1145 Weatherfish
Misgurnus fossilis (Linnaeus, 1758)

Photo. 1. Weatherfish (photo by T. Kuczyński)

The following methodology for studies of the weatherfish in brackish water is supplementation of the weatherfish methodology described in the Methodological guide (Mazurkiewicz 2012) for individuals found in inland freshwater.

1. Species distribution

The weatherfish was a species commonly found in the Polish waters. Its occurrence covered almost the whole region of the country excluding the southern mountainous and foothill areas. It was recorded in the majority of lowland rivers, ox bow lakes, drainage ditches, canals, small reservoirs and carp ponds. Nowadays, the occurrence of the weatherfish is less numerous because of the development of the agriculture and due to the anthropogenic changes of its habitats (Danilkiewicz 1997, Kotusz 1996, Witkowski et al. 2009, Boroń 2004). It inhabits stagnant and slow flowing waters in which the bottom is characterized by the mud sediment and heavily vegetation coverage. Lack of the weatherfish in the coastal zone from the Szczecin Lagoon to the Vistula mouth is confirmed in the report for the European Commission 2007. However, it was observed in the Bezimienny canal in the Reda River basin of the Beka nature reserve (Skóra 2014), in the canals and drainage ditches linking Łebsko Lake and Gardno Lake of the Słowiński National Park (Ciepielewski and Hornatkiewicz-Żbik 2003) and in the drainage ditches of Różaniec polder adjacent to the Vistula Lagoon (Nermer et al. 2012).

I. METHODS

1. Concept of species monitoring

Currently, the monitoring methodology for the weatherfish is based on the general method of fishing according to the Water Framework Directive based on electrofishing (Makomaska-Juchiewicz and Baran 2012). This methodology is used in rivers or canals, however, the possibility of using it in stagnant waters such as lakes or reservoirs is practically limited. Electrofishing should be excluded from this monitoring, because area of the research in coastal waters is characterized by significant fluctuations in salinity. Monitoring in these waters should coincide with the monitoring proposed for streams including the assessment of population and habitat status. At the same time, the research methods should be relatively simple and possibly no invasive for fish and their habitat. So far, general concept of monitoring for fish species living in the stagnant water has not been developed. These requirements of the monitoring are only accomplished for the lake minnow, because it is based on catches with minnow traps which are minimally invasive for fish and their habitats. Therefore, it is proposed to modify the previously used methods of the monitoring for the weatherfish by replacement electrofishing by minnow traps.

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 'Population' parameter for the weatherfish, while the table (Table 2) presents the valorisation method of these indicators.

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

Indicator	Unit	Indicator description
Abundance	mean NPUE	number of individuals determined based on catches with the minnow traps
Age structure	length class [cm]	indicator based on the occurrence 3 age classes of adults (ADULT, >10 cm), immature juveniles (JUV, 10–5 cm) and young-of-the-year (YOY, <5 cm), based on the total length of catched fish

Table 2. Valorization of indicators for assessing the status of the weatherfish 'Population' parameter

Indicator	Assessment		
	FV favourable	**U1** unfavourable inadequate	**U2** unfavourable bad
Abundance	if the value is >20	if the value is in the range 20–1	lack of individuals
Age structure	3 age stages are observed	2 age stages are observed	1 age stages is observed

Habitat status indicators

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

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

Indicator	Unit	Indicator description
Vegetation coverage on the bottom	%	the share of the coastline with submerged vegetation and rush and floating vegetation at the station
Type of sediment	%	the share of mud with detritus in the sediment

Table 4. Valorization of indicators for assessing the status of the weatherfish 'Habitat' parameter

Indicator	Assessment		
	FV favourable	**U1** unfavourable inadequate	**U2** unfavourable bad
Vegetation coverage on the bottom	if the value is >80%	if the value is in the range 80–50%	if the value is <50%
Type of sediment	if the share of mud with detritus is >70%	if the share of mud with detritus is within a range of 70–50%	if the share of mud with detritus is <50%

Conservation prospects

Assessment of the conservation prospects of the species on the site is a prediction of the population and habitat status in the perspective of the next 10-15 years. This is an expert method that takes into consideration the current population (if it has been assessed) and habitat status of the species as well as all current impacts and anticipated threats that may affect the future status of the population and the habitat on the surveyed site. The parameter should be assessed in the context of the population and habitat status for the longest possible period for which data and observation data are available. The weatherfish is a species that lives in an unattractive specific habitats for other species of fish. These habitats are characterized by an adverse environmental conditions which are often subjected to anthropogenic pressure, such as melioration and drainage, regulation and shaping river channels, water and soil pollution as well as eutrophication of waters and reducing of the land to a lesser degree. Therefore, in the assessing of the conservation prospects of the weatherfish, threats associated with loss or deterioration of the habitat status should be also take into consideration.

Conservation prospects can be assessed as favourable (FV) if in the perspective of a 10−15 years the currently observed species status FV will persist or if the unfavourable inadequate status (U1) will improve. The unfavourable inadequate status (U1) of the species' behaviour can be assessed when we predict that due to negative impacts or planned projects, the currently assessed favourable status may deteriorate or the unfavourable inadequate status will not change. Particular attention should be paid to these possible changes in the habitat which will negatively affect the population or habitat in the long-term perspective. Conservation prospects can be assessed as unfavourable bad (U2) if we predict that the currently observed status will not improve and the unfavourable inadequate status of the species (U1) will deteriorate or the current favourable status will significantly deteriorate.

Overall assessment

Overall assessment of conservation status of species is determined according to lowest assessment from among the three parameters: 'Population', 'Habitat' and 'Conservation prospects'. Scheme of assessment aggregation of indicators and parameters of the conservation status for the weatherfish is presented in the figure (Fig. 1).

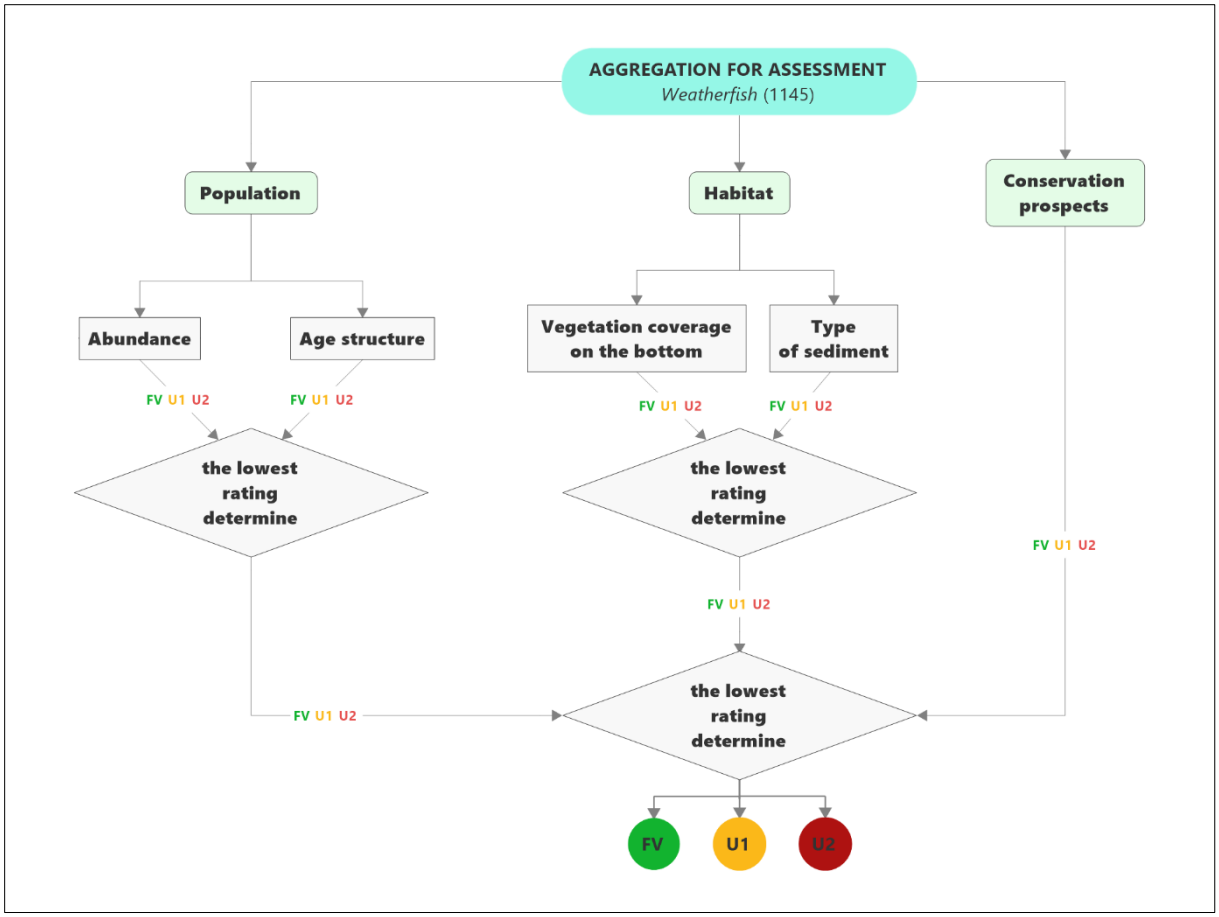

Fig. 1. Diagram of aggregation of indicators and parameters to assess the state of protection of the weatherfish

3. Description of monitoring

Selection of monitored stations

In the 'Monitoring of marine species and habitats' the research sites for the spine loach are: Beka nature reserve in the Reda mouth and Mewia Łacha nature reserve in the Vistula mouth (Bobrowe Lake) (Fig. 2). Research catches should be carried out at maximum 3 stations located in the littoral zone or along the channel bank due to the small surface of water area designated as a monitoring sites for the weatherfish.

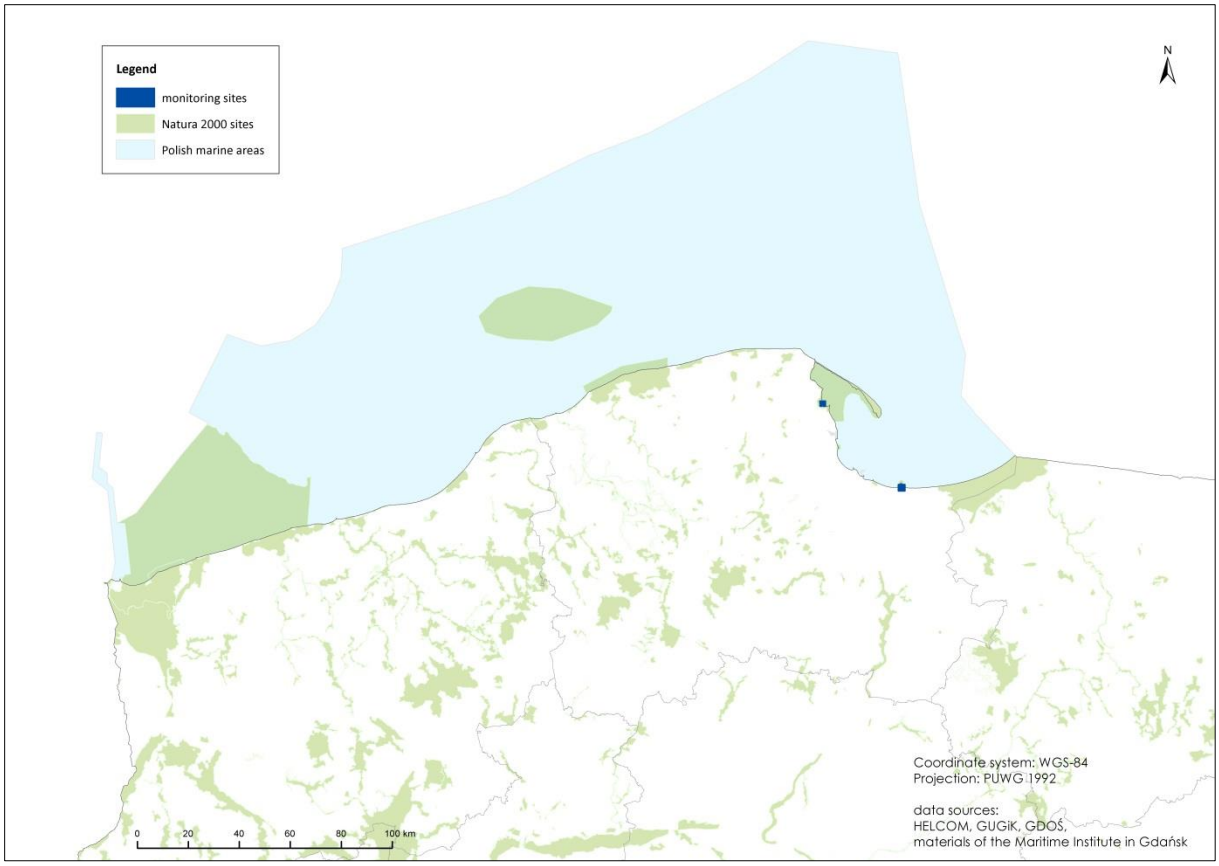

Fig. 2. Sites for weatherfish monitoring

4. The method of investigation

Determination of population status indicators

The basis for determining the population status of the studied species are results of abundance (averaged for the station) and body length of fish obtained from research catches at selected stations using a set consists of 10 minnow traps exposed for 12 hours at night. After removal of the traps, the species composition and number of individuals in the catch should be determined. It is necessary to conduct vital length measurements of the fish with an accuracy of 0.5 cm, rounded down. After measurement, the fish should be released into the water. The age structure is determined based on the body length of the caught fish classified into three categories: YOY (<50mm), JUV (50 – 100 mm) and ADULT (> 100mm).

Determination of the habitat status indicators

There is no a specific research methodology for lakes, e.g. hydromorphological quality in contrast to flowing waters. The classification of lakes in view of abiotic factors is not relevant for the weatherfish. Two indicators, i.e. vegetation coverage on the bottom and type of sediment, was selected for assessing of the weatherfish. The values of both indicators are assessed by means of the expert method during observation from the boat or wading at the station. If it is not possible to determine the type of sediment by visual observation then a sample of the sediment should be taken using the bottom sediment grab to assess its type.

5. The date and frequency of investigations

Monitoring should be carried out once in a three-year period from May to June.

6. Equipment and materials for investigations

The minnow traps should be used for monitoring catches. The body size of a single trap is 0,5x0,5x1 m. The trap is made of knotless net with mesh sizes smaller than 5mm. The trap has two inlets of 15 cm in diameter placed in opposite sides. One set consists of 10 traps connected by means of a rope with floats. The distance between the traps should be 5 m. It is important that the traps are set in such a way that the their upper part should protrude above the water surface. This will allow that caught weatherfish could breathe atmospheric air.

7. Examples of weatherfish research forms

Fishing form		
Name of a site: *Ujście Redy*		
Setting method (mark **X**):	x from the boat	□ wading
Type of gear:	*minnow traps*	

No.	Station	Depth [m][1]		Date of setting / starting	Time	Starting position		Final position[2]		Date of removal/ end	Time	Threats/Remarks
		P	K			Latitude	Longitude	Latitude	Longitude			
1.	*Ujście Redy 1*	*0,7*	-	*2017-06-13*	*17:45*	*54,1111*	*18,8888*	-	-	*2017-06-14*	*7:30*	-
2.	*Ujście Redy 1*	*0,6*	-	*2017-06-13*	*17:45*	*54,1122*	*18,8744*	-	-	*2017-06-14*	*7:30*	-

Compiled by:	**Checked by:**	**Approved by:**
Date:	Date:	Date:
Signature – full name:	Signature – full name:	Signature – full name:

[1] P – starting depth, K – final depth in case of the electrofishing, for other gears write only for P

[2] For fish traps – Do not fill out!

Analysis form

Station	*Ujście Redy 1*	Date *2017-06-14*

Species				Species				Species			
Lt [cm]	*weatherfish*			**Lt [cm]**	*weatherfish*			**Lt [cm]**			
0,5				18,0				35,5			
1,0				18,5				36,0			
1,5				19,0	*II*			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	*II*			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	*II*			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			

Remarks:

Compiled by:	**Checked by:**	**Approved by:**
Date:	Date:	Date:
Signature – full name:	Signature – full name:	Signature – full name:

Analysis form			
Station	*Ujście Redy 1*	**Date**	*2017-06-14*
Species	**Abundance [ind.]**	**Weight [g]**	**Remarks**
weatherfish	*6*	*-*	
round goby	*12*	*-*	
Remarks:			

Compiled by:	**Checked by:**	**Approved by:**
Date:	Date:	Date:
Signature – full name:	Signature – full name:	Signature – full name:

Observation and measurement form																								
[1] Name of a site	*Ujście Redy*	Date	*2017-06-14*	Time	
[2] Station	*Ujście Redy 1*				
[3] Geographical coordinates	*54,1111*	*18,8888*
[4] Depth	*0,7 m*	[5] Number of bivalves 1	-	[5] Number of bivalves 2	-
[6] Submerged vegetation	1	2	x	4	[7] Rush and floating vegetation	1	x	3	4	[8] Filamentous algae	0	x	2
[9] Mud	1	2	3	x	[10] Sand	x	2	3	4	[11] Gravel	x	2	3	4	[12] Stones	x	2	3	4
[13] Threats	
Remarks	

Compiled by:	**Checked by:**	**Approved by:**
Date:	Date:	Date:
Signature – full name:	Signature – full name:	Signature – full name:

Necessary measuring instruments: GPS, measuring staff (2 m), weight with line, camera, frame or Bernatowicz grab, buoy with an anchor;
Instruction for filling out the form:
[1] name of a site, example: *Jamno,*
[2] station, example: *Jamno2*
[3] geographical coordinates in WGS 84 form
[4] depth near the buoy measures by measuring staff or weight with line
[5] mark only at the stations for the bitterling
[6] bottom coverage estimated as a percentage in the research area [1] up to 25%, [2] 26%-50%, [3] 51%-75%, [4] 76%-100% (circle the number)
[7] water surface coverage estimated as in point [6]
[8] 0- none, 1 – up to 20% of coverage of a bottom substrate, 2 – more than 20% of coverage of a bottom substrate (circle the number)
[9] [10] [11] [12]] bottom coverage estimated as a percentage as in point [6] determined by the expert method
[13] write codes of the observed threats from the list of the threats

8. Other species for which the methodology can be applied

This catch methodology can be used also for the bitterling and the spined loach in the coastal lakes. However, the methodology of the assessment of the habitat status is characteristic only for one selected species.

9. References

Boroń A. 2004. Piskorz. W: Adamski P., Bartel R., Bereszyński A., Kepel A., Witkowski Z. (red.). Poradniki ochrony siedlisk i gatunków Natura 2000 – podręcznik metodyczny. Tom 6. Ministerstwo Środowiska, Warszawa: 245–248

Ciepielewski W., Hornatkiewicz – Żbik A. 2003. Różnorodność ichtiofauny w jeziorach Słowińskiego Parku Narodowego, Komunikaty Rybackie 2: 22-26

Danilkiewicz Z. 1997. Minogi oraz ryby rzeki Bugu i jego polskich dopływów. Arch. Pol. Fish. 5: 5–28

Kotusz J. 1996. Ochrona gatunków piskorzowców (Cobitadee, Cypriniformes) w Polsce na tle ich występowania i status w innych krajach Europy. Zoologia Poloniae 41: 147–155

Makomaska-Juchiewicz M., Baran P. (red.). 2012. Monitoring gatunków zwierząt. Przewodnik metodyczny. Część III. GIOŚ, Warszawa.

Mazurkiewicz J. 2012. Piskorz *Misgurnus fossilis*. W: Makomaska-Juchiewicz M., Baran P. (red.). Monitoring gatunków zwierząt. Przewodnik metodyczny. Część III. GIOŚ, Warszawa: 266–275

Nermer T., Grochowski A., Fey D., Radtke K., Szymanek L., Ramutkowski M., Lejk A., Psuty I., Horbowa K., Celmer Z., Dziemian Ł., Zaporowski R., Jarek T., Witalis B., Wodzinowski T. 2012. Wyniki realizacji III etapu projektu „Inwentaryzacja ichtiofauny w polskiej części Zalewu Wiślanego wraz z Zatoką Elbląską". MIR, Gdynia, s. 176

Skóra M. 2014. Nowe stanowisko piskorza *Misgurnus fossilis* w dorzeczu Redy i propozycje jego ochrony, Chrońmy Przyr. Ojcz. 70 (2): 178–184

Witkowski A., Kotusz J., Przybylski M. 2009. Stopień zagrożenia słodkowodnej ichtiofauny Polski: Czerwona lista minogów i ryb – stan 2009. Chrońmy Przyr. Ojcz. 65 (1): 33–52

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