C1.5 Permanent inland saline and brackish waterbody

Summary

This habitat includes the submerged vegetation of non-coastal brackish, saline or hypersaline lakes, ponds or pools that have developed in arid and semi-arid conditions as in the Pannonian basin and, more locally, the Mediterranean region where intermittent saline water courses also occur. Salinity and chloride content vary according to rainfall, evaporation and the character of the substrate which affects the character of the predominantly halophytic vegetation and associated invertebrates which provide food for birds. Already often naturally fragmented, the habitat has suffered over the last decades from anthropogenic changes in hydrology. Conservation needs maintenance of hydrology and mitigation of fresh water input.

Synthesis

Quantitative data on trend in area and quality are strongly dominated by information about the largest saline lake in Europe, the Neusiedlersee in Austria. There has been a negative trend in the waterbody of this lake due to drainage and reed bed encroachment, especially in the period 1910-1950. In seven other countries the average trend since 1950 is a decline of about 40/50% of the area, but this figure relates to less than 10% of the total area. Small area declines in this period in Austria lead to an average European value close to the threshold for Near Threatened under criterion A1. The trends in quality over the same period are relatively small. The habitat qualifies however as Near Threatened (NT) due to its historical decline in area (since 1900), for which quantitative figures are not known, but which is estimated to be between 30 and 50%.

Overall Category & Criteria			
EU 28		EU 28+	
Red List Category	Red List Criteria	Red List Category	Red List Criteria
Near Threatened	A3	Near Threatened	A3

Sub-habitat types that may require further examination

The habitat may be further divided into permanent and temporary saline waterbodies.

Habitat Type

Code and name

C1.5 Permanent inland saline and brackish waterbody

Inland permanent brackish water of the Kreidebergsee in northern Germany, with *Bolboschoenus maritimus* on the shore (Photo: Carsten Hobohm).

Lake Vrana *(Vransko jezero)* in the coastal karst region of Dalmatia (Croatia) is a rare example of a cryptodepression that is naturally influenced by calcareous fresh ground water and salt water from the near Adriatic Sea. The brackish character of the lake is illustrated in the foreground by *Schoenoplectus litoralis* (Photo: John Janssen).

Habitat description

This habitat type includes non-coastal brackish, saline or hypersaline lakes, ponds or pools. These water bodies may have been directly related to the sea in the past, but are currently separated from any sea influence. They develop in arid and semi-arid climatic conditions, in endorheic drainage basins (which are not connected to other water bodies such as rivers, and therefore the water does not drain to the sea), like in the Pannonian Basin or in smaller basins in the Mediterranean area. In these conditions permanent or temporary lakes become saline due to evaporation that concentrates dissolved salts that either have been introduced by rainwater or have been caught from substrata within the drainage basin. This habitat also includes saline intermittently flowing Mediterranean rivers, running on substrata with high salt content. These watercourses frequently dry out in summer, leaving shallow pools colonized by aquatic halophytes. Salinity and concentrations of chloride may vary from brackish to hypersaline water, depending on rain fall, evaporation rate and the basin substrate. In general brackish waters comply to a minimum salinity of 0.5‰. The water level may vary as well and can have high seasonal fluctuations up to the complete drying out in summer in the most arid and warm areas of Europe. Water is alkaline and highly buffered by bicarbonate (high alkalinity). Phosphorus- and sulphate concentrations can be relatively high (for submerged macrophyte vegetation), which may be related to high sulphur concentration in the sediment. The habitat represents a dynamic environment due to the variations in water quality and quantity as mentioned above. Species composition is largely determined by the presence of brackish water and the variability in salinity.

he vegetation growing in this habitat type is characterized by halophytes adapted to these circumstances. In general, the species composition is poor and the vegetation often consists of monospecific communities. Characteristic halophytes are *Najas marina, N. minor, Ruppia maritima, Batrachium* (=*Ranunculus*) *baudotii* and *Zannichellia palustris, Z. pedunculata, Z. obtusifolia*. Besides vascular plants, some stonewort are characteristic species, like *Tolypella nidifica, Chara canescens, Ch. baltica, Ch. aspera, Ch. intermedia* and *Ch. vulgaris*. Species with a broad habitat range may extend to these brackish waters, like *Lemna* spp. (L. gibba, L. minor, L. trisulca), *Potamogeton* spp. (*P. crispus, P. natans, P. pectinatus*), *Callitriche* spp. (*C. lenisulca, C. stagnalis, C. truncate* subsp*. fimbriata*), *Ceratophyllum demersum*, *Myriophyllum spicatum*, *Batrachium* spp., and *Nymphae alba*.

The shores of these saline water bodies are characterized by emergent vegetation dominated by macrophytes tolerant to brackish water, such as *Phragmites australis, Scirpus tabernaemontani, Bolboschoenus maritimus, Typha laxmannii, Cladium mariscus* and *Carex melanostachya*. However, such shore communities are included in habitat C5.4. Similar communities in coastal dune slacks are included under the habitats B1.8a or B1.8b. The habitat is important for several species of invertebrates and forms a feeding ground for birds. Because salt and ion concentrations are dependent on the evaporation rate, this habitat type is strongly related to climatic conditions. Therefore it is sensitive to climate change. Within Europe this habitat is rare. The largest sites are found in the Pannonian basin, for example the Neusiedler See.

Indicators of good quality:

The following characteristics may be used as indicators of a good quality:

- Minimum salinity around 0.5 ‰
- Natural high electrical conductivity of the water
- No alteration of the natural salinity range
- Aquatic vegetation and species characteristic of brackish water
- Absence of overgrowing with shrubs and trees
- No signs of eutrophication (no dominance of algae such as Cladophora sp., Enteromorpha sp., Vaucheria sp.)
- No indicator of negative anthropogenic influence (e.g. regulation of the water level, chemical pollution)

Characteristic species:

Flora

Vascular plants: *Althenia filiformis, Althenia orientalis, Callitriche lenisulca, Callitriche stagnalis, Callitriche truncate subs. fimbriata, Myriophyllum spicatum, Najas minor, Najas marina, Potamogeton pectinatus, Ranunculus baudotii* (=*Batrachium baudotii*), *Ranunculus polyphyllus, Ruppia cirrhosa, Ruppia drepanensis, Ruppia maritima, Zannichellia palustris, Zannichellia obtusifolia, Zannichellia pedicellatae*

Macro-algae: *Ceramium diaphanum, Ceramium rubrum, Chaetomorpha linum, Chara aspera , Chara baltica, Chara canescens, Chara connivens, Chara galioides, Chara horrida, Chara intermedia, Chara tomentosa, Cladophora fracta, Enteromorpha intestinalis, Lamprothamnium papulosum, Tolypella nidifica, Tolypella hispanica, Tolypella salina, Ulva sp., Vaucheria sp.*

Fauna Macroinvertebrates: *Gammarus duebeni, Cordylophora caspia, Palaemonetes varians, Artemia spp, Daphnia magna, Alona elegans, Lestes macrostigma, Vertebrates: Aphanius fasciatus*

Classification

This habitat may be equivalent to, or broader than, or narrower than the habitats or ecosystems in the following typologies.

EUNIS:

C1.5 Permanent inland saline and brackish waters

EuroVegChecklist (alliances):

Charion canescentis Krausch 1964

Zannichellion pedicellatae Schaminée et al. 1990

Ranunculion aquatilis Passarge 1964

Ruppion maritimae Br.-Bl. ex Westhoff in Bennema et al. 1943

Annex 1:

-

Emerald:

C1.5 Permanent inland saline and brackish lakes, ponds and pools

C1.66 Temporary inland saline and brackish waters

MAES:

Rivers and lakes

IUCN:

5.16. Permanent Saline, Brackish or Alkaline Marshes/Pools

Does the habitat type present an outstanding example of typical characteristics of one or more biogeographic regions?

Yes

Regions
Mediterranean
Pannonian

Justification
This habitat develops mainly in arid and semi-arid climatic conditions, in endorheic drainage basins (not connected to other water bodies) like the Pannonian Basin or minor basins in the Mediterranean area where salt is present due to past geomorphological processes.

Geographic occurrence and trends

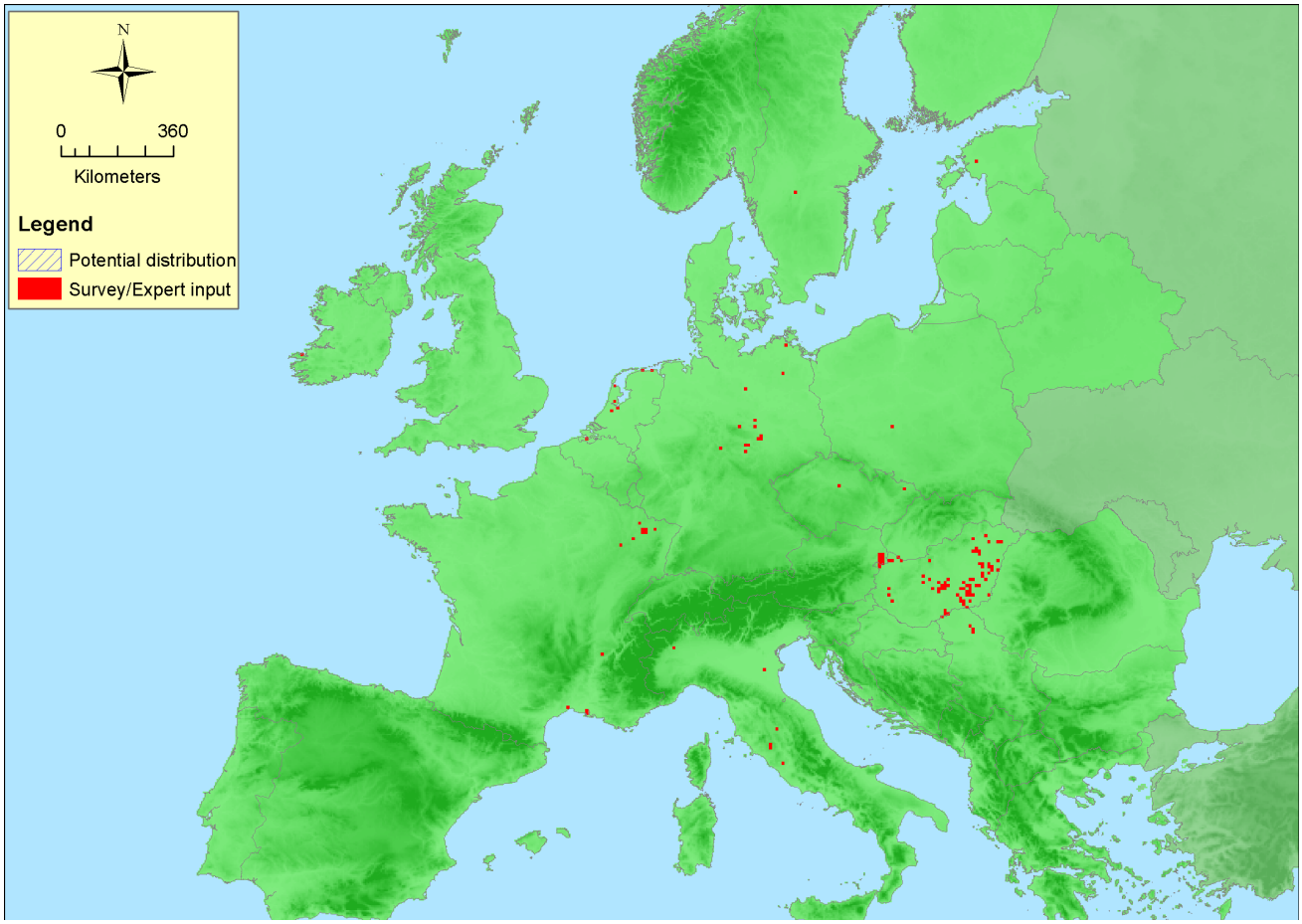
EU 28	Present or Presence Uncertain	Current area of habitat	Recent trend in quantity (last 50 yrs)	Recent trend in quality (last 50 yrs)
Austria	Present	135 Km^2	Decreasing	Decreasing
Croatia	Present	unknown Km^2	Unknown	Unknown
Denmark	Uncertain	unknown Km^2	Unknown	Unknown
France	France mainland: Present	1 Km^2	Stable	Decreasing
Germany	Present	0.5 Km^2	Decreasing	Unknown
Hungary	Present	0.1 Km^2	Decreasing	Decreasing
Italy	Italy mainland: Present Sardinia: Present Sicily: Present	2.6 Km^2	Decreasing	Decreasing
Netherlands	Present	1 Km^2	Stable	Unknown
Poland	Uncertain	unknown Km^2	Unknown	Unknown
Romania	Present	1 Km^2	Decreasing	Unknown
Spain	Spain mainland: Present	4.7 Km^2	Decreasing	Decreasing

EU 28 +	Present or Presence Uncertain	Current area of habitat	Recent trend in quantity (last 50 yrs)	Recent trend in quality (last 50 yrs)
Serbia	Uncertain	unknown Km^2	Unknown	Unknown

Extent of Occurrence, Area of Occupancy and habitat area

	Extent of Occurrence (EOO)	Area of Occupancy (AOO)	Current estimated Total Area	Comment
EU 28	2822300 Km^2	125	146 Km^2	Estimated area based on 8 countries
EU 28+	2848400 Km^2	128	146 Km^2	Estimated area based on 8 countries

Distribution map



Map with many data gaps. AOO is probably much larger. Data sources: NAT, LIT, EXP, EVA.

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

<5%. The percentage of the current distribution of this habitat in Europe relative to the worldwide distribution is considered to be lower than the land occupied by Europe on earth (3%). Large surface areas of this habitat are found in regions with arid climate, notably in North-Africa (Chotts, Sebkha), South-Africa, North America (NW), South-America (West), Asia, Australia (NE).

Trends in quantity

The estimated area based on 8 countries is 149,5 sq. km, including 135 sq. km from Austria (Neusiedlersee and smaller alkaline lakes in the surrounding). The average trend in quantity over 50 years based on data from 7 countries is -43%, excluding Austrian data. Austrian data has some uncertainty in it. For the Neusiedlersee a 5% decline is estimated since 1950, but much larger declines occurred (due to encroachment of reed beds) in the period 1910-1950 (after the stabilization of the water table after the construction of a canal in 1910). However, in the last 50 years much larger area declines occurred in surrounding alkaline lakes, of which many are semi-permanent. If these lakes are including, the overall trend over 50 years is about -20% for Austria.

Historical quantitative declines are calculated to be larger than -70% based on data from 3 countries only (Hungary, Germany and Spain), covering less than 10% of the area. With an additional large decline in the Neusiedersee in the period 1910-1950 (exact figures unknown), the historical negative trend is estimated to be between 30 and 50%. Future trends are an expected further decrease.

- 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
  The habitat has a large natural range (far above 50,000 Km^2), while it has suffered a decline in area over the past 50 years.
- Does the habitat have a small natural range by reason of its intrinsically restricted area?
  Yes
  Justification
  This aquatic habitat has been directly or indirectly related to the sea in the (far) past and is mainly found in endorheic drainage basins under arid or semi-arid climatic conditions, and besides in areas where relict concentrations of salt are present in the bedrock. Although the largest brackish lake in Europe is very large (Neudsiedlersee), many smaller lakes have a small area due to restricted abiotic conditions.

Trends in quality

Extent of degradation is estimated at 20% with a severity of 26% based on data from 5 countries, including Austria (and therefore covering more than 90% of the area). Current trends are considered as still moderate or slightly decreasing. Two experts provided projections for future with expected decreasing trends.

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

Pressures and threats

Land reclamation for expansion of agricultural and urban areas is probably responsible for most of the historical decline in inland saline or brackish water vegetation in Europe. Declines over the last decades are mostly associated with human induced changes in hydraulic conditions: modification of catchment areas or changes in water allocation will translate into reduced hydroperiod leading potentially to the disappearance of submerged macrophytes, while input of freshwater to serve human uses such as waterfowl hunting or ecotourism will translate into increased flooding and dominance of aquaic species adapted to permanent and less saline conditions (eg. *Potamogeton pectinatus*, *Myriophyllum spicatum*).

List of pressures and threats

Agriculture

Cultivation

Pollution

Pollution to surface waters (limnic, terrestrial, marine & brackish)

Natural System modifications

Human induced changes in hydraulic conditions

Climate change

Droughts and less precipitations
Flooding and rising precipitations

Conservation and management

Most important conservation measures are: (1) avoidance of input of freshwater that modifies water salinity and prevents summer dry periods, and (2) avoidance of embankment, modification of catchment

area or water derivation, that would result in absence of flooding (which can be compensated by minimal water input in some cases).

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

Establish protected areas/sites

Conservation status

Not related to any Annex 1 habitat type.

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

The habitat can be restored relatively quickly if adequate hydroperiods can be restored while maintaining water conductivity above the 0.5 ‰ threshold. Depending on the situation, this can be done through indirect intervention (eg by restoring the natural functioning of catchment area) or naturally (by preventing artificial water inputs).

Effort required

10 years
Through intervention

Red List Assessment

Criterion A: Reduction in quantity

Criterion A	A1	A2a	A2b	A3
EU 28	-22 %	unknown %	unknown %	-30/50% %
EU 28+	-22 %	unknown %	unknown %	-30/50% %

The habitat has suffered an average -22% decrease over the last 50 years according to national experts from 8 countries, including data for the Neusiedlersee, the largest brackish lake in Europe. The decline outside Austria is much larger, on average -44 to -53% (indicating Vulnerable levels) based on data from 7 countries, but covering less than 10% of the area. Areas are further expected to decrease for 5 countries, quantified at -5% to -20% by experts from two countries. Historical quantitative trends were calculated at -72 to -74% based on data from only 3 countries, lacking Austrian data. However, also in the Neusiedlersee large declines in brackish water bodies occurred in the period 1910-1950, the average historical decline is estimated to be between 30 and 50%, qualifying this habitat for the Near Threatened (NT) category.

Criterion B: Restricted geographic distribution

Criterion B	B1				B2				B3
	EOO	a	b	c	AOO	a	b	c	
EU 28	>50000 Km^2	Yes	No	No	>50	Yes	No	No	No
EU 28+	>50000 Km^2	Yes	No	No	>50	Yes	No	No	No

The EOO and number of locations of the habitat are very large, but the AOO is relatively restricted, but

above the threshold for Near Threatened under criterion B2.

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	20 %	26 %	unknown %	unknown %	unknown %	unknown %
EU 28+	20 %	26 %	unknown %	unknown %	unknown %	unknown %

Criterion C	C1		C2		C3	
	Extent affected	Relative severity	Extent affected	Relative severity	Extent affected	Relative severity
EU 28	20 %	26 %	unknown %	unknown %	unknown %	unknown %
EU 28+	20 %	26 %	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%

Reduction in quality since 1950-1970 is based on estimates given by territorial experts from 5 countries, including Austria (covering more than 95% of the area). Qualitative future trends are expected to decrease (2 countries). No estimates have been provided regarding historical trends. Reduction in quality is attributed to abiotic conditions only because it is moslty related to changes in hydraulic conditions.

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 that estimates the probability of collapse of this habitat type.

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	LC	DD	DD	NT	LC	LC	LC	LC	DD	DD	LC	DD	DD	DD	DD	DD	DD
EU28+	LC	DD	DD	NT	LC	LC	LC	LC	DD	DD	LC	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
Near Threatened	A3	Near Threatened	A3

Confidence in the assessment

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

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