

The influence of settlers resident in the proximity of Lake Gościąg since the Mesolithic is much weaker than in other Polish lakes studied earlier (Bińka et al. 1988, 1991, Szeroczyńska 1985, 1991). In these lakes strong induced eutrophy existed during the periods of intensive anthropopressure, from Neolithic times to the present day. However, the lakes studied earlier, such as Błędowo, Skrzetuszewskie, Woryty, are small. Therefore an inflow of organic and mineral compounds into a lake, provoked by settlers' farming, radically changed the water chemistry and was followed by an intensive expansion of cladoceran species that prefer eutrophic living conditions.

According to Cladocera analyses for deep lakes, such as Lake Gościąg (25 m) and Lake Lednickie (15 m) (Szeroczyńska 1998), the settlement was not too important for changes in the species composition. It caused only a slight increase of species preferring rising trophy, and it eliminated neither planktonic nor clear-water species. An extraordinary period in Lake Gościąg history was the period of the Mesolithic settlement, characterized by a long-lasting absence of Bosminidae. Such a situation was noted in lake sediments in Poland for the first time. An absolute absence of Bosminidae for the Preboreal period was observed by Flössner (1990) in Barsch-See (Germany), but this lake is an acid one with a dominance of the acidophilous species *Alonella excisa*, so it cannot be compared to Lake Gościąg.

This phase is connected with the Atlantic period, with a warm and humid climate. In the Polish lakes studied earlier the presence of both the families Bosminidae and Chydoridae was noted during the Atlantic period. What caused such drastic changes in the plankton composition in Lake Gościąg? What caused an almost total extinction of the *Bosmina* species? Was it a result of the activity of the Mesolithic people? It seems rather unlikely, because their activity is only insignificantly reflected in the history of the lake. It should not be forgotten, that the lake has always been supplied by ground water. So it may suggest that a change in the ground-water supply caused an important change in the oxygenation of the lake and thereby in the species composition of Cladocera.

9.2. RECORD OF HUMAN IMPACT FROM AD 1660 TILL RECENT TIMES IN THE LAKE GOŚCIAŻ SEDIMENTS

9.2.1. ARCHIVE DATA AND ECONOMIC-SOCIAL BACKGROUND TO THE ANTHROPOGENIC CHANGES IN THE LAKE GOŚCIAŻ REGION FROM AD 1700 UNTIL TODAY

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Lake Gościąg is situated in the Gostynińskie Lake District, being now protected by the Włocławek-Gostynin Landscape Park. Due to its situation far from towns

(20 km east of Włocławek with >100,000 inhabitants, 15 km northeast from Kowal with <3500 inhabitants, and 6 km south of Dobrzyń at the opposite bank of Vistula River with <2500 inhabitants) and from industrial plants, and on sandy soils of low fertility, it has never been too strongly influenced by human activity. Also for that reason the historical sources do not give too many details about human occupation of the lake vicinity. Instead, only general remarks about the developing settlements are available.

The Lake District is placed in the southeastern part of Kujavia historical region. In 16th century, the majority of the area was the property of Polish kings. In nearby Kowal, the king Kazimierz the IIIrd, called "the Great" was born in 1310.

At present the whole catchment area of the small stream Ruda, connecting a system of four lakes (Fig. 9.20), is almost completely covered by pine forest. The southern edge of the forest lies ca. 6 km from Lake Gościąg. The area south of lake, at the present forest limit, is covered by relatively high unsettled sand dunes. Probably also for that reason, any data about settlement in that area has not been found. Directly north of lake, and farther west, the forest nearly reaches the dammed Włocławek lake on the Vistula River. To northeast the forest limit approaches the lake at ca. 2.5 km. The nearest public road runs along the Vistula bank. Forest roads are closed for public traffic. Human settlements closest to the lake include a small farm situated ca. 1 km downstream from the Lake Mielec and a forester's lodge ca. 1 km farther down, where Ruda stream is dammed (by 1–2m). The individual farms dispersed outside the northern forest edge form small villages: Dąb Mały, Dąb Wielki, Dąb Polski, Skoki Duże, and Dobiegniewo.

The earliest written remarks on village Dąb (old spelling "Domb") come from 1228 (Pelisiak & Rybicka, Chapter 9.1.2) and 1489 (Senkowski 1961). The villages Dąb, Dobiegniewo, and the "industrial settlement" Ruda are mentioned in 1565 (Tomczak 1963, Guldon 1964) and are also documented in the 17th century (Guldon 1981). The name of village Ruda (ore) corresponds to that "...a mill and primitive smelting factory, 10 buildings altogether..." existed there already in AD 1565 (Tomczak 1963). In the mill, situated probably near the present dam on Ruda stream, a rye flour was produced (Tomczak 1963). The date when the smelting was stopped is not known, but the settlement (10 inhabitants) is mentioned in a Geographical Lexicon (Sulimierski et al. 1882). On the other hand, the mill was working in 1634 (Guldon & Guldon 1973) and in 1760 (Żytkowicz 1957), and according to A. Rerych (oral inf.) it was burnt in January 1945.

The development of Dąb, mentioned as a single settlement still in 1786 (Wizytacja 1786), is documented by a growing number of villages of related names (Dąb Wiel-

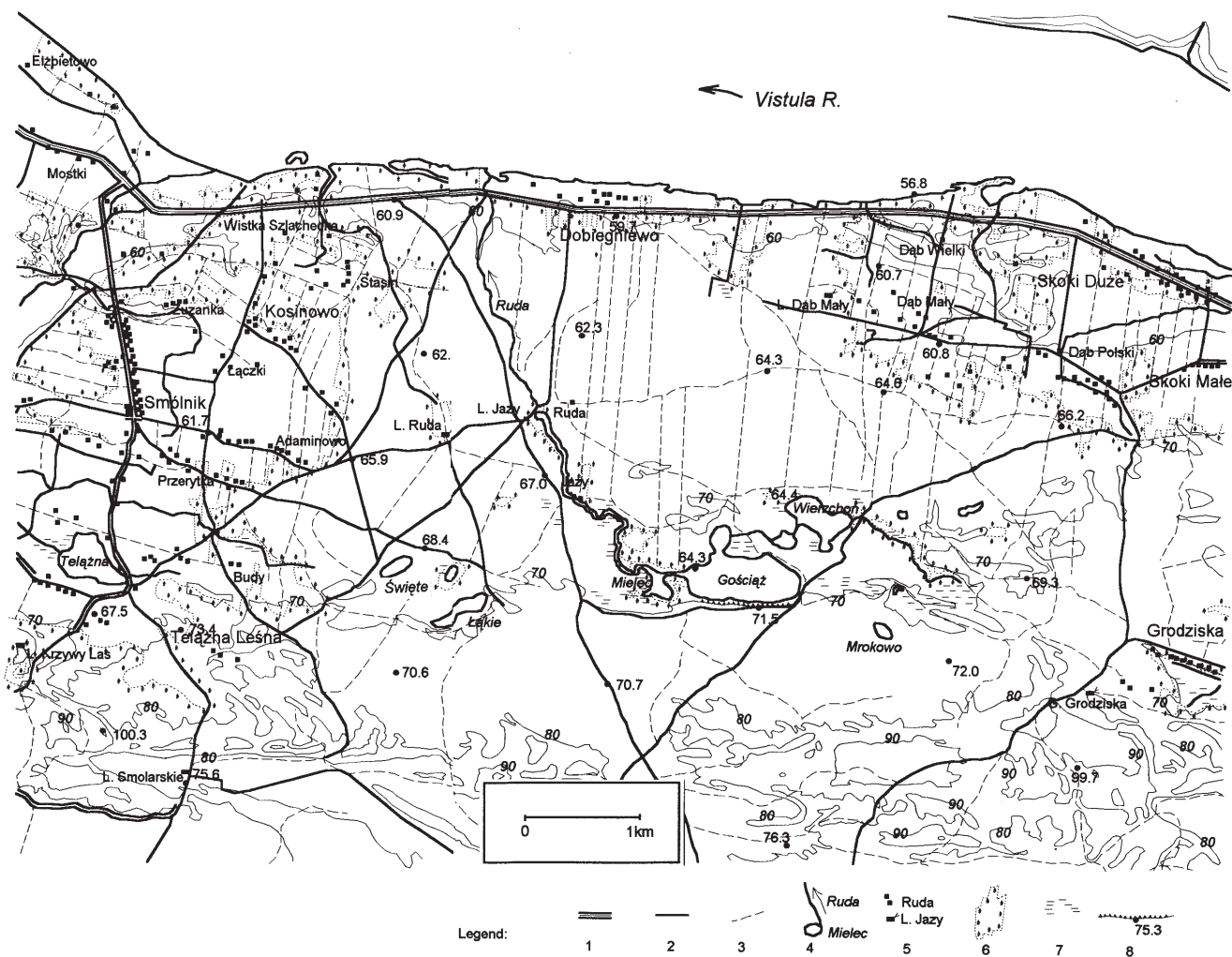


Fig. 9.20. Map of present surroundings of Lake Gościąż (acc. to Map, 1981). 1 – main roads; 2 – forest roads and non-surfaced roads; 3 – paths; 4 – streams and lakes; 5 – buildings and forest lodge; 6 – forests, 7 – swamps; 8 – shore escarpment and height reference (m a.s.l.).

ki, Dąb Niemiecki, Dąb Mały, Dąb Leśny, Dąb Polski, Dąb Borowy, Fig. 9.21). The common core of the name (Dąb means oak) would suggest some split of a single settlement, but the villages could also have been settled separately in a forest rather abundant in oak. Such an interpretation would be supported by significant percentage of *Quercus* pollen in the Gościąż sediment from before the 19th century (Ralska-Jasiewiczowa & van Geel, Chapter 9.2.4). Development of villages was probably connected with the so-called “Hollandii” (or “oleder-skie”) settlement. Intensification of Hollandii settlement on the “low-fertile, forested areas, especially upon Vistula River” is dated to the 18th century (Zimecki 1990) or more exactly to 1775–89 (Guldon & Guldon 1984). The word “Oleder” refers to “a free man, settled by a privilege, engaged in forest clearing and drying the bogs” (Burszta 1958). As shown in Fig. 9.21, the Dąb... villages were mentioned in the official state registers, in church documents, and a Geographical Lexicon. Fig. 9.2.1 would suggest that they were settled mostly by the end of the 18th or beginning of the 19th centuries. The

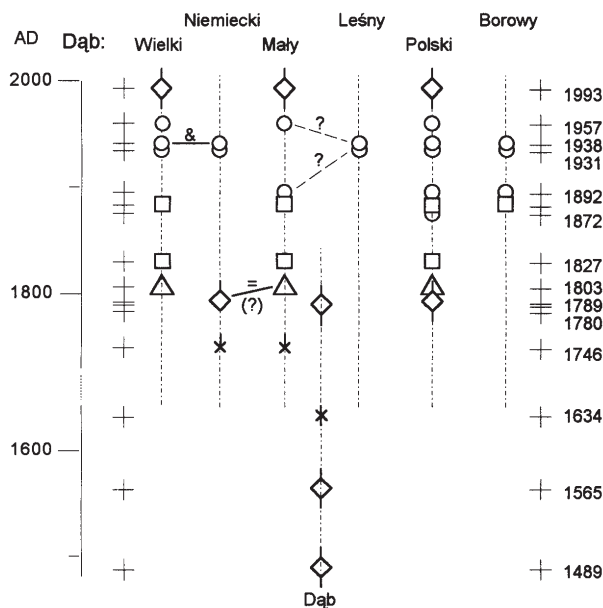


Fig. 9.21. Diagram of written remarks about Dąb villages. The symbols indicate kind of source: diamonds – state reports, triangles – maps, rectangles – geographical lexicon, circles – church annual reports, stars – other compilations.

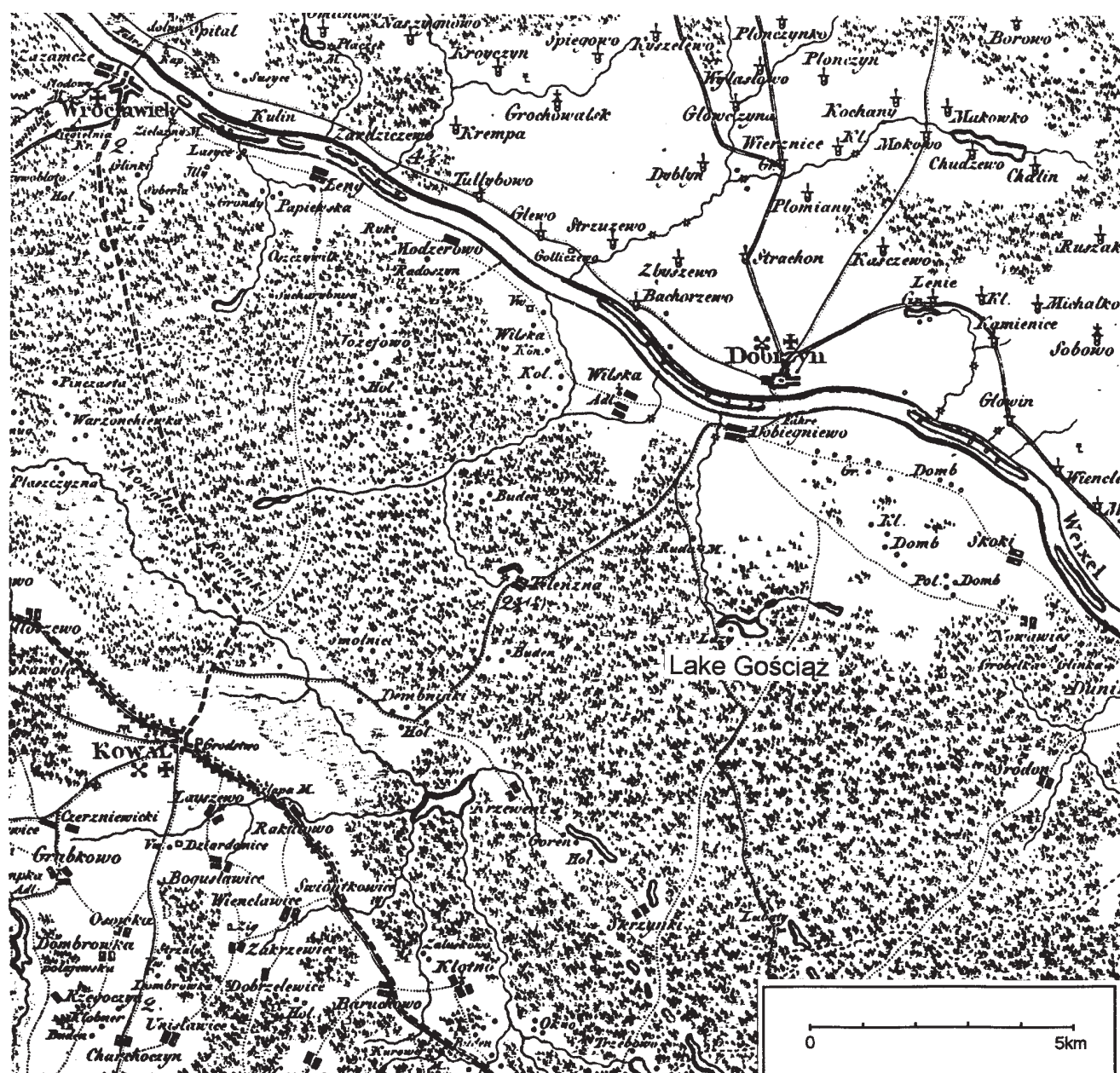


Fig. 9.22. Map of Lake Gościąg region from the beginning of 19th century (Gilly 1802).

Dąb Niemiecki (means German) with 38 buildings, was reported as newly settled in 1789 (Tomczak 1977), though Zimecki (1990) gives a much earlier date (1746) for the establishment of the villages of Dąb Niemiecki, Dąb Mały, Jazy, and Dębniaki, settled together by 47 families.

The map published by Gilly (1802, Fig. 9.22), shows the Dąb (denoted as “Domb”) villages northeast of Lake Gościąg (= Jazy). Surprisingly, Gilly’s map does not show Dąb Niemiecki, and according to Tomczak (1977) it was probably identified with Dąb Mały (= Kl.), situated between Dąb Polski and Wielki (= Gr.). This seems to be supported by the Geographical Lexicon (Sulimierski et al. 1880), which for AD 1827 reports Dąb Mały, Dąb Polski, and Dąb Wielki but not Dąb Niemiecki.

Gilly’s map shows the mill at Ruda and also one in Tęlna. Two villages called “Buden” west of Gościąg were settled in 1775–89 (Guldon & Guldon 1984). They do not exist now, but the date of their abandoning is not known.

After the loss of independence by the Polish State in 1795, the territory of Poland was partitioned by neighbouring states, and the eastern part of the Kujavia region fell first under Prussian and after 1807 under Russian administration. After the defeat of Polish insurrection in 1863, the next intensification of settlement took place in the region (Burszta 1958). The Russian administration, especially after the insurrection, tried to suppress Polish nationality at the western borders of state, by favouring the German colonisation (Burszta 1958) through the so-

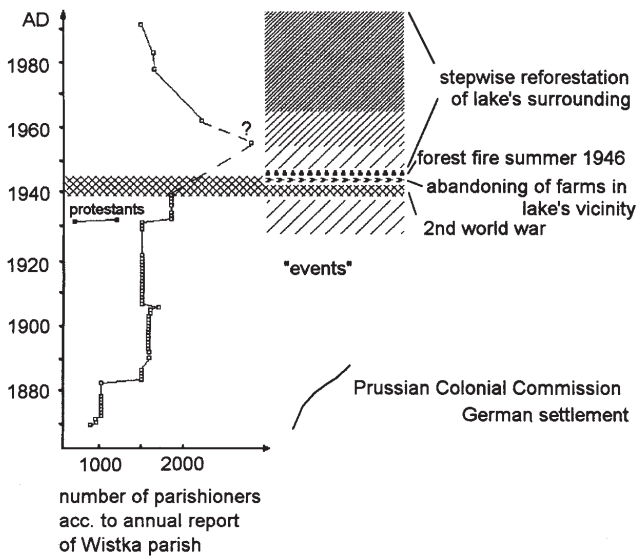


Fig. 9.23. Diagram showing selected information about settlement in the surroundings of Lake Gościąż.

called “Prussian Colonial Commission” (Świąch, oral inf.). At that time, the village Dąb Borowy (the closest village to the lake) was settled. The first written mention

about this village comes from 1880 (Sulimierski et al. 1880). The register of settlements, published irregularly in annual reports of Wistka parish, includes Dąb Borowy for the first time in 1892. The development of Dąb Borowy could be attributed to the distinct increase (reported annually) of the number of parishioners between 1882 and 1883 (Roczniki, 1863–1991; Fig. 9.23). As shown on the map from 1927 (Fig. 9.24), Dąb Borowy consisted of individual farms spread around Gościąż and adjacent lakes and in the forest (bór – means conifer forest) upon the Ruda stream in its upper course. The lake surroundings were not forested at that time. The vicinity of Gościąż was probably most intensively inhabited before the Second World War, fifty-fifty by Polish and German farmers. During the war the German farmers were gradually moving to the more fertile areas in western Kujavia, while the Polish farmers were forced to abandon the settlement in 1944 (Zjawiński, oral inf.). After the war, Dąb Borowy was not settled again, the buildings were gradually destroyed, and now the former farms are only traced by agglomerates of ruderal vegetation.

Before the war, Lake Gościąż was surrounded by pastures, meadows, or arable land. After 1945, the land was gradually forested. According to Kosiński (oral inf.), the

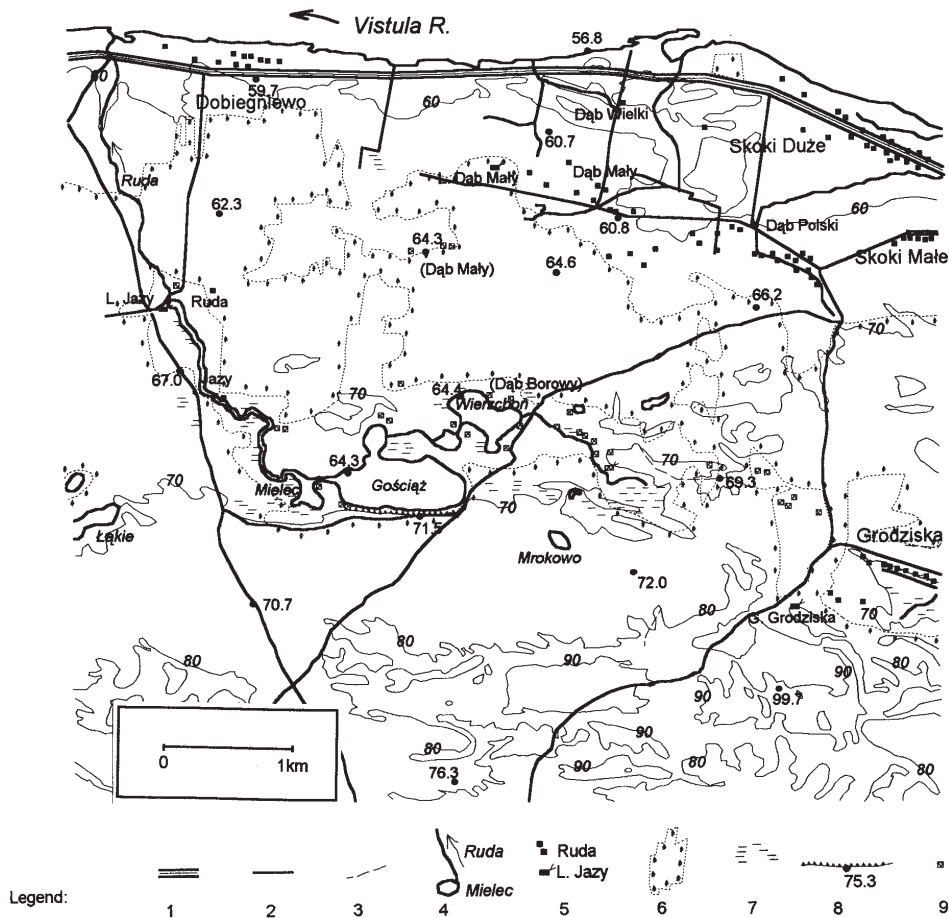


Fig. 9.24. Map of surroundings of Lake Gościąż showing the positions of buildings and forest limit at 1927 (according to Map, 1930). 1–8 as in Fig. 9.20, 9 – buildings from 1927 not existing at present.

whole area has been planted with trees until the middle of the sixties, and the lake shore itself by the middle of fifties (1954–56). During forestation, however, the non-forested area of abandoned farms was still used by inhabitants of neighbouring villages who planted cereals and vegetables there.

Only a few elemental disasters from the last two centuries are known to struck the area. In 1921, an especially strong fire destroyed ca. 400 buildings in Kowal and was moved by wind to the next village, ca. 2 km away (Zimecki 1990). The forest fires are not mentioned in written sources. According to Zjawński (oral inf.) the strongest one happened in summer 1946 and reached the southern shore of Lake Gościąż. The high flood of the Vistula River has been noted in 1867 (Chudzyński 1990b) and 1934. Cholera epidemics in eastern Kujawy were noted especially in the first half of the 19th century: 1831, 1837, 1847, 1848, 1852 (the strongest), and 1894 (Chudzyński 1990a, 1990b). One may expect that they influenced the population growth at that time.

Generally at the beginning of the 19th century the system of three-year crop rotation (winter crop, spring crop, idle land) was applied in the region (Szczepański 1990). In the second half of century, it was being gradually replaced by the system of shift of crops. At that time, fertilizers (superphosphate) were introduced (Chudzyński 1990a). The production of potassium fertilizers in Łowicz started in 1895–1897. Chudzyński (1990b) mentions the strong failures of potato crops in 1847, 1849, and 1850. However, the details of agriculture development in the immediate surroundings of Lake Gościąż are not reconstructed.

9.2.2. CHRONOLOGICAL BASE AND RECONSTRUCTION OF YEARLY CYCLES IN THE LAKE GOŚCIAŻ YOUNGEST SEDIMENTS

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Correlation of the cores frozen *in situ*

The long piston cores of sediment from the central deep of Lake Gościąż show no lamination in the fragment above 1.26 m. This is mostly a result of coring, as it is clearly demonstrated by the occurrence of regular laminations above 1.2 m in the cores of sediment frozen *in situ* (Walanus, Chapter 4.1.2 and Goslar, Chapter 8.1). In the years 1989 through 1993, 20 cores were raised in such a way. Usually tube samplers were used, except of the case of cores G31-33f and G42-43f, collected with

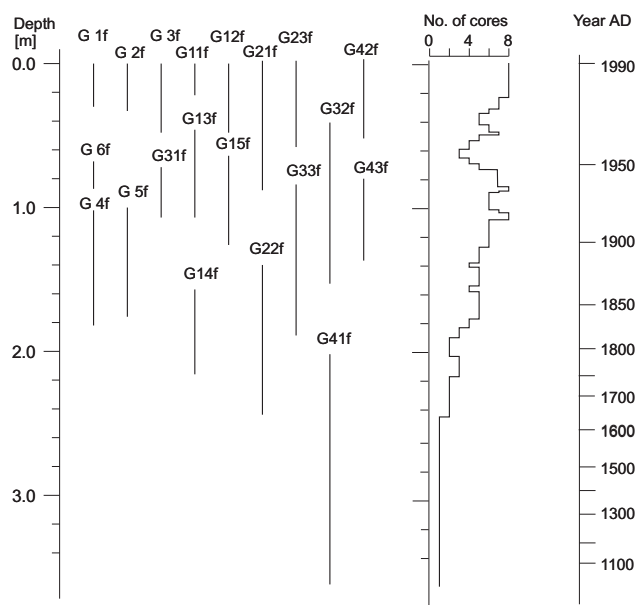


Fig. 9.25. Diagram illustrating the replication of varve chronology in the uppermost sediment from Lake Gościąż, based on the cores frozen *in situ*.

the wedge-shape sampler (Walanus, Chapter 4.1.2). The individual cores were 0.22–1.60 m long.

The laminated sequences of all the cores were copied on adhesive tape according to the tape-peel method (Simola 1977, Goslar 1993). The copies are easy to handle and store for a long time, and they were used in precise visual correlation of laminae in individual cores, enabling the construction of continuous, replicated sequence (Fig. 9.25). In that sequence, the characteristic layers are marked in all the cores. The sedimentation rates differ among cores, and the depth scale for the common sequence is an average of all the cores.

Seasonal changes of sediment composition

The seasonal changes of sediment composition along the selected fragments of cores were recognized by microscopic inspection of the tape copies. Each inspected area was ca. 0.5 mm wide, and 200 contiguous areas were analysed per each 10 cm of profile. The main components recognized were chrysophycean cysts, diatoms, carbonate, and organic matter. In each area the chrysophycean cysts and frustules of *Centricae* (except for *Aulacoseira* sp.) and *Pennatae* (except for *Fragilaria*, *Synedra*, and *Asterionella*) diatoms were counted. The frustules of abundant genera of *Aulacoseira*, *Fragilaria*, *Synedra*, and *Asterionella* were counted separately. Abundances of calcite and organic matter were expressed as percentages of the microscopic image covered by the carbonate and by organic fragments, and the mean size of calcite grains was determined qualitatively. Additionally, the occurrence of vivianite, pyrite, *Pinus* pollen, and

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