

Stock name: European eel

Latin name: *Anguilla anguilla*

Geographical area: Europe and North Africa (ICES subareas 1-2, 4-8, division 3a)

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Stock Sensitivity Attributes

HABITAT SPECIFICITY: The European eel (*Anguilla anguilla*, Anguillidae) is distributed across the majority of coastal countries in Europe and North Africa, with its southern limit in Mauritania (30 °N) and its northern limit in the Barents Sea (72 °N) including the entire Mediterranean basin (Tesch, 2003). However, eel has only one spawning area (exact location is unknown) in the Sargasso Sea (Schmidt, 1923). It is unknown how climate change may affect spawning in the Sargasso Sea.

PREY SPECIFICITY: The diet of eels is highly opportunistic and is size dependent. They feed mainly on benthic organisms which vary from fish to crustaceans. The diet of larvae is not well defined. It is likely marine snow and gelatinous plankton (Ayala et al., 2018; Riemann et al., 2010). Variations in primary productivity may affect the survival of larvae (Bonhommeau et al., 2008; Durif et al., 2011; Miller, 2009).

SPECIES INTERACTION: Because the species is present in many habitat types (fresh-, brackish and saltwater) and temperature ranges (Tesch, 2003), it is very unlikely that another fish species are able to compete with eel throughout its distribution range.

ADULT MOBILITY: European eel is very widely distributed but has only one spawning area in the Sargasso Sea (Als et al., 2011; Schmidt, 1923). It is unknown how conditions in the Sargasso Sea may affect spawning.

DISPERSAL OF EARLY LIFE STAGES: Larvae are highly dispersed (Tesch, 2003).

EARLY LIFE HISTORY SURVIVAL AND SETTLEMENT REQUIREMENTS: For the same reasons as above, recruitment to coastal and freshwater habitats require minimal conditions. However, larval requirements in the Sargasso Sea and during the 1 to 2-year journey towards Europe are unknown (Bonhommeau et al., 2010).

COMPLEXITY IN REPRODUCTIVE STRATEGY: This is very uncertain since spawning eels have never been observed in the wild and the exact location of the spawning area is unknown. The European eel, however, is a panmictic species (Pujolar et al., 2014). This means that all individuals are potential mates from all over the distribution area that congregate at the same time and location. Individuals spawn once in their lifecycle and there is only one spawning location (Tesch, 2003).

SPAWNING CYCLE: There is one spawning event per year. The duration is unknown, but likely over 1 to 2 months (Miller et al., 2015; Schmidt, 1923).

SENSITIVITY TO TEMPERATURE: Adult eels occur over a wide temperature range (>15°C) (ICES, 2016; Tesch, 2003). However, larvae are probably restricted to specific temperature ranges.

SENSITIVITY TO OCEAN ACIDIFICATION: This is unknown, but there is no obvious link between ocean acidification and eel ecology.

POPULATION GROWTH RATE: von Bertalanffy (K), age at maturation and maximum age is extremely different depending on the sex and habitats of eels (Durif et al., 2009). On average age at maturation

is around 16 to 19 years (De Leo & Gatto, 1995; Durif et al., 2020). Maximum length is around 0.9-1 m. Natural mortality is estimated around 0.2 (ICES, 2016).

STOCK SIZE/STATUS: Data coverage is incomplete. Biomass indices are available for certain countries, but the uncertainty is high. Nevertheless, recruitment and timeseries are 1 to 10% of the reference levels (pre-1980's) (ICES, 2018).

OTHER STRESSORS: There are multiple stressors: obstacles and dams to migrations, habitat loss, parasites (*Anguillicola crassus*, Anguillicolidae), viruses, contaminants, and overfishing (Castonguay & Durif, 2016). All of these stressors have contributed to a substantial decline of the European eel stock.

Scoring of the considered sensitivity attributes

Sensitivity attributes, climate exposure based on climate projections allowing the evaluations of impacts of climate change, and accumulated directional effect scoring for Europe eel (*Anguilla anguilla*) stock in ICES subareas 1-2, 4-8, division 3a. L: low; M: moderate; H: high; VH: very high, Mean_w: weighted mean; N/A: not applicable. Usage: this column was used to make ad hoc notes, including considerations about the amount of relevant data available: 1 = low, 2 = moderate; 3 = high. N/A = not applicable.

European eel (*Anguilla anguilla*) in ICES subareas 1-2, 4-8, division 3a

SENSITIVITY ATTRIBUTES	L	M	H	VH	Mean _w	Usage	Remark
Habitat Specificity	2	3	0	0	1.6		
Prey Specificity	3	2	0	0	1.4		
Species Interaction	5	0	0	0	1.0		
Adult Mobility	3	2	0	0	1.4		
Dispersal of Early Life Stages	5	0	0	0	1.0		
ELH Survival and Settlement Requirements	1	3	1	0	2.0		
Complexity in Reproductive Strategy	0	0	3	2	3.4		
Spawning Cycle	0	0	1	4	3.8		
Sensitivity to Temperature	0	3	2	0	2.4		
Sensitivity to Ocean Acidification	5	0	0	0	1.0		
Population Growth Rate	0	0	1	4	3.8		
Stock Size/Status	0	0	5	0	3.0		
Other Stressors	0	0	0	5	4.0		
Grand mean					2.29		
Grand mean SD					1.17		

CLIMATE EXPOSURE	L	M	H	VH	Mean _w	Usage	Directional Effect
Surface Temperature	0	0	0	0		N/A	
Temperature 100 m	4	1	0	0	1.2	2	1
Temperature 500 m	0	0	0	0		N/A	
Bottom Temperature	0	0	0	0		N/A	
O ₂ (Surface)	4	1	0	0	1.2	2	-1
pH (Surface)	5	0	0	0	1.0	2	-1
Gross Primary Production	3	2	0	0	1.4	1	1
Gross Secondary Production	2	3	0	0	1.6	1	1
Sea Ice Abundance	0	0	0	0		N/A	
Grand mean					1.28		
Grand mean SD					0.23		
Accumulated Directional Effect					-		2.0

Accumulated Directional Effect: POSITIVE

2.0

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