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Corynocera ambigua (Insecta, Diptera) subfossils occurrence in recent sediments of four shallow Polesie lakes

Historia występowania subfosylnych szczątków *Corynocera ambigua* (Insecta, Diptera) we współczesnych osadach płytkich jezior Polesia

SUMMARY

Sediment cores were analysed from five shallow Polesie lakes (Eastern Poland) representing trophic status from mezo – to hypertrophy. The subfossil remains of *Corynocera ambigua* ZETTERSTEDT 1837 were found in all the lakes, except for hypertrophic Lake Syczyńskie. The age of the cores was between about 200– 400 years. The most abundant development of *Corynocera* in the lakes took place around 200 years ago. After a few decades, a sudden drop in the numbers was marked in all the lakes. It was a sign of the further, steady diminishing of the populations, until possible total extinction in the lakes Kleszczów, Głębokie Uścimowskie and Sumin. Only in the mesotrophic Lake Rotcze the remains were present up to the top layers of the sediments. It may suggest that the species is still present in the lake.

STRESZCZENIE

Analizowano rdzenie osadów z pięciu płytkich jezior poleskich zróżnicowanych pod względem statusu troficznego od mezo- po hypertrofię. Sybfosylne szczątki *C. ambigua* stwierdzono we wszystkich jeziorach z wyjątkiem hypertroficznego jeziora Syczyńskiego. Wiek analizowanych osadów sięgał od ok. 220 do ponad 400 lat. Najsilniejszy rozwój *Corynocera* w jeziorach miał miejsce ok. 200 lat temu. Następnie we wszystkich jeziorach doszło do dość gwałtownego spadku liczebności, co było zapowiedzią dalszego stopniowego spadku populacji aż do jej prawdopodobnego całkowitego wyginięcia w jeziorach Kleszczów, Głębokie Uścimowskie i Sumin. Tylko w mezotroficznym jeziorze Rotcze szczątki były obecne aż do stropowej części rdzenia, co może sugerować obecność tego gatunku we współczesnej żyjącej faunie.

K e y w o r d s: subfossil chironomids, *Corynocera ambigua,* shallow lakes

INTRODUCTION

C. ambigua has attracted attention of paleolimnologists for a long time (e.g. 3, 2). In older literature it was believed to be a cold-stenothermal species living in the sediments of shallow, oligotrophic lakes of arctic and subarctic regions (6, 14, 20). In areas located more to the south, it was considered a postglacial relict (16). It was also found in late-glacial sediments of temperate lakes, often in very high numbers (3). However, in recent years, information about the occurrence of living larvae in temperate lakes has been reported (3). This questions its bioindicative value as a cold-stenotherm.

In Poland, living larvae of the species were also encountered in several shallow, macrophyte-dominated lakes located in the northern part of the country (23). Subfossil remalns of *C. ambigua* were found first time in Poland in Lublin Polesie lakes. This paper presents the occurrence and dynamics in *C. ambiqua* numbers in the period of the recent centuries.

STUDY AREA

The research was carried out in five lakes: Kleszczów, Rotcze, Sumin, Głębokie Uścimowskie and Syczyńskie), located in the Łęczna-Włodawa Lakeland (51°30'N, 23°20'E); (Fig. 1).

They are relatively shallow (2.9–6.4 m), but differ in respect of area (6-50 ha) and trophic status (from meso– to hypertrophy) (Tab. 1). Their emergent vegetation is similar, forming a belt of various widths, composed mainly of reed *Phragmites australis*. In contrast, the submerged macrophytes differ between the lakes with regard to their qualitative and quantitative composition (PVI = 0% – 34.5%). In mesotrophic lakes Kleszczów and Rotcze, they form extensive underwater meadows; in eutrophic Głębokie and Sumin, they occur in scattered clumps; and in hypertrophic Lake Syczyńskie, they are almost deprived (Tab.1).

According to the theory of alternative stable states of lakes (17), the mesotrophic lakes Kleszczów and Rotcze are classified as macrophyte-dominated, hypertrophic Lake Syczyńskie as phytoplankton-dominated, and the remaining lakes Sumin and Głębokie Uścimowskie represent intermediate status (10).

For years, these lakes have been an object of limnological research taking into consideration physico-chemical properties of water and bottom sediments (15, 18, 19) and dwelling biocoenosis (e.g. 5, 13, 10, 12, 9).

Tab. 1. Morphometric characteristics of the lakes, Secchi Disc visibility (SD), submerged macrophytes development, expressed as PVI coefficient (percent of lake water volume infested), and trophic status (according to Kornijów et al. 2002).

Lake	Surface area [ha]	Max. depth [m]	SD [m]	PVI [%]	Trophic status
Kleszczów	50	3	2.4	29.3	mesotrophy
Rotcze	46	4.3	2.5	34.5	mesotrophy
Sumin	86	6.5	1.6	3.3	eutrophy
Głębokie U.	20	6.4	0.9	0.75	eutrophy
Syczyńskie	6	2.9	0.3	0	hypertrophy

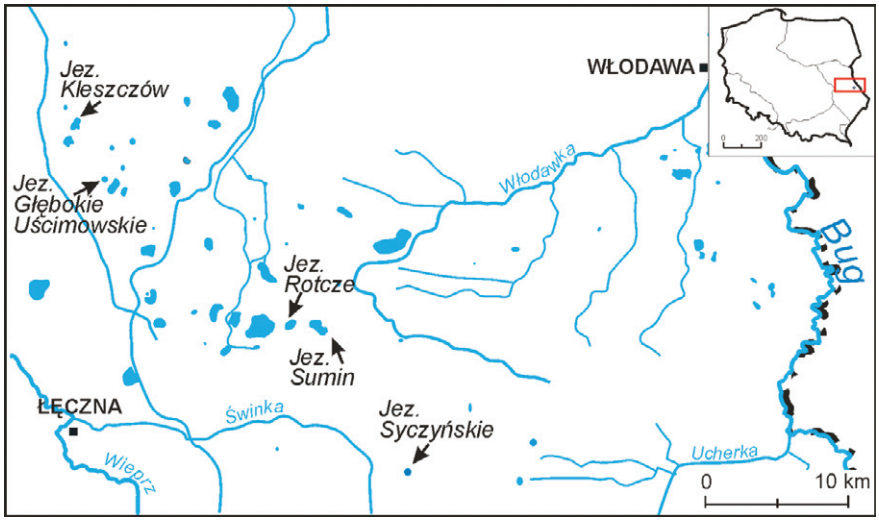

Fig. 1. Location of the lakes studied in the Łęczna-Włodawa Lakeland

METHODS

The research was carried out in 2005, right after the disappearance of ice. Sediment cores of 0.4 m – 0.7 m in length were taken from the deepest part of the lakes using a gravitational Uwitec-corer equipped with a plexiglas tube of 120 cm in length and 6 cm in diameter.

The cores were sliced into 1 cm layers. Until the depth of 20 cm, each slice was analysed, below that – every fifth. The samples were treated following the procedures by Warwick (21). The subfossil material was sieved through a 180-µm screen.

The head capsules were identified according to Brooks et al. (4) and Wiederholm (22). The numbers of head capsules (HC) were converted into 10 g dry weight of the sediments. The age of the sediments was calculated on the basis of a constant rate of supply of unsupported ^{210}Pb model (1) by Gąsiorowski (7).

RESULTS

The remains of *C. ambigua* were found in four out of five examined lakes. Only in the hypertrophic, phytoplankton-dominated Lake Syczyńskie, they were not encountered.

The highest numbers of head capsules, although differing in individual lakes (range: 189–771 HC/10 g DW), were recorded above 200 years ago (Fig. 2). There was a drop in the numbers of midge towards the sediment top in all the lakes, except Lake Rotcze. In the lakes Kleszczów and Głębokie Uścimowskie, it even became extinct on the level of 8 and 7 cm, respectively (Fig. 2). The de-

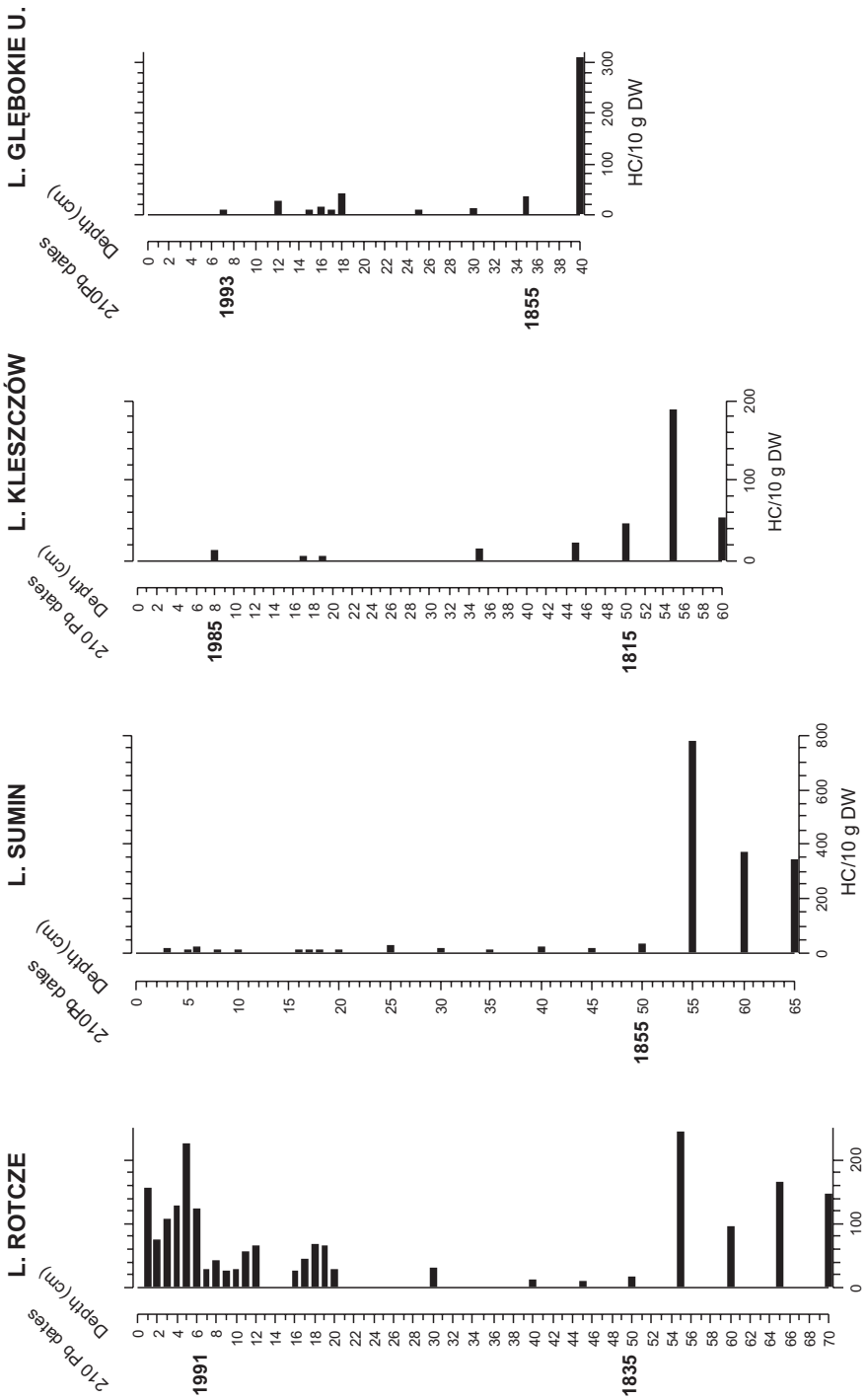

Fig. 2. Changes in *Corynocera ambigua* numbers in four Polesie Lakes sediment profiles. In the hypertrophic Lake Syczyńskie *C. ambigua* was not found

cline was quite sudden in all the lakes and took place in approximately the same period, around 150–190 years ago.

The increase in the numbers of head capsules took place again only in Lake Rotcze, in the beginning of the 1990s. (Fig. 2).

DISCUSSION AND CONCLUSIONS

Corynocera was found in meso-, as well as in eutrophic Polesie lakes. It is in agreement with the records of Brodersen and Lindegaard (3), who found the species in a broad spectrum of lake fertility, from oligo– to eutrophy.

The most abundant development of *C. ambigua* in the lakes studied took place around 200 years ago. Then, the numbers of the midge rapidly dropped. Taking into consideration that the decline took place in all the lakes in approximately the same period, it can be assumed that it was brought about by the same external reason. In Danish Lake Stigsholm, a decline in *Corynocera* abundance in the sediments, although not so sudden, took place in approximately the same years (3).

In the lakes Głębokie Uścimowskie, Kleszczów and Sumin, the species most probably became extinct. It is interesting that in the two very similar lakes (Kleszczów and Rotcze), the fate of *Corynocera* was different. It vanished around 1985 in the former lake, while in the latter one the remains are present until the top sediment layers. This raises the question whether the larvae of *Corynocera* still live in Lake Rotcze. In order to answer this question it is hecessary to carry out limnological analysis of currently living Chironomid larvae in the lake.

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