Roczniki Akademii Rolniczej w Poznaniu CCCXCII

Botanika – Steciana

17, 2013, 71-75

www.up.poznan.pl/steciana

ISSN 1896-1908

CHAROPHYTES (CHARACEAE, CHAROPHYTA) OF PEATLAND HABITATS IN THE VICINITY OF DRAWSKO AND MIAŁY (NOTEĆ FOREST, NW POLAND)

Paulina Mróz, Maciej Gąbka

P. Mróz, Didactic and Scientific Branch in Piła, Adam Mickiewicz University, Kołobrzeska 15, 64-920 Piła, Poland, e-mail: pmroz@amu.edu.pl
M. Gąbka, Department of Hydrobiology, Institute of Environmental Biology, Faculty of Biology, Adam Mickiewicz University, Umultowska 89, 61-614 Poznań, Poland, e-mail: gmaciej@amu.edu.pl

(Received: April 2, 2013. Accepted: May 7, 2013)

ABSTRACT. This paper presents recent localities of charophytes in the peatland complex of the northern part of Noteć Forest (Wielkopolska, Poland). In alkaline or calcareous fens and shallow waters, seven species of charophytes were found: *Chara globularis*, *C. intermedia*, *C. virgata*, *C. vulgaris*, *Nitella capillaris*, *N. mucronata* and *N. syncarpa*. Some of the charophytes, which were observed in this area, are regarded as endangered and vulnerable in Poland, especially, *C. intermedia*, *N. capillaris* and *N. syncarpa*. The preliminary research results on the studied charophyte distribution and ecology are presented.

KEY WORDS: Characeae, Chara, Nitella, peatland habitat, distribution, threatened and rare charophytes, Noteć Forest, Poland

INTRODUCTION

Charophytes (Characeae, Charophyta) are macroscopic algae that grow mainly in standing and fresh waters, less frequently in flowing and saline waters (e.g. Dąmbska 1964, 1966, Hutorowicz and Dziedzic 1998, Wołowski 2003, Urbaniak 2006). In Poland, the majority of studies of these macrophytes were conducted in lakes (e.g. Dąmbska 1966, Karczmarz 1975). Only infrequently, charophytes are observed in rivers and in coastal bays of the Baltic Sea (e.g. Kornaś et al. 1960, Dąmbska 1966). However, they also occur in various small water bodies, often of anthropogenic origin, which are usually omitted during hydrobotanical investigations (e.g. Dąmbska 1966, Gąbka 2006). Besides lakes of different type, charophytes are found in large numbers in fish ponds and such small water bodies as peat, clay and gravel pits, drainage ditches, overflow areas and astatic reservoirs (e.g. Podbielkowski 1960, Dąmbska 1964, Gąbka 2006, 2009, Pukacz et al. 2009, Urbaniak et al. 2011). Only few observations of these algae were reported from peatlands, particularly, alkaline and calcareous fens, and peatland depressions dominated by peat mosses (poor fens) (Gąbka 2007, Gąbka et al. 2009, Lamentowicz et al. 2011, Urbaniak et al. 2011). Habitat conditions of charophytes within peatlands are very diverse in terms of their trophic conditions, calcium content, water pH and, above all, they depend on water level fluctuation.

The most frequently noted charophyte species occurring in the studied peatlands was *Chara vulgaris*. This stonewort was reported from many peatlands of different trophic characteristics, e.g. from the Wielkopolska (e.g. Gąbka 2009, Lamentowicz et al. 2011) and Lublin regions (Karczmarz and Malicki 1971, Buczek 2005, Urbaniak et al. 2011), as well as the southern part of the country (Krajewski 2011, Czerwik-Marcinkowska and Vončina 2012).

In Wielkopolska, where 25 out of 35 Polish representatives of Characeae are found, three species occur exclusively in peatlands: *Chara tenuispina*, *C. crassicalis* and *Nitella tenuissima* (Gąbka 2009). However, it should be noted, that also 11 lake species, *C. aspera*, *C. contraria*, *C. globularis*, *C. hispida*, *C. intermedia*, *C. polyacantha*, *C. virgata*, *C. vulgaris*, *Nitella capillaris*, *N. mucronata* and *N. syncarpa*, were recorded in peatland depressions and in humotrophic water bodies (Gąbka 2009).

The aim of this work was to present the distribution of charophytes connected with peatlands of the northern part of Noteć Forest, situated in the vicinity of Miały and Drawsko (N Wielkopolska). Also, the basic ecological data on charopyte occurrence were gathered. Such analysis can be useful in the preparation of proposals on peat bog transformation degree, particularly, related to the changes in hydrological regime, proper protection activities and protected area management.

MATERIAL AND METHODS

Study area

The study was conducted in one of largest alkaline fen and poor fen complexes in Wielkopolska (500 ha in area), connected with the Miała river valley, in the vicinity of Miały and Drawsko (Fig. 1). This area is

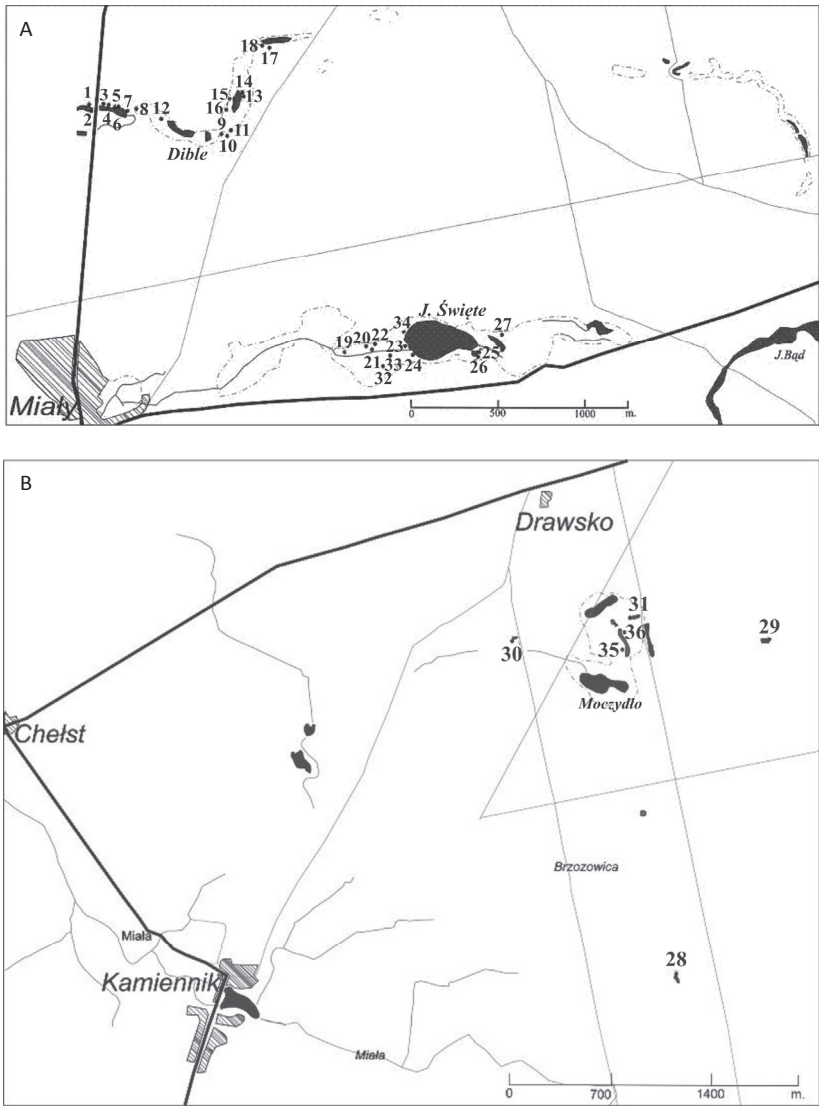

Fig. 1. Distribution of charophytes from the vacinity of Miały (A) and Drawsko (B). Numbering as in Appendix 1

situated within Drawsko and Wieleń communes in the Czarnków-Trzcianka district (Wielkopolska region). Its characterised by sandy forms that make the largest inland dune complex in Poland. The dunes are mostly occupied by a monotypic pine forest, roughly of the same age, called the Noteć Forest. The Miała river flows through the northern part of dune fields. This is the only watercourse of the Noteć Forest dune complex (Kondracki 2000), which makes a hydrological axis of the studied area. 11 lakes, called Lakes Mialskie, are situated on the river. These are artificial water bodies which originated as a result of barrages construction. The Miała Valley is rich in peat, with many poor fens and peatlands and numerous peat post-excavation pits and pits with stagnant water. Also, the abundance of small, anthropogenic, mid-forest water reservoirs (water drawing points) occur in the studied area. The majority of the studied peatlands are situated within the Natura 2000 site – "Miała Valley" PLH300042. Three types of peatland habitats (poor, alkaline and calcareous fens) were identified in this area, as well as charophyte lakes (Gąbka et al. 2009, Natura 2000 SFD 2001-2009).

Data sources

The field studies were conducted from July to September 2011. Particularly, they involved marshy areas around Lake Święte, quaking bog surrounding Lake Moczydło and small water bodies: fire reservoirs, peat pits as well as swampy and peatland areas in the Miała Valley and in Drawsko surroundings. The charophyte distribution was studied in six main localities connected with peatlands (Fig. 1). In total, 36 microhabitats of 1 m^2 each, were analysed.

The analysis included the following types of peatland microhabitats: (1) depressions ("hollows"), (2) drainage ditches (3) fire reservoirs, (4) peat pits and (5) small, shallow humotrophic lakes.

This work takes into consideration also previous results, obtained in 2003-2009 (Gąbka, unpubl.). The charophyte nomenclature follows the Algaebase web site: http://www.algaebase.org (Guiry and Guiry 2013). Materials that document the studied localities are kept in the charophyte herbarium of Department of Hydrology of Adam Mickiewicz University in Poznań.

Habitat analyses

In each microhabitat with the charophyte presence, the basic habitat parameters were measured directly in the field with a portable multiparameter meter (YSI6600 multiparameter sonde; YSI Corporation, Yellow Springs, OH, USA). The measured physical and chemical parameters of surface waters included: temperature, conductivity, pH and soluble oxygen content. The water depth in the studied localities was measured with a centimetre measure tape. The zero level was determined by the bryophyte tops layer (in peatland "hollows") or water table level (in other water bodies). Samples of water for watercolour analysis (WC) and calcium content (Ca) were collected from each microhabitats. The standard spectrophotometric method for watercolour measurement was used, at the wavelength of 440 nm, after the previous sample filtration through 0.45 µm membrane filter. The calcium level was measured using atomic-absorption spectrophotometry (APHA 1998).

List of localities

The distribution of localities and microhabitats in the Miała Valley and Drawsko surroundings is shown in Figure 1. The data on charophyte distribution in 36 microhabitats are presented. The list of charophyte species is included in Appendix 1.

RESULTS

Based on the conducted study, seven species of charophytes were found: four species from the genus Chara and three from the genus Nitella (Table 1, Appendix 1). These charophytes occurred in 36 localities connected with peatlands. The most frequently observed species in the studied area included: *Chara virgata*, *Nitella syncarpa* and *Chara globularis* (16, 10 and 9 habitats, respectively). *Chara intermedia* was less abundant (5 microhabitats), while *Chara vulgaris*, *Nitella mucronata* and *N. capillaris* had only single localities in the Miała Valley.

Table 1. List of charophytes and their localities in different types of peatland microhabitats: 1 – depressions ("hollows"), 2 – drainage ditches, 3 – fire reservoirs, 4 – peat pits, 5 – small, shallow humotrophic lakes

Species	1	2	3	4	5
Charaglobularis Thuill. 1799	+	+	+	–	+
Chara intermedia A. Braun 1859	–	–	+	+	+
Chara virgata Kütz. 1834	+	+	+	+	+
Chara vulgaris L. 1753	–	–	–	+	–
Nitella capillaris (Krock.) J. Groves & Bull.-Webst. 1920	+	–	–	–	–
Nitella mucronata (A. Braun) Miq. 1840	–	–	–	+	–
Nitella syncarpa (Thuill.) Kütz. 1845	+	–	–	+	+
Total	4	2	3	5	4

The occurrence of numerous populations of *Nitella syncarpa*, a threatened and rare species on the country scale, strictly protected by law, is worth emphasizing (Rozporządzenie... 2012). This species is known only from few localities in Poland (e.g. Gąbka and Owsianny 2005, Urbaniak 2006, Pełechaty et al. 2007, Gąbka 2009, Krajewski 2011, Urbaniak et al. 2011). Also, *Chara intermedia* and *Nitella mucronata* populations were identified. Both species are recognised as endangered in Poland (category E, Siemińska et al. 2006). The other taxa recorded during the study: *Chara virgata*, *C. globularis* and *C. vulgaris*, belong to the group of vulnerable charophytes in Poland (category V, Siemińska et al. 2006) and are not protected by law.

The studied localities in the Miała Valley and Drawsko surroundings were divided into five habitat types: poor fen depressions ("hollows"), ditches, peat pits (former peat excavation sites), natural shallow lakes and mid-forest fire reservoirs. The highest number of localities, i.e. 14 out of 36, were found in peatland depressions and, the same number, in shallow humotrophic lakes (Table 1).

DISCUSSION

The highest diversity of charophyte species in the studied area was connected with peat pits. These group included *Chara virgata*, *C. intermedia*, *C. vulgaris*, *Nitella mucronata* and *N. syncarpa*. In turn, the lowest number of charophyte species was found in drainage ditches – only *Chara virgata* and *C. globularis* were identified in this habitat (Table 1).

The charophyte research plots represented a wide spectrum of conditions, from poor to rich, on a scale of microhabitat characteristics for different types of alkaline peatlands (compare Hájek et al. 2006). The charophyte habitat parameters within peatlands were very diverse in terms of calcium content, electrolytic conductivity, water pH (Table 2) and, above all, water level fluctuation (periodic drying of peatland depressions). The growth of some species, i.e. *C. intermedia* and *N. syncarpa*, in very low calcium conditions (even below 3 mg Ca l^{-1}) and near neutral water (pH 6.5) is worthy of attention. It should be also mentioned that in the studied area, the aforementioned species occurred also at the highest calcium concentrations of analysed microhabitat scale (above 150 mg Ca l^{-1}).

Furthermore, an important ecological factor for the charophyte occurrence was a high concentration of humic substances in water that restricted light accessibility (Table 2). The obtained results indicate the possibility of charophyte growth in waters highly coloured with humic substances, even in polyhumic conditions (> 50 mg Pt l^{-1}). Particularly, in the most strongly coloured waters, such species as *Nitella syncarpa* and *Chara intermedia* were observed.

The obtained floristic and ecological data deepen our knowledge of charophyte growth abilities in the peatland habitat conditions (compare Beltman et al. 1996, Hájková and Hájek 2004, Gąbka 2009, Lamentowicz at al. 2011, Urbaniak et al. 2011). They also indicate the possibility of charophyte communities occurrence

Table 2. Minimum, maximum and median values of physicochemical properties of water from 36 microhabitats of charophytes species. Explanations: Depth – depth of water, EC – electrolytic conductivity, DO – dissolved oxygen, WC – colour of water, Ca – calcium content

Species	Depth (m)	pH	EC (µS cm^{-1})	DO (mg l^{-1})	WC (mg Pt l^{-1})	Ca (mg l^{-1})
Chara globularis	0.09-1.37 (0.61)	6.46-7.57 (7.07)	95-512 (276.38)	5.23-6.77 (5.87)	26-328 (99.25)	2.6-105 (56.61)
Chara intermedia	0.10-0.80 (0.34)	6.85-7.46 (7.21)	58-587.50 (301.68)	6.02-11.59 (9.18)	20-155 (61.80)	3.78-154 (45.50)
Chara virgata	0.1-1.15 (0.6)	6.62-7.79 (7.04)	54-636 (229.25)	4.30-11.78 (7.07)	24-255 (111.44)	17.50-154 (67.85)
Chara vulgaris	0.1	7.21	587.5	10.50	36	15.37
Nitella capillaris	0.15	6.82	289	5.23	70	59.8
Nitella mucronata	1.15	7.18	258	4.50	160	47
Nitella syncarpa	0.25-0.77 (0.48)	6.13-7.63 (6.77)	55-512 (190.80)	4.17-6.04 (5.17)	42-192 (109.40)	2.6-137 (46.21)

in the peatland succession, from mesotrophic conditions of open waters to rich alkaline peatlands (e.g. Beltman et al. 1996, Hájková and Hájek 2004).

Recently, the algae from the family Characeae have aroused special interest due to the protection of Natura 2000 habitats and functional significance of these algae in trophic condition regulation, particularly in shallow lakes. Only few works indicate the charophyte importance in restoration of rich fens and peat post-excavations pits, especially, in relation to their positive influence on the quality of usable water and role in decalcification (e.g. Beltman and Allegrini 1996, Beltman et al. 1996, Lamers et al. 2002). It should be emphasized that the studied peatland complex is a very important biodiversity centre of charophytes in the Noteć Forest. Thus, the charophyte occurrence should be considered in the management of Natura 2000 site "Miała Valley" PLH300042, in the peatland active protection and, particularly, renaturalisation of artificial water bodies, like, e.g., peat pits and fire reservoirs.

Acknowledgments

The presented results were obtained during investigations realized as part of the Polish Ministry of Science and Higher Education project No. N304 050 31/1853 and statutory research of the Department of Hydrobiology of Adam Mickiewicz University in Poznań. The studies of protected charophyte species were conducted with the consent of Regional Directorate for Environmental Protection in Poznań. We wish also to thank the Forest Inspectorate Potrzebowice for giving approval for accessing and conducting research in the forest area and peatlands.

REFERENCES

APHA (1998). Standard methods for the examination of water and wastewater. 20th edition. American Public Health Association, Washington, D.C.

Beltman B., Allegrini C. (1996): Restoration of lost aquatic plant communities: New habitats for Chara. Aquat. Ecol. 30, 4: 331-337.

Beltman B., Van Den Broek T., Van Maanen K., Vaneveld K. (1996): Measures to develop a rich-fen wetland landscape with a full range of successional stages. Ecol. Eng. 7, 4: 299-313.

Buczek A. (2005): Siedliskowe uwarunkowania, ekologia, zasoby i ochrona kłoci wiechowatej *Cladium mariscus* (L.) Pohl. w makroregionie lubelskim. Acta Agrophys. Rozpr. Monogr. 9, 129.

Czerwik-Marcinkowska J., Vončina G. (2012): Algoflora and vascular flora in the eutrophic fens of the Pieniny National Park (South Poland). Rocz. AR Pozn. 391, Bot. Stec. 16: 55-66.

Dąmbska I. (1964): Charophyta – ramienice. Flora słodkowodna Polski. 13. PWN, Warszawa.

Dąmbska I. (1966): Zbiorowiska ramienic Polski. Pr. Kom. Biol. PTPN 31, 3: 1-76.

Gąbka M. (2006): Występowanie ramienic (Characeae, Charophyta) w drobnych zbiornikach wodnych Wielkopolski. Ekol. Techn. 14, 3: 114-117.

Gąbka M. (2007): Distribution of *Chara tenuispina* A. Braun 1835 (Characeae) in Poland. Oceanol. Hydrobiol. Stud. 36 (Supl. 1): 241-248.

Gąbka M. (2009): Charophytes of the Wielkopolska region (NW Poland): distribution, taxonomy and autecology. Bogucki Wydawnictwo Naukowe, Poznań.

Gąbka M., Owsianny P.M. (2005): The occurrence and habitat requirements of *Nitella syncarpa* (Thuillier) Kützing and *Nitelletum syncarpae* (Corillion 1957) Dąmbska 1996 in the Wielkopolska region. Rocz. AR Pozn. 372, Bot. Stec. 9: 59-68.

Gąbka M., Owsianny P.M., Rusińska A. (2009): SOO „Dolina Miały". PLH300042. Natura 2000. Standardowy Formularz Danych. Materiały Wojewódzkiego Zespołu Specjalizacyjnego w Poznaniu. Instytut Ochrony Przyrody PAN, Kraków. Narodowa Fundacja Ochrony Środowiska, Centrum UNEP/GRID, Warszawa. PAN, Kraków. Narodowa Fundacja

Ochrony Środowiska, Centrum UNEP/GRID, Warszawa. http://natura2000.gdos.gov.pl/natura2000/dane/pdf/pl/PLH300042.pdf.

Gąbka M., Pełechaty M., Krupska J., Burchardt L. (2009): Ramienice (Characeae, Charophyta) Wielkopolskiego Parku Narodowego – różnorodność, stan poznania, zagrożenia i ochrony. Pr. Wielkopolskiego Parku Narodowego. Morena 14: 263-274.

Guiry M.D., Guiry G.M. (2013): AlgaeBase. World-wide electronic publication. National University of Ireland, Galway [online], http://www.algaebase.org searched on 11-15.12.2012.

Hájek M., Horsák M., Hájková P., Dítě D. (2006): Habitat diversity of central European fens in relation to environmental gradients and an effort to standardise fen terminology in ecological studies. Perspect. Plant Ecol. Evol. Syst. 8, 2: 97-114.

Hájková P., Hájek M. (2004): Sphagnum-mediated successional pattern in the mixed mire in the Muránska planina Mts (Western Carpathians, Slovakia). Biologia – Sect. Botany 59, 1: 65-74.

Hutorowicz A., Dziedzic J. (1998): Historyczne i współczesne stanowiska ramienic w jeziorach Pojezierza Olsztyńskiego. Fragm. Florist. Geobot. Ser. Polonica 5: 279-291.

Karczmarz K. (1975): Sukcesja zespołów i występowanie ramienic na Pojezierzu Łęczyńsko-Włodawskim. Ann. Univ. Mariae Curie-Sklodowska, Sect. C 30: 113-118.

Karczmarz K., Malicki J. (1971): Zespoły i ekologia ramienic Pojezierza Łęczyńsko-Włodawskiego. Ann. Univ. Mariae Curie-Sklodowska, Sect. C 26, 23: 297--327.

Kondracki J. (2000): Geografia regionalna Polski. Wyd. Nauk. PWN, Warszawa.

Kornaś J., Pancer E., Brzyski B. (1960): Studia nad roślinnością denną Zatoki Gdańskiej w okolicy Rewy. Fragm. Florist. Geobot. 6, 1: 3-92.

Krajewski Ł. (2011): Przyroda piaskowni Kuźnica Warężyńska w Dąbrowie Górniczej. Cz. 5. Ramienice i ich zbiorowiska. Przyr. Gór. Śl. 65: 5-7.

Lamentowicz Ł., Gąbka M., Rusińska A., Sobczyński T., Owsianny P.M., Lamentowicz M. (2011): Testate amoeba (Arcellinida, Euglyphida) ecology along a poor-rich gradient in fens of Western Poland. Int. Rev. Hydrobiol. 96, 4: 356-380.

Lamers L.P.M., Smolders A.J.P., Roelofs J.G.M. (2002): The restoration of fens in the Netherlands. Hydrobiologia 478, 166: 107-130.

Pełechaty M., Pełechata A., Pukacz A. (2007): Flora i roślinność ramienicowa na tle stanu trofii jezior Pojezierza Lubuskiego (środkowo-zachodnia Polska). Bogucki Wydawnictwo Naukowe, Poznań.

Podbielkowski Z. (1960): Zarastanie dołów potorfowych. Monogr. Bot. 10, 1: 3-144.

Pukacz A., Pełechaty M., Raabe U. (2009): The first locality of *Chara baueri* (Characeae) in Poland. Fragm. Florist. Geobot. Ser. Polonica 16, 2: 425-429.

Rozporządzenie Ministra Środowiska z dnia 5 stycznia 2012 r. w sprawie ochrony gatunkowej roślin. Dz.U. 2012 nr 0, poz. 81.

Siemińska J., Bąk M., Dziedzic J., Gąbka M., Grygorowicz P., Mrozińska T., Pełechaty M., Owsianny P.M., Pliński M., Witkowski A. (2006): Red list of the algae in Poland. In: Red list of plants and fungi in Poland. Eds Z. Mirek, K. Zarzycki, W. Wojewoda, Z. Szeląg. W. Szafer Institute of Botany, Polish Academy of Sciences, Kraków: 37–52.

Urbaniak J. (2006): Stanowisko *Nitella syncarpa* (Thuill.) Chevall. 1827 (Charophyta) w masywie Gromnika. Przyr. Sudet. 9: 3-6.

Urbaniak J., Sugier P., Gąbka M. (2011): Charophytes of the Lubelszczyzna region (Eastern Poland). Acta Soc. Bot. Pol. 80, 2: 35-42.

Wołowski K. (2003): Różnorodność gatunkowa – glony. In: Różnorodność biologiczna Polski. Eds R. Andrzejewski, A. Weigle. Narodowy Fundusz Ochrony Środowiska, Warszawa: 37-48.

Appendix 1. List of charophyte species recorded in the peatland habitats of Miały and Drawsko surroundings. Localities as in Figure 1.

Chara globularis – **1.** Reservoir No. 13, depth 1.37 m; **2.** Peatland ditch No. 15, depth 0.56 m; **3.** Peatland depression No. 17, depth 1 m; **4.** Peatland depression No. 23, depth 0.09 m; **5.** Reservoir No. 26, depth 0.4 m; **6.** Peatland depression No. 27, depth 0.35 m; **7.** Reservoir No. 29, water drawing point No. 61, depth 1.23 m; **8.** Peatland depression No. 32, depth 0.35 m; **9.** Peatland depression No. 33, depth 0.15 m.

Chara intermedia – **1.** Reservoir No. 25, depth 0.8 m; **2.** Reservoir No. 31, water drawing point No. 52, depth 0.16 m; **3.** Reservoir No. 34, depth 0.15 m; **4.** Peat pit No. 35, depth 0.1 m; **5.** Peat pit No. 36, depth 0.5 m.

Chara virgata – **1.** Reservoir No. 1, depth 0.6 m; **2.** Reservoir No. 2, depth 1.15 m; **3.** Reservoir No. 3, depth 0.74 m; **4.** Reservoir No. 4, depth 0.8 m; **5.** Reservoir No. 6, depth 0.75 m; **6.** Reservoir No. 8, depth 0.76 m; **7.** Peat pit No. 10, depth 0.68 m; **8.** Peat pit No. 11, depth 0,25 m; **9.** Peatland depression No. 12, depth 0.19 m; **10.** Reservoir No. 14, depth 0.67 m; **11.** Peatland ditch No. 16, depth 0.1 m; **12.** Peatland depression No. 18, depth 0.77 m; **13.** Peatland depression No. 21, depth 0.12 m; **14.** Reservoir No. 28, water drawing point No. 5, depth 0.44 m; **15.** Reservoir No. 30, water drawing point No. 16, depth 0.35 m. **16.** Reservoir No. 31, water drawing point No. 52, depth 0.52 m.

Chara vulgaris – **1.** Peat pit No. 35, depth 0.1 m.

Nitella capillaris – **1.** Peatland depression No. 36, depth 0.15 m.

Nitella mucronata – **1.** Peat pit No. 9, depth 1.15 m.

Nitella syncarpa – **1.** Reservoir No. 5, depth 0.45 m; **2.** Reservoir No. 7, depth 0.5 m; **3.** Reservoir No. 8, depth 0.76 m; **4.** Peat pit No. 11, depth 0.25 m; **5.** Peatland depression No. 18, depth 0.77 m; **6.** Peatland depression No. 19, depth 0.6 m; **7.** Peatland depression No. 20, depth 0.5 m; **8.** Peatland depression No. 22, depth 0.33 m; **9.** Peatland depression No. 24, depth 0.31 m; **10.** Peatland depression No. 32, depth 0.35 m.

For citation: Mróz P., Gąbka M. (2013): Charophytes (Characeae, Charophyta) of peatland habitats in the vicinity of Drawsko and Miały (Noteć Forest, NW Poland). Rocz. AR Pozn. 392, Bot. Stec. 17: 71-75.