

1103 Twaite Shad
Alosa fallax (Lacépede, 1803)



Photo 1. Twaite shad (photo by P. Pieckiel)

I. INFORMATION ON SPECIES

1. Systematic affiliation

Order: Clupeiformes

Family: Clupeidae

2. Legal status and threat to the species

International law

Habitats Directive - Annexes II and V

Bern Convention - Annex III

National law

Species protection - is subject to species protection (partial protection)

Category of threat IUCN

IUCN Red list – LC (Least Concern ver. 3.1), (Freyhof and Kottelat, 2008)

Red list of lamprey and fish (2009) - CR A2 (Critically Threatened) - critically endangered species (Witkowski et al. 2009)

Polish Red Book of Animals. Vertebrates - EN (strongly threatened), (Głowaciński 2002)

3. Species description

Twaite shad *Alosa fallax* (Linnaeus, 1758) belongs to the order of Clupeiformes – fish from the Clupeidae family. In nature, there also occurs a similar species of the same family - the allis shad (*Alosa alosa*), (Linnaeus, 1758), which may be confused with it. The spindle shape of a twaite shad and its body size is very similar to herring, however, it is distinguished by the characteristic row of 5 to 10 dark spots on the sides of the body, beginning at the height of the top of the gill lid. In the later stages of its life the individual size can reach up to 55 cm of total length (Lt.) and 1.5 kg of body mass. From very similar allis shad it can be distinguished on the basis of a smaller head, greater uniformity of the body shape and the difference in coloration, as the allis shad usually has one or more dark spots on the sides of the body, the first of which is the largest with intense black colour. In addition to the stains, the twaite shad has the coloration of a typically pelagic fish with a dark back and light, silver sides and belly, as in sprats or herrings commonly occurring in the Baltic Sea. The twaite shad body is covered with a small, cycloid scales, on the abdomen there are sharp keel scales, which is common in this family.

4. Biology of the species

The twaite shad is an anadromous fish, spending most of its life in the sea feeding grounds, however, for breeding it requires fresh water and for this purpose it regularly goes up to the rivers. These fish live up to 9 years and during this period they spawn several times. Spawning takes place for the first time, depending on the area in which they grow up, at the age 3 to 5 years, when they reach the size of 20 to 30 cm [Lt]. Depending on the temperature in a particular year, ready-to-breed adult specimens start a spawning run to rivers, mostly in April, at a water temperature of about 12°C. Large spawning run takes place in May and may last until the beginning of July. Spawning usually takes place within the lower sections of rivers, with gravelly bottom substrate. After spawning adults immediately return to the sea. After 3-4 days, from the spawn fallen to the bottom, lively pelagic larvae hatch, which often immediately after that reach the main stream of the river. Juveniles migrate in a short time to the estuary of the river, where they feed on the zooplankton, zoobenthos, and later also on small fish. Food-rich areas of estuaries are a kind of nursery of juvenile forms. There are also populations of twaite shad inhabiting large coastal lakes, where the spawning takes place in the water body, these basins are both spawning grounds and rearing of the fry.

5. Habitat conditions

The twaite shad lives in open sea waters at various depths, as well as in the bays and estuaries of large rivers, such as: Adour, Nemunas, Severn, Thames, Mondega. There are also forms inhabiting large coastal lakes (lacustrine). For reproduction, the most marine forms of the twaite shad requires fresh water, preferably large rivers. Most often, it uses the lower and middle sections with gravelly bottom substrate for breeding. The central part of the coastal lakes plays an important role for the lacustrine forms, where the twaite shad feeds and spawns.

6. Species distribution

The twaite shad occurs around Europe, in the Baltic, North and Mediterranean seas and in the North Atlantic waters. In the Polish marine areas of the southern Baltic (ICES subareas 25 and 26), the twaite shad occurs regularly (the ICES The twaite shad DATRAS database). The open waters of the southern Baltic Sea are fed by a population of the twaite shad probably coming from recruitment taking place in Lithuanian waters in the Curonian Lagoon and the Neman River (Svagzdys 1999, Thiel

et al 2008, Stankus 2009). In the territory of Poland, in the current and historical place of the twaite shad occurrence, in the Vistula river, no spawning grounds are recognized, and there are no data on the areas of the fry rearing. Probably, taking into account the historical course of the Vistula, where its main estuary was the Vistula Lagoon (Starkel 2001), there were more favourable hydrological conditions for the development of this species, such as nowadays observed in the Curonian Lagoon and the Nemunas River (Stankus 2009).

II. METHODS

1. Concept of species monitoring

The twaite shad monitoring should be based on studies of its two stages of life, i.e. spawning migration and the juvenile period. Research in terms of spawning run should be carried out in the lower section of the Vistula River, while studies of juvenile individuals should be carried out in the coastal zone of the Gulf of Gdansk in the immediate vicinity of the Vistula estuary.

Assessment of the twaite shad habitat, due to the lack of knowledge about its specific spawning requirements within the boundaries of the lower Vistula waters, where it could potentially reproduce, should be limited to the assessment of the ecological patency of the Vistula. In addition, the index of the ecological status of open waters based on ichthyofauna research should also be applied.

2. Indicators and assessment of the conservation status of the species

Population status indicators

The table (Table 1) presents indicators for the assessment of the status of the twaite shad 'Population' parameter, while the table (Table 2) presents the method of valorisation of these indicators.

Table 1. Indicators for assessing the status of the twaite shad 'Population' parameter

Indicator	Unit	Indicator description
Number of individuals migrating for spawning	NPUE	number of adults in the lower part of the river during spring spawning run
Number of juvenile individuals	NPUE	the number of juveniles occurring in the coastal zone near the estuary of a river

Table 2. Valorisation of indicators for assessing the status of the twaite shad 'Population' parameter

Indicator	Assessment		
	FV favourable status	U1 unfavourable inadequate status	U2 unfavourable bad status
Number of individuals migrating for spawning	if the value is >9	if the value is in the range 9–4	if the value is <4
Number of juvenile individuals	if the value is >20	if the value is in the range 20–1	lack of individuals

Habitat status indicators

The table (Table 3) presents the indicators for the assessment of the status of the parameter 'Habitat', whereas the table (Table 4) presents the method of valorisation of these indicators.

Table 3. Indicators for assessing the status of the twaite shad 'Habitat' parameter

Indicator	Unit	Indicator description
LFI (Large Fish Index)	-	current value of the marine environment status indicator based on ichthyofauna research for ICES subareas 25 and 26
Patency of migratory routes	-	indicator based on the inventory of migration barriers, such as: clogged / non-functional fish passes, bridges / anthropogenic development of banks causing intensive vibration, noise and light, fishing gear, poaching

Table 4. Valorisation of indicators for assessing the status of the twaite shad 'Habitat' parameter

Indicator	Assessment		
	FV favourable status	U1 unfavourable inadequate status	U2 unfavourable bad status
LFI (Large Fish Index)	GES in both subareas	subGES in one area, GES in another	subGES in both subareas
Patency of migratory routes	no migration barriers to the spawning grounds	periodically migration barriers to the spawning grounds	durable migration barriers to the spawning grounds

Conservation prospects

Evaluation of the conservation prospects of the species at the site is a forecast of the population status of the species and the condition of its habitat in the next 10-15 years. It is an expert judgment taking into account the current population status (if assessed) and species habitats as well as all current impacts and anticipated threats that may affect the future status of the population and habitat in the surveyed site. At present, the status of a twaite shad population in the Polish waters is still not clearly known. Probably the specimens of this species observed in the by-catch in the Gulf of Gdańsk come from the population that reproduces in the Lithuanian part of the Curonian Lagoon. Therefore, it is not possible to refer to the population status parameter when assessing protection prospects. However, as regards the condition of the habitat and its protection, potential threats include all activities related to changes in the habitat, such as the closure of migration corridors.

Conservation prospects can be assessed as good (FV), when we predict that in the perspective of 10–15 years the currently observed condition of the species will improve. The unfavourable inadequate (U1) species conservation prospects can be assessed when we predict that due to negative impacts or planned ventures, the favourable status may deteriorate or the unfavourable status will not change.

Perspectives of preserving can be assessed as bad (U2) if we predict that the currently observed bad state (U2) will not improve, or that as a result of negative impacts or planned projects it will continue to deteriorate.

Overall assessment

The overall assessment of the conservation status of a species is synonymous with the lowest rating from among the three assessed parameters: 'Population', 'Habitat' and 'Conservation prospects'. The diagram of aggregation of indicators and parameters to assess the state of protection of a twaite shad is presented in the figure (Fig. 1).

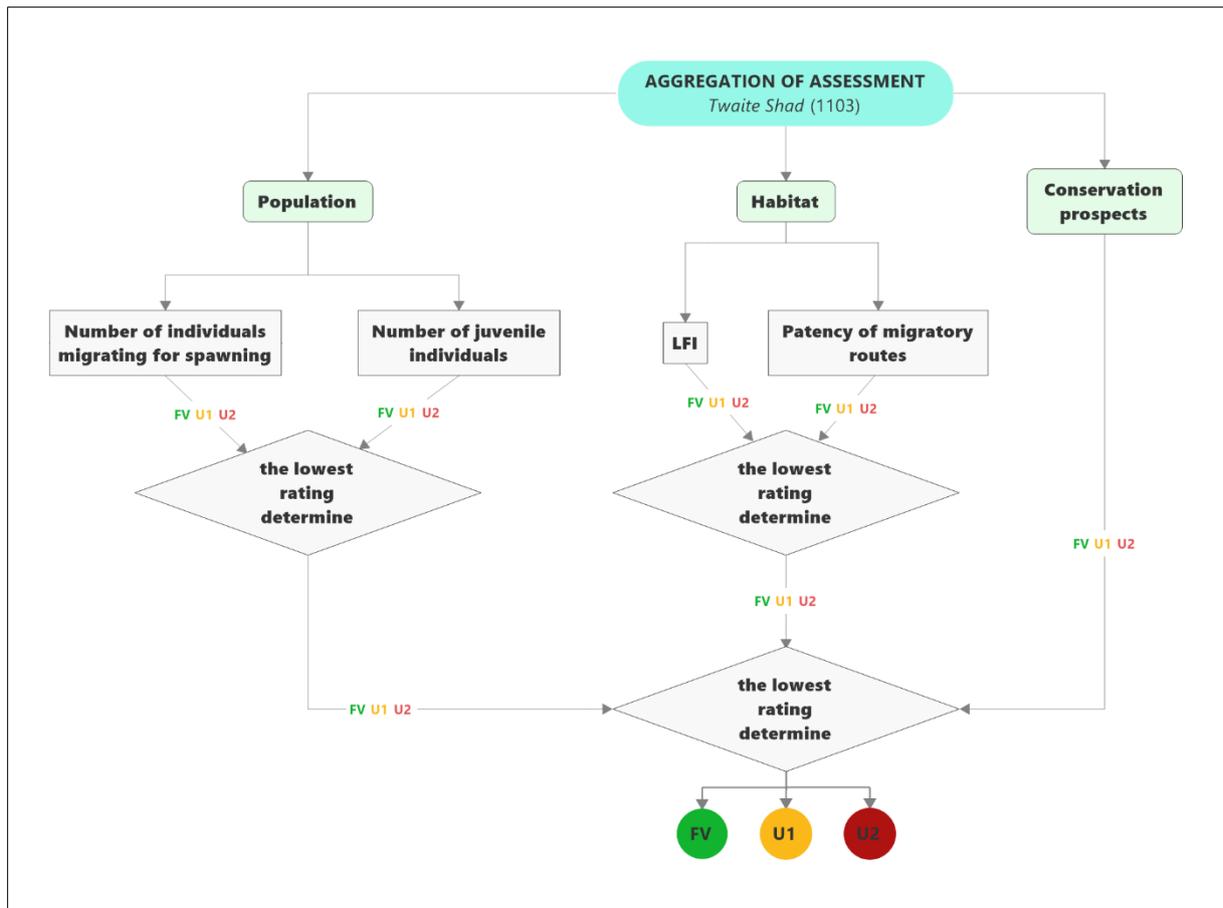


Fig. 1. Diagram of aggregation of indicators and parameters to assess the state of protection of the twaite shad

3. Description of monitoring

Selection of monitoring stations

The research on the spawning migration of the twaite shad should be carried out in the lower section of the Vistula, which is a confirmed historical place of occurrence of this species in the Polish waters. Catches of juveniles should be carried out in the coastal zone of the Gulf of Gdansk in the immediate vicinity of the mouth of the Vistula in the eulitoral zone (Figure 2).

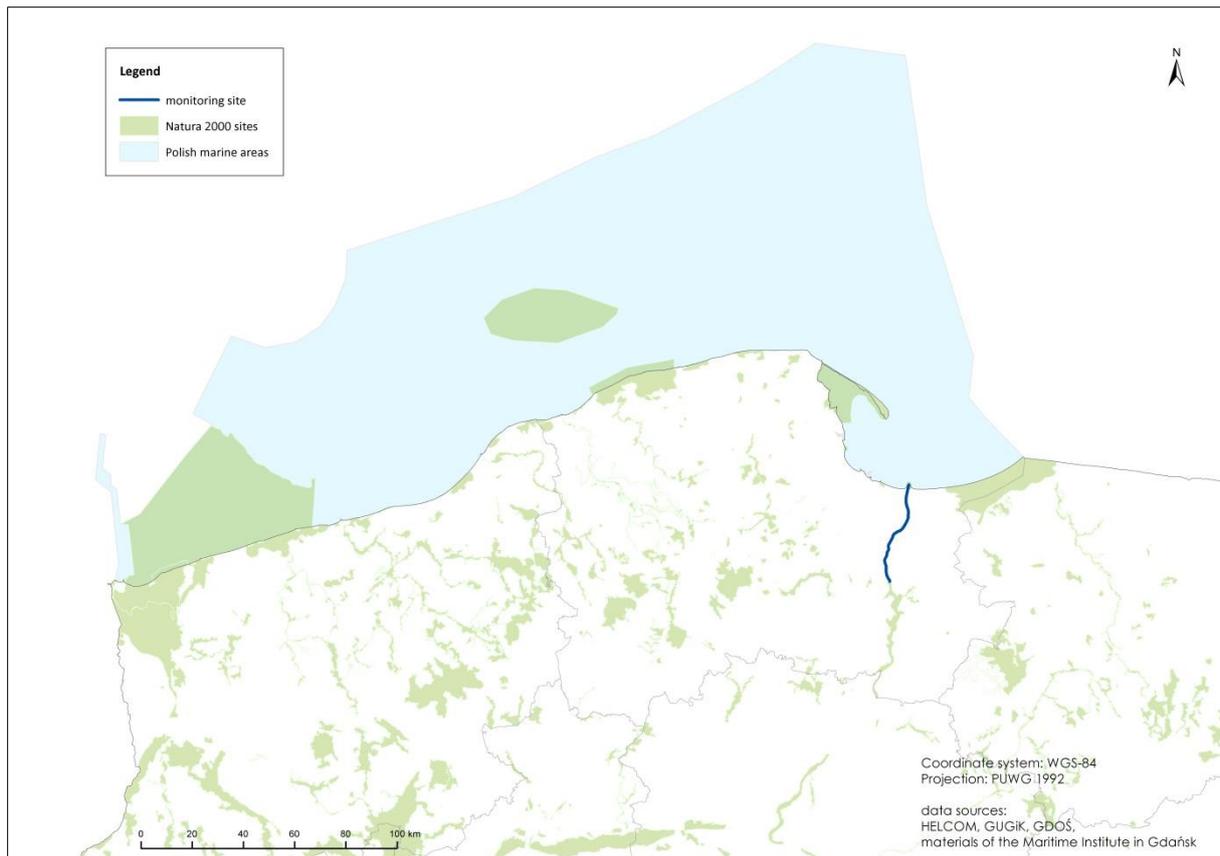


Fig. 2. Sites for the twaite shad monitoring

4. The method of investigation

Determination of population status indicators

The studies of the migratory population should be carried out in five series, consisting of 3 repetitions (floating), at a given research station during the daytime. The nets should be placed out of the boat and drifted with the current along a distance of about 2 km. In order to maintain the net in an outstretched position perpendicular to the banks of the river, plank boards can be used. The float site should be selected so that the catch section does not have significant swallowing that may affect the catch and net setting. Fishing should be done by a professional fishermen under the supervision of an ichthyologist specialist.

The number of individuals is expressed as the NPUE, corresponding to the number of recorded adults in relation to the type and number of fishing gear per unit of time. The indicator should be calculated from the maximum number of individuals from the catch recorded in one of the fishing campaigns.

Surveys of juveniles should be performed in three series, consisting of 3 replicates at a research station. The catches should be conducted along the shore or toward the shore in the eulitoral zone so as to trawl at least 1000 m² of the zone in each repetition. The number of juveniles is expressed as the NPUE, corresponding to the number of juveniles recorded in relation to the type of fishing gear and the area covered by the fishery. The assessment should be calculated from the average number of individuals from the catch recorded in one of the fishing campaigns.

Determination of the habitat status indicators

Habitat status is determined on the basis of the LFI fish index (Large Fish Index) for the open sea deepwater zone in ICES subareas 25 and 26. LFI is used as an indicator for C3 descriptor -

commercially exploited fish and invertebrate populations – for the purposes of the Marine Strategy Framework Directive. Data for LFI should be obtained from official reports on the annual assessment of the Baltic Sea's environment published by the Chief Inspectorate for Environmental Protection.

Observations of patency of migratory routes should take place on the basis of field surveys carried out mainly during the study of the migratory population and involve the identification of migration barriers such as clogged / non-functional fish passes, bridges / anthropogenic development of banks causing intense vibration, noise and light, fishing gears, poaching in the area of the lower Vistula and its estuary.

5. The date and frequency of investigations

The research of the twaite shad spawning run should be carried out from April to July. Research on the number of juveniles should be carried out from September to November, in the same year in which spawning research was carried out.

6. Equipment and materials for investigations

For research on the twaite shad spawning run the dedicated floating gillnet should be used. A single net consists of four connected panels with lengths of 30 m and a height of 3 m and with mesh sizes 38 mm, 50 mm, 45 mm and 70 mm. Two sets with a total length of 240 m should be used for each float.

Investigations on the number of juveniles should be performed with a hand trawl with a minimum wing width of 20 m and a 1 mm mesh size.

7. Examples of twaite shad research forms

Fishing form

Name of site: *Wisła*

Way of fishing (mark X): from boat wading

Type of device (mark X): twaite shad floating gillnets
 hand trawl

No.	Station	Depth [m] ¹		Date	Initial position of haul / catch			Final position of haul / catch			Threats/Remarks
		P	K		Hour	Latitude	Longitude	Hour	Latitude	Longitude	
1.	<i>Świbno</i>	-	-	2017-05-12	11:20	54,7777	18,1111	11:26	54,7766	18,1112	<i>Fishing nets, ships</i>
2.	<i>Świbno</i>	-	-	2017-05-12	11:27	54,7766	18,1112	11:38	54,7755	18,1109	
3.	<i>Świbno</i>	-	-	2017-05-12	11:41	54,7755	18,1109	11:50	54,7744	18,1108	

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¹ p - initial depth, K – final depth

Observation and measurement Form

Name of site: *Wisła*

No	Station	Date	Hour	Weather conditions		Water parameters			
				Temp [°C]	Clouds [8/8]	Temp [°C]	O ₂ [mg/l]	O ₂ [%]	Salinity [PSU]
1.	<i>Świbno</i>	<i>2017-05-12</i>	<i>11:10</i>	<i>15,5</i>	<i>6</i>	<i>13,2</i>	<i>7,2</i>	<i>88,8</i>	<i>4,7</i>

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Analysis Form											
Station		Świbno				Date 2017-05-12					
Species			Species				Species				
Lt [cm]				Lt [cm]				Lt [cm]	<i>twaite shad</i>		
0,5				18,0				35,5			
1,0				18,5				36,0			
1,5				19,0				36,5			
2,0				19,5				37,0			
2,5				20,0				37,5			
3,0				20,5				38,0	//		
3,5				21,0				38,5			
4,0				21,5				39,0			
4,5				22,0				39,5			
5,0				22,5				40,0			
5,5				23,0				40,5			
6,0				23,5				41,0			
6,5				24,0				41,5			
7,0				24,5				42,0			
7,5				25,0				42,5			
8,0				25,5				43,0			
8,5				26,0				43,5			
9,0				26,5				44,0			
9,5				27,0				44,5			
10,0				27,5				45,0			
10,5				28,0				45,5			
11,0				28,5				46,0			
11,5				29,0				46,5			
12,0				29,5				47,0			
12,5				30,0				47,5			
13,0				30,5				48,0			
13,5				31,0				48,5			
14,0				31,5				49,0			
14,5				32,0				49,5			
15,0				32,5				50,0			
15,5				33,0				50,5			
16,0				33,5				51,0			
16,5				34,0				51,5			
17,0				34,5				52,0			
17,5				35,0				52,5			

Uwagi:

asp: 3
bream: 1

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8. Species protection

The twaite shad in Poland is covered by partial species protection, according to the regulation of the Minister of the Environment of 28 December 2016 on animal species protection (Journal of Laws of 2016, item 2183) and is an important species for EU whose protection requires the designation of special areas of protection, listed in Annex II of the Habitats Directive (Council Directive 92/43 / EEC of 21 May 1992 on the conservation of natural habitats and wild fauna and flora).

9. References

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