*Cryptogamie, Bryologie, 2006, 27 (4): 453-458*


# *Aneura maxima* – a liverwort new to Poland

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*(Received 17 July 2005, accepted 2 January 2006)*

**Abstract** – *Aneura maxima* has been recently discovered for the first time in Poland at three localities in the lowlands and one in the mountains. Poland is the seventh European country where occurrence of *A. maxima* has been recorded so far. Morphological description, habitat preferences and distribution map of plants collected in Poland are given.

**Liverworts / *Aneura maxima* / oil bodies / morphology / Europe / Poland**

## INTRODUCTION

Described in 1898 from Java, *Aneura maxima* (Schiffn.) Steph. was known until the 1990s only from Asia: Japan (central Honshu), Indonesia, New Caledonia and India; but also from the Appalachians and Piedmont in North America (Furuki, 1991; Schuster, 1992). In 1994, this species was found in Europe for the first time: in Belgium, in the Ardennes Massif (Andriessen *et al.,* 1995). Now *A. maxima* is known also from several other localities in Europe: France (Sotiaux & Sotiaux, 1996), Finland (Frahm, 1997), Denmark (Thingsgaard, 2002), and Luxemburg (Werner, 2003) and Czech Republic (Kučera, 2004). In Poland, *A. maxima* was not recorded previously (Koła & Turzańska, 1995). During our intensive studies of the *A. pinguis* complex in Poland conducted in 2002-2005, in four sites (reserve Diabli Skok near Wałcz, in the Białowieża National Park, in the reserve Redykajny near Olsztyn and in the Tatra Mts.) we found very large plants of *Aneura* Dumort., which morphologically fitted very well the descriptions of *A. maxima* reported from Belgium (Andriessen *et al.*, 1995).

## MORPHOLOGICAL AND ANATOMICAL DESCRIPTION OF COLLECTED PLANTS

Plants dioecious, when fresh green, lustreless; thalli very large (10-12 mm wide and 45-80 mm long), with relatively distinct costa and wings. Margins of

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thalli unistratose and translucent, undulate with occasional incisions forming lobes (Fig. 1). Thallus c. s. in costal region 450-490 μm (10-13 cells) thick. Wings very wide, 15-22 cells wide, unistratose part of 3-4 cell rows. Inner cells of thallus thin-walled, without chloroplasts, large: (42.8-)54.7-71.4 μm × (47.6-)83.3-95.2 (-123.8) μm. Epidermal cells chlorophyllose, smaller: 26.2-38.1 μm × 45.2-71.4 μm. Numerous, thin-walled, colourless rhizoids (19.0-28.6 μm diameter) restricted only to costal region. Slime papillae occurring on ventral side near thallus, apical cell of slime papillae hyaline, large: 23.8-35.7 μm × 95.2-169.0 μm. Oil bodies present in all epidermal cells, spherical to ovoid, small 2-3(-4) μm, homogeneous and glistening, or rarely finely granulate, 20-35 per cell (Fig. 2). Fertile plants present in all Polish collections, male plants more frequent. Androecial branches short; archaegonia situated in a deep sinus, usually on both side of thallus and surrounded by cilia 600-1100 μm long. Calyptrae smooth, (only one plant with two immature calyptrae found); sporophytes not seen.

**Collection sites of examined specimens, all specimens are deposited at POZW herbarium. 1.** Zachodniopomorskie Prov.: 'Diabli Skok' reserve near Wałcz, 11.09.2003, leg. K. Buczkowska and 12.10.2004 *leg. K. Buczkowska & A. Bączkiewicz*; **2.** Podlaskie Prov.: Białowieża National Park, Wysokie Bagno reserve, 24.09.2002 *leg. Małgorzata Adamczak & Artur Adamczak*; Białowieża National Park, Aurochs' reserve, forest section 425, 26.09.2002 *leg. Małgorzata Adamczak & Artur Adamczak*; Białowieża National Park, forest section 254Dc, 27.09.2002 *leg. Małgorzata Adamczak & Artur Adamczak*; **3.** Warmińsko-Mazurskie Prov. 'Redykajny' reserve near Olsztyn, 23.10.2004, *leg. K. Buczkowska & M. Orzechowska*; **4.** Małopolskie Prov.: Tatra Mts. Białka Valley and Capowski Forest, 23.09.2005, *leg. K. Buczkowska and A. Buczkiewicz* (Fig. 3).

## ASSOCIATED SPECIES AND HABITAT PREFERENCES

In all localities in Poland, *A. maxima* was associated with *Trichocolea tomentella* (Ehrh.) Dumort. and *Conocephalum conicum* (L.) Dumort. Moreover, in the Diabli Skok reserve it occurred together with *Pellia borealis* Lorbeer, and in the Białowieża National Park with *Pellia epiphylla* (L.) Corda. In all localities, *A. maxima* was also accompanied by cryptic species of the *A. pinguis* complex. In the Białowieża National Park it grew together with all cryptic species of *A. pinguis* (A, B and C), in the Diabli Skok and Redykajny reserves with species B and C sensu Szweykowski & Odrzykoski (1990) and Andrzejewska (2000). All species always grew in separate colonies and on different substrata. *A. pinguis* species B occurred on wet rotten wood, species C on the soil on river banks, while *A. maxima* was found on wet humus or peaty soil. In the Diabli Skok reserve it grew on very wet humus in a mire on river banks, in the Białowieża National Park on wet peaty soil in alder swamp (*Carici elongatae-Alnetum*) and on wet humus on banks of drains in *Sphagno girgenshonii-Piceetum*.

## DISCUSSION

Plants collected in Poland are morphologically similar to *A. maxima* described by Schiffner (Schuster, 1992). They have very large thalli without the greasy luster that is characteristic for *A. pinguis* (L.) Dumort., and at first glance are similar to *Pellia* Raddi, as has been pointed out by several authors (Furuki,

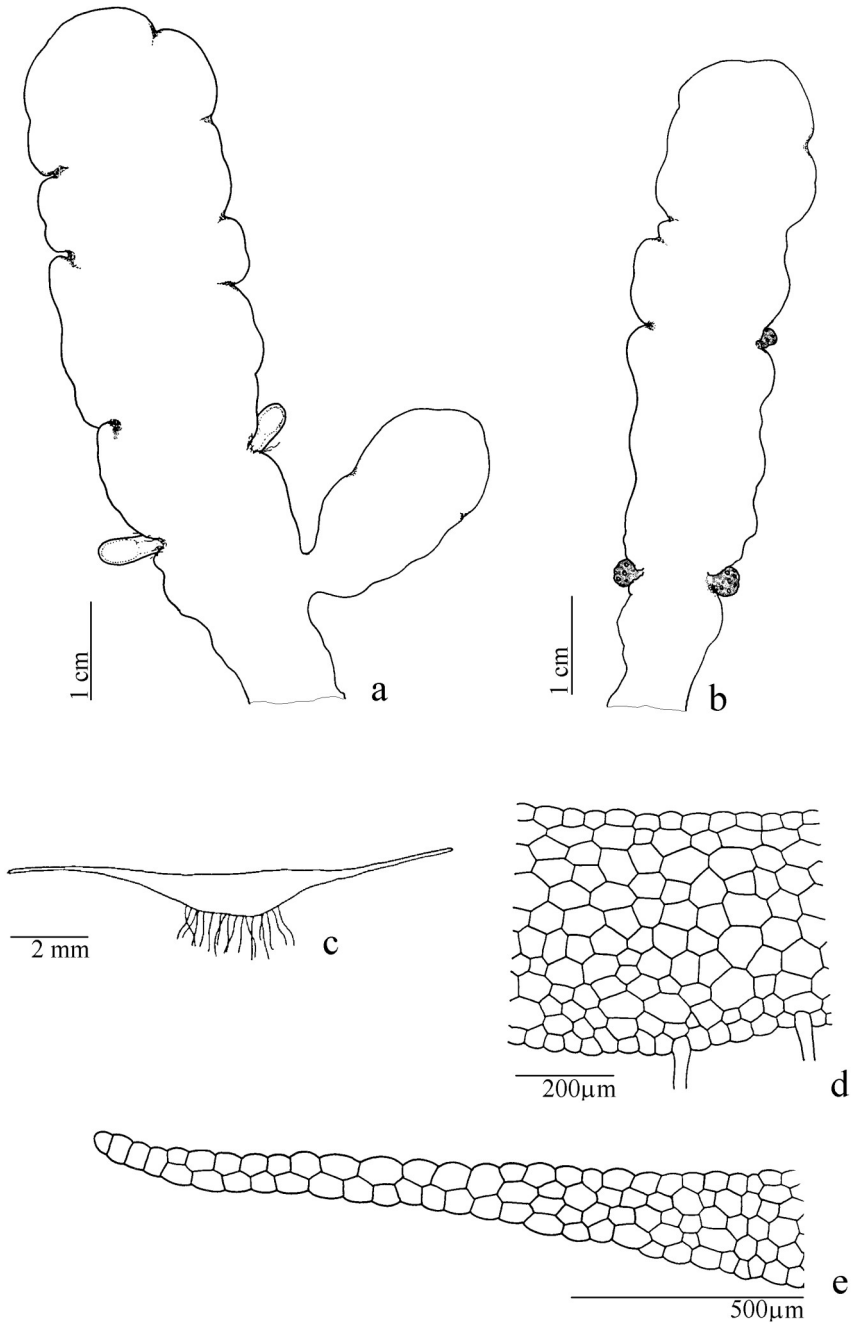


Fig. 1. *Aneura maxima* (Schiffn.) Steph.: dorsal view of female thallus (**a**), and male thallus (**b**), cross section of thallus (**c**), cross section of median part of thallus (**d**), cross section of wing (**e**).

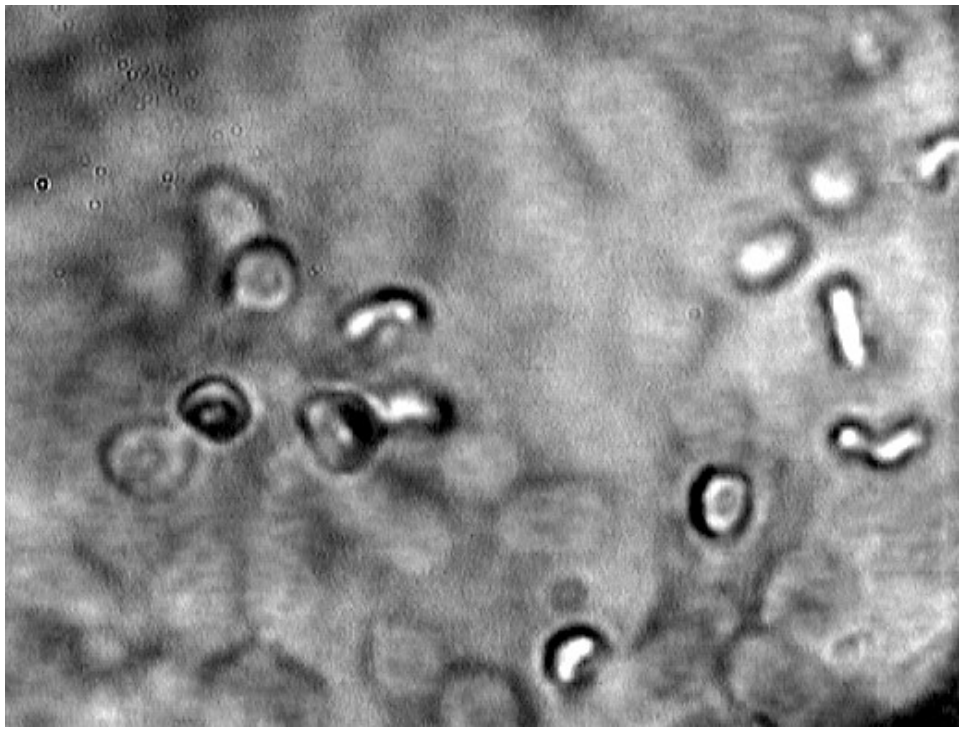

Fig. 2. Oil bodies in epidermal cells of thallus of *Aneura maxima* (Schiffn.) Steph.

1991; Schuster, 1992; Andriessen *et al.*, 1995). Since 1994, *A. maxima* has been recorded in Europe in six countries, so Poland is the seventh country where this rare species has been recently discovered. Thus Andriessen's *et al.* (1995) hypothesis that *A. maxima* can be discovered in other places in Europe has been confirmed. Andriessen *et al.* (1995) suggested that *A. maxima* in Europe had been so far overlooked and mistaken for *Pellia epiphylla* or *P. neesiana* (Gottsche) Limpr.

However, in Poland *A. maxima* seems to be rather rare, since in spite of intensive studies of the genus *Aneura* in our country we found it so far only at three localities in the lowlands and one in the mountains. Our plants grew in loose and usually abundant patches, occurred in similar habitats and were associated with the same liverwort species as *A. maxima* reported from Belgium (Andriessen *et al.*, 1995) and Denmark (Thingsgaard, 2002). Our observations confirm reports of Inoue and Miller (1985), who claimed that there are ecological differences between *A. maxima* and *A. pinguis*. However, *A. maxima* in North America occurred on mineral substrata, like spring banks and wet rocks (Schuster, 1992), while in Japan in various habitats: on humus in swamps, on wet soil, and even on granite rock (Furuki, 1991).

**Acknowledgements.** We would like to thank Małgorzata and Artur Adamczak for help in sampling the plant material. This work was financially supported by a grant from the State Committee for Scientific Research (KBN 0216/PO4/2002/22).

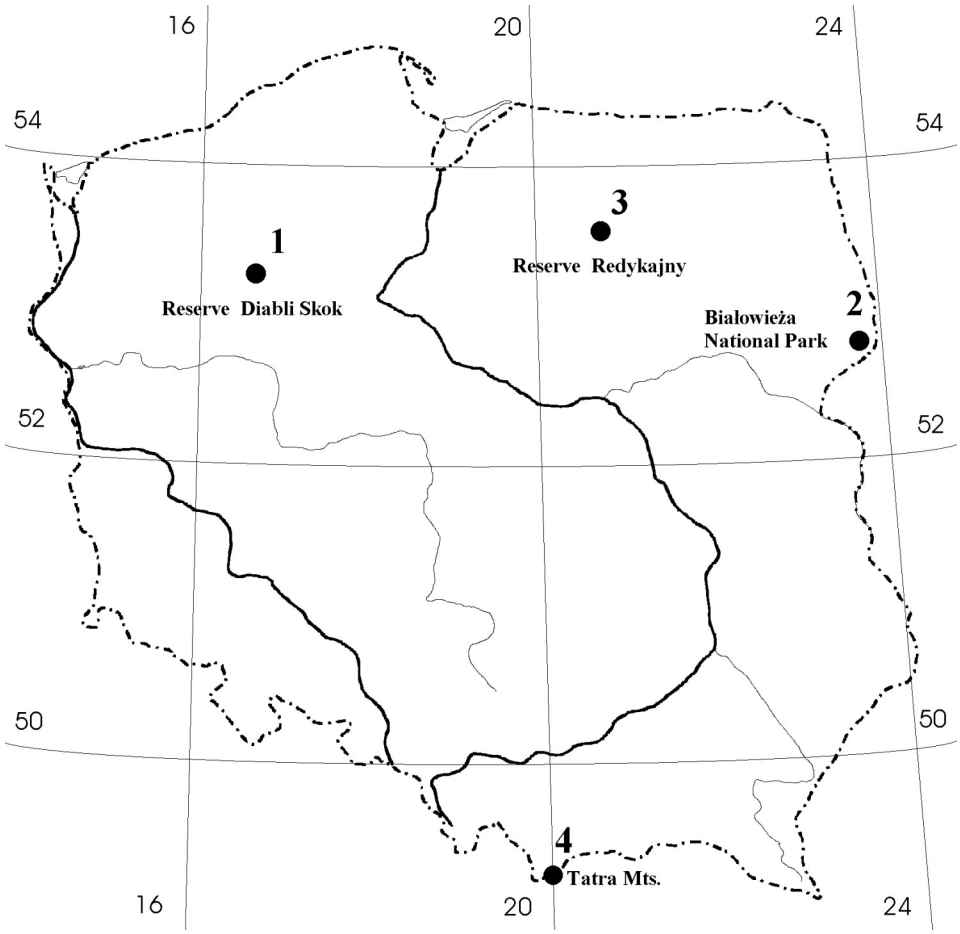


Fig. 3. Localities of *Aneura maxima* (Schiffn.) Steph. in Poland.

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