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**THE OCCURRENCE AND HABITAT REQUIREMENTS  
OF *NITELLA SYNCARPA* (THUILLIER) CHEVALLIER  
AND *NITELLETUM SYNCARPAE* (CORILLION 1957)  
DĄBBSKA 1996 IN THE WIELKOPOLSKA REGION**

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**ABSTRACT.** This paper presents new and historical localities of *Nitella syncarpa* in the Wielkopolska region. This is a rare charophyte species whose distribution in the light of the published data and herbarium material was restricted to a few localities in the region. The description of geographical extent of the species, information on the ecology and characteristics of phytocoenotic interrelation of the new locality are also provided.

**Key words:** *Nitella syncarpa*, *Nitelletum syncarpae*, *Characeae*, macrophytes, habitats, locality, shallow lakes

### Introduction

*Nitella syncarpa* (Thuillier) Chevallier, a member of the family of *Characeae*, is rarely noticed in Poland: so far, only 20 sites of this species have been found (e.g. **Karczmarz** 1963, 1975, **Dąbbska** 1964 a, 1966, **Dąbrowska** and **Goszczyński** 1998). It is strictly protected and it was included into the “Red list of threatened algae in Poland” (**Siemińska** 1992). The scattered occurrence of this sub-Atlantic macroalga (**Corillion** 1957) was documented in a few sites in the Pomerania and Wielkopolska regions, in the Masurian Lake District, Podkarpacie, Silesia and, to a greater extent, in the Lublin Upland (**Karczmarz** 1963, **Dąbbska** 1964 a). *N. syncarpa* was documented as well with herbarium material gathered by prof. Dąbbska (charophyte herbarium of Department of Hydrobiology Adam Mickiewicz University, Poznań) and coming from eight sites (**Dąbbska** 1955, 1960, 1962, 1963, 1964 b, 1967).

This study aims at bringing up-to-date the information concerning the occurrence of *N. syncarpa*, its habitat requirements and the phytocenotic characteristics of charophyta

meadows dominated by it which can be found in the Wielkopolska region. It was based on field studies carried out in the seasons of 2003-2004, and on herbarium material and available literature. The site of the research – the Wielkopolska region – is understood as a historical-cultural region (**Topolski** 1999), including the present administrative unit (i.e. the Wielkopolska voivodship). However, the study also includes the sites from the southern part of the Gwda Valley and from the south-western part of the Krajeńskie Lake District (**Kondracki** 1998).

The nomenclature of vascular plants was used according to **Mirek et al.** (1995), that of charophytes was based on **Dąmbska** (1964), and of bryophytes on **Ochyra et al.** (1992). Phytosociological nomenclature followed Brzeg and Wojterska's syntaxonomical system (**Brzeg and Wojterska** 2001).

### Characteristics of sites in the Wielkopolska region

*Nitella syncarpa* is one of the rarest representatives of the *Characeae* family in the Wielkopolska. So far, only one site has been noticed and documented with herbarium material by prof. I. Dąmbska; it was detected in Borzkowo near Pyzdry (leg. Karpiński, September 1937), but, unfortunately, the detailed characteristic of its site is missing. In the neighbouring region of Ziemia Lubuska, however, two sites of this species were noticed: one in the shallow lake Niesulice (county Świebodzin), and the other in a hollow peat near lake Lubikowskie (**Dąmbska** 1962).

In the study period (the years 2002-2004), six new sites of *N. syncarpa* were found (Fig. 1):

1) a mid-forest water basin located to the south-west of lake Lubosina, ca. 1 km south-west of the village of Lubosz (village district of Kwilcz, county of Międzybóże). This ephemeral shallow basin (max. 0.3 m deep) was most probably formed by beavers damming the stream flowing to the lake. The population of *N. syncarpa* formed small patches on the organic substratum in the vicinity of a wide belt of swamp vegetation. It grew together with *Typha angustifolia* as well.

2) lake Kleszczynek, located 2 km to the north-east of the village Zelgniewo (village district of Kaczory, county of Piła). The lake is shallow, developed in the process of succession, surrounded with wide belts of swamps and transitional bogs (**Owsianny and Gąbka** 2004). The population of *N. syncarpa* was found in the southern sandy coastal part of the basin, relatively shallow (up to 0.5 m deep); it formed small patches in a mosaic of communities *Litorello-Elecharitetum acicularis*, *Myriophylletum spicati* and *Lemno-Utricularietum vulgaris*.

3) lake Święte located ca. 2.5 km to the east of the village Miały (village district of Wieleń, county of Czarnków-Trzcianka) in the Notecka Primeval Forest. The community of *Nitelletum syncarpae* was connected with shallow water-filled hollows (max. depth 0.5 m), most probably created by gradually overgrowing workings from the nearby transitional bog adjacent to the eastern part of lake Święte. The population developed on the boggy substratum in the mosaic with *Thelypterido-Phragmitetum* and peat-bog communities.

4) lake Małe Bagna – a mid-forest basin located 4.5 km to the north of the village Skórki (village district of Krajenka, county of Złotów). *N. syncarpa* grew over the most of the bottom, mainly as a part of the phytocenoses of *Nupharo-Nymphaetum albae*

dominated by *Nymphae alba* and *Fontinalis antipyretica*. Close to the eastern and south-western shore it formed its own phytocenosis *Nitelletum syncarpa*. Its patches occupied coastal parts max. 0.7 m deep (the average depth was 0.45 m). They grew on organic, highly hydrated substratum. Among the patches of this association other charophytes were noticed, too, mainly *Chara fragilis* and *C. aculeolata*, less frequently *C. vulgaris*.

5) lake Duże Bagna, a mid-forest basin located 60 m to the north-west of lake Małe Bagna (ca. 4.5 km to the north of the village of Skórki, village district of Krajenka, county of Złotów). It is a very shallow basin whose central parts are occupied by rush phytocenoses, mainly *Typhetum latifoliae* and *Thelypterido-Phragmitetum*. This basin has a characteristic form of a trench with an open water table ca. 5 m wide, surrounding

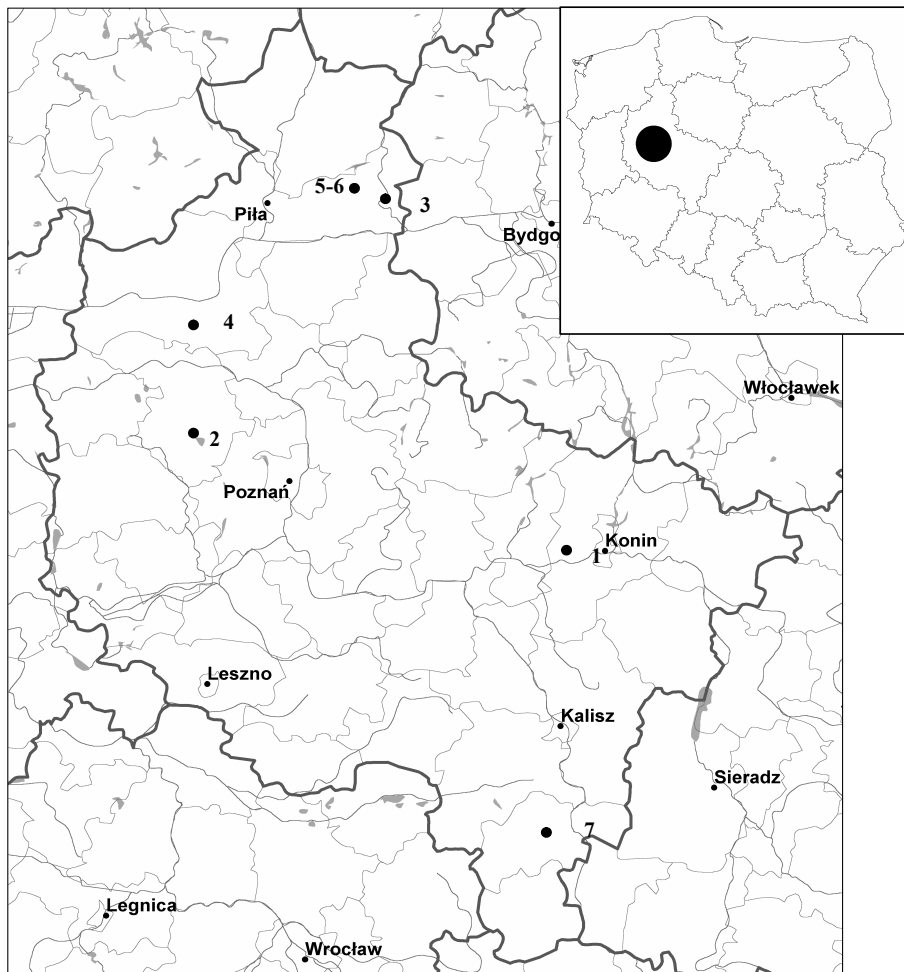


Fig. 1. Distribution of localities of *Nitella syncarpa* (Thuillier) Chevallier in the Wielkopolska region: 1 – on the basis of herbarium materials by Dąmbska, 2-7 – new localities

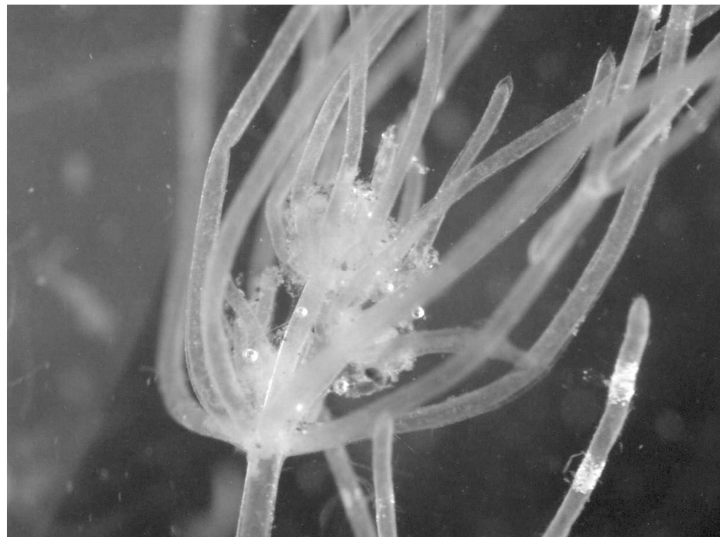
Ryc. 1. Występowanie *Nitella syncarpa* (Thuillier) Chevallier w Wielkopolsce: 1 – na podstawie materiałów zielnikowych Dąmbskiej, 2-7 – nowe stanowiska

the rush vegetation and only in the western part widening to ca. 50 m. *N. syncarpa* grew along its whole length forming phytocenoses with a high species density. It was found, too, in the surrounding trench and in the mosaic of the patches of *Potametum natantis* and the *Nupharo-Nymphaetum albae* dominated by *Nymphaea alba*.

6) a small fish pond (ca. 200 m<sup>2</sup>) adjacent to the northern part of pond Staw Bardo, located ca. 0.5 km to the east of the village of Bronisławka (village district of Sośnie, county of Ostrów Wlkp.). *Nitella syncarpa* occurs in the most shallow (max. 0.2 m deep) sandy parts on the outskirts of this newly created basin. The population of this species was found in the vicinity of the phytocenoses of *Litorello-Eleocharitetum acicularis* and the patches with *Alisma lanceolata*.

*Nitella syncarpa* is one of the species whose oogonia and anteridia are surrounded by an amorphous gelatinous envelopment (**Dąbbska** 1964 a). The dioecious species is characteristic of its usually small size and unforking branchlets of female plants equipped with oogonia. Black oospore does not have protruding ridges. It is assumed that *Nitella syncarpa* reaches its optimum development at the end of summer and in autumn (**Dąbbska** 1964 a, **Krause** 1997).

Shallow-water forms of the species were mainly represented in the newly analysed sites. The most frequent was the form *capituligera* A. Br., pointed out by **Migula** (1897), with characteristic numerous dense clusters of oogonia or anteridia. The male plants of this species usually have considerably shortened branchlets up to 50 mm long, in contrast to the female plants whose branchlets vary from 200 to 400 mm. Selected morphological features of the analysed species are presented in the Photographs 1-4. Both male and female plants were observed in most of the newly found sites. Male individuals dominated in lake Małe Bagna, while the basin near lake Lubosina was almost entirely grown with female ones, with the male plants only sporadically met.



Phot. 1-4. *Nitella syncarpa* collected from lake Małe Bagna (photo by M. Gąbka)

Phot. 1. Part of specimen showing two whorls and fruiting organs

Fot. 1-4. *Nitella syncarpa* zebrana z jeziora Małe Bagna (fot. M. Gąbka)

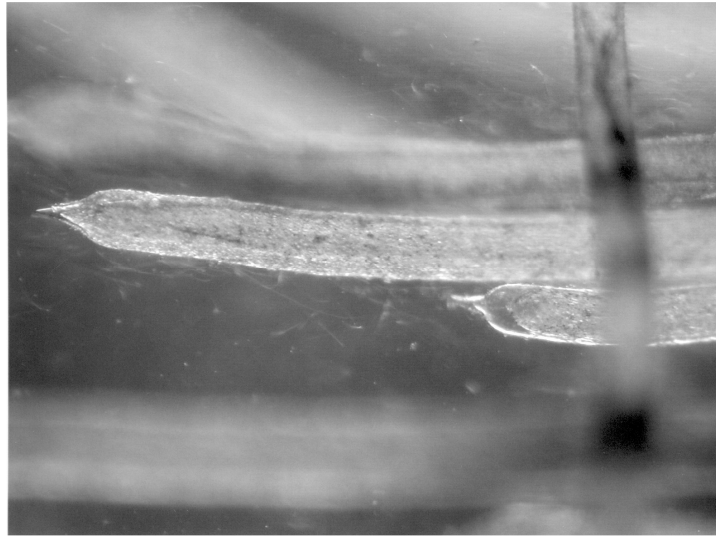
Fot. 1. Pokrój rośliny z widocznymi dwoma węzłami i organami rozmnażania



Phot. 2. Branchlet-nodes with group of oogonia and oospores surrounded by an amorphous gelatinous envelopment  
Fot. 2. Nibyliście z grupą lęgni i oospor pokrytych galaretowatą otoczką



Phot. 3. Branchlet-nodes with group of antheridium surrounded by an amorphous gelatinous envelopment  
Fot. 3. Nibyliście z grupą plemni pokrytą galaretowatą otoczką



Phot. 4. Apex of branchlets  
Fot. 4. Zakończenie nibyliści

### Phytocenotic information

*Nitella syncarpa* is considered to be a characteristic species of the association *Nitelletum syncarpae* (Corillion 1957) Dąbska 1966 of the alliance *Nitellion syncarpotenuissime* W. Krause 1969. In the Wielkopolska, this association has the status of a natural auksohoric syntaxon, in danger of extinction and with a scarce phytosociological documentation (Brzeg and Wojterska 2001). It was documented by Dąbska for the Niesulickie Lake in the Lubuskie region (Dąbska 1966). As Brzeg and Wojterska (2001) point out, this syntaxon has the western regional centre of occurrence and the northern geographical extent.

In five of the analysed basins patches classified as *Nitelletum syncarpae* were detected. The greatest concentration of this species was found in lake Małe Bagna and in the basin near lake Lubosina. The species composition of phytocenoses is presented in Table 1. Phytocenoses dominated by *N. syncarpa* formed mosaic structures with other water and rush communities. Among the analysed phytosociological records, out of the species of *Charetea fragilis*, it is only *C. fragilis* that exhibits greater constancy. This observation refers as well to the scarce phytosociological documentation of this species all over the country (Dąbska 1966, Tomaszewicz 1979). In its documented patches in the Wielkopolska region, it occurred with numerous accompanying species, mainly hydrophytes, which was already noticed by Tomaszewicz (1979) in his synthetic study of this association. Floristic abundance observed in the phytocenoses of *Nitellum syncarpae* (20 species found altogether) is rare in the case of assemblage communities of the class *C. fragilis*.

Table 1

*Nitellum syncarpae* (Corillion 1957) Dąbska 1966

Successive No. Numer kolejny zdjęcia	1	2	3	4	4	5	7
No. of relevé Numer zdjęcia	1	8	5	4	2	5	4
Date – Data day – dzień month – miesiąc year – rok	14 9 2004	13 8 2003	15 8 2002	14 9 2004	14 9 2004	14 9 2004	15 8 2002
Locality – Lokalizacja zdjęcia	MB	Ś	L	MB	MB	MB	L
Area of relevé (m <sup>2</sup> ) Powierzchnia zdjęcia (m <sup>2</sup> )	70	5	6	20	15	150	12
c layer cover (%) Pokrycie c (%)	95	60	60	100	100	90	50
d layer cover (%) Pokrycie d (%)	20	5	-	20	20	20	-
Min. depth (m) Głębokość minimalna (m)	0.05	0.2	0.3	0.3	0.2	0.3	0.2
Max. depth (m) Głębokość maksymalna (m)	0.7	0.5	0.3	0.6	0.5	0.6	0.2
Number of species Liczba gatunków	9	7	7	5	5	7	4
<b>I. Ch. <i>Nitellum syncarpae</i></b> <i>Nitella syncarpa</i>	<b><u>5.5</u></b>	<b><u>4.4</u></b>	<b><u>3.3</u></b>	<b><u>4.4</u></b>	<b><u>5.5</u></b>	<b><u>5.5</u></b>	<b><u>4.4</u></b>
<b>II. Ch. <i>Charatea fragilis</i></b> <i>Chara fragilis</i> <i>Chara aculeolata</i>	2.2 . .	1.1 . .	1.1 . .	1.1 . .	1.1 2.2 .	+ 2.2 .	. . .
<b>III. Others – Inne</b> <i>Fontinalis antipyretica</i> <i>Nymphaea alba</i> <i>Utricularia vulgaris</i> <i>Potamogeton gramineus</i> <i>Potamogeton natans</i> <i>Lemna minor</i> <i>Alisma plantago-aquatica</i>	2.2 r r 1.1 r . .	. . . . . . .	. . + . + + .	2.2 + . . . . .	2.2 + . . . . .	2.2 r . r . . .	. . + . . . 1.1 +

Sporadic species: – Gatunki sporadyczne:

II. *Chara vulgaris* 4 (+);

III. *Najas marina* 1 (r); *Sparganium erectum* 6 (r); *Utricularia minor* 2 (1.1); *Batrachium aquatile* 1 (r); *Aldrovanda vesiculosa* 2 (+); *Hydrocharis morsus-ranae* 2 (+); *Menyanthes trifoliata* 2 (+); *Typha angustifolia* 3 (1.1); *Drepanocladus aduncus* 2 (1.1).

Explanations: – Objaśnienia: MB – Małe Bagna, Ś – Święte, L – Lubosina.

### Characteristics of habitat conditions

The data published so far point to the wide ecological range of occurrence of both *N. syncarpa* itself and charophyta meadows formed by it. The eurythermic and xerothermic character of this macroalga is usually emphasised, too (**Dąbbska** 1964). Its high thermic requirements, necessary for the development of the species, can be confirmed by the fact that in new sites it was observed with fully developed thallus and reproduction organs at the end of summer and in autumn. Similar observations can be found in numerous studies of this species in Eastern Europe (i.g. **Corillion** 1957, **Krause** 1997), as well as in herbarium material from Poland (e.g. **Dąbbska** 1960, 1962, 1963, 1964 a, b, 1955, 1967).

This study shows that in the Wielkopolska region charophyta meadows with *N. syncarpa* appear in relatively shallow waters, with the average depth of 0.35 m, max. 0.7 m. In most of the studied phytocenoses in Poland the depth of water did not exceed 1 m (**Tomaszewicz** 1979, **Dąbbska** 1966). The analysed patches of the associations appeared both on sandy substratum (lake Kleszczynek, the basin near Staw Bardo), and on strongly hydrated organic substratum (lake Małe Bagna, the basin near lake Lubosina), or on boggy substratum (the site near the lake Święte). The associations developed in water habitats of semi-neutral reaction and high mineralisation, visible in considerable electrolytic conductivity (over 500  $\mu$ S). Detailed physico-chemical analyses of the water in the patch of *N. syncarpae* in lake Święte (August 2003) showed its strong colouring and very high concentration of dissolved organic carbon. Additionally, semi-neutral waters were characteristic of high fecundity and considerable calcium and magnesium concentration. It is worth pointing out that all the documented phytocenoses appeared in basins whose waters were highly coloured with humic acids. It seems, then, that in the Wielkopolska region, the optimum occurrence of charophyta meadows dominated by *N. syncarpa* is connected with basins of humotrophic waters.

A small number of documented sites of *N. syncarpa* in the Wielkopolska region might result from its tendency to appear in small water basins, often of ephemeral character, usually omitted in hydrobotanical studies. We can assume, however, that the newly found sites abounding in *N. syncarpa* are connected with the air temperature anomalies. Temperatures higher than the long-period average, recorded during most of the analysed period of study (**Koczorowska** 2003), were undoubtedly beneficial for the development of this species.

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ROZMIESZCZENIE I WARUNKI WYSTĘPOWANIA *NITELLA SYNCARPA*  
(THUILLIER) CHEVALLIER ORAZ *NITELLETUM SYNCARPAE* (CORILLION  
1957) DĄBSKA 1966 W WIELKOPOLSCE

S t r e s z c z e n i e

*Nitella syncarpa* (Thuillier) Chevallier należy do rzadko stwierdzanych przedstawicieli *Characeae* w Polsce. Z terenu Wielkopolski i Ziemi Lubuskiej gatunek ten został udokumentowany zbiorami zielnikowymi z trzech stanowisk. W trakcie badań w okresie 2002-2004 odnaleziono sześć nowych stanowisk *N. syncarpa*: z jeziora Święte koło Miały i jeziora Kleszczynek koło Zelgniewa, ze zbiornika wodnego koło miejscowości Lubosz, z jezior Małe Bagna i Duże Bagna koło Skórki i z niewielkiego stawu koło wsi Bronisławka. Gatunek ten występował na podłożu organicznym, rzadziej mineralnym, w płytkich miejscach, do głębokości wody 0,7 m.

W pięciu zbiornikach *N. syncarpa* tworzył fitocenozy *Nitelletum syncarpae* (Corillion 1957) Dąbska 1966.

Łąki ramienicowe z dominacją tego gatunku było rzadko dokumentowane w polskiej literaturze. Na podstawie przeprowadzonych badań stwierdzono, że w regionie wielkopolskim łąka ramienicowa z kryniczkiem obskubanym występowała na niewielkiej głębokości wody – średnio 0,35 m, maksymalnie do 0,7 m. Optimum występowania *Nitelletum syncarpae* w Wielkopolsce było związane z płytkimi zbiornikami wodnymi o charakterze humotroficznym.

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