

2.3 Types of river mouth

2.3.1 Classification of river mouth areas

River mouth areas (or more briefly, river mouths) are defined as specific geographical objects situated at places of river inflow into recipient basins (oceans, seas or lakes) and as zones of dynamic interaction, mixing of river and seawater, and of the deposition of riverine and/or marine sediments.

As a hydrographic system a river mouth area can be divided into two parts:

- (a) the river part, where a fluvial hydrological regime predominates, though sea influences may occur actively (tidal and storm surge water level variations and intrusion of salt seawater); and
- (b) coastal part, where a marine hydrological regime predominates, though river influences may occur actively (significant freshening of seawater due the river flow).

River and coastal parts of the river mouth area are separated from each other by a coastline cross-section of the river (or of a delta branch) and by a delta coastline. River mouth areas can be classified by morphology, river or sea hydrological regime and the character of the mixing of river and seawater.

Morphologically river mouth areas are divided into two main types: those without deltas (I) and those with deltas (II) (Fig. 2.6). River mouth areas can be also divided into two classes: those with semi-enclosed (A) and those with open coastal parts (B). Semi-enclosed coastal parts of the mouth areas are represented by narrow sea bays, limans, lagoons, estuaries. The deltas developing in semi-enclosed coastal parts of the mouths are called as inner (or filling) deltas; the deltas, developing in open coastal parts of the mouths are called as outer or protruding deltas.

Thus there are four subtypes of river mouth areas: IA – without delta and with semi-enclosed coastal parts (for example the mouths of the South Bug River, the Mesen, the Thames, the Delaware, etc.); IB – without deltas and with open coastal parts (the Rotterdam Waterway, mouths of small rivers flowing into the ocean); IIA – with inner (filling) deltas in semi-enclosed coastal parts (the mouths of the Ob, the Enisei, the Don, the Dnieper, the Vistula, etc.); IIB – with outer (protruding) deltas in open coastal parts (the mouths of the Volga, the Danube, the Mississippi, the Rhone, the Hwang Ho, etc.). In the course of the deposition of river sediments the subtype of river mouth area changes in following way: IA → IIA → IIB and IB → IIB (Fig. 2.6). The evolution of a river mouth area leads to an advance of the delta coastline in a seaward direction.

With regard to river (fluvial) hydrological regime, river mouth areas are divided into: (1) river mouths with a well defined river flooding period due to snow melting or long rainfall, and (2) river mouths with flushy rainfall floods.

As far as sea (marine) hydrological regimes are concerned, river mouth areas can be divided into: (1) tidal, and (2) non-tidal. River mouths are considered tidal when the tidal range is above 0.3 m. Storm surges take place in practically all river mouths. Besides that river mouth areas can be divided, by the character of the recipient basin, into: (a) those of a sea type (in this case the river debouches as a rule into a saltwater sea), and (b) those of a lake type (in this case the river generally flows into a freshwater lake).

According to the character of vertical mixing of river and seawater three types of river mouth areas can be distinguished: (1) well mixed river mouths (the water density being practically constant over the depth and varying in longitudinal direction); (2) partially (moderate) mixed river mouths (the water density changing continuously both over the depth and longitudinal direction); and (3) river mouths with a saltwater wedge (the water density changing sharply at the interface of fresh and saltwater).

2.3.2 The mouth mixing zone

Independently of their types, river mouth areas always include a mixing zone of river water and water of the recipient basin, called the mouth mixing zone. A mouth mixing zone is more typical for river mouths debouching into seas with saltwater, where fresh river water and salt seawater

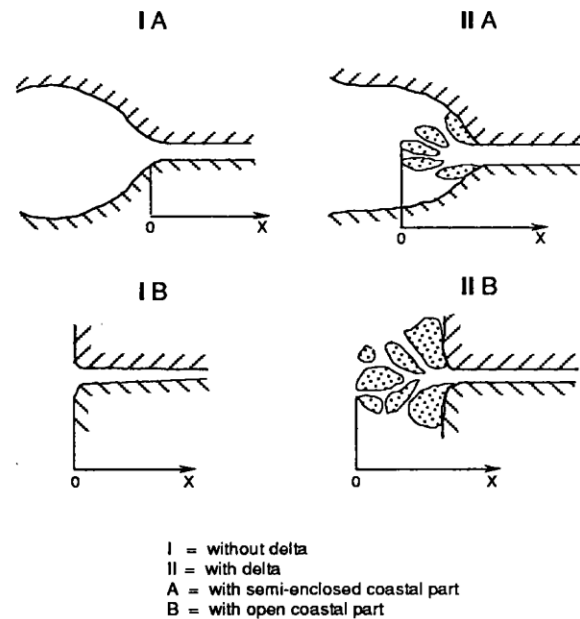


Fig. 2.6 Classification of river mouth areas

with different physical, chemical and biological properties mix. Within the mouth mixing zone the salinity changes from the salinity of river water (usually not more than 1‰) to that approaching the salinity of seawater (as much as 10–40‰ in certain seas).