WESTERN HORSE MACKEREL

Stock name: Western horse mackerel
Latin name: *Trachurus trachurus*
Geographical area: Northeast Atlantic (ICES subarea 8 and divisions 2.a, 4.a, 5.b, 6.a, 7.a-c, e-k)
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Date: 07 February 2020

Stock Sensitivity Attributes

HABITAT SPECIFICITY: The western horse mackerel (*Trachurus trachurus*, Carangidae) is a habitat generalist and utilizes very common and widely distributed habitats. The stock is distributed in pelagic waters from Spanish and Portuguese waters in the south to the northern part of the Norwegian Sea in the north (Abaunza et al., 2003, 2008; ICES, 2019b, 2019a; S. Iversen, 2004; Nøttestad, 2019). Horse mackerel is regarded as a pelagic species, but its behaviour resembles demersal characters (ICES, 2009).

PREY SPECIFICITY: Western horse mackerel is a prey generalist and feeds on a variety of prey species (e.g. fish and copepods) and size groups (ICES, 2018a, 2018b, 2019c; S. Iversen, 2004; Nøttestad, 2019).

SPECIES INTERACTION: The interaction with other species is, however, considered low with little influence by competition for the same prey and predation by other fish stocks located in its main feeding area. Most documented species interactions are reported for western horse mackerel and mackerel during the spawning season (ICES, 2016, 2017a, 2017b, 2018a, 2018b, 2019b, 2019c). Mackerel may have somewhat influence on the feeding activity and availability by competition for similar type of prey species. Limited studies have been done on species interaction between western horse mackerel and other fish species and predators.

ADULT MOBILITY: Western horse mackerel can be characterized as site dependent, but highly mobile (ICES, 2016, 2017a, 2017b, 2019c; S. Iversen, 2004). This is comparable to e.g. Northeast Atlantic mackerel.

DISPERSAL OF EARLY LIFE STAGES: Eggs and larvae disperse over large areas documented by a triannual international egg survey mainly in the Bay of Biscay, Celtic Sea, Porcupine Bank and the North Sea (ICES, 2016, 2019c).

EARLY LIFE HISTORY SURVIVAL AND SETTLEMENT REQUIREMENTS: Larval requirements are assumed to be low for western horse mackerel due to their extensive distribution of early life stages in space and time (ICES, 2016, 2019c).

COMPLEXITY IN REPRODUCTIVE STRATEGY: Western horse mackerel is a non-deterministic spawner, and the stock contains no more than one characteristic that suggest complexity in reproductive strategy (Abaunza et al., 2003, 2008; ICES, 2016, 2017a, 2017b, 2018a, 2018b, 2019c, 2019b, 2019a).

SPAWNING CYCLE: Western horse mackerel is spawning over a widely distributed area and an extensive spawning season from January to July (ICES, 2016, 2019c, 2019b, 2019a; O'Hea et al., 2019).

SENSITIVITY TO TEMPERATURE: Western horse mackerel has a low sensitivity to temperature and can survive and thrive over a large range of temperatures from approximately 2 to 25 °C (ICES, 2019a, 2019b, 2019c). There may be a connection between the strength of the inflow of Atlantic water into Norwegian waters and the amount of western horse mackerel migrating to northern areas along the Norwegian coast (S. A. Iversen et al., 2002).

SENSITIVITY TO OCEAN ACIDIFICATION: Unknown. Presumably, low sensitivity to possible future ocean acidification due to its widely distributed spawning and feeding areas and periods as well as a wide utilization of prey species and size groups.

POPULATION GROWTH RATE: There exist good estimates of age at maturity, 2-4 years for females, depending on location (Abaunza et al., 2003), and thus population growth rate; K-selected (high) species (ICES, 2019a).

STOCK SIZE/STATUS: Presently a low stock status at around the limit reference point for spawning stock biomass (SSB) (ICES, 2019a, 2019b, 2019c); the SSB has rather steady declined since the late 1980s. The corresponding recruitment success has also been low; the last strong recruitment at age 0 was in 1982, and a moderate recruitment in 2001 (ICES, 2019c).

OTHER STRESSORS: The stock is assumed to experience limited stress other than fishing (ICES, 2019c). Predation and other sources of natural mortality of different life stages of western horse mackerel is difficult to quantify (ICES, 2019c).

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 Western horse mackerel (*Trachurus trachurus*) in ICES subarea 8, divisions 2.a, 4.a, 5.b, 6.a, 7.a-c, e-k. 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.

Western horse mackerel (*Trachurus trachurus*) in ICES subarea 8, divisions 2.a, 4.a, 5.b, 6.a, 7.a-c, e-k

SENSITIVITY ATTRIBUTES	L	M	H	VH	Mean$_w$	Usage	Remark
Habitat Specificity	1	3	1	0	**2.0**		
Prey Specificity	1	3	1	0	**2.0**		
Species Interaction	1	4	0	0	**1.8**		
Adult Mobility	1	4	0	0	**1.8**		
Dispersal of Early Life Stages	1	3	1	0	**2.0**		
ELH Survival and Settlement Requirements	5	0	0	0	**1.0**		
Complexity in Reproductive Strategy	1	3	1	0	**2.0**		
Spawning Cycle	1	4	0	0	**1.8**		
Sensitivity to Temperature	0	3	2	0	**2.4**		
Sensitivity to Ocean Acidification	5	0	0	0	**1.0**		
Population Growth Rate	1	3	1	0	**2.0**		
Stock Size/Status	0	1	3	1	**3.0**		
Other Stressors	0	4	1	0	**2.2**		
Grand mean					**1.92**		
Grand mean SD					**0.52**		

CLIMATE EXPOSURE	L	M	H	VH	Mean$_w$	Usage	*Directional Effect*
Surface Temperature	2	3	0	0	**1.6**		1
Temperature 100 m	0	0	0	0		N/A	
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**		-1
pH (Surface)	4	1	0	0	**1.2**		-1
Gross Primary Production	1	3	1	0	**2.0**		1
Gross Secondary Production	1	3	1	0	**2.0**		1
Sea Ice Abundance	0	0	0	0		N/A	
Grand mean					**1.60**		
Grand mean SD					**0.40**		
Accumulated Directional Effect					**–**		**3.2**

Accumulated Directional Effect: POSITIVE	**3.2**

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