

Scuba diving activities for scientific research in the Tatra National Park, focus on the Tatra lakes

Małgorzata Orlewicz-Musiał¹, Krzysztof Broda²

- ¹ *Akademia Wychowania Fizycznego w Krakowie, Instytut Nauk Humanistycznych, Zakład Historii i Organizacji Kultury Fizycznej*
² *AGH University of Science and Technology, Faculty of Mining and Geoengineering (Akademia Górniczo-Hutnicza w Krakowie, Wydział Górnictwa i Geoinżynierii)*

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Summary

Research activities that have been carried out for many years in the Tatras make a good chapter in the history of learning the nature and in the history of the Polish science. Some of the ways of studying are very interesting from the point of view of using this method and research techniques. In our study we would like to draw attention to is method's role in hydrologic studies of the Tatra nature, played by the studies of the Tatra lakes with the participation of scuba divers.

The purpose of the studies was to show how the development of diving technique contributed to the knowledge of the most difficult to access study objects: water bodies. The paper concentrates on presenting the underwater actions the purpose of which was collecting materials from water bodies, excluding underground waters. The research projects carried out by: the Tatra National Park, Jagiellonian University, Polish Society of the Friends of Earth Sciences are presented, and the work were carried out by scuba divers from different clubs. As result of the work, the course of underwater activities is to be presented, as well as the applied methods and the results of research carried out in the connection with these activities. In the paper we try to establish how much important in scientific research is the work with a direct participation of humans.

Polish diving contributed a lot to the history of studying our natural environment, becoming an important research tool in the hands of scientists. In Poland, underwater studies have usually been associated with research activities carried out in the Baltic Sea. The pioneer of Polish underwater research was a professor of biology Roman Wojtusiak, in 1935. He used a diving cask of his own construction, enabling him to submerge

a few metres under the surface of water and make direct observations in natural environment (Wojtusiak, 1973). However, deeper studies on the history of underwater studies indicate that the significant element in research activities in Polish waters were studies carried out by divers in the lakes of the Tatra National Park. The scale of these activities was not very large and research-oriented diving in the Tatras was dominated by the exploration of caves, where the important role was played by underground exploration of those waters. These diving activities contributed much important data to the knowledge on the Tatra caves. Underwater cave exploration, treated as one of mountaineering techniques, was described in scientific literature (Baryła, 1981; Przybyszewski, 1979; Wiśniewski, 1993; Orlewicz-Musiał, 2000).

Diving in the Tatra lakes has been an inspiration to many brave people for a long time. The motivation for diving in crystal-clear and picturesque lakes of the Tatra Mountains was the desire for getting knowledge of the underwater world, staying in it and benefiting from its resources. The creative role in the development of diving was played by intentional research processes of the researchers. Scientific activities became more and more demanding both in terms of diving and research techniques, where the research object was the underwater world. An area most difficult to access included mountainous lakes, the ones in the Tatras in particular (Orlewicz-Musiał, 2004).

The purpose of this paper is to present less widely known scientific underwater activities in the area of the Tatra lakes. The beginnings of underwater exploration go back to the early 1950s. The list of diving actions shows an over half a century history of the explorers of underwater depths in the Polish Tatras in 20th century, from the first action in 1953 and ending with 1990s. So far there has been no comprehensive paper dealing with research diving in the Tatras. There were many attempts to list the underwater actions in the Tatra caves (Przybyszewski, 1979; Wiśniewski, 1993; Broda, Orlewicz-Musiał, 2005). In this paper, to get the readers familiar

with diving in the Tatra lakes, the following methods were applied: direct observations, collecting sources, analysing and compiling them (Grabowski, 1996). Source materials possessed by the Tatra National Park (TPN) were used, as well as the divers' booklets confirming the diving and scientific papers resulting from underwater research.

According to the existing regulations, experts recognized diving in the mountains as "diving in untypical conditions", requiring additional qualifications and adequate training (Orlewicz-Musiał, 2003). Nowadays it is regulated by appropriate legal regulations: *The Regulation by the Minister of Sport in the Rules of Safety while Diving of 17th August 2006. the Polish Journal of Laws no. 154, position 1103*. The specific characteristics of diving actions in the Tatra lakes include some difference from this type of activities carried out in lowland waters, combined with requirements resulting from respective research methods. This posed a particular challenge for their organizers. Underwater actions, combined with the research, not only require very good technical preparation and fitness from scuba divers, but also the knowledge of natural and weather conditions in the area of the explored waters. Apart from that, any kind of diving in the mountains should be predeceased by at least one day of getting the participants used to climatic conditions. It is necessary to possess proper equipment for underwater and scientific activities (that has usually to be delivered to places unavailable to different means of transport) as well as the knowledge of research methods, according to the rules of a given scientific discipline (Broda, Orlewicz-Musiał, 2005).

The beginnings of underwater activities in the Tatras were focused on exploring caves. The first expedition, in which 12 speleologists participated, where the diving technique was used to go through a so-called "water barrier", was organized on 1–8th February 1953 to the Zimna Cave. To overcome the sump, speleologists used classical diving suits designed by Tadeusz Bernhard and Włodzimierz Starzecki. The approach succeeded and

encouraged further actions. Preparations for further attempts to explore caves in the Tatra lakes was carried out (Gradziński, 1953; Kuczyński, 1953). Further studies show that speleologist underwater activities definitely outnumber diving in the Tatra lakes.

The earliest underwater diving in the mountainous lakes, when the pioneer studies were carried out with the direct method, took place in the Polish Tatras also in 1950s. Press presented that event in a sensational way. In October 1955 the Institute of Submarine Engineering in Gdansk and the members of the Cave Mountaneering Section of PTTK (Polish Tourist and Sightseeing Society) of Krakow carried out in Morskie Oko a spectacular underwater action, which was also the first Polish diving in a Tatra lake, when scientific research was done. The purpose of this action was, as reported in the press: "exploring the depth of Morskie Oko" by sampling the sediments from the lake bottom. The task of divers was to get to the algae samples from the bottom of the lakes and provide them to laboratories. Divers used C-G scubas imported from France. It should be underlined that research activities were combined with training, preparing speleologists – scuba divers to diving in caves. No detailed data, however, is available referring to specific scientific achievements being a result of this expedition (Siemińska, 1956).

Further diving in the Tatra lakes, although being not a research action, was important for underwater activities – moving the limits of human possibilities in underwater activities in mountain conditions. On 20th June 1961 Jerzy Chomik achieved the depth of 72 m diving in Czarny Staw under the Rysy Mountain. He used an air scuba (Broda, Orlewicz-Musiał, 2005). Reaching such a great depth proved that when operating in the mountain conditions, there is a possibility of underwater exploration, achieving greater and greater depths, exceeding even 70 m. Encouraged by this success, divers tried to get the bottoms of the lakes to explore the mysteries of this silent world.

For further direct research methods it was necessary to wait 8 years from the moment of carrying out the first



Ryc. 1. Dwoisty Staw Gąsienicowy – poszukiwania skrzepływki bagiennej

Fig. 1. Dwoisty Staw Gąsienicowy – search for *Branchinecta Paludosa*



Ryc. 2. Długi Staw Gąsienicowy – pobieranie próbek biologicznych

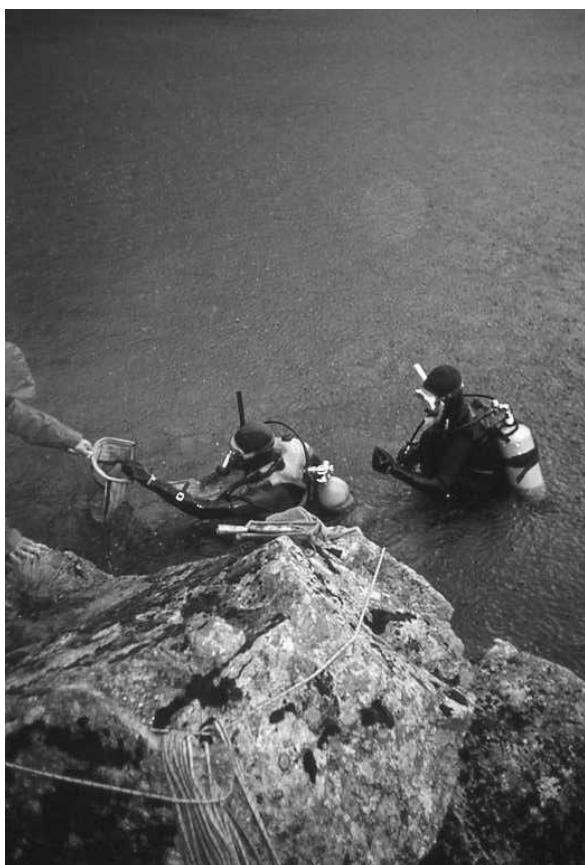
Fig. 2. Długi Staw Gąsienicowy – collecting biological samples



Ryc. 3. Długi Staw Gąsienicowy – pobieranie próbek biologicznych

Fig. 3. Długi Staw Gąsienicowy – collecting biological samples

diving in Morskie Oko. The object of the scuba divers activities were sessile algae in Morskie Oko and Wielki Staw in Dolina Pięciu Stawów Polskich. The action was organized in 1963 by the Department of Water Biology of the Polish Academy of Sciences. In the realization of underwater studies the participants were scuba divers of the Warsaw of the Underwater Club (Kawecka B. 1966.). Deep diving in Wielki Staw in Dolina Pięciu Stawów



Ryc. 4. Dwoisty Staw Gąsienicowy – pobieranie próbek biologicznych

Fig. 4. Dwoisty Staw Gąsienicowy – collecting biological samples



Ryc. 5. Dwoisty Staw Gąsienicowy – poszukiwania skrzepływki bagiennej

Fig. 5. Dwoisty Staw Gąsienicowy – search for *Branchinecta Paludosa*

Polskich was unfortunate. During underwater activities, Mieczysław Kwapisiewicz was diving in Wielki Staw at the depth of about 70 m when he had an accident. The rescue operation was successful and Kwapisiewicz came back to diving in a few years, however the unfortunate course of events pushed out the information on the effect of studies (Kownacki A., Kownacka M., 1965 and Kawecka B. 1966, 1970), concentrating only on hazardous aspects of diving in mountain lakes and engagements of many rescuers (Dubrawska, 1971).

The medial publicity around the accident and the need for rescue operation in the Tatras resulted in the ban of such activities in the Tatra National Park. There was a long break in research activities carried out by the divers in the depths of the Tatra lakes. The approach to underwater actions changed only after the director of the Tatra National Park by Wojciech Gąsienica-Byrcyn. Diving in lakes, after many years' gap, from the moment of the mentioned accident with Kwapisiewicz, was restored in 1970s. It was probably one expedition. Research activities with the use of direct methods with the application of scientific techniques were carried out in 1971. Then Krakow scuba divers connected with the Academic Underwater Club „Krab”, from the depths of the Morskie Oko, took samples of micro-fauna and micro-flora for the Institute of Water Biology of the Polish Academy of Sciences. They used scubas of the type called “mors” and dry diving suits. During the exploration scuba divers reached the depth of about 20 m. Samples taken from the lake bottom were given to the Institute for further analysis (Stós, Pajdak-Stós, 1994).

After the further break in underwater activities, the divers-researchers returned to the Tatra lakes in 1989. The divers from the Krakow Academic Underwater Club “Krab” started a series of research fulfilling the request of two scientific centres: the Department of Hydrobiology of the Jagiellonian University and the Department of Water Biology of the Polish Academy in Krakow. They included the area of Morskie Oko and Czarny Staw under the Rysy. The task was carried out by scuba divers

of the Academic Underwater Club „Krab”. The underwater actions were carried out by Piotr Stós. Apart from bottom sampling and taking photographic documentation, they were cleaning up the waters and removing wastes (Stós, A. Pajdak-Stós, 1994; Orlewicz-Musiał M., 1993).

In subsequent years 1990–1993 a series of underwater actions was carried out in Morskie Oko and Czarny Staw for the Institute of Environmental Biology of the Jagiellonian University. The purpose of the action was studying the sessile algae in these lakes (studying “bottom micro-fauna in Morskie Oko and Czarny Staw”). The actions were supervised, as previously, by P. Stós and T. Cieniawa. In total (according to the records in divers’ booklets of the organizers) 49 diving actions were carried out. The diving was undertaken by scuba divers of the Academic Underwater Club „Krab”. These activities are recorded by the Archives of the Tatra National Park in Zakopane, where “Licences to the activities” (“Diving permit issued on 26/03/1990 to the Institute of Environmental Biology of the Jagiellonian University to study sessile algae in Morskie Oko and Czarny Staw” in the period of 26th March to 30th September 1990, also: The interview with Piotr Stós; diving cards; from the archives of the Academic Underwater Club “Krab”).

The year 1993 was rich in underwater events. On 9 October, in the framework of programmes „ALPE” and „ALPE II” the diving was carried out in: Długi Staw and Zielony Staw on Hala Gąsienicowa. Divers Jacek Zachara and Jerzy Nabielec carried out the project: “The assessment of the influence of atmospheric pollution on water ecosystems” (“Acidification of Mountain Lakes: Palaeolimnology and Ecology, Remote Lakes as Indicators of Air Pollution and Climate Change”). During the studies the divers achieved in Długi Staw the depth of 9 m with the visibility of 9 m, and in Zielony Staw, depth 14 m at the visibility of 2 m (Broda, 1996). The results of the studies were presented in a separate paper (Galas, Dumnicka, Kawecka, Kownacki, Jelonek, Stós, Wojtan, 1996; also (the Licence given on 17/09/1993 to the University of London, the University of Prague and the Polish Academy of Sciences in Krakow for the project: “The Assessment of the influence of atmosphere on water ecosystems” carried out in Długi Staw and Zielony Staw from 7th October to 10th October 1993). The permit for scientific research was also given to the Wrocław University (Licence issued on 24th August 1993 to the Wrocław University for “ecological studies on the influence of the pollution of atmosphere and hydrosphere on the state of selected water ecosystems” in the period of 23rd August to 31st December 1993, however, there are no data on the execution of this programme).

To assess the effects of diving on the Tatra National Park it would be necessary to look at the documents containing detailed accounts from the research and analysing these activities from the perspective of the knowledge on the nature in Tatras (see the bibliography included).

To facilitate the analysis of research actions carried out by scuba divers, we present the table 1 showing the set of the most important research programmes in the lakes of the Tatra National Park.

Here it would be appropriate to assess the significance of the actions of scuba divers in the area of the Tatra lakes in hydrobiological studies. This is:

1) sampling sessile algae and macro-invertebrates from the stony shores below one meter,

2) direct assessment of situation in the lake – example: the bottom grown by a thick layer of moss *Warnstorfia exannulata* (Długi Staw Gąsienicowy) made classical sampling impossible,

3) sampling and looking for moving invertebrates hiding among the rocks – only a scuba diver is able to collect them with an ejector, classical methods from the surface do not give desirable effects,

4) only a scuba diver is able to select the most appropriate place to collect specific samples seeing exact relief of the bottom, heaps of stones and rocks, submerged roots and tree branches or “clouds” of plankton (it is not evenly distributed in the water body, but in the form of clusters in many places – observations from the Dwoisty Staw Gąsienicowy).

5) the possibility of making documentation of the research point *in situ* using the underwater photography – this facilitates the analysis of research and drawing conclusions.

Examples shown above prove an important role of divers in underwater studies. Among the researchers (biologists or geologists) the opinions on diving, as one of the methods of sampling are not unanimous. The controversies are connected with the possibility of disturbing the layout of the layers of sediments by scuba divers. The positive side of these activities is reaching the studies materials in the place of its natural occurrence. One should then work out the compromise when the researchers would receive reliable results and the environment of the Tatra lakes would be undamaged. This would give the possibility of carrying out more valuable research.

**Działalność nurkowa na rzecz
badań naukowych
w Tatrzańskim Parku Narodowym
ze szczególnym uwzględnieniem
jezior tatrzańskich**

Działalność badawcza jaką na przestrzeni wielu lat prowadzono na terenie Tatr to piękna karta w dziejach poznawania przyrody a zarazem w dziejach polskiej nauki. Niektóre ze sposobów badań są bardzo interesujące ze względu na wykorzystywane w nich metody i techniki badawcze. W naszym opracowaniu chcieliśmy zwrócić uwagę na fakt jak istotną rolę w hydrologicznym poznawaniu przyrody tatrzańskiej odegrały badania prowadzone na terenie jezior tatrzańskich z udziałem pletwonurków.

Celem badań jest pokazanie w jaki sposób rozwój techniki nurkowej przyczynił się do poznania jedne-

Table 1.

No.	Water Body	Year	Research Organizer/Participants	Research Programme
1	Morskie Oko	1955	The Institute of Submarine Engineering in Gdansk/Speleologic Section of PTTK	Taking the samples of algae from the bottoms of lakes
2	Wielki Staw in the Dolina Pięciu Stawów Polskich, Morskie Oko	1962/63	The Department of Water Biology of the Polish Academy of Sciences/scuba divers of the Warsaw Club	Sessile algae on <i>Potamogeton</i> sp. in Morskie Oko and Wielki Staw
3	Morskie Oko	1971	Institute of Water Biology of the Polish Academy of Sciences	Micro-fauna and micro-flora from the bottoms of lakes
4	Morskie Oko, Czarny Staw under the Rysy	1989	Institute of Environmental Biology of the Jagiellonian University, The Department of Hydrobiology of the Jagiellonian University and the Department of Water Biology of the Polish Academy of Sciences in Krakow	Sampling the bottom and taking photographic documentation
5	Morskie Oko, Czarny Staw under the Rysy	1990–1993	Institute of Environmental Biology of the Jagiellonian University	Studying sessile algae in these lakes
6	Długi Staw and Zielony Staw Gąsienicowy	1993–1995	The Department of Water Biology of the Polish Academy of Sciences in Krakow, Section of Free Diving of the Krakow Division of the Polish Society of the Friends of Earth Sciences	AL:PE II “Acidification of Mountain Lakes: Palaeolimnology and Ecology, Remote Lakes as Indicators of Air Pollution and Climate Change”
7	Dwoisty Wschodni Staw Gąsienicowy and Zachodni Staw Gąsienicowy	1995–1997	The Department of Water Biology of the Polish Academy of Sciences in Krakow, members of Section Diving of the Polish Society of the Friends of Earth Sciences	Research Project of the Polish Committee of Scientific Research no. 6 PO4F 053 08 “The causes of extinction and the attempts of restitution of <i>Branchinecta paludosa</i> O.F.Müller in the Tatra National Park”
8	Długi Staw Gąsienicowy	1996–1999	The Department of Water Biology of the Polish Academy of Sciences in Krakow, members of the Section of Free Diving of Earth Sciences	MOLAR „Mountain Lake Research”

The list of diving actions in the lakes of the Tatra National Park – authors' work.

Sources: Galas J., Dumnicka E., Kawecka B., Kownacki A., Jelonek M., Stós P., Wojtan K. 1996; Kownacki A. 1999; Kawecka B. 1966; Kawecka B. 1970; Kownacki A., Kownacka M., 1965; Kownacki A. 2004; Kownacki A. Kawecka B., Dumnicka E., Galas J. 2002; Kownacki A. Kawecka B., Dumnicka E., Galas J. 2002; Galas J., Dumnicka E., Kawecka B., Kownacki A., Jelonek M., Stós P., Wojtan K. 1996.

go z najtrudniej dostępnych obiektu badań – akwenów wodnych. Opracowanie koncentruje się na przedstawieniu akcji podwodnych, których celem było zebranie materiałów badawczych dotyczących wód stojących, z wyłączeniem akwenów podziemnych (te zostały zaprezentowane przez Autorów na poprzedniej Konferencji). W opracowaniu zostaną przedstawione próby realizacji programów badawczych prowadzonych przez różne instytucje: Tatrzański Park Narodowy, Uniwersytet Jagielloński, Towarzystwo Przyjaciół Nauk o Ziemi, PAN, przy współpracy z pletwonurkami wywodzącymi się z różnych środowisk. W pracy zostanie zaprezentowany przebieg prac podwodnych, stosowane metody i wyniki badawcze będące konsekwencją owych prac. Na zakończenie zostanie podjęta próba oceny, na ile badania z bezpośrednim udziałem człowieka (pletwonurka) stały się bardziej miarodajnym, dokładnym i ważnym elementem prac naukowych środowiska podwodnego od dotychczas stosowanych metod badań z powierzchni.

Literature

- Baryła J., 1981. Zarys dziejów polskiego taternictwa jaskiniowego, „Wierchy” R:49, ss. 182–198.
- Broda K., 1996. Sprawozdanie z działalności Krakowskiej Sekcji Nurkowej Polskiego Towarzystwa Przyjaciół Nauk o Ziemi, Kraków, PTPNoZ.
- Broda K., Orlewicz-Musiał M., 2005. Zarys historii nurkowania w Tatrach (1953–2006), [w:] Przyroda Tatrzańskiego Parku Narodowego a człowiek – Tatry, red. Z. Krzan, Zakopane Materiały III Ogólnopolskiej Konferencji Naukowej, TPN, PTNoZ Oddział w Krakowie.
- Dubrawska A., 1971. Garść mułu, „Sportowiec” 1971, no. 51, s. 9.
- Dumnicka E., Galas J., Stability of the oligochaete taxocens in the alpine ponds in Tatra Mountains (Poland) (Oddane do druku).
- Dumnicka E., Galas J., Stan wiedzy o skąposzczetach wodnych Tatrzańskiego Parku Narodowego (W druku).

- Galas J., Dumnicka E., Kawecka B., Kownacki A., Jelonk M., Stós P., Wojtan K., 1996. Ekosystemy wybranych jezior tatrzańskich – polski udział w międzynarodowym programie ALPE 2. (W:) Kownacki A. (Red.): Przyroda Tatrzańskiego Parku Narodowego a Człowiek, T. II. Biologia, TPN, PTPNoZ, Oddz. Kraków – Zakopane: 96–99 (badania w ramach programu międzynarodowego ALPE 2).
- Galas J., Dumnicka E., Kawecka B., Kownacki A., Jelonk M., Stós P., Wojtan K., 1996.
- Gradziński R., 1953. Z rozwoju speleologii tatrzańskiej, „Wierchy” 1953.
- Karty nurkowań AKP „Krab”, Książeczka Nurka P. Stós Kawecka B., 1966. Glony osiadłe na Potamogeton sp. w Morskim Oku. Acta Hydrobiol. 8: 321–328.
- Kawecka B., 1970. Algae on the artificial substratum in the Wielki Staw in the Valley of the Five Polish Lakes (High Tatra Mountains). Acta Hydrobiol. 12: 423–430
- Kawecka B., Galas J. 2003. Diversity of epilithic diatoms in high mountain lakes under the stress of acidification (Tatra Mts, Poland). Ann.Limnol. – Int. J. Lim. 39: 239–253.
- Kownacki A., 2004. Branchinecta paludosa (O.F. MÜLLER, 1788) Skrzepolówka bagienna s. północna. W: Głowaciński Z, Nowacki J. (red.). Polska czerwona księga zwierząt. Bezkręgowce. Wyd. Inst. Ochr. Przyrody PAN., Kraków, Akad. Rolnicza im. A. Cieszkowskiego, Poznań: 35–36 (projekt KBN no. 6 PO4F 053 08).
- Kownacki A., 2004. Branchinecta paludosa polonica Gajl 1934 w Tatrach – systematyka, zoogeografia, biologia, ekologia, zagrożenia. Štúdie o Tatranskom Národnom Parku, 7 (40): 273–281 (projekt KBN no. 6 PO4F 053 08).
- Kownacki A., Kawecka B., Dumnicka E., Galas J., 2002. Przyczyny wyginięcia i próba restytucji gatunku Branchinecta paludosa (O.F. Muller) w Tatrzańskim Parku Narodowym. (W:) Borowiec W., Kotarba A., Kownacki A., Krzan Z., Mirek Z. (Red.): Przemiany środowiska przyrodniczego Tatr, TPN, PTPNoZ, Krak. Oddz. Kraków – Zakopane, 297–302 (projekt KBN no. 6 PO4F 05308).
- Kownacki A., Galas J., Dumnicka E., Mielewczyk S., 2000. Invertebrate communities in permanent and temporary high mountain lakes (Tatra Mts). Anns Limnol. 36: 181–188 (badania w ramach programów międzynarodowego ALPE 2, MOLAR, EMERGE).
- Kownacki A., Kownacka M., 1965a. The bottom fauna of the lakes Morskie Oko and Wielki Staw in the Polish Tatra Mts. Kom. Zagosp. Ziem Górskich, 11: 33–38.
- Kuczyński M., 1953. Przez podziemne jeziora Jaskini Zimnej, „Turysta”; Metody empiryczne w naukach o kulturze fizycznej, 1996, pod red. H. Grabowskiego, AWF Kraków.
- Orlewicz-Musiał M., 2000. Tematyka nurkowania swobodnego w polskim czasopiśmiennictwie w latach 1950–1995. Studia Humanistyczne AWF (Zeszyty Naukowe no. 80) Kraków.
- Orlewicz-Musiał M., 1993. Tatronurki, czyli płetwonurkowie w Morskim Oku i Czarnym Stawie, „Wierchy”, R: 59.
- Orlewicz-Musiał M., 2004. Nauka i wartości poznawcze stymulatorem rozwoju turystyki kwalifikowanej (na przykładzie turystyki podwodnej) [w:] Turystyka w humanistycznej perspektywie, pod red. Marka Kazmierczaka) AWF Poznań.
- Orlewicz-Musiał M., 2003. Polskie nurkowanie swobodne. Dzieje, organizacje, wartości. Wyd. Sekcja Nurkowania Swobodnego Polskiego Towarzystwa Przyjaciół Nauk o Ziemi. Kraków.
- Przybyszewski W., Płetwonurkowie w jaskiniach tatrzańskich, „Biuletyn Komisji Działalności Podwodnej”, Zarząd Główny PTTK, grudzień 1979 r., s. 39–51.
- Siemińska J., 1956. Nurkowanie w Morskim Oku, „Ziemia”.
- Stós P., Pajdak-Stós A., 1994. Trzydzieści lat minęło. „Krab-spektywy” biuletyn AKP „Krab”.
- Wiśniewski W., Zmiany na liście największych jaskiń Polski, „Góry”, 1993, no. 6, s. 39.
- Wojtusiak R.J., 1973. A Review of Under-sea Biological Studies by Polish Divers, 1936–1973 (w:) Science Diving, international edited by N.C. Flemming, London, British Sub Aqua Club, s. 122.