water

MDPI

Article

Evaluation of the Composition of Ichthyofauna in Lakes Free from Commercial Use in a Tightly Protected Area of the Wolin National Park (Poland)

Marcin Biernaczyk [1,*], Konrad Wrzecionkowski [2], Arkadiusz Nędzarek [1] and Katarzyna Stepanowska [3]

[1] Department of Aquatic Bioengineering and Aquaculture, Faculty of Food Sciences and Fisheries, West Pomeranian University of Technology in Szczecin, Królewicza Street 4, 71-550 Szczecin, Poland; anedzarek@zut.edu.pl
[2] Woliński National Park, Grodno 1, 72-500 Międzyzdroje, Poland; k.wrzecionkowski@wolinpn.pl
[3] Darłowska Group of Fish Producers and Shipowners, ul. Kotwiczna-Molo bn, 76-153 Darłowo, Poland; greyseal@o2.pl
* Correspondence: mbiernaczyk@zut.edu.pl

Abstract: The ichthyological biodiversity of Polish lakes is poorly understood, even in lakes not used for fishing and those under strict protection. With this in mind, the aim of this study was to conduct a comprehensive ichthyological survey of several lakes in the Wolin National Park (Poland). The study was conducted in Domysławskie and Gardno lakes and the anthropogenic Stara Kredownia reservoir. Each fishing exercise was conducted using benthic nets over a 12 h period. The fish caught were measured and weighed, and the species identified. Shannon-Wiener (H) and Simpson biodiversity indices were determined. The catch comprised a total of 4580 fish (of which 4391 were caught in Domysławskie Lake) belonging to 15 species, with a combined weight of 98,165 g. In general, the most prevalent species were non-predatory fish: roach (*Rutilus rutilus*), freshwater bream (*Abramis brama*), white bream (*Blicca bioerkna*), bleak (*Alburnus alburnus*), and rudd (*Scardinius erythrophthalmus*). Individually, perch (*Perca fluviatilis*) and roach (*Rutilus rutilus*) were the most abundant species. Ichthyofauna diversity varied greatly between the studied water bodies, with 15 species found in Domysławskie Lake and only 6 species in Gardno Lake. In Stara Kredownia Reservoir, no fish were caught, but amphibians were observed, such as great crested newts (*Triturus cristatus*) and common newts (*Lissotriton vulgaris*). Based on the results obtained, Lake Domysławskie had a higher species ichthyofauna diversity than the other 'tench and pike' lakes. Gardno Lake had a much lower biodiversity.

Keywords: ichthyology; biodiversity; fisheries; protected areas; aquatic environmental monitoring

check for updates

Citation: Biernaczyk, M.; Wrzecionkowski, K.; Nędzarek, A.; Stepanowska, K. Evaluation of the Composition of Ichthyofauna in Lakes Free from Commercial Use in a Tightly Protected Area of the Wolin National Park (Poland). *Water* **2021**, *13*, 2530. https://doi.org/10.3390/w13182530

Academic Editor: José Luis Sánchez-Lizaso

Received: 4 August 2021
Accepted: 8 September 2021
Published: 15 September 2021

Publisher's Note: MDPI stays neutral with regard to jurisdictional claims in published maps and institutional affiliations.

Copyright: © 2021 by the authors. Licensee MDPI, Basel, Switzerland. This article is an open access article distributed under the terms and conditions of the Creative Commons Attribution (CC BY) license (https://creativecommons.org/licenses/by/4.0/).

1. Introduction

Biodiversity assessment of ichthyofauna in lakes is usually based on analysis of commercial fishing or angling surveys [1–4]. Unfortunately, these methods are subject to biases, such as those caused by gear selectivity in commercial fishing, which results from both the fishing laws that mandate specific minimum size net or slot limits to protect younger fish, and also from consumer preferences. While individual anglers have individual preferences, their catch does not reflect the ichthyofauna composition. Additionally, only a few surveys (catch records) are returned, which can also be quite imprecise (Biernaczyk, unpublished data).

In scientific research, direct fishing usually focuses on specific species rather than a comprehensive description of the structure of ichthyofauna in a given water body [5,6], likely due to the difficulty and time-consuming nature of such studies, as well as the consequent death of many fish. Furthermore, according to our experience, there is a significant strong reluctance on the part of fishermen or anglers toward research based on the use of non-selective nets. Despite the aforementioned problems with conducting

comprehensive ichthyological research, available literature about Polish lakes does include data on the biodiversity of fish inhabiting selected lakes, e.g., [7,8], but for most water bodies, this is fragmented and often very selective.

One typical example of the poor level of knowledge on ichthyological diversity is in the case of protected lakes and those with bans on fishing or angling [3]. It is just generally assumed that specific ichthyofauna species should be present in a particular type of water body. It is also assumed that a lack of commercial fishing should result in a better condition of the fish populations in these lakes. Due to the reduction of anthropogenic impact, these waters may also be a habitat for species protected under Polish and European law. This directly concerns strictly protected water bodies located in national parks, such as in the Wolin National Park (WNP) in northwest Poland. Wolin National Park contains very diverse terrestrial and aquatic ecosystems, such as one nautical mile of coastal waters of the Baltic Sea, an archipelago of islands in a 'reverse' delta of the Świna River together with the surrounding waters of the Szczecin Lagoon, and selected freshwater bodies of the Wolin Island, of natural and anthropogenic origin [9].

Despite a number of studies conducted in the terrestrial zone of the Wolin National Park, the area is poorly known in terms of aquatic ecosystems, especially the freshwater bodies [10]. One hypothesis is that the long-term absence of human interference in the structure of ichthyofauna has resulted in increased biodiversity. To this end, the aim of the study was to conduct comprehensive ichthyological studies on the Domysławskie, Gardno, and Stara Kredownia Lakes located in the Wolin National Park (Poland).

2. Materials and Methods

2.1. Study Area

The lakes selected for study were the natural lakes Domysławskie and Gardno, and the post-mining reservoir Stara Kredownia, located in the area of the Wolin National Park on the Wolin Island (NW Poland) (Figure 1). The lakes are morphometrically very different. Domysławskie Lake is the largest (ca. 50 ha), while Gardno Lake is the deepest (7.3 m). The smallest of the studied water bodies is Stara Kredownia (area < 1 ha) (Figure 1; Table 1). Domysławskie Lake is a flow-through lake, and Lake Gardno is an isolated lake.



Figure 1. Location of the studied lakes in the Wolin National Park ((a)—Domysławskie Lake; (b)—Gardno Lake; (c)—Stara Kredownia).

Table 1. Morphometric data of the studied water bodies [11–13]. Data regarding the southern water-covered basin of the Stara Kredownia reservoir are based on our analysis of satellite images.

		Domysławskie	**Gardno**	**Stara Kredownia**
Surface area	ha	43.5–52.9	2.4–3.8	0.73
Length	m	1200	474	185
Width	m	600	120	50
Shoreline length	m	3250	1640	509
Shoreline development index		1.26	2.87	1.68
Maximum depth	m	3.1	7.3	2
Mean depth	m	1.9	2.6	1

Domysławskie Lake (Figure 2; Table 1) was commercially exploited until 1991, after which it was placed under full supervision and legal protection by the Wolin National Park. Since then, human interference has been limited to a low level of poaching. This lake is the fourth along the Lewienska Struga watercourse and the last within the borders of the Park. Upstream are the Warnowo, Rabiąż, and Czajcze lakes, and downstream, outside the Park area, are the Żółwińskie, Kołczewo, and Koprowo lakes.

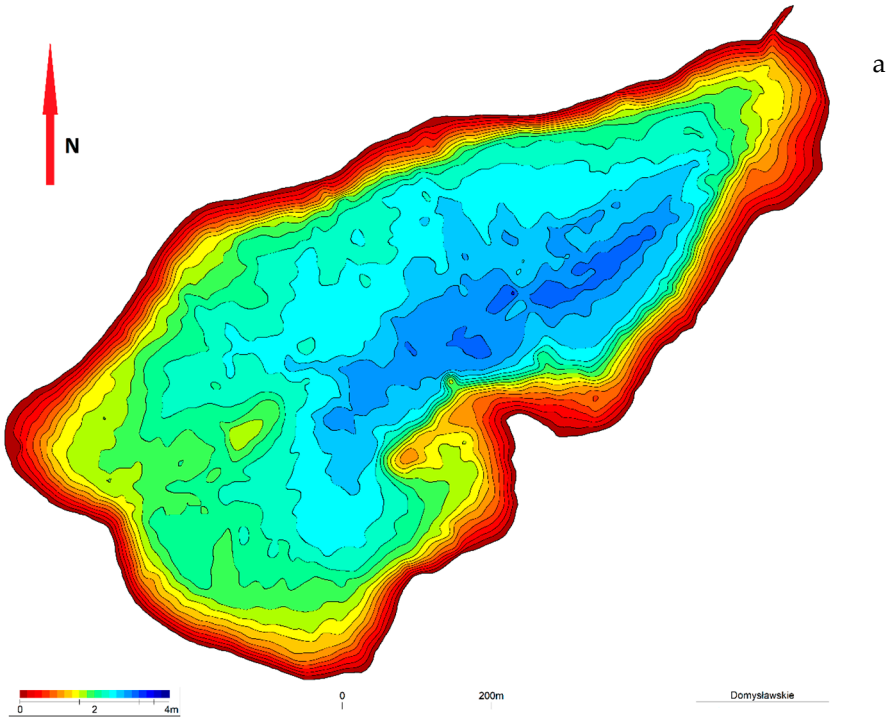


Figure 2. *Cont.*

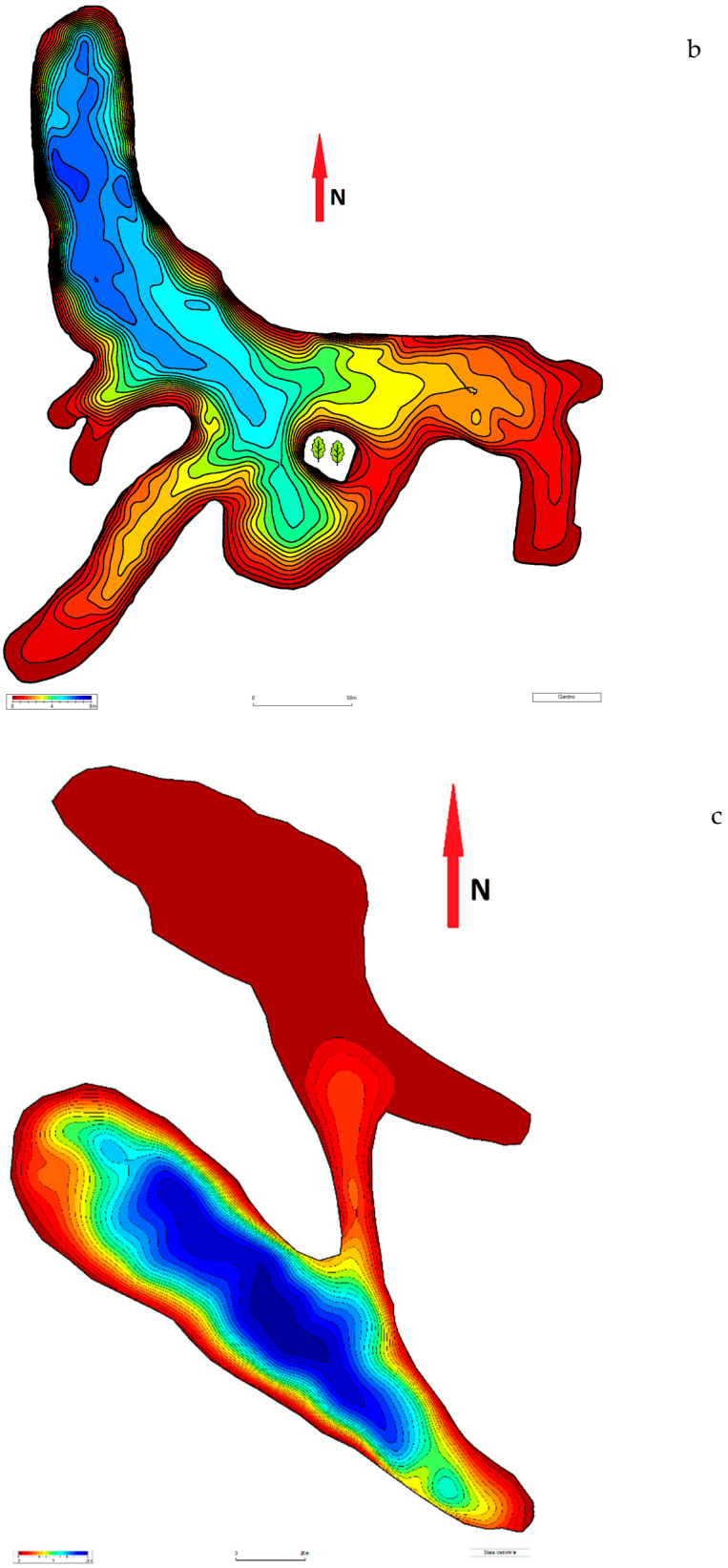


Figure 2. Bathymetry of the studied water bodies ((**a**)—Domysławskie Lake, (**b**)—Gardno Lake, (**c**)—Stara Kredownia).

Lake Domysławskie is classified as a 'tench-pike' fishing lake [12]. It is polymictic, where water masses mix from the surface to the bottom with no thermal stratification.

There is a dense belt of emergent vegetation (Figure 3) surrounding the lake [14]. The lake waters are characterized by high nutrient content [15] with a water transparency in summer no greater than 0.5 m. There is no observed expansion of reed beds [16]. Despite the significant concentration of nutrients and low transparency, the waters in this reservoir are classified as second purity class [14,16]. A recent study by Bucior and Poleszczuk [17] showed that the lake has a significant oxygen deficiency and elevated nutrient content, and the chances for self-purification of the waters are practically non-existent.



Figure 3. Reed bed on Domysławskie Lake (photo: Konrad Wrzecionkowski).

The bathymetry of Domysławskie Lake showed a more varied bottom profile than in previous studies using less advanced technology (Figure 2), which recorded a maximum depth of 3.4 m using an echo sounder. This result was confirmed several times in subsequent research sequences.

Gardno Lake (Figure 4, Table 1) is the deepest natural reservoir in the Wolin National Park, with an origin not fully explained [9]. The lake is endorheic and is fed by groundwater and rainfall. From the bathymetric point of view, there is a significant bay in the northern part of the lake with a maximum depth of 7.3 m. The configuration of the lakebed, the historical records, and the zinc contamination in the bottom sediments suggest mining works in this bay of the lake (in the 16th century), and thus, Gardno Lake is probably a polygenetic lake, resulting from many processes. Thermal stratification has been observed in the northern part of the lake [13]. According to Filipiak and Sadowski [12], Gardno Lake can be classified as a 'crucian carp' lake. Until 2009, the lake formed part of the recreational complex of the Chancellery of the Council of Ministers of the Republic of Poland. Then the area of the resort was handed over to the Wolin National Park and has not been used commercially since.

Stara Kredownia (Figure 5, Table 1) is a basin of anthropogenic origin (the Polish name means Old Chalk Pit). In the pre-war period, so called 'squeaky chalk' was mined in this area [18]. The entire area consists of two basins connected by a narrow channel; however, only the southern basin is continuously filled with water [19]. Due to the fact that it is located in a Strict Protection Area and due to the steep hills around the basin, this reservoir has never been used for fishing, and no ichthyological studies have ever been conducted there.



Figure 4. View over Gardno Lake from the north (photo: Konrad Wrzecionkowski).



Figure 5. View from the escarpment over the Stara Kredownia reservoir (photo: Konrad Wrzecionkowski).

Ichthyological Research

Fishing was undertaken using gill nets compliant with PN EN 14,757 standard [20], consisting of 12 panels with mesh sizes ranging from 5 mm to 55 mm (knot to knot). Ratio between mesh-sizes of about 1.25. Each gillnet was 30 m long and 1.5 m deep. Each mesh panel was 2.5 m long, was mounted on a 30 m long buoyancy line (with a recommended linear density in water of 6 g/m), and had a 33 m long lead line (recommended linear density in air 22 g/m and in water 9.9 g/m). The gillnets were made out of homogeneous nylon. The diameter of the thread varied between 0.10 mm for the 5 mm mesh, to 0.25 mm for the 55 mm mesh. The hanging ratio was 0.5 for all mesh sizes. The study was conducted between 2012 and 2014. During each fishing session, nets were set in the evening and retrieved in the morning (12 h).

Fishing was undertaken in Domysławskie Lake in 2012 (April, July, October), 2013 (November), and 2014 (May). Eight nets were used during each sequence. Net deployment sites were distributed throughout the lake. Due to the shallow depth of the water body in question, no separation of nets was implemented according to the depth at which they were set.

Gardno Lake was surveyed in the same manner in 2012 (April, July, and October). Eight nets were used during each catch. The nets were placed all over the lake. Due to the depth of the water (exceeding 7 m), nets were used separately in two depth ranges. Four nets were set at 0–3 m depth sites and another four at 3–6 m depth sites. The locations of the nets in the two described depth ranges were chosen randomly.

The Stara Kredownia reservoir was surveyed once in 2012 (April). Due to the very small size of the surveyed reservoir, only two nets were used.

The caught fish were transported to the laboratory, their species identified, their total length (lt) was measured with an electronic caliper to an accuracy of 1 mm, and they were weighed on an electronic Radwag WLC precision balance to an accuracy of 0.1 g.

We calculated catch per unit effort (CPUE) and biodiversity indices for each lake. Catch per unit effort was calculated for both the number and weight of fish caught by the net in a 12 h period (fish/net night). Shannon-Wiener (H′) and Simpson (D) biodiversity indices were determined according to the formulas by Krebs [21] and Simpson [22]:

$$H' = -1 \times \sum\left(\frac{n}{N}\right) \times \ln\left(\frac{n}{N}\right) \quad (1)$$

$$D = \frac{\sum n(n-1)}{N(N-1)} \quad (2)$$

where:

n—number of individuals of a given species.
N—total number of individuals.

3. Results

During the study, a total of 4580 fish (of which 4391 were caught in Domysławskie Lake) belonging to 15 species were caught, with a total weight of 98,165.38 g (Table 2, Figure 6). In the case of Stara Kredownia reservoir, no fish were caught.

Table 2. Species composition, abundance (N), total length (lt, in cm), and weight (W, in g) of the fish caught.

Species	N	Lt			W			
		Min	Max	Mean ±SD	Min	Max	Mean ±SD	Total
Domysławskie Lake								
Asp *Leuciscus aspius* (L.)	1		29.5			232.5		232.5
Ruffe *Gymnocephalus cernua* (L.)	257	3.8	10.7	6.57 ± 1.18	0.6	13.5	3.39 ± 1.97	870.8
Prussian carp *Carassius gibelio* (Bloch, 1782)	1		42.0			1685.1		1685.1
Gudgeon *Gobio gobio* (L.)	121	4.2	10.3	7.10 ± 1.53	0.5	8.6	3.40 ± 2.28	411.7
Spined loach *Cobitis taenia* L.	19	6.2	10.4	9.07 ± 1.35	1.3	7.2	5.09 ± 1.79	96.7
White bream *Blicca bjoerkna* (L.)	627	3.8	21.0	8.76 ± 2.69	0.5	74.5	8.44 ± 9.13	5289.4

Table 2. *Cont.*

Species	N	Lt			W			
		Min	**Max**	**Mean ±SD**	**Min**	**Max**	**Mean ±SD**	**Total**
Freshwater bream *Abramis brama* (L.)	69	5.7	47.0	19.78 ± 10.61	1.8	1171.3	142.33 ± 187.10	9820.6
Tench *Tinca tinca* (L.)	1		39.5			865.0		865.0
Perch *Perca fluviatilis* L.	1339	4.2	36.4	7.31 ± 4.22	0.6	741.0	11.68 ± 46.96	15636.2
Roach *Rutilus rutilus* (L.)	1243	4.2	32.4	11.89 ± 4.76	0.6	479.7	26.98 ± 43.34	33532.9
European bitterling *Rhodeus amarus* (Bloch, 1782)	69	4.0	7.3	5.92 ± 0.82	0.7	4.7	2.51 ± 1.08	173.5
Pike-perch *Sander lucioperca* (L.)	16	10.5	15.4	12.91 ± 1.46	6.4	21.0	13.58 ± 4.62	217.2
Northern pike *Esox Lucius* L.	8	29.8	78.0	53.93 ± 19.53	170.6	3668.5	1464.60 ± 1351.89	11716.8
Bleak *Alburnus alburnus* (L.)	558	4.4	16.0	9.53 ± 3.33	0.7	32.3	9.18 ± 8.63	5096.6
Rudd *Scardinius erythrophthalmus* (L.)	61	7.5	23.1	15.48 ± 3.75	4.9	170.5	51.15 ± 32.64	3119.9
Gardno Lake								
White bream *Blicca bjoerkna* (L.)	1		6.7			2.0		2.0
Freshwater bream *Abramis brama* (L.)	2	23.8	28.4	26.10 ± 2.30	120.3	265.0	192.63 ± 72.38	385.3
Tench *Tinca tinca* (L.)	1		10.0			15.2		15.2
Perch *Perca fluviatilis* L.	54	8.4	39.0	12.77 ± 5.96	5.3	767.0	44.74 ± 113.41	2416.0
Roach *Rutilus rutilus* (L.)	130	5.5	23.2	10.84 ± 3.80	1.5	141.5	17.34 ± 21.35	2254.0
Northern pike *Esox Lucius* L.	1		87.0			4290.0		4290.0
Stara Kredownia								
lack of fish								



Figure 6. Nets during picking (photo: Konrad Wrzecionkowski).

3.1. Ichthyological Biodiversity of Domysławskie Lake

A total of 4391 fish belonging to 15 species with a total weight of 88,802.9 g were caught in Domysławskie Lake. One fish was classified as a roach/bream hybrid (lt = 16.3 cm and W = 38.0 g). During the research, a poaching set (hook line) with a caught European eel (*Anguilla anguilla* L.) was found, which confirms the occurrence of this species as well, raising the number to 16. Two protected species, namely spined loach (n = 19) and bitterling (n = 69), were also recorded in the conducted catches (Figures 7 and 8). The Shannon-Wiener H and Simpson D biodiversity indices were 1.776 and 0.786, respectively, while the average catch per unit of effort (CPUE) per net night was 2220.07 g, with an abundance of 110 individuals.



Figure 7. Spined loach caught in Domysławskie Lake (photo: Marcin Biernaczyk).



Figure 8. Europena bitterling caught in Domysławskie Lake (photo: Marcin Biernaczyk).

Both in terms of numbers and weight, the catch was dominated by non-predatory fish such as asp, prussian carp, gudgeon, goatfish, white bream, tench, roach, bitterling, bleak, and rudd, accounting for 63% (n = 2770) of the total number of fish caught and 68% (60,129.4 g) of the total catch weight.

Among all the species, perch (n = 1339, 30%) and roach (n = 1243, 28%) were most frequent, followed by white bream and bleak at 14% and 13%, respectively (Table 2; Figure 9). The biomass was clearly dominated by roach (38% of the total catch weight) with perch biomass half that of roach, and then pike and bream at 13% and 11%, respectively, of the total weight of caught fish (Figure 10).

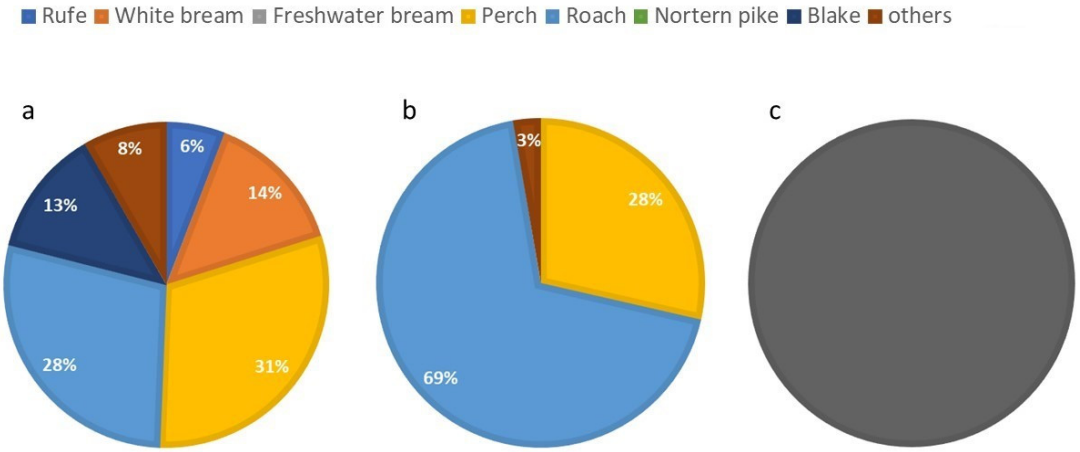


Figure 9. Comparison of the percentage of the main fish species in the total number of fish caught ((**a**)—Domysławskie Lake; (**b**)—Gardno Lake; (**c**)—Stara Kredownia).

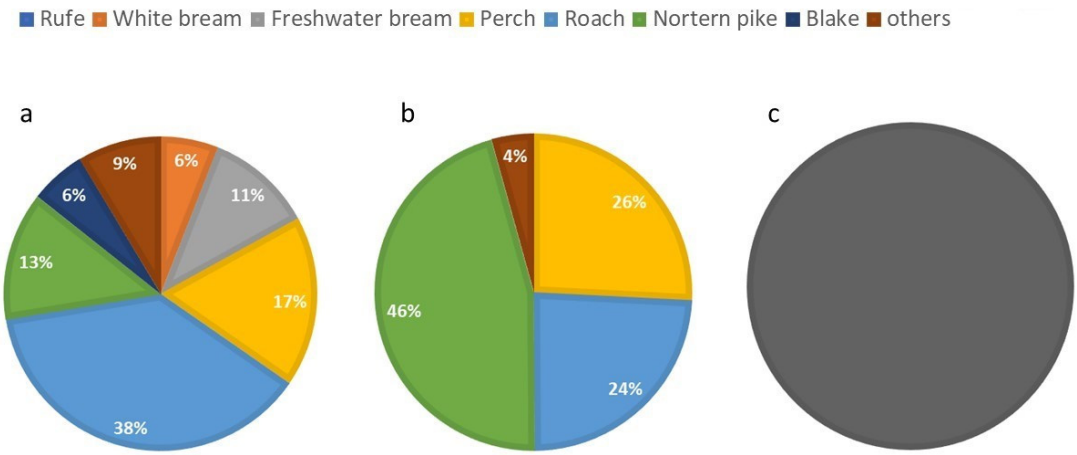


Figure 10. Comparison of the percentage of the main fish species in the weight of the caught fish ((**a**)—Domysławskie Lake; (**b**)—Gardno Lake; (**c**)—Stara Kredownia).

The dominant species in terms of numbers (bream, perch, and roach) were small specimens, particularly for roach and perch, where those under 15 cm total length accounted for as many as 97% and 95% of the individuals caught. In the case of roach, the percentage was 75%. No greater number of juvenile fish was found for bleak—the fourth dominant species.

3.2. Ichthyological Biodiversity of Lake Gardno

In Gardno Lake, a total of 189 fish belonging to 6 species were caught, with a total weight of 9362.5 g. Roach constituted 69% of the caught fish (Figure 9.). The total weight of the catch was dominated by one pike (n = 1), constituting 46% of the catch weight. Perch was second (26%), followed by roach (24%) (Figure 10). However, if the weight of the pike is not taken into account, the weight shares of perch and roach are 48% and 44%, respectively.

In the case of roach, no specimens over 25 cm were found in this lake, while at the same time, specimens up to 39 cm in length were recorded among perch. The Shannon-Wiener H and Simpson's D biodiversity indices were 0.747 and 0.447, respectively, while the mean catch per unit of effort (CPUE) per net night was 390.1 g, with 8 individuals.

4. Discussion

Depending on the fishing type, Polish lakes are characterized by wide ranging biodiversity in the ichthyofauna. For example, Rechulicz et al. [7] found the biodiversity of the Dratów and Krzczeń lakes (Łęczyńsko-Włodawskie Lake District, eastern Poland) to be 9 and 13 fish species, respectively. Similarly, Czerniawski et al. [8] found between 5 and 11 fish species in eighteen lakes in the northern Drawa and Piława river catchments (northern Poland). More species (n = 16) were recorded by Rechulicz [23] in Lake Skomielno (Łęczyńsko-Włodawskie Lake District), which is quite a bit larger than the studied lakes (area 73.5 ha, depth of 5.5 m). In two lakes similar to those studied (Miejskie and Rotcze), Rechulicz [23] reported 14 and 10 fish species, respectively. Both Lake Skomielno and Lake Miejskie are used for fishing, so restocking is carried out in order to increase their biodiversity. In the 1970s, Jarzynowa and Stroński [1] found 9 to 13 fish species in the lakes of the Łęczyńsko-Włodawskie Lake District, despite using different fishing methods. In a study of Dołgie Wielkie Lake (northern Poland), 9 fish species were found [24]. In a study conducted on Mukrz Lake, which is part of a nature reserve, 16 fish species were found [3]. Only in the case of lakes in the Tatra National Park, a mountainous region, were fish species diversity much poorer. In the first studies conducted in the mid-19th century, only one species (Salmo trutta) was found in Morskie Oko Lake, while currently as many as 6 fish species can be found [25]. A total of 14 fish species were found across 14 lakes in the West Pomeranian Province (Poland) used by the Polish Angling Association in Szczecin, but there were only 4 to 10 species per lake [26,27]. Previous surveys indicated that the ichthyofaunal biodiversity of regional lakes was mostly lower than in the studied Domysławskie Lake, and higher than in Gardno Lake.

An interesting result of the study was the high proportion of small specimens for the dominant species in Domysławskie Lake. In a study conducted by the author in the waters of the Szczecin Lagoon (NW Poland), in the case of perch, and using the same fishing gear, specimens below 10 cm constituted less than 30% of the catch (Biernaczyk, unpublished data). Moreover, Kwiatkowski et al. [28] found no such dominance of small-sized individuals. On the other hand, a similarly high percentage of juveniles in the catch was observed during a study conducted on Dołgie Wielkie Lake [24], but this was most likely the result of the specific survey methodology (catches were conducted with a fry trawl) rather than the actual population structure.

Taking into account the results of the analysis of the growth rate of perch [29], it can be assumed that the majority of the population of this species in the waters of Domysławskie Lake consisted of individuals aged 1+ and 2+ years. Larger individuals, even above 35 cm, were present in the catch, but their proportion was marginal. This size distribution may suggest increased mortality in the years preceding the survey, followed by improved conditions to allow growth. Populations dominated by juveniles are usually found in lakes where, once every few years, severe oxygen deficits and mass fish deaths occur (oxygen deficits in Lake Domysławski were reported by Bucior and Poleszczuk [17]). Furthermore, the small number of pike-perch, a species sensitive to oxygen deficits, and only in sizes that correspond to the age of 1+ years, seems to support this hypothesis. The presence of a small number of larger and older individuals among the dominant species indicates that part of the population had survived or has migrated in from neighboring waters.

Despite the presence of adverse aerobic conditions for ichthyofauna with narrow environmental requirements, two partly protected species of fish were recorded in Domysławskie Lake. Of particular interest is the abundance of bitterling, which requires bivalves for breeding, mainly those from the Unionidae family. This may indicate that any oxygen deficits do not cover the entire lake.

During the study of fish populations from Lake Gardno, a similar number of species were found as in the work by Kwiatkowski et al. [28]. However, except for the dominant species (which are the same) the remaining species differ. Kwiatkowski et al. observed the occurrence of rudd and bleak, whereas they did not find the occurrence of white bream, freshwater bream, or tench. Summarizing both studies, it can be concluded that there are at least 8 species of fish in the lake. It also confirms the conjecture by Kwiatkowski et al. [28] that there are no favorable conditions for bentophagus in this lake, which is confirmed by the absence of larger individuals of roach in the catch, a fish whose diet usually consists of mussels [30].

With regard to the number of species occurring in Gardno Lake, it is difficult to refer unequivocally to any other studies conducted in other reservoirs. This matter is complicated by the specific morphometric structure of the lake (vertical banks). According to the study by Filipiak and Sadowski [12], the reservoir is classified as a 'crucian carp' fishery; however, it does not possess typical features for this type of water. This is because such lakes are characterized by both low area and depth, which results in frequent oxygen deficits during the summer and winter periods. Gardno Lake has a small area, but is relatively deep (7.3 m max). Oxygen deficits do occur in such waters, but only in the deeper parts [13]. In this particular case, it is a result of its morphometry, i.e., not associated with eutrophication but with the fact that the waters in this water body do not mix. This makes it extremely difficult to find a reservoir with similar characteristics, and comparing Gardno Lake with other 'crucian carp-type' reservoirs is not entirely correct.

Another interesting issue requiring further consideration and research is the lack of ichthyofauna caught in the Stara Kredownia reservoir. During the survey, a rich invertebrate fauna and numerous amphibians, including great crested newts (*Triturus cristatus*) and common newts (*Lissotriton vulgaris*), were observed in water conditions of high transparency and visibility of the bottom. Such a great number of special amphibians is probably due to the lack of ichthyofauna in the waters of this reservoir [19].

In the case of Domysławskie Lake, both the Shannon-Wiener and Simpson biodiversity indices either exceeded the values obtained by other authors or were close to the highest observed values. In Dołgie Wielkie Lake, a Simpson index of only 0.2082 was calculated [24]. In the Łęczyńsko-Włodawskie Lake District, the Shannon-Wiener index ranged from 0.44 to 1.55 and the Simpson index from 0.20 to 0.64 in the lakes tested [23]. Despite this high species diversity and low incidental exploitation, catch efficiency was not high, but rather in the medium catch range relative to other studies [7,23]. Gardno Lake, both in terms of the biodiversity indices and fishing productivity (CPUE), ranks well below the value presented by other researchers. In summary, average and low fishing efficiencies in the lakes studied suggest that pressure from fishing (angling) is not always the only factor limiting fish population growth in lakes.

Gaining knowledge of fish populations specific to particular ecosystems allows these populations to be managed properly and to maintain an appropriate level of biodiversity [31]. Perhaps when a lake is in a strictly protected area, such as a national park, the assumption that nothing should be changed in it may be a valid approach. However, it seems that in the case of some waters in protected areas where both the catchment area and the structure of ichthyofauna had been significantly modified as a result of fishing and other forms of human activity (e.g., municipal sewage disposal), it is necessary to consider possible paths of ecosystem improvement and support, especially in the area of providing optimal conditions for the life and development of protected species.

5. Conclusions

The number of fish species (15 species) caught in Domysławskie Lake, which is classified as a 'tench-pike' type water body, should be considered significant, and with calculated biodiversity indices higher than for other lakes of the same fishery type.

The number of fish species (6 species) caught in Gardno Lake should be considered low. Moreover, the calculated biodiversity indices were lower than for lakes of similar morphometry.

Active protection of ichthyofauna in the Wolin National Park should be taken into consideration.

Due to the specific location and isolation from other surface waters of Stara Kredownia, it has not yet been colonized by fish, which gives it unique conditions for the development of amphibian populations.

Author Contributions: Conceptualization, M.B. and K.S.; methodology, M.B. and K.W.; formal analysis, M.B.; resources, M.B.; data curation, M.B.; writing—original draft preparation, M.B. and A.N.; writing—review and editing, M.B. and A.N.; visualization, M.B. and K.W.; supervision, A.N. and K.S.; project administration, M.B. All authors have read and agreed to the published version of the manuscript.

Funding: This research received no external funding.

Institutional Review Board Statement: Ethical review and approval for this study was waived due to the fact that the study is conducted using dead fish (we consider fish caught in gillnets to be such). Therefore, research of this type does not require ethics committee approval.

Informed Consent Statement: Not applicable.

Data Availability Statement: The results presented in this work have not yet been archived in any database. At this time, the only data holders are the authors of this paper. The publication also does not use any figures provided by other researchers, but only cites other scientific articles (listed in the literature list).

Conflicts of Interest: The authors declare no conflict of interest.

References

1. Jarzynowa, B.; Stronski, R. Przyczynek do poznania ichtiofauny trzech odmiennych troficznie jezior Pojezierza Łęczyńsko-Włodawskiego. [A study on ichthyofauna of three trophically different lakes of the Łęczyńsko-Włodawskie Lake District]. *Annales Universitatis Mariae Curie-Skłodowska Lublin—Polonia vol. XXXVII, sectio C.* **1982**, *13*, 151–161.
2. Wołos, A. Społeczne, ekonomiczne i ekologiczne znaczenie wędkarstwa [The social, economic and ecological importance of angling]. In *Rybactwo, wędkarstwo, ekorozwój [Fishing, Angling, Eco-Development]*; Wołos, A., Ed.; Wyd. IRŚ: Olsztyn, Poland, 2006; pp. 57–71.
3. Kapusta, A.; Morzuch, J.; Bogacka-Kapusta, E.; Pajakowski, J. Ichtiofauna jeziora Mukrz w rezerwacie przyrody "Cisy Staropolskie im. Leona Wyczółkowskiego" w Wierzchlesie. [Ichthyofauna of Mukrz Lake in the Leon Wyczółkowski Nature Reserve of Old Polish Yews, Wierzchlas]. *Chrońmy Przyrodę Ojczystą* **2012**, *68*, 6.
4. Kapusta, A.; Czarkowski, T.; Kapusta-Bogacka, E.; Jacek Morzuch, J. Ichtiofauna i gospodarka rybacka w jeziorach lobeliowych [Ichthyofauna and fishery management in lobelia lakes]. In *Działalność gospodarstw rybackich w 2016 roku–uwarunkowania ekonomiczne, prawne i ekologiczne [Fishing Companies in 2016-Economic, Legal and Environmental Conditions]*; Mickiewicz, M., Wołos, A., Eds.; Instytut Rybactwa Śródlądowego: Olsztyn, Poland, 2017; pp. 137–153.
5. Czerniejewski, P.; Rybczyk, A. Variations in age and length growth rates of vendace, *Coregonus albula* (L.), from selected lakes in Western Pomerania. *Arch. Pol. Fish.* **2008**, *16*, 63–74. [CrossRef]
6. Kozłowski, K.; Kozłowski, J.; Poczyczyński, P.; Martyniak, A. Age and growth of vendace, *Coregonus albula* (L.), from Lake Wigry (northeast Poland). *Arch. Pol. Fish.* **2010**, *18*, 239–245. [CrossRef]
7. Rechulicz, J.; Płaska, W.; Monika-Kukuryk, M. The ichthyofauna of littoral of two shallow lakes on background of fishery management and angling pressure. *Teka Kom. Ochr. Kszt. Środ. Przyr.–OL PAN* **2014**, *11*, 163–172.
8. Czerniawski, R.; Domagała, J.; Pilecka-Rapacz, M.; Kraczek, G.; Sługocki, Ł.; Krepski, T. Ichtiofauna różnych typów rybackich jezior zlewni Drawy i Piławy. [Ichthyofauna of various types of lakes in the catchment areas of Drawa and Piława rivers]. *Rocz. Nauk. PZW* **2015**, *28*, 105–121.
9. Poleszczuk, G.; Domagała, J.; Markiewicz, I.; Sitek, S. Ekosystemy wód przybrzeżnych Wolińskiego Parku Narodowego-jako odbiorniki wód odpadowych. [Coastal Water Ecosystems of the Wolin National Park-as Waste Water Reservoirs]. *Rocznik Ochrona Środowiska [Yearb. Environ. Prot.]* **2002**, *4*, 403–417.
10. Jakuczun, U.; Nowacki, F. *Problemy krążenia wód wyspy Wolin, korzystania z zasobów oraz ich ochrony, Mater. Warsztatów Ekologicznych: Program zagospodarowania i rozwoju wyspy Wolin. [Problems of Water Circulation on the Wolin Island, Use of Resources and Their Protection, Materials of the Ecological Workshop: Programme of Management and Development of the Wolin Island] Międzyzdroje 6-7 października 1994*; Woliński Park Narodowy: Międzyzdroje, Poland, 1994; pp. 137–165.

11. Choiński, A. Katalog jezior Polski. Pojezierze Pomorskie. [Catalogue of Polish lakes. Pomeranian Lake District.] Wydawnictwo Naukowe Uniwersytetu im. *Adama Mickiewicza w Poznaniu* **1991**, 221.
12. Filipiak, J.; Sadowski, J. *Jeziora Szczecińskie [Lakes of Szczecin]*; Zakład poligrafii AR w Szczecinie: Szczecinie, Poland, 1994; p. 259.
13. Tylkowski, J.; Samołyk, M. Meteorological conditions, physiochemical properties, thermal-oxygen stratification, water overturn and water balance of Lake Gardno on Wolin Island. *Limnol. Rev.* **2015**, *15*, 107–118. [CrossRef]
14. Machula, S.; Choiński, A.; Ławniczak, A. Wody w parkach narodowych. Woliński Park Narodowy. In *Waters in National Parks. Wolin National Park*; Instytut Geografii i Gospodarki Przestrzennej Uniwersytetu Jagiellońskiego Kraków: Kraków, Poland, 2012.
15. Poleszczuk, G.; Bucior, A.; Nowicka, E.; Grzegorczyk, K. O jakości wód powierzchniowych jezior Czajczego i Domysłowskiego w Wolińskim Parku Narodowym w różnych porach roku. [The quality of surface waters of the Czajcze and Domysłowskie lakes in the Wolin National Park in different seasons]. *Rocznik Ochrona Środowiska* **2005**, *7*, 219–231.
16. Cieśliński, R.; Olszewska, A. Exploitation and protection of the polish southern baltic coastal zone lakes and their potential for recreation. *Pol. J. Nat. Sci.* **2012**, *27*, 377–392.
17. Bucior, A.; Poleszczuka, G. What happens in the waters of the Warnowo, Rabiaz, Czajcze and Domyslowskie lakes in the Wolin National Park during summer stagnation? *Ecol. Chem. Eng. A* **2013**, *20*, 7–20. [CrossRef]
18. Głąbiński, Z. Tajemnice krajobrazów Pomorza Zachodniego-przewodnik dla dociekliwych. In *The Secrets of Western Pomerania's Landscapes-a Guide for the Inquisitive*; Forum Turystyki Regionów: Szczecin, Poland, 2009; ISBN 978-83-61289-12-8.
19. Biernaczyk, M.; Pociecha, A.; Wrzecionkowski, K.; Polczynska-Konior, G.; Stepanowska, K.; Kuciel, H.; Walusiak, E.; Wilk-Wozniak, E.; Bielanska-Grajner, I. Występowanie traszek w sztucznym zbiorniku wodnym Stara Kredownia [Occurrence of newts in the artificial water body Stara Kredownia] (Woliński Park Narodowy). *Chrońmy Przyrodę Ojczystą* **2014**, *70*, 558–562.
20. PN EN 14757 Water quality-Sampling of fish with multi-mesh gillnets.
21. Krebs, C. *Ecological Methodology*; HarperCollins: New York, NY, USA, 1989.
22. Simpson, E.H. Measurement of diversity. *Nature* **1949**, *163*, 688. [CrossRef]
23. Rechulicz, J. Diversity of the ichthyofauna in some of the lakes in the Łęczyńsko-Włodawskie Lake District. In *Water Biodiversity Assessment and Protection*; Jankun, M., Furgała-Selezniow, G., Woźniak, M., Wiśniewska, A.M., Eds.; University of Warmia and Mazury in Olsztyn: Olsztyn, Poland, 2011; pp. 165–178.
24. Kapusta, A.; Bogacka, E. Characteristics of the structure of ichthyofauna assemblages in the littoral of the lobelia-lake lake Dołgie Wielkie and the analysis of fisheries catches. *Arch. Pol. Fish.* **2003**, *11*, 265–275.
25. Kozłowski, J.; Kozłowski, K.; Dynowski, P.; Pęksa, Ł.; Traczuk, P.; Walter, K.; Żelazkowski, M. *Ichtiofauna wybranych jezior Tatrzańskiego Parku Narodowego. [Ichthyofauna of selected lakes of the Tatra National Park.] In Zrównoważone korzystanie z zasobów rybackich na tle ich stanu w 2014 roku [Sustainable Use of Fisheries and Their Condition in 2014]*; Mickiewicz, M., Wołos, A., Eds.; Instytut Rybactwa Śródlądowego: Olsztyn, Poland, 2015; pp. 239–249.
26. Keszka, S.; Tański, A.; Pender, R.; Potkański, Ł.; Czerniejewski, P. Identifi cation of threats to biodiversity on the basis of an analysis of the ichthyofauna in Głębokie Lake in the city of Szczecin. In *Water Biodiversity Assessment and Protection*; Red Jankun, M., Furgała-Selezniow, G., Woźniak, M., Wiśniewska, A.M., Eds.; University of Warmia and Mazury in Olsztyn: Olsztyn, Poland, 2011; pp. 147–154.
27. Tański, A.; Czerniejewski, P.; Keszka, S.; Pender, R. Struktura ichtiofauny w różnych typach rybackich jezior użytkowanych wędkarsko przez Okręg Polskiego Związku Wędkarskiego w Szczecinie. [Structure of ichthyofauna in various types of lakes used for angling by the District of the Polish Angling Association in Szczecin]. In *Gospodarowanie ichtiofauną w warunkach zróżnicowanego środowiska wodnego [Management of Ichthyofauna in a Diverse Aquatic Environment]*; Jankun, M., Furgała-Selezniow, G., Woźniak, M., Wiśniewska, A.M., Eds.; Uniwersytet Warmińsko-Mazurski: Olsztyn, Poland, 2011; pp. 163–170.
28. Kwiatkowski, A.; Biernaczyk, M.; Karpuk, M.; Jędraszczyk, R.; Stepanowska, K. Monitoring ichtiologiczny jeziora Gardno, Woliński Park Narodowy. [Ichthyological monitoring of Gardno Lake]. *Wolin National Park. Komunikaty Rybackie* **2016**, *155*, 17–22.
29. Epler, P.; Łuszczek-Trojnar, E.; Socha, M.; Drąg-Kozak, E.; Szczerbik, P. Age and growth of the perch (Perca fluviatilis L.) in the Solina and Roznow dam reservoirs. *Acta Sci. Pol. Piscaria* **2005**, *4*, 43–50.
30. Niederholzer, R.; Hofer, R. The feeding of roach (*Rutilus mtilus* L.) and rudd (*Scardinius erythrophthahnus* L.) Studies on natural populations. *Ekologia Polska* **1980**, *28*, 45–59.
31. Marshall, T.R.; Ryan, P.A. Abundance Patterns and Community Attributes of Fishes Relative to Environmental Gradients. *Can. J. Fish. Aquat. Sci.* **1987**, *44* (Suppl. S2), 198–215. [CrossRef]