters. As Elliott and McLusky (2002) noted, the term *brackish* has a wider meaning than *estuarine* and all waters with salinities between those of sea and fresh water can be called brackish, whether they be large seas (e.g. Baltic or Caspian), closed lagoons or tidal estuaries. Thus, all estuaries by definition are brackish, but not all brackish waters are estuarine. Furthermore, as estuarine plumes can extend far into adjacent coastal waters, brackish waters can be away from land.

The problem for European Community legislators is that there is full range of brackish water habitats from tidal estuaries to closed brackish lagoons to large brackish seas present in the member states of the European Community (Table 1). European estuaries, as defined by the principal definitions, are effectively confined to the Atlantic coast from mid-Norway at 60°N to southern Portugal at 37°N. These regions represent all European estuarine systems possessing predictable and pronounced influence from semi-diurnal tides, and generally have substantial intertidal habitats with an extensive benthic fauna and flora. But there are other parts of the European coastline, such as the coasts of Denmark, Sweden and the Baltic states which experience brackish water without any substantial tidal influence, so that Conley et al. (2000) working in Danish estuaries chose to define an estuary as ''a partially enclosed body of water open to saline water from the sea and receiving freshwater from rivers, land run-off or seepage'', noting the lack of tides as well as the broader range of freshwater inputs. Similarly on the margins of the Mediterranean Sea, despite the absence of tides, some river mouths are commonly called estuaries. There are also many non-tidal brackish water lagoons on the Mediterranean coast as well as on the Atlantic coast. Where there is an extended period of dry weather in the summer, coupled with varying rainfall during the winter, longshore drift at the seaward end may close a tidal estuary from its connection with the open sea for months at a time, creating so-called ''temporary'' estuaries. The term ''transitional

Table 1
Main physiographic forms to be included under the term transitional waters

Type	Characteristics
Classical estuary	Tidally dominated at the seaward part; salinity notably reduced by freshwater river inputs; riverine dominance inward
Fjord	Land freshwater seepage or markedly seasonal riverine inputs; limited tidal influence; stratified; long narrow, glacially eroded sea inlet, step sided, sill at mouth
Lentic non-tidal lagoon	Limited exchange with the coastal area through a restricted mouth; separated from sea by sand or shingle banks, bars, coral, etc., shallow area, tidal range $\leq$50 cm
Lentic microtidal lagoon	As above but with tidal range $\geq$50 cm
Ria	Drowned river valley, some freshwater inputs; limited exchange
Fjard	Glacially carved embayment, sea inlet, smaller than fjord; limited freshwater inputs
River mouth	River outlet as well-defined physiographic coastal feature
Delta	Low energy, characteristically shaped, sediment dominated, river mouth area; estuary outflow
Coastal freshwater/ brackish water plume	Outflow of estuary or lagoon, notably diluted salinity and hence differing biota than surrounding coast