A5.32 Communities of Mediterranean sublittoral estuarine sediments

Summary

This estuarine habitat is characterized by an environment of variable salinity that ranges from brackish to fully marine conditions. Typically there is an impoverished benthic macroinvertebrate community in the upper reaches of the estuary dominated by Tubificidae and Chiromidae. This contrasts with the lower reaches with a 'salt wedge' community dominated by polychaetes, molluscs and crustaceans. Species diversity is generally low but abundance may be high.

The habitat is especially prone to impacts from coastal pollution (urban, agricultural, industrial), coastal zone development (particularly urbanization and uncontrolled coastal infrastructures), contamination of sediments and biota, episodic perturbations (i.e. sediment removal and illegal dumping) and changes in hydrological conditions. Beneficial conservation measures include regulating discharges to improve water quality, managing fisheries, establishing protected areas, coastal zone planning including zoning of developments, and whole estuary management including regulation of water abstraction from the river system and other activities which affect the hydrological regime.

Synthesis

This habitat has a wide range in the Mediterranean being present in all the sub-basins. It is considered likely to have declined significantly in extent in the recent past due to coastal development and urbanisation as well as the damming of rivers which have altered the hydrographic conditions. The majority of Mediterranean estuaries are also considered likely to have declined in quality for similar reasons.

There is a lack of quantiative data however expert opinion is that it is reasonable to presume that this habitat has suffered declines in both quantity and quality in the last 50 years. The pressures leading to such declines are predicted to continue therefore a continuing decline is likely. This habitat has therefore been assessed as Vulnerable under criteria A1 and C/D1 for both the EU 28 and EU 28+.

Overall Category & Criteria			
EU 28		EU 28+	
Red List Category	Red List Criteria	Red List Category	Red List Criteria
Vulnerable	A1, C/D1	Vulnerable	A1, C/D1

Sub-habitat types that may require further examination

None.

Habitat Type

Code and name

A5.32 Communities of Mediterranean sublittoral estuarine sediments

There are no characteristic photographs of this habitat currently available.

Habitat description

In Mediterranean estuaries tidal amplitude is very weak and tidal currents, which generate vertical mixing of the water, are negligible. This favors vertical stratification of salinity with a counter current of saline

water beneath the less dense river water (salt wedge estuaries). There are also distinct seasonal differences in salinity. In winter the estuary runoff from winter storms and greater flushing reduces the salinity. In spring, runoff becomes small and the estuary gradually returns to marine salinities. One consequence is that the benthos of the sublittoral sediments show rapid transitions from marine to freshwater species.

Typically there is an impoverished benthic macroinvertebrate community in the upper reaches of this estuarine habitat dominated by Tubificidae and Chiromidae. This contrasts with the lower reaches where there is a "salt wedge" community dominated by an abundance of polychates, molluscs and crustaceans. In shallower areas, beds of *Cymodocea nodosa* may be present. Species diversity is generally low but abundance may be high. Sudden influxes of salt water and drying up in the summer create recurrent disturbances that sometimes cause populations to disappear. In contrast, under oligotrophic conditions and long periods of salt wedge permance, the complexity of the benthic communites can increase.

Indicators of quality:

Many indicators of quality have been used for this habitat with particular parameters set in certain situations e.g. protected features within Natura 2000 sites, where reference values have been determined and applied on a location-specific basis.

Indices developed to assess the ecological status of coastal waters, including estuaries, according to the Water Framework Directive, include physical indicators, water quality indicators and measures of benthic diversity, species richness and abundance. The latter group, which is particularly relevant to benthic habitats, includes a Benthic Quality Index, an Infaunal Trophic Index, a Marine Biotic index based on ecological groups, and the Benthic Opportunistic Polychaetes/Amphipods Index.

Characteristic species:

Oligochaetes:*Tubificoides* spp., *Limnodrilus hoffmeisteri, Heterochaeta costata, Thalassodrilides gurwitschi;* Polychaetes: *Capitella capitata, Ficopomatus enigmaticus, Heteromastus filiformis, Alitta succinea, Scolaricia typica, Spio decoratus, Aphelochaeta marioni; Gastropods: Hydrobia acuta;* Bivalves: *Spisula subtruncata,* Crustaceans*: Corophium orientale, Gammarus aequicauda, Carcinus mediterraneus.*

Classification

EUNIS (v1405):

Level 4. A sub-habitat of Sublittoral mud (A5.3)

Annex 1:

1130 Estuaries

MAES:

Marine - Marine inlets and transitional waters

MSFD:

Shallow sublittoral mud

EUSeaMap:

Shallow muds

IUCN:

9.5 Subtidal sandy-mud

9.6 Subtidal muddy

9.10 Estuaries

Does the habitat type present an outstanding example of typical characteristics of one or more biogeographic regions?
No

Justification
Estuarine habitats are not a common feature of the Mediterranean.

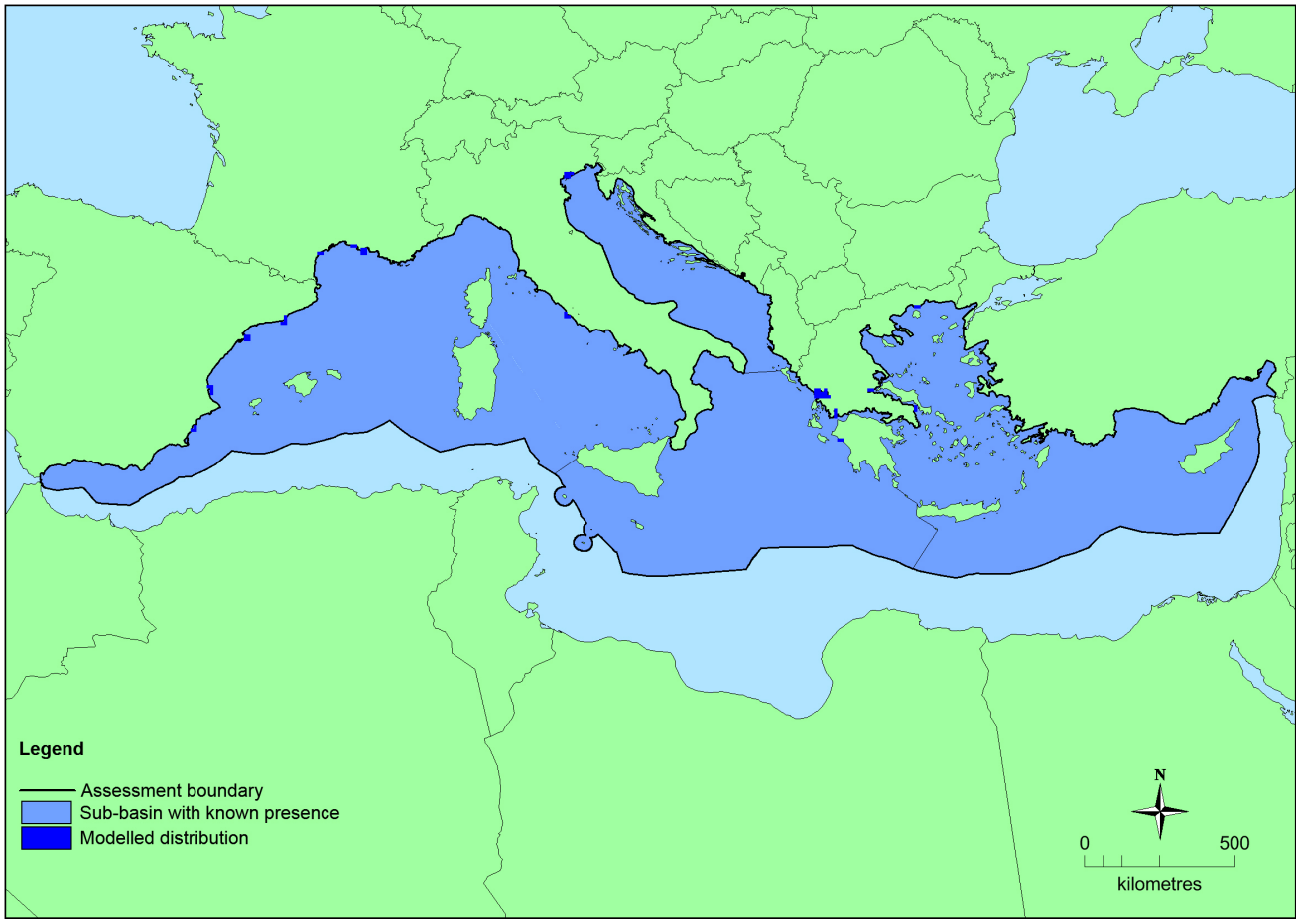
Geographic occurrence and trends

Region	Present or Presence Uncertain	Current area of habitat	Recent trend in quantity (last 50 yrs)	Recent trend in quality (last 50 yrs)
Mediterranean Sea	Adriatic Sea: Present Aegian-Levantine Sea: Present Ionian Sea and the Central Mediterranean Sea: Present Western Mediterranean Sea: Present	Unknown Km^2	Decreasing	Decreasing

Extent of Occurrence, Area of Occupancy and habitat area

	Extent of Occurrence (EOO)	Area of Occupancy (AOO)	Current estimated Total Area	Comment
EU 28	1,271,537 Km^2	54	Unknown Km^2	EOO and AOO have been calculated on the available data. Although this data set is known to be incomplete the figures exceed the thresholds for threatened status.
EU 28+	1,271,537 Km^2	54	Unknown Km^2	EOO and AOO have been calculated on the available data. Although this data set is known to be incomplete the figures exceed the thresholds for threatened status.

Distribution map



There are insufficient data to provide a comprehensive and accurate map of the distribution of this habitat.This map has been generated using EMODnet data from modelled/surveyed records for the Mediterranean (and supplemented with expert opinion where applicable) (EMODnet 2010). EOO and AOO have been calculated on the available data presented in this map however these should be treated with caution as expert opinion is that this is not the full distribution of the habitat.

How much of the current distribution of the habitat type lies within the EU 28?

It is unknown how much of this habitat is hosted by the EU 28 in the Mediterranean although it does occur in the EU 28+.

Trends in quantity

Around two thirds of the Mediterranean coastline is urbanized, with this fraction exceeding 75% in the regions with the most developed industries. Close to the shoreline this frequently involves the construction of artificial structures, mainly groynes and breakwaters, seawalls and jetties, along naturally low sediment shores such as those typically of estuaries. In the north Adriatic for example more than 190 km of artificial structures have been built along 300 km of naturally low sedimentary shores. This hardening has caused severe losses and alterations of shallow sedimentary habitats and has introduced new artificial habitats, with dramatic effects on native habitats and assemblages. Detailed mapping of coastal habitats along some sections of coast have also provide information on quanitity. One example is along the Catalan coast (Spain) where infralittoral estuarine muddy sands and mediolittoral muddy sands were the dominant habitats along 53km out of 1,110km of coastline.

Historical as well as recent coastal development has also resulted in loss of estuarine habitat by impoundment and drainage in both small and large estuarine systems. S'Albufera-Alcudia Bay on the island of Mallorca, for example, has been affected by human activities since the second half of the 19th century when drainage programme was instituted, whilst the estuarine environment of the Ebro,

particuarly around the delta has changed very significantly since the beginning of the 16th century.

A decline in extent of this habitat can also be attributed to upstream activities, particularly the alteration of the natural flow regime by damming. This not only affects water flow but also sediment deposition in the bed of the estuary and where it discharges into the sea. The scale of change has been very significant as revealed by the fact that in some southern European rivers (e.g. Ebro, Douro, Urumea, Rhone), the annual volume of sediment discharge represents less than 10% of their level of 1950; for the Ebro this is even less than 5%. Similar changes have also been reported in the eastern Mediterranean, for example in the estuaries of the Nestos, Acheloos, Arachthos, Sperchelos and Alfeios, in Greece.

The overall trend is therefore one of decreasing quantity.

- Average current trend in quantity (extent)
  EU 28: Decreasing
  EU 28+: Decreasing
- Does the habitat type have a small natural range following regression?
  No
  Justification
  This habitat does not have a small natural range as the EOO is greater than 50,000 km^2 .
- Does the habitat have a small natural range by reason of its intrinsically restricted area?
  Yes
  Justification
  Estuarine habitats are intrinsically restricted however this habitat does not have a small natural range as the EOO is greater than 50,000 km^2.

Trends in quality

There have been significant historical as well as recent changes in the quality of this habitat. Trends are difficult to determine because of the natural variability of the benthic communities associated with estuaries, and especially salt-wedge estuaries as typically occur in the Mediterranean. This variability is exacerbated by a long history of human-induced pressures that have led to serious changes in the natural ecological cycles of estuarine systems in the Mediterranean. The complexity of this is well illustrated by the situation in the Ebro estuary, Spain. Nutrient enrichment and alteration of the natural flow regime led to severe eutrophication episodes in the 1980s, and anoxic conditions. Urban sewage treatment and restriction on the use of phosphate based compounds has since reduced the eutrophication effects however the upstream dams and regulation of water flow means that the salt wedge no longer fluctuates. Water quality is therefore worsening below the halocline due to low water renewal rates.

Toxic contamination has also resulted in decline in quality. Research indicated a significant concentration of some herbicides that persist in the areas of the Ebro delta on the Eastern Coast of Spain, the Rhone delta in the South of France, the River Po, Italy/the Northern Adriatic Sea, and the Thermaikos and Amvrakikos Gulfs in Greece.

- Average current trend in quality
  EU 28: Decreasing
  EU 28+: Decreasing

Pressures and threats

Significant anthropogenic pressures affecting estuaries are industrial waste water, urban sewage effluents, agriculture and farmland runoff. These activities cause an excess of nutrients, increase the organic matter loads and may promote the accumulation of dangerous pollutants in the sediment, such as heavy metals, toxic compounds and hydrocarbon substances. Coastal development has resulted in direct loss of habitat and alteration to the natural flow regime, for example through the construction of dams and water

abstraction both of which have had a major affect on some estuaries by altering sediment transport, flushing and the stability of water column stratification.

List of pressures and threats

Agriculture

Use of biocides, hormones and chemicals
Fertilisation

Urbanisation, residential and commercial development

Urbanised areas, human habitation
Industrial or commercial areas
Discharges

Biological resource use other than agriculture & forestry

Marine and Freshwater Aquaculture
Fishing and harvesting aquatic resources

Pollution

Pollution to surface waters (limnic, terrestrial, marine & brackish)
Marine water pollution
Soil pollution and solid waste (excluding discharges)

Natural System modifications

Human induced changes in hydraulic conditions

Conservation and management

This habitat occurs in some protected areas. Beneficial conservation measures include regulating discharges to improve water quality, managing fisheries, establishing protected areas, coastal zone planning including zoning of developments, and whole estuary management including regulation of water abstraction from the river system and other activities which affect the hydrological regime. Direct engagement of stakeholders in the planning of the management process, and analysis of social and economic costs and benefits of different management options will be essential to the successful implementation of conservation actions.

List of conservation and management needs

Measures related to wetland, freshwater and coastal habitats

Restoring/Improving water quality
Restoring/Improving the hydrological regime

Measures related to spatial planning

Other spatial measures
Establish protected areas/sites

Measures related to hunting, taking and fishing and species management

Regulation/Management of fishery in marine and brackish systems

Measures related to urban areas, industry, energy and transport

Urban and industrial waste management

Conservation status

Annex 1:

1130: MMED U2

When severely damaged, does the habitat retain the capacity to recover its typical character and functionality?

Unknown. Some of the associated species are able to recolonise rapidly, however where land claim has taken place, recovery will not be possible.

Effort required

Red List Assessment

Criterion A: Reduction in quantity

Criterion A	A1	A2a	A2b	A3
EU 28	>30 %	Unknown %	Unknown %	Unknown %
EU 28+	>30 %	Unknown %	Unknown %	Unknown %

The area of sublittoral estuarine habitats in the Mediterranean is considered likely to have declined significantly in the recent past. These declines are associated with coastal development and urbanisation as well as damming of rivers which altered the hydrographic conditions, in particular water flow and sediment transport. These pressures and trends are predicted to continue.

Although quantitative data are lacking, expert opinion is that it is reasonable to presume that this habitat has suffered large declines in surface area of more than 30% over the last 50 years. No estimate has been made of historical declines although these are known to have occurred. This habitat has therefore been assessed as Vulnerable under criteria A1 for both the EU 28 and EU 28+.

Criterion B: Restricted geographic distribution

Criterion B	B1				B2				B3
	EOO	a	b	c	AOO	a	b	c	
EU 28	>50,000 Km^2	Yes	Yes	No	>50	Yes	Yes	No	No
EU 28+	>50,000 Km^2	Yes	Yes	No	>50	Yes	Yes	No	No

This habitat is present in the Eastern and Western Mediterranean basins. The precise extent is unknown but estimated as EOO >50,000km^2 and AOO >50 which exceeds the thresholds for a threatened category on the basis of restricted geographic distribution. The habitat is known to have declined in quantity and quality. The nature and size of threats to this habitat and the distribution data which are available suggest that no known threats are likely to affect all localities at once. This habitat has therefore been assessed as Least Concern under criteria B for both the EU 28 and EU 28+.

Criterion C and D: Reduction in abiotic and/or biotic quality

Criteria C/D	C/D1		C/D2		C/D3	
	Extent affected	Relative severity	Extent affected	Relative severity	Extent affected	Relative severity
EU 28	>50 %	Intermediate %	Unknown %	Unknown %	Unknown %	Unknown %
EU 28+	>50 %	intermediate %	Unknown %	Unknown %	Unknown %	Unknown %

Criterion C	C1		C2		C3	
	Extent affected	Relative severity	Extent affected	Relative severity	Extent affected	Relative severity
EU 28	Unknown %	Unknown %	Unknown %	Unknown %	Unknown %	Unknown %
EU 28+	Unknown %	Unknown %	Unknown %	Unknown %	Unknown %	Unknown %

Criterion D	D1		D2		D3	
	Extent affected	Relative severity	Extent affected	Relative severity	Extent affected	Relative severity
EU 28	Unknown %	Unknown%	Unknown %	Unknown%	Unknown %	Unknown%
EU 28+	Unknown %	Unknown%	Unknown %	Unknown%	Unknown %	Unknown%

The majority of estuaries in the Mediterranean are believed to has suffered some decline in both abiotic and biotic quality over the last 50 years, predominantly due to the effects coastal development, urbanisation, pollution and alteration of hydrographic conditions. The scale of this for the Mediterranean region is difficult to quantify however expert opinion is that this is likely to amount to a substantial reduction, probably represented by an intermediate decline affecting more than 50% of the extent, in both the EU 28 and EU 28+. This habitat has therefore been assessed as Vulnerable under criteria C/D1.

Criterion E: Quantitative analysis to evaluate risk of habitat collapse

Criterion E	Probability of collapse
EU 28	Unknown
EU 28+	Unknown

There is no quantitative analysis available to estimate the probability of collapse of this habitat type. Therefore, it is assessed as Data Deficient under Criterion E.

Overall assessment "Balance sheet" for EU 28 and EU 28+

	A1	A2a	A2b	A3	B1	B2	B3	C/D1	C/D2	C/D3	C1	C2	C3	D1	D2	D3	E
EU28	VU	DD	DD	DD	LC	LC	LC	VU	DD	DD	DD	DD	DD	DD	DD	DD	DD
EU28+	VU	DD	DD	DD	LC	LC	LC	VU	DD	DD	DD	DD	DD	DD	DD	DD	DD

Overall Category & Criteria			
EU 28		EU 28+	
Red List Category	Red List Criteria	Red List Category	Red List Criteria
Vulnerable	A1, C/D1	Vulnerable	A1, C/D1

Confidence in the assessment

Low (mainly based on uncertain or indirect information, inferred and suspected data values, and/or limited expert knowledge)

Assessors

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Contributors

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