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Fisheries

**ROUND GOBY, *NEOGOBIOUS MELANOSTOMUS* PALLAS, 1811  
IN THE CATCHES OF *R/V BALTICA***

**BABKA BYCZA (*NEOGOBIOUS MELANOSTOMUS* PALLAS, 1811)  
W POŁOWACH BADAWCZYCH STATKU *R/V BALTICA***

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The present work constitutes an attempt of assessment of the expansion of the round goby, *Neogobius melanostomus* Pallas, 1811 in the waters of the southern Baltic Sea. It is based on frequency analysis of this species in the survey catches conducted within 1993–1999 by *R/V Baltica* of the Sea Fisheries Institute in Gdynia, Poland. Since 1996 the round goby has become noticeable in the catches carried out in the Gulf of Puck. A constant increase of the catches of this species has been recorded in catches conducted outside the Gulf of Puck on the fishing grounds: Bromka, Wisłoujście, and Krynica Morska.

INTRODUCTION

The round goby has become a recent inhabitant of the coastal waters of the southern Baltic Sea. The first record of this species from Polish waters dates back to June 1990, when this fish was caught near the port of Hel (Skóra and Stolarski 1993). In time it has become an element of the biocoenosis and it has been more and more frequently recorded in the catches, both commercial and scientific. Its range constantly increased (Kuczyński 1995; Horackiewicz and Skóra 1996). Currently the round goby, as a species practically unexploited, inhabits in great masses principally the waters of the Gulf of Puck. The high abundance of this fish causes unfavourable quantitative changes in the coastal fisheries of the Gulf as well as changes in the specific composition of the ichthyofauna.

The aim of this work was to assess the level of expansion of the round goby in the waters of the southern Baltic, through analysis of changes in the frequency of this species in the survey catches conducted within 1993–1999 by *R/V Baltica* owned by the sea Fisheries Institute in Gdynia.

### Description of the species

The round goby, *Neogobius melanostomus* Pallas, 1811 is a small, reaching a maximum of 25 cm in length, stout fish representing the family Gobiidae. It leads a demersal life, occurring most often in coastal, brackish waters of seas at depths not exceeding twenty meters. In winter it moves deeper to few dozen meters (Whitehead et al. 1986; Moskalkova 1996). Its batch spawning takes place between April and August. As a typical benthophage it feeds mainly on bivalves, snails, crustaceans, polychaetes, and small fishes. Due to its exceptional eurytypicity and adaptive abilities, this species is able to settle different types of water bodies, even those of very adverse environmental conditions. The natural range of the round goby covers: the coastal areas of the Black Sea, Caspian Sea, entire area of the Sea of Azov, and also the Marmara Sea (Moskalkova 1996). Since the end of the 1950s its gradual expansion to the areas outside its previous range has been recorded (Crossman et al. 1992; Jude et al. 1992; Sokolov et al. 1994; Moskalkova 1996). Among the new sites was the Gulf of Puck (Skóra and Stolarski 1993).

### MATERIAL AND METHODS

The present work was based on the results of the survey catches conducted by *R/V Baltica* during 13 cruises between Dec 1993 and Mar 1999 (Tab. 1). Data from 1996–1999 were recovered from the biological-fisheries reports while the earlier data were obtained from unpublished materials of the Division of Biology and Fish Resources of the Sea Fisheries Institute in Gdynia.

Stratified survey catches were carried out in the Polish Zone of the Baltic Sea in the Gulf of Gdańsk, Słupsk Gully, Kołobrzeg-Darłowo fishing grounds and the Pomeranian Bay at depths from 20 to 100 meters along the isobaths with 10-m intervals. The fish were caught with a bottom herring trawl WP-20/25 equipped with a codend insertion with 6-mm mesh size. The survey hauls lasted 30 or 60 minutes. The speed of trawling was 3.0 knots. The present work includes data of all hauls where the presence of round goby, *Neogobius melanostomus* was recorded. Among analysed data were: the geographical co-ordinates, catch size, fishing efficiency (kg/h of trawling) and the quantities of round goby. The total lengths (*TL*) of the latter fish were measured.

## RESULTS

In fourteen analysed survey cruises the round goby was present in 34 hauls taken in the Gulf of Puck, near the Vistula River mouth (Wisłoujście fishing ground), on the high sea fishing grounds near Hel and Jastarnia (Bromka fishing ground) and near the town Krynica Morska (Fig. 1)

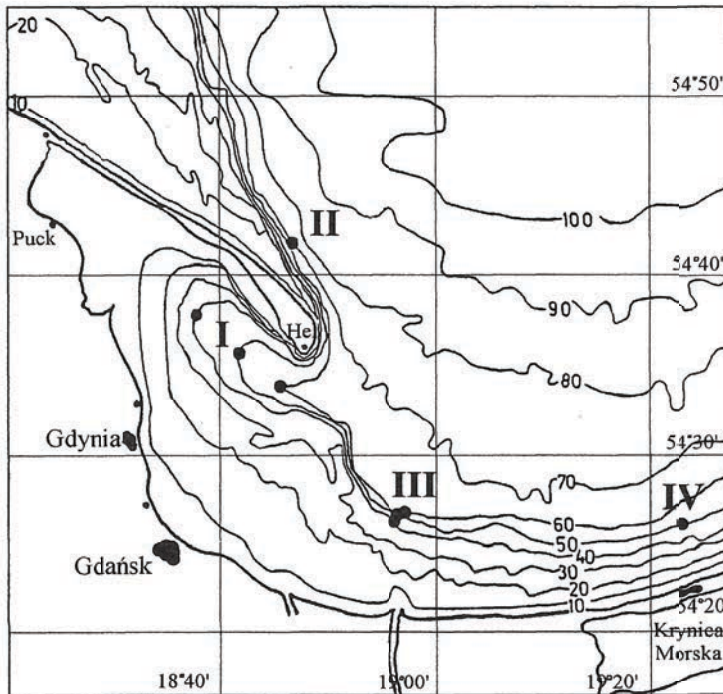


Fig. 1. Sites of occurrence of the round goby in the survey catches of *R/V Baltica* within 1996–1999. Fishing grounds: I—Gulf of Puck; II—Bromka; III—Wisłoujście; IV—Krynica Morska.

1993

In a single cruise, in the area of the Gulf of Puck, in December of 1993 the presence of gobiid fishes was recorded in four out of six hauls performed at depths of 40, 50, and 60 m. No data, however, were available on the specific composition of this group of fishes.

1994

In three cruises of *R/V Baltica* in the Gulf of Puck carried out in 1994 a total of 0.5 kg of a goby identified as black goby or big goby was caught (Tab. 1). This species was recorded in six out of ten half-an-hour hauls conducted in January at depths of 50 and

60 m. It was also found in one haul done in March at 50 m, and in three—in December at 40, 50, and 60 m. The catches of the goby were small, ranging from 0.01 kg (19 Jan 1994) to 0.23 kg (13 Dec 1994). Their share in the overall catch were from 0.04 to 0.039%. The length of the fish measured (*TL*) did not exceed the limit of 10 to 15 cm

Table 1

Round goby in the catches of *R/V Baltica*—the list of the survey cruises carried out from 1993 to 1999

No.	Date	Place of catch	Depth [m]	Geographic position		Catch [kg]	
						all	round goby
1	06 Dec 93	Gulf of Puck	40	54°35'N	18°40'E	17.5	+ *
2	18 Dec 93	Gulf of Puck	40	54°37'N	18°42'E	42.9	+ *
3	18 Dec 93	Gulf of Puck	50	54°35'N	18°44'E	401.0	+ *
4	18 Dec 93	Gulf of Puck	60	54°33'N	18°47'E	163.3	+ *
5	12 Jan 94	Gulf of Puck	60	54°34'N	18°47'E	197.8	0.025 *
6	19 Jan 94	Gulf of Puck	50	54°35'N	18°44'E	186.5	0.010 *
7	21 Mar 94	Gulf of Puck	50	54°35'N	18°44'E	341.0	0.085 *
8	13 Dec 94	Gulf of Puck	60	54°34'N	18°49'E	766.1	0.030 *
9	13 Dec 94	Gulf of Puck	40	54°38'N	18°42'E	592.1	0.230 *
10	13 Dec 94	Gulf of Puck	50	54°35'N	18°44'E	393.4	0.120 *
11	06 Feb 95	Gulf of Puck	50	54°35'N	18°44'E	1273.4	0.400 *
12	09 Jan 96	Gulf of Puck	40	54°39'N	18°41'E	292.7	0.250
13	09 Jan 96	Gulf of Puck	50	54°35'N	18°44'E	1265.9	3.745
14	26 Mar 96	Gulf of Puck	40	54°39'N	18°41'E	674.5	0.155
15	26 Mar 96	Gulf of Puck	50	54°36'N	18°44'E	302.0	0.945
16	26 Mar 96	Gulf of Puck	60	54°34'N	18°46'E	117.3	0.065
17	07 Jan 97	Wisłoujście	60	54°26'N	19°05'E	516.7	0.024
18	13 Jan 97	Bromka	70	54°41'N	18°50'E	458.7	0.020
19	15 Jan 97	Gulf of Puck	60	54°34'N	18°50'E	440.5	1.900
20	15 Jan 97	Gulf of Puck	50	54°34'N	18°44'E	731.6	25.140
21	27 Feb 97	Gulf of Puck	50	54°36'N	18°44'E	534.4	14.200
22	27 Feb 97	Gulf of Puck	60	54°34'N	18°47'E	772.8	0.835
23	07 Apr 97	Gulf of Puck	50	54°36'N	18°44'E	87.1	5.345
24	15 Jan 98	Gulf of Puck	40	54°38'N	18°42'E	203.5	15.000
25	15 Jan 98	Gulf of Puck	50	54°36'N	18°44'E	203.9	7.320
26	15 Jan 98	Gulf of Puck	60	54°34'N	18°46'E	165.7	14.200
27	20 Jan 98	Krynica Morska	50	54°25'N	19°17'E	91.7	0.010
28	22 Jan 98	Wisłoujście	50	54°26'N	19°05'E	102.7	0.060
29	04 Mar 98	Wisłoujście	60	54°27'N	19°05'E	256.1	0.030
30	10 Mar 98	Gulf of Puck	40	54°39'N	18°41'E	1095.4	1.690
31	10 Mar 98	Gulf of Puck	50	54°36'N	18°44'E	231.0	10.420
32	21 Feb 99	Wisłoujście	50	54°26'N	19°00'E	583.2	0.290
33	21 Feb 99	Wisłoujście	40	54°25'N	19°07'E	610.6	0.155
34	08 Mar 99	Gulf of Puck	45–60	54°34'N	18°47'E	873.8	132.500

\* gobies determined as representatives of Gobidae, black goby or big goby

1995

Only one (6 Feb 1995) out of three hauls conducted in the Gulf of Puck at depth of 50 m yielded gobiids identified as the black goby. Their combined weight amounted to 0.4 kg and fishing efficiency—0.8 kg/h. The gobies constituted 0.031% of the combined weight of all fishes caught. The gobies were absent at depths of 40 and 60 m.

1996

Five hauls carried out in 1996 in the Gulf of Puck contained fish specimens identified as *Neogobius melanostomus*. A total of 5.26 kg of this fish was collected jointly in two cruises (Radtke 1996a, b, c). The highest efficiency of 7.49 kg/h was reached on 9 Jan 1996 at depth of 50 m, while the lowest (0.13 kg/h)—on 26 Mar 1996 at 60 m (Fig. 2). The most frequent size (*TL*) of the gobbies was 11 to 15 cm, while the smallest was 6 cm and the largest—17 cm. One cruise of this year with one haul performed at depth of 50 m in the Gulf of Puck produced no round goby (Grygiel 1996).

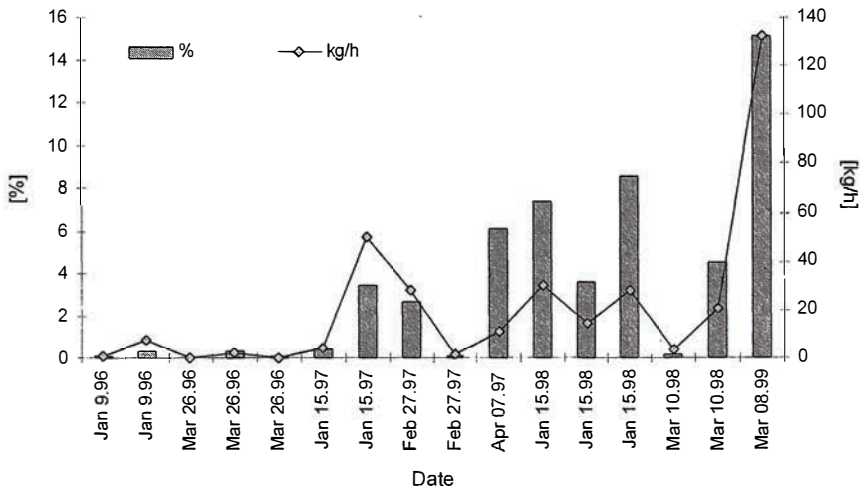


Fig. 2. Fishing efficiency [kg/h] and shares of round goby in the overall catch volume [%] in the catches carried out by *R/V Baltica* within 1996–1999

1997

In January 1997 for the first time in *R/V Baltica* cruises two specimens of the round goby were caught outside the Gulf of Puck. On 7 Jan, at depth of 60 m, a single fish of this species measuring 11 cm and weighing 24 g was caught on the Wisłoujście fishing ground. On 13 Jan a 10-cm goby, weighing 20 g was caught at depth of 70 m on the Bromka fishing ground (Kuczyński 1997). In addition a total of 47.42 kg of round goby was collected

in the Gulf of Puck in five out of seven hauls performed. It translated into 94.84 kg/h of fishing efficiency and the goby constituted 1.8% of the overall catch (Kuczyński 1997; Wszyński et al. 1997; Zaporowski 1997). Catches of 15 Jan and 27 Feb turned to be record ones. They were conducted at depth of 50 m and they yielded: 25.14 kg (50.28 kg/h) and 14.20 kg (28.40 kg/h) of the round goby respectively. The fish under study constituted 3.44% and 2.66% of the respective catches. The total length of the specimens collected ranged from 5 to 18 cm. The majority of them did not exceed 15 cm.

1998

The round goby measuring 9 cm *TL* caught in Jan 1998 at depth of 50 m extended the previously known range of this fish to the vicinity of the town of Krynica Morska. This constitutes the farthest site from the Gulf of Puck where this species was recorded based on the catches of *R/V Baltica*. Also two specimens of the round goby (14 and 12 cm *TL*) were recovered from the Wisłoujście fishing ground at depths of 50 and 60 m. Five hauls conducted in 1998 in the Gulf of Puck yielded a total of 48.63 kg of round goby, which constituted 2.7% of the overall catch weight (Radtke and Kurowicki 1998; Zaporowski and Kurowicki 1998). Exceptionally high shares of this fish species amounting to 7.37% (30.0 kg/h) and 8.57% (28.4 kg/h) were recorded at depths of 40 and 60 m respectively in the hauls performed on 15 Jan. The total lengths ranged from 6 to 19 cm, however the most prevalent total lengths were from 10 to 15 cm.

1999

A single haul conducted in the Gulf of Puck in 1999 at depths of 45 to 60 m yielded an exceptionally high catch of round goby. As much as 132.5 kg of this fish was recovered, which constituted 15.16% of the total catch (Grygiel 1999). In addition, two specimens were caught on the Wisłoujście fishing ground at depths of 50 and 40 m. The total length of the fish was within 6–19 cm with the majority of specimens were 10 to 14 cm long.

## DISCUSSION

In the 1950s and 1960s the round goby was a mass-occurring and economically important fish in the Pontocaspian region. Its excessive exploitation as well as degradation of its natural habitats caused a collapse of its catches in the 1970s. The reduction of populations of the round goby within its traditional range was accompanied by expansion of this species to waters previously not inhabited by this fish. It occurred, among other places in: the Moscow River (Sokolov et al. 1994), Dnepr, Dnestr, Aral Sea (Moskalkowa 1996), the Baltic Sea near Lithuanian coasts (Skóra 1996) and the American Great Lakes (Crossman et al. 1992; Jude et al. 1992).



Since the first record of the round goby in the Gulf of Puck in 1990 (Skóra and Stolarski 1993) a constant expansion of this species in the gulf waters and outside it has been recorded. According to Kuczyński (1995) no single round goby was found in the survey catches conducted within 1993–1995 by the Sea Fisheries Institute in the Gulf of Gdańsk using a small-mesh-size bottom trawl. It is evident from the analysed catch statistics of *R/V Baltica* that fully documented presence of the round goby has been recorded as recently as 1996. The data of 1994–1995, however, may prove even earlier occurrence of the round goby in the catches. In this time-period a number of gobiids identified as black goby or big goby was recorded. There is a likelihood that the above-mentioned fish represented the species of *Gobius niger*. The measurements, however, of the specimens collected seem to exclude such possibility. *Gobius niger*—the largest goby of Polish waters—can reach 9 cm in the Baltic Sea (Żmudziński 1990), while the lengths of the specimens measured in the course of the present study ranged from 10 to 15 cm. It is possible therefore, that the records of *Gobius niger* are a result of misidentification of a new, at that time, taxon—*Neogobius melanostomus*. Since 1996 the round goby has been identified in a precise, correct way and since that time it became a substantial component of the survey catches on the Gulf of Puck (Fig. 2). In 1996 the percentage of this species in the catches was on average 0.16% of the total weight of catch. In 1997 it was 2.55%, in 1998—4.84%, while in 1999—as much as 15.16%. The constant increase of the catches of the round goby in the Gulf of Puck was associated with the records of this species from the fishing grounds outside the gulf: Bromka, Wisłoujście, and Krynica Morska (Tab. 1, Fig. 1). Unusual plasticity of this species and its adaptive ability to different environmental conditions (Moskalkowa 1988, 1996), aggressive competition with other species for food and living space (Dubs and Corkum 1996) and also lack of the fishing pressure may contribute to further expansion of the round goby in the waters of Southern Baltic Sea. The survey catches conducted by the Sea Fisheries Institute can only confirm a number of data on the constant expansion of this fish in the waters of the southern Baltic. In November 1994 a specimen of this species was recorded south of Hel (54°31'N and 18°51'E) by a German research ship *R/V Walther Herwig III*. In May 1995, two specimens were collected on the beach in Dębki (Grygiel 1995). A number of sightings by professional fishermen proves that the round goby frequently occurs in the coastal zone of the Gulf of Gdańsk between Wisłoujście and Krynica Morska. In 1998 the presence of this species was recorded by coastal-zone fishermen from Jarosławiec (central part of the Polish seacoast) (Psuty-Lipska, personal communication). According to the information gathered in the fisheries ports of the Gulf of Puck, the mass occurrence of the round goby in the waters of the Gulf of Puck causes, even at present, substantial changes in the specific composition and the volume of fyke-net, gill-net and

hook catches of the coastal fisheries. In that area it becomes a major component causing at the same time decrease in profitability of catches.

### CONCLUSIONS

1. Fully documented presence of the round goby in the survey catches of *R/V Baltica* has been recorded in the Gulf of Puck since 1996.
2. The average share of round goby in the survey catches in 1996 was 0.16% of the total weight of catch in a single haul. In 1997 it was 2.55%, in 1998—4.84%, while in 1999—as much as 15.16%.
3. Constant increase of the presence of the round goby in the survey catches conducted in the Gulf of Puck may be an evidence of constantly growing presence of this fish species in the habitat of this body of water.
4. Since 1997 the presence of round goby has been observed also in the catches conducted by *R/V Baltica* outside the Gulf of Puck on the fishing grounds of Bromka, Wisłoujście, and Krynica Morska.
5. Based on the published materials and on the information from the fishermen it is evident that the round goby expands its range not only in the waters of the Gulf of Gdańsk but also in the coastal zone of the southern Baltic, and even in the waters of North America.
6. Unusual plasticity of this species and absence of fishing pressure can contribute to a further expansion of the round goby in the waters of the Gulf of Puck and outside it.

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W POŁOWACH BADAWCZYCH STATKU *R/V BALTICA*

STRESZCZENIE

Celem pracy była ocena stopnia ekspansji gatunku babka bycza (*Neogobius melanostomus*, Pallas 1811) w wodach południowego Bałtyku poprzez analizę zmian udziału tego nowego składnika ichtiocenozy naszych wód w połowach badawczych prowadzonych w latach 1993–1999 przez Morski Instytut Rybacki na statku *r/v „Baltica”*. Stratyfikowane połowy kontrolne prowadzone były w polskich obszarach morskich w rejonie Zatoki Gdańskiej, Rynny Słupskiej, łowisk Kołobrzeko-Darłowskich i Zatoki Pomorskiej.

W trzynastu przeanalizowanych rejsach badawczych, babkę byczą zanotowano w 34 zaciągach kontrolnych przeprowadzonych na Zatoce Puckiej, w okolicach ujścia Wisły (łowisko Wisłoujście) i na łowiskach otwartego morza w pobliżu Helu i Jastarni (łowisko Bromka). Od czasu pierwszej obserwacji babki byczej w Zatoce Puckiej w roku 1990 notuje się rozprzestrzenianie się tego gatunku w wodach Zatoki i poza nią. Z przeanalizowanych w niniejszej pracy statystyk połowowych statku *r/v „Baltica”* wynika, że w pełni udokumentowaną obecność omawianego gatunku notuje się od 1996 roku. W 1996 roku udział *Neogobius melanostomus* w połowach badawczych na Zatoce Puckiej wyniósł średnio 0,16 % całkowitej masy połowu w zaciągu, w 1997 – 2,55%, w 1998 – 4,84%, a w roku 1999 aż 15,16%. Według informacji uzyskanych w bazach rybackich Zatoki Puckiej masowe występowanie babki byczej w wodach Zatoki już dzisiaj powoduje istotne zmiany w składzie gatunkowym i wielkościach żakowych, mancowych i haczykowych połowów rybołówstwa przybrzeżnego, gdzie staje się ona czasami ich głównym składnikiem zmniejszając jednocześnie opłacalność prowadzenia połowów.

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