

LIVERWORT OIL BODY DIVERSITY IN PACIFIC ASIA

РАЗНООБРАЗИЕ МАСЛЯНЫХ ТЕЛЕЦ ПЕЧЕНОЧНИКОВ В ПРИТИХООКЕАНСКОЙ АЗИИ

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Abstract

This paper summarizes data on the oil body characteristics of liverworts sampled from Pacific Asia and provides 1032 photographs of living cells in 572 species and 6 infraspecific taxa (1 subspecies and 5 varieties) collected mostly in Northeast, East and Southeast Asia. Several cases of oil body characteristic variations may imply taxonomic differences between populations from geographically remote areas that are now treated as belonging to the same taxon.

Резюме

Приводятся характеристики масляных телец 572 видов и 6 внутривидовых таксонов, распространенных в притихоокеанской Азии на основании описания 1032 фотографий живых клеток. В ряде случаев характеристики масляных телец в популяциях из взаимноудаленных регионов, отнесенных к одному «морфологическому виду», значительно отличаются, что может свидетельствовать о таксономических различиях между популяциями.

KEYWORDS: East Asia, Hepaticae, liverworts, morphology, oil bodies, taxonomy.

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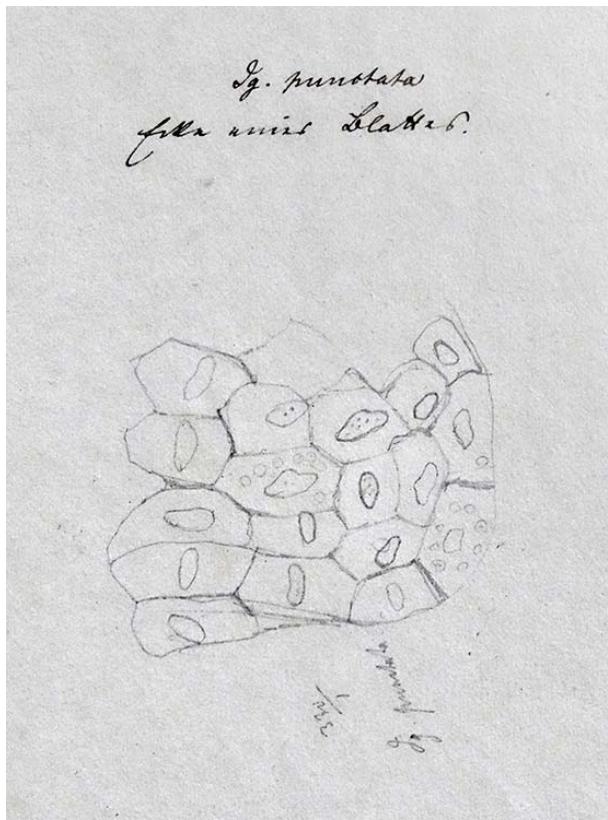


Fig. 1. Oil bodies in *Jungermannia punctata* Gottsche auct. non Taylor, handwriting by Gottsche (STR).

INTRODUCTION

Liverwort oil bodies are intracellular organelles originating mostly from the dilation of endoplasmic reticulum cisternae (He et al., 2013), and they were first reported over 185 years ago. Hübener (1834) observed oil bodies in *Mylia taylorii*, and although he was likely the first researcher to focus on this large organelle, he did not recognize them as a special structure. In the next year, a study by Mirbel (1835) on *Marchantia* first described ellipsoidal white masses with warty exteriors in some cells that were clearly oil bodies, as they are now known. Therefore, oil bodies were first discovered and described nearly at the same time as chloroplasts (Mohl, 1835). In the same time period, Gottsche focused on large oil bodies in the cells of liverwort, which he assumed was closely related to *Jungermannia caespiticia* (=*Endogemma caespiticia*). The taxon (a heterotypic synonym of *E. caespiticia*) was published in 1844 (Gottsche et al., 1844) under the name *Jungermannia punctata* Gottsche (n. illeg., auct., non *J. punctata* Tayl.). Moreover, Gottsche wrote “Nucleo cellulari discum macularum retis folii occupante” (l.c.: 92), which stressed the distinguishing aspect of the observed feature. He produced a pencil drawing of the oil bodies (“nuclei” in l.c.), and although that picture has been maintained at STR, it does not appear to have been published (Figure 1).

One year before the volume of *Synopsis Hepaticarum* was published (Gottsche et al., 1844), Gottsche (1843) published an exhaustive study on *Haplomitrium hookeri* and described the leaf cells of the species, and he referred to these oil bodies in several liverwort taxa as “Zellenkörper” (“cell bodies”) (Pages 287–292 in l.c.). Slightly over 20 years after the first observation, in 1857, the oil bodies of 30 liverwort taxa were described by Holle (1857). In 1874, which was forty years after they were first mentioned, oil bodies ‘received’ their currently used name, i.e., ‘oil bodies’, which is ‘Ölkörper’ in the German language (Pfeffer, 1874). Stewart (1978) stressed that Wilhelm Pfeffer (plant physiologist by its main interest) was the first person who realized the taxonomic value of external characteristics of oil bodies for morphological systematic analysis. Although, the taxonomic value of oil body features was subsequently formally accepted, the first species that was differentiated based on oil body features, *Lophozia silvicola* H. Buch (Buch, 1929), was reported 55 years after the report by Pfeffer (1874). Ten years later, Müller (1939) published the first exhaustive account on oil body occurrence and morphology in 210 species of liverworts and hornworts. The account was very carefully prepared, and even where the specimens were studied for oil bodies after initial drying, any instances were always noted. Among a very few mistakes included *Monoselenium tenerum* and *Riccardia pinguis* (=*Aneura pinguis*), which were described as “Ohne Ölkörper” (l.c.: 349 and 351, respectively) and *Trichocolea pluma*, for which 10 oil bodies of very small size (3 µm) were identified.

The last eighty years (since Müller’s (1939) summary) were marked by a series of valuable works on liverwort oil bodies, including miscellaneous summaries in the introductory sections of certain papers. The relatively recent review by He et al. (2013) is an excellent account of the various aspects of liverwort oil body knowledge, and the authors analyze oil body studies with a focus on chemistry, ultrastructure organization, physiological functions, etc. Many papers have described the oil bodies’ external characteristics, such as the microscopic surface features, size, shape and number per cell. The goal of the present work is to provide a description of the external morphology of oil bodies, which was also the objective of the papers cited below.

Stewart (1978) provides several references for further studies on the morphology, taxonomy and anatomy (as much as possible with light microscopy) for oil bodies. All papers mentioned in his review and observed over the last 40 years fall into two groups: 1) focus on oil bodies as a self-sufficient research object or 2) treatment of oil bodies as a supplementary species characteristic for taxonomic monographs.

More publications belong to the second group. Moreover, providing data on oil body morphology became a popular focus of taxonomic revisions since the 1950s. Many monographs and manuals published from the mid-

dle of the 20th century (somewhat inconsistently at primary stages) include data on oil bodies. The most valuable books began with Müller (1951–1958) and Arnell (1956) and continued to Schuster (1966, 1969, 1974, 1980, 1992a, b), Paton (1999), Damsholt (2002), Schljakov (1979, 1980, 1981, 1982), Inoue (1974, 1976), etc. Not mentioned here are the numerous papers describing oil bodies as part of monograph studies of certain taxonomic units. However, at least two are more prominent and should inevitably be cited. These are Amakawa's treatment of Japanese Jungermanniaceae (Amakawa, 1959, 1960), Furuki's revision of Aneuraceae in Japan (Furuki, 1991) and the revision of epiphyllous liverworts of China by Zhu & So (2001). Among conditionally 'floristic' works, the valuable book on West Greenland Hepaticae by Schuster and Damsholt (1974) should also be mentioned because of the thoroughness of the laboratory study of oil bodies that was performed immediately after collecting the material in severe natural conditions. The studies of *Riccardia* and *Plectocolea* by Mejer (1959a, b) are also noticeable because they provide valuable information on oil bodies in these genera in tropical taxa. The present account does not aspire to list all such works, which represents a task that has become more difficult to manage due to the increasing number of publications. However, the publication of such works presumes the importance of studies on oil bodies of liverworts, at least for floristic and taxonomic practices.

Of course, considerably fewer papers have been devoted directly to oil bodies, especially papers that focus on the features of oil bodies to support morphological descriptions of taxa. The following valuable papers were published since Müller (1939), and they were specifically devoted to determining the oil body morphology by light microscopy and providing oil body line drawings (or photographs): 1) the study on oil bodies in Japanese liverworts by Hattori (1951, 1953), 2) the study on oil bodies in Lejeuneaceae by Schuster and Hattori (1954) and Schuster (1992c), 3) the study on oil bodies in Malayan liverworts by Inoue (1967), 4) the study on oil bodies in Andean Aneuraceae by Meenks and De Jong (1985), 5) the doctoral dissertation on oil bodies in South Appalachian leafy liverworts by Hicks (1973), 6) the study on oil bodies in hepaticas from Singapore by Juslen et al. (2001), 7) the study on oil bodies in African liverworts by Kis and Poós (1997), 8) the description of oil bodies in Chinese Lejeuneaceae by Zhu and Gradstein (2003), 9) the description of oil bodies in some liverworts from Sikkim by Singh et al. (2012), 10) the study on oil bodies in New Zealand liverworts by Stewart (1978), and 11) the account of oil bodies in liverworts collected in Pakistan (Furuki, 1993). The provided list is certainly not exhaustive and somewhat arbitrary, although it may provide insights on the state of knowledge in this field. We should also mention the Tremblay (2016) dissertation, which suggested the exceptional 'ancientry' oil cells scat-

tered in simple thallose Paleozoic liverworts. He et al. (2013) mentioned that the most basal group of liverworts, including Haplomitriales and Treubiales, are units with principally different oil body characteristics (scattered in thallus oil cells, with one large oil body within Treubiales and numerous small and homogeneous oil bodies in Haplomitriales). Schuster (1992c) conceptualized the plesiomorphic nature of small numerous oil bodies (similar or smaller in size as chloroplasts), whereas the report by Tremblay (2016) showed the plesiomorphic nature of scattered oil cells. Thus, this noticeable contradiction requires further investigation.

The vast majority of works published in the 20th century depict oil bodies using a line art technique, although intravital grayscale photography of oil bodies was widely used as early as Amakawa (1959). In contrast, the first decades of the 21st century, which were marked by the wide distribution of colored photographs due to the widespread use of digital cameras, resulted in the ability to immediately observe the imagery and easily obtain many repeated images. In addition, methods of producing layer-by-layer photographs and machine stacking photographs were realized within the last ten years using various software programs.

Oil bodies are present in liverworts not only in leaves and stems but also in seta and spores, as illustrated by Müller (1939), Suire (1966), Pihakaski (1972a, b), etc. However, the most widely used taxonomic and routine identification process focuses on the features of oil bodies distributed in leaf cells of leafy liverworts and the thalli of thallose liverworts. Our work is restricted to oil bodies observed in leaves of leafy liverworts and thalli of simple thallose liverworts. We do not provide photographs of oil cells in Marchantiopsida (with one exception for *Monosolenium*) and thus limit the sampling to Jungermanniopsida and Haplomitriopsida.

Within the last decade, we have conducted several field expeditions that collected many live materials, which were then studied in various laboratories. Approximately 15000 photographs (including layerwise series) were taken of the collected specimens. Most expeditions took place in Pacific Asia (in the boundaries outlined in the Materials and Methods); therefore, the second limitation of our work is the regional linkage over this large and diverse territory, although photomicrographs of oil bodies sampled from other areas are used in several cases.

To summarize, the main goal of the present work is to provide and systematize the information on oil bodies in leafy and simple thallose groups of liverworts sampled from Pacific Asia within the last decade and stored in the VBGI.

MATERIAL AND METHODS

Area

Pacific Asia is an unofficial name for the huge land area stretching from the northern extremes at the Arctic Ocean shore (including Herald and Wrangell Islands

within the Chukchi Sea), along the western fringe of Pacific Ocean (300–2000 km strip of land inward to the continental mainland) to the southern extremes of the Malayan Peninsula bordered by the Indian Ocean in the West and Pacific Ocean in the East. This land area covers at least three floristic regions within two floristic kingdoms: the Circumboreal and East Asian Regions in the Holarctic Kingdom and Indochinese Region in the Paleotropical Kingdom, which is based on Takhtajan (1979, 1986). Other authors (Chen et al., 2018; Wu & Wu, 1996) have treated the East Asian region as a self-dependent kingdom and subdivided it into two floristic subkingdoms ('*Rhododendron*' and '*Metasequoia*'). Naturally, the vegetation in this extraordinary latitudinal diapason experiences noticeable but gradual changes from the Arctic (Polar) deserts to typical tropical forests. Pacific Asia hosts one of the most durable pairings of mesophytic communities in the world. Woody vegetation varies from tundra dwarf shrubs and crooked forests of *Pinus pumila* (Pall.) Regel and *Duschekia fruticosa* (Rupr.) Pouzar in the north and from boreal (coniferous) and temperate (broadleaf deciduous) forests to evergreen forests in the subtropics and tropics, and an interrupted gradient of almost 70 latitudinal degrees is observed. Certainly, the changes in liverwort flora across this land area are also noticeably high. The total species list in Pacific Asia includes species from the countries with the richest taxonomic diversity, such as China and Japan. Vietnam to the south is also one of the floristically richest countries in Asia and hosts close to 600 species. The Russian Far East hosts slightly over 400 species, although the flora is considerably different from that of Japan or China due to the presence of many Arctic-Montane and Arctic taxa, including those of the Beringian distribution. Therefore, the total list is an artificial mixture of various geographic flora elements, and the approximate number of liverwort species is close to 1400–1500, which is approximately 1/5 (or more) of the total liverwort diversity in the world (cf. Söderström et al., 2016).

Sampling and microscopy

The basic limitation for the number of included specimens was the amount of fresh material we were able to deliver to the laboratory, process and then photograph within the last 9 years (starting from the spring of 2012). The most frequently used camera was an Olympus UC30 camera installed on an Olympus CX31 microscope in the laboratory of cryptogamic biota at the Botanical Garden Institute (herbarium VBGI), and it represented the main but not the only source of oil body photographs. Many photographs were produced in other laboratories using cameras and microscopes provided to the herbarium curators: CBM, JNU, and HN. In total, over 15000 oil body photographs were obtained, including layerwise photographs. In the next step, we selected photographs to illustrate the oil bodies in as many taxa as possible from Pacific Asia. If variations in oil body characteris-

tics among specimens were observed, then more than one photograph per species was included (up to 8 at the maximum). For comparison purposes, we included a limited number of photos of our dataset that included liverworts from other regions, such as Murmansk Province in north-western Russia, Taymyr Peninsula in the Siberian Arctic and Java Island in Indonesia. In all cases, the included species occurred in Pacific Asia but were not studied alive in the area or other oil body characteristics were observed in the 'alien' region. We occasionally observed variations in the oil body characteristics in one species within the same region. In the vast majority of cases, we could not identify the initial reason for the observed discrepancies. Two likely possible reasons of observed discrepancies should be noted: 1) the differences were based on simple morphological variations, and 2) the differences indicated the presence of different taxa.

The specimen statistics are as follows:

1) The total number of published photographs is 1032, which corresponds to approximately 990 specimens (some specimens were photographed twice, e.g., in the lower and upper parts of the leaf or the outer and inner cells of simple thallose liverworts).

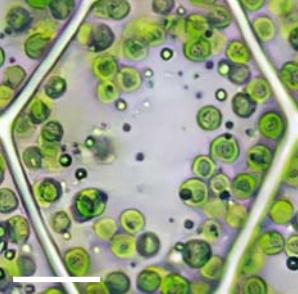
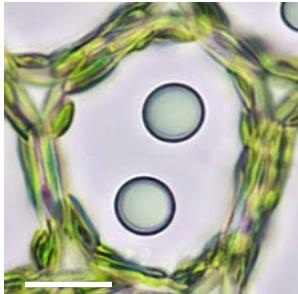
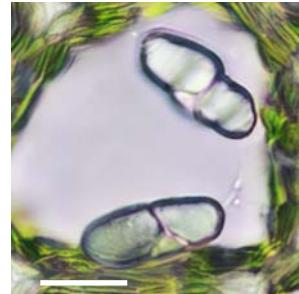
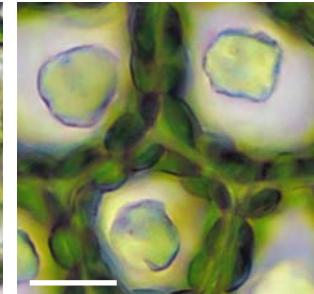
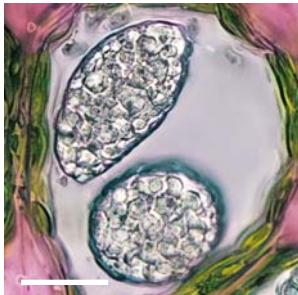
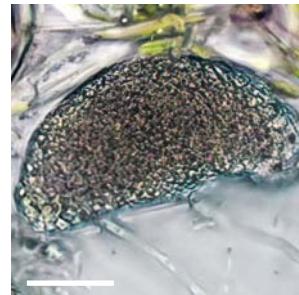
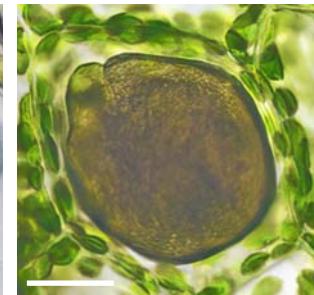
2) One-hundred twenty-five photographs were taken for specimens collected in China, 27 were taken for specimens from Indonesia, 68 were taken for specimens from Japan, 80 were taken for specimens from the Republic of Korea, 353 were taken for specimens from Russia and 379 were taken for specimens from Vietnam.

3) Five-hundred twelve photographs were taken for specimens collected by Bakalin, 29 were taken for specimens by Klimova, 451 were taken for specimens by Bakalin & Klimova, 10 were taken for specimens by Klimova & Bakalin, 2 were taken for specimens by Chernyagina (KAM), 8 were taken for specimens by Furuki (CBM), 6 were taken for specimens by Borovichev (KPABG) and 13 were taken for specimens by Fedosov (MW).

Specimen preparation

Although oil body characteristics have appeared in monographs and manuals for many years and their descriptions have been a vital part of traditional species diagnosis in recent papers, this feature is often not treated properly because oil bodies present unstable characteristics and commonly disappear soon after the first artificial drying; moreover, in warm temperatures, moist plants are commonly attacked by fungi whose toxins seem to accelerate the deterioration of oil bodies in specimens that are not dried properly. These features are certainly not the 'fault' of plants and do not provide an argument against using oil body features; rather, they indicate that photographs should be taken as soon as possible after sample collection. Therefore, time restriction is one of the main factors guiding our work. The following treatment may be recommended for gathered specimens. The collected material was stored in a refrigerator (not freezer) as soon as possible. However, in subarctic and Arctic

Table 1. Main types of oil bodies. Scale bars are 10 µm for all.

			
Small putative oil bodies	Smooth	Segmented	Crumbling paper ball
Very small oil bodies 0.5–1.5 µm in diameter, commonly numerous and generally unstable (chaotically present or absent in the same species) [Metzgeria]	No visible segmentation is discernible [Nardia]	Oil body with smooth surface, loosely or distinctly divided into 2–4 sometimes unclear segments [Nardia]	Oil bodies are similar to crumbling paper ball; always spherical, with many cavities in the surface [Plectocolea]
			
Botryoidal	Coarsely granulate	Granulate	Finely granulate
Oil body resembling grape cluster, composed of 6–15 distinct segments, each 4–8 µm in diameter [Plectocolea]	The transitional type between botryoidal and granulate oil bodies, surface with numerous granules, each 1–3 µm in diameter [Plectocolea]	Surface with numerous granules, each less 1 µm in diameter [Plectocolea]	Surface indistinctly rough [Apotreubia]

areas, especially when collected specimens are kept out of direct sunlight, they may survive in the field for 2 or 3 weeks in shady locations with daily mean temperatures below 10 °C. In the tropics, however, the specimens should be refrigerated within 3–4 days; otherwise, oil body deterioration will become prominent. Within the refrigerator, the specimens need to be kept at 1–5 °C. After the specimens are placed in the refrigerator, they may be studied within 3–4 weeks. The most delicate are the oil bodies of Aneuraceae (especially *Riccardia*) and Calypogeiaceae, and these groups should be studied within the first week after collection. Genera such as *Porella* and *Frullania* may be refrigerated without visible oil body deterioration for 4–6 weeks if they are not attacked by mold fungus. To maintain live material with surviving oil bodies for longer periods, the material should be placed in the refrigerator immediately and processed for very gradual freezing passing 0°C over several days. The frozen specimens may then be refrigerated at a temperature of –20 °C or below (tested up to –90°), and under such conditions, they may be kept for several years (a maxi-

mum of 5 years of direct observation occurs in our laboratory) if not longer. However, some groups lost oil bodies completely, regardless of whether they were frozen gradually or suddenly. The latter mostly applies to tropical Lejeuneaceae, which do not seem to be preadapted to temperatures below zero. Moreover, *Riccardia* (in all cases) and *Calypogea* (the vast majority of taxa, regardless of collection location, e.g., subarctic) lose their oil bodies at the first freezing. When the specimens are held in the refrigerator, oil body deterioration may occur very gradually and appears as the formation of increasingly coarse granules compared with the fresh specimens. However, in the vast majority of cases, no visible evidence of deterioration occurs, and the cells start to lose oil bodies suddenly until all cells are deprived of oil bodies.

Photograph preparation

Most of the photographs were taken with an ×40 objective, and although some were taken with an ×63 objective (the latter objective was not always available and sometimes introduced additional optical aberrations). However, due to the different characteristics of the mi-

croscope prism and camera matrix field, photographs taken with different cameras did not have the same scale. Taking the figures obtained in the VBGI as the ‘standard’ (because the largest set was obtained at this location), we modified the size of the other photos to ensure that the scales were equal to that obtained by camera in the VBGI.

After this operation, the photographs were divided into three large groups depending on the cell size. Since the cell size in the leaves and thalli varies by ten times or more within hepaticas (e.g., from 5–7 µm wide in *Gymnomitrion alpinum* and *Cephaloziella* to 50–70(–200) µm wide in *Mylia* and *Riccardia*), providing all pictures with the same scale would not be appropriate. Therefore, the groups were conditionally named ‘big cells’, ‘middle-sized cells’ and ‘small cells’. Differentiating the groups at the micrometer scale is impossible because of the principle we used for photograph grouping: photographs obtained from the same genus generally were not separated into different groups (e.g., with ‘small’ and ‘middle-sized’ cells) because the cell size and oil body size would be easy to compare from species to species within the genus. This introduced issues for certain genera (e.g., in *Cololejeunea*) where the cell diameter occasionally varies by three or more times. Nevertheless, we followed the latter principle as much as possible.

Complete photographs obtained with the microscope camera could not be presented because it would cover an A4-sized sheet of paper. Therefore, we selected a fragment of the original camera snapshot that included as many elements as possible. The inevitable result of this ‘optimization’ was the omission of some data; however, the oil body descriptions are based on the whole picture.

Oil body descriptions

After the oil bodies were photographed, they were manually measured using the obtained photographs and the descriptions were compiled.

Since our work was inspired by the need to collect and summarize data on oil bodies and provide these data as guidance for florists and taxonomists, our classification and understanding of oil bodies in this work is purely utilitarian. However, oil bodies can be of different origins, such as from endoplasmic reticulum cisternae or Golgi-derived vesicles, and they may be difficult to distinguish from cytoplasmic lipid droplets under a light microscope (e.g., *Cephalozia*, *Kurzia*, *Metzgeria*, cf. He, 2013). Therefore, in terms of our purely practical and artificial classification, the following definitions are used in the descriptions:

1) Oil bodies number per cell. This parameter is not simple to estimate because in the various sites of the leaf, the mean oil body number per cell varies. Marginal cells commonly have fewer oil bodies per cell (with several exceptions, e.g., in *Scapania gymnostomophila*), whereas the number of oil bodies per cell in the leaf base is higher than that in the midleaf. In the vast majority of

cases, we photographed and measured the number of oil bodies per cell in the midleaf. In any other cases where oil bodies were photographed, e.g., in the leaf margin or leaf base, the location is indicated in the description. Moreover, the elements of the cell network, such as vitta and oblong cells or ocelli (*Herbertus*, *Frullania*, etc.), introduced additional issues. In all these cases, the origin of the data on the oil bodies (vitta, vitta adjacent cells, etc.) is indicated.

The oil body number is commonly provided as two numerals, thus showing the range that includes 90% of the data. The data provided in brackets show the numerical data observed in 10% of cases or rarer, which was noted as “rare” (concerning size, shape, number, etc.), thus indicating that the probability of occurrence is less than 10% in the original photograph (fragment of which is published).

A small oil body that is much smaller than the main oil body in the cell was called a satellite. This situation is quite common in *Radula*. Very small smooth-surfaced oil bodies like structure (less than 1.5 µm) are called small putative oil bodies. Some of them may have surrounding membrane and some do not have it. In the present study we could not estimate which variant is in hand and regarded them as the single category. These small putative oil bodies are present in some genera which commonly regarded as oil bodies free (*Cephalozia*, *Nowellia*, *Metzgeria*, etc.). Their presence in the cell is very unstable, in our estimation the southern specimens (tropical and subtropical in origin) have small putative oil bodies more commonly than in the same genera (and even the species) from northern latitudes.

2) Oil body surface structure. The variation of surface structure in oil bodies may be reproduced as the series of states when the smooth-surfaced oil bodies experienced increasingly fine structuring, as indicated below:

> smooth > segmented > botryoidal > granulate.

Moreover, this structuring is not a one-way oriented trend but rather a cyclic regularity since very finely granulate oil bodies are sometimes difficult to distinguish from smooth oil bodies. Since phylogenetic aspects are not included in the provided scheme, this structuring may be used for purely descriptive reasons only. Occasionally, we had to identify intermediate characteristics, e.g., “coarsely granulate” for oil bodies structured much more coarsely than typical granulate but not botryoidal (= grape cluster) or “finely granulate” for a surface that is grading to smooth but not yet smooth. The only additional surface type not included in the present scheme was the “crumpled paper ball” type, which is presented here in *Plectocolea virgata* and *Nardia breidlerii* only. The listed main types of oil bodies surface are illustrated in Table 1

A special case is the description of lipophilic globules, which are commonly referred to as ‘eyes’ within oil bodies in keys and morphological descriptions. Follow-

ing this tradition, we maintain the use of ‘eye’ in the description. In the vast majority of species, oil bodies have no distinct eye, although in some taxa, from one eye (e.g., *Lophozia silvicola*) to several eyes (e.g., 1–7 per oil body in *Plectocolea radicellosa*) are present. The ‘eyes’ may be situated on the surface of the oil body (the most common situation) or submerged into the oil body (rarely observed in *Plectocolea*).

3) Oil body shape. In addition to clearly spherical shapes, oil bodies possess a great variety of shapes that were variously named (sometimes volunteristically) in the literature. Actually, it is quite rare to observe purely fusiform or ellipsoidal oil bodies. Thus, we treated all oil bodies for which the ‘length’ and ‘width’ could be determined as oblong. The real shape (which is in many cases indescribable irregularly oblong) may be easily revealed by the photographs. The only character of the shape we also recognized was biconcave, which may be simply the result of plasmolysis or a similar process. Ocelli are widely known phenomena in some groups of liverworts, including some Lejeuneaceae and Frullaniaceae, when one (rarely two, which are mostly adjacent) very large oil body is distributed in the cell and commonly fills the cell lumen; these cases are described separately. Ocelli are not differentiated from ‘oil cells’, although Amakawa (1960) distinguished oil cells in *Plectocolea tetragona* from oil cells of Marchantiales, because chloroplasts are observed in the former but supposedly absent in the latter. However, as shown by Galatis et al. (1978), Kronestedt (1983), Suire (2000) and He et al. (2013), ‘true’ ocelli also have chloroplasts, although they occupy less of the common cell.

4) Oil body color. In the vast majority of cases, the oil body color simply reflects the color of chloroplasts or cell walls or even surrounding matter. However, some genera are characterized by independent variation in this parameter, and some species may possess special and easily distinguished colors. Besides some species of *Porella* or *Lejeunea*, where oil bodies have a light bluish tinge (which varies based on subjective impressions), there are several genera where the color is prominently evident, such as in *Calypogeia*, the genus including the taxa with blue oil bodies (even grading to purple in *C. aeruginosa*). The phenomenon of blue color is due to the extensive accumulation of blue azulene derivatives (Suire et al., 2000). Species of *Radula*, *Conoscyphus*, some *Plectocolea* and several other genera are characterized by oil bodies of distinctly brown color.

Final precautions

1) Within one leaf, the cell size sometimes varies greatly, e.g., especially in *Bazzania*, to a lesser extent in *Plagiochila*. Therefore, although we tried to measure oil bodies and photograph the cells within the leaf middle, some variations from photograph to photograph occurred; thus, the cell size (especially in various specimens) could vary greatly.

2) The oil body surface characteristics (rarely oil body size) may change depending on the storage conditions. Some fragmentation (looking as coarsely granulate oil body surface) may occur in some taxa; therefore, ‘old’ specimens may show different features compared with very fresh specimens. Such photographs were excluded from consideration where possible, although in some cases when the deterioration was not obvious, such photographs might be used in the study unintentionally.

3) The oil body eye is a structure highly sensitive to storage conditions and the time between collection and microscopy examination. These structures can easily disappear with time or appear unexpectedly (which represents a morphologically analogous but not homologous structure). For obvious cases, we eliminated such photographs, although some cases were not obvious. Moreover, in several species, oil bodies have not yet been described; therefore, we could not decide whether the ‘eye’ present in the oil body is typical for the taxon or occurred because of a deterioration aberration. When series of such cases were observed, we certainly included such information in the descriptions and provided the photographs. In several other cases when the reasons were not so obvious.

4) Sometimes plants from geographically remote areas are identical (or nearly so) in all essential morphological features but their oil body characteristics will differ. This discrepancy might be the result of simple morphological variations in oil bodies or reflect genetic differences between populations. Since we were not able to check the genetic identity for all such cases, we tried to include corresponding information with the photographs of all morphological ‘races’ and indicated that further study on the taxonomic identity of collected specimens is actually required.

5) When we photographed oil bodies, we did not plan to produce clear photographs of cell wall features (e.g., trigones, intermediate thickenings, or middle lamina between cells). Moreover, due to the different focuses, it was commonly impossible to obtain clear photographs of cell walls and oil bodies in the same photograph. Therefore, in many cases, the series of oil body photographs not be used to reveal or describe cell wall features.

6) All scale bars in the catalogue are 30 µm. We used three scales in the photographs (namely, ‘small’, ‘middle-sized’ and ‘big’ cells), trying to maintain the same scale within one genus and focus on the dominant cell size in the genus, even if the cell size varied greatly from taxon to taxon. Such variations are especially obvious in *Cololejeunea*, where the cell width sometimes differed by three or more times; however, all *Cololejeunea* taxa were regarded as taxa with ‘small cells’, thus ensuring that the photographs were visually comparable. Similar problems occurred in *Marsupella*, *Gymnomitrion*, etc. In addition, one exclusion was noticeable: the vast majority of *Porella* were characterized by cells more than

25 µm wide; therefore, the genus should fall to the ‘middle-sized’ category. However, since oil bodies in *Porella* are distinctively small and numerous, to provide adequate pictures, the genus was included in the group of taxa with ‘small’ cells.

7) The range of oil body variations is poorly understood in many species. In some cases, the oil body features may slightly vary and be species-specific, whereas in other, the variation within the species may coincide with the variation within the section (which we attempted to illustrate when sufficient photos were available). For instance, the oil body variation in *Scapania parvifolia* is quite significant and generally similar with the variation in *S. mucronata*. However, the oil bodies variation in *Scapania praetervisa* (morphologically and genetically belonging to the same section) are different from those in *S. parvifolia* and *S. mucronata* and seem to be only slightly variable.

8) Oil body photographs were taken from the midleaf if otherwise not indicated. In the case of strongly bilobed (sometimes near the base) or conduplicate leaves (*Scapania*, *Lejeunea*, etc.), the cells were photographed in the middle part of the largest lobe.

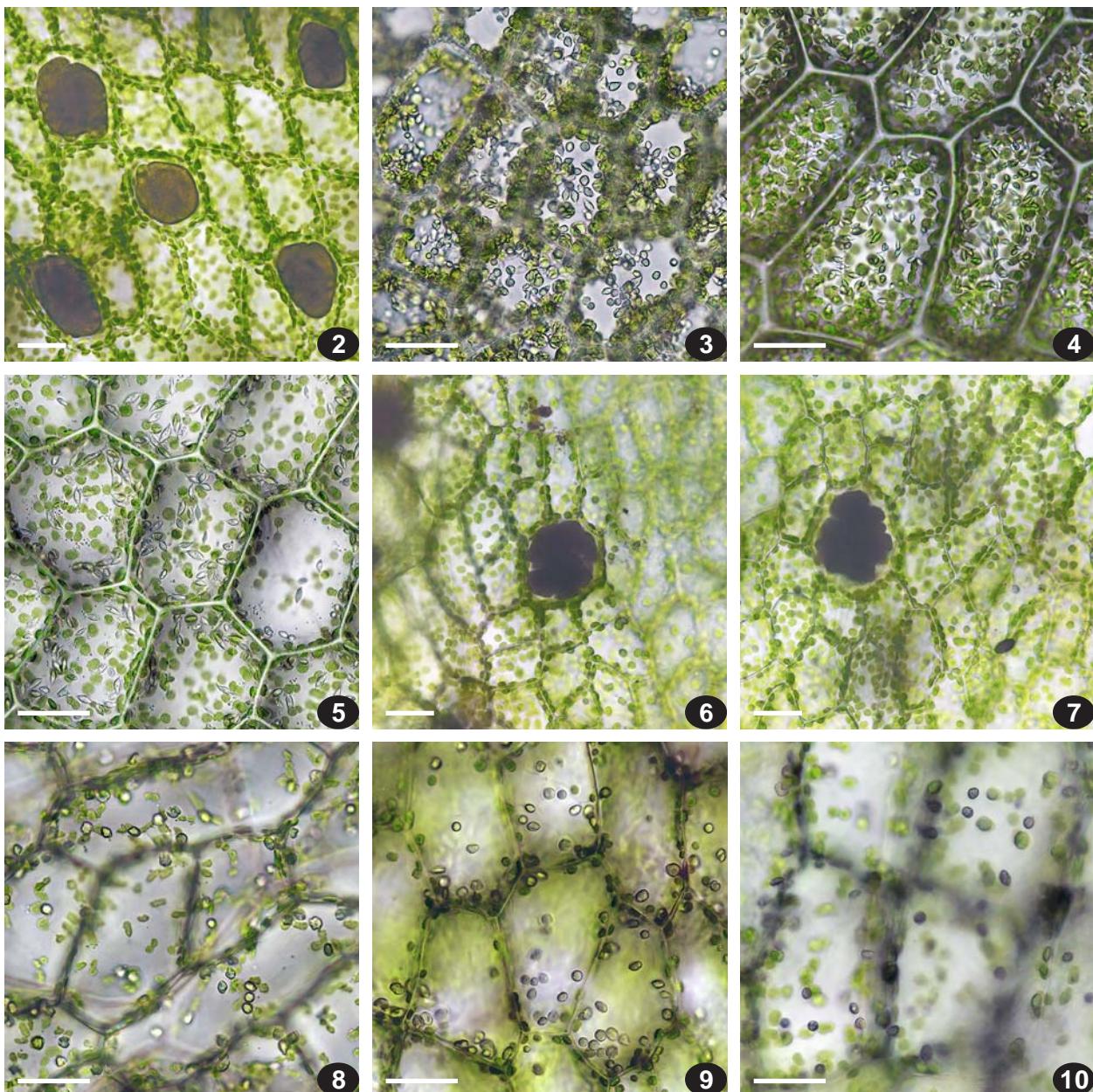
9) The generic treatments in the list mostly follow Söderström et al. (2016), with the following exceptions: 1) the narrow genus concept was applied in Solenostomataceae, 2) *Pseudolophozia* was recognized as distinct from *Barbilophozia* and *Leucolejeunea* is treated separately from *Cheilolejeunea*. Despite arguments provided by Ye & Zhu (2010) and Ye et al. (2015) we guess this complex may require further splitting into several genera. Species are arranged alphabetically within genera, genera are arranged alphabetically within families, and families are generally arranged following the system proposed by Crandall-Stotler et al. (2009).

10) the photographs in high resolution (1600x1600 dpi) are available online via the permanent link <http://oil-bodies.hepaticae.ru/>

DISCUSSION

Oil bodies vary in the number per cell, size, surface characteristics, and even color. In the vast majority of liverwort genera, oil bodies are colorless or have a very faint tinge (grayish, brownish, bluish). On the other hand, there are a number of genera characterized by a wide distribution of colored oil bodies. The most common are brown colored oil bodies (*Riccardia*, *Plectocolea*, *Radula*, etc.). Oil bodies of the genus *Calypogeia* occupy a

special place in terms of the variety of colors. In this genus, along with colorless and brownish oil bodies, there are completely unusual color options. Oil bodies may be pale to dark blue and brown-blue, and even purple (*Calypogeia aeruginosa*). By the surface characteristics, the most common are granulate oil bodies. The remaining groups are less common. Although within the genera *Calypogeia* and, in part, *Plagiochila*, botryoidal oil bodies are widespread. *Cephaloziella* and *Porella* are dominating by smooth oil bodies. The greatest variety of surfaces is found in the genera *Plectocolea* (all common types, except for completely smooth-surfaced), *Nardia*, *Plagiochila* (except for smooth-surfaced). On the contrary, the oil body surface stability occurs in such large genera as *Frullania*, *Lophozia*, *Scapania* (everywhere only granulate, with minor modifications). A number of genera either do not have oil bodies, or have small putative oil bodies, these are *Cephalozia*, *Metzgeria*, *Nowellia*, *Pseudolepicolea*, etc. By the number of oil bodies (excluding small putative oil bodies), most genera have 10 to 30 oil bodies per cell. The largest numbers are known within the ancient *Haplomitrium*, as well as in more “advanced” genera, such as *Lejeunea*, *Obtusifolium*, *Schistochilopsis*, *Porella*. One oil body is known in many genera. The genus *Radula* is characterized by the greatest constancy in this feature; the vast majority of species in the genus has one oil body per each leaf cell. A special case are isolated “oil cells”, with 1-2 large oil bodies per some cells in the leaf (or thallus), while the neighboring cells do not have oil bodies at all. Such oil cells are widespread in complex thallose liverworts (only *Monosolenium* is illustrated), and among other groups (of those presented here) are known in *Plectocolea* and *Apotreubia*. These large oil bodies occurring in “oil cells” somewhat resemble ocelli, present in several genera (*Frullania*, *Eremontus*, several genera in Lejeuneaceae). However, ocelli surrounded cells commonly have smaller and more or less numerous oil bodies. In other words the variation of oil bodies across liverworts is comparable with the variation characteristics of some morphological features, e.g. trigones in the leaf cell: some genera have entirely small-sized or large-sized trigones, while some genera are characterized by the great variation in this parameter. As in the provided example, the oil body features are commonly ‘working’ at the species level identification, but rarely so on the genus level and even more rarely on the level of the family.



OIL BODIES DESCRIPTION (all scales 30 µm)

Treubiaceae

Apotreubia nana (S.Hatt. et Inoue) S.Hatt. et Mizut.

Fig. 2: Oil bodies in specified cells, 28–40×40–55 µm, finely granulate, brown – RUSSIA, KHABAROVSK TERRITORY, Bakalin, kh-27-1-16.

Haplomitriaceae

Haplomitrium hookeri (Lyell ex Sm.) Nees

Fig. 3: Oil bodies 20–30(–35) per cell, spherical, 2–4 µm in diameter, oblong 3–5×2–3 µm, unclearly segmented – RUSSIA, SAKHALIN PROVINCE, Bakalin, k-70-19-15.

Haplomitrium mnioides (Lindb.) R.M.Schust.

Fig. 4: Oil bodies 50–70 per cell, spherical, 1.5–2 µm in diameter, oblong 3–5×1.5–3 µm, smooth to segmented – JAPAN, KOCHI PREFECTURE, Bakalin, j-10-25-15.

Fig. 5: Oil bodies 18–35 per cell, rarely spherical, 2 µm in diameter, commonly oblong 3–8(–10)×1.5–2.5(–3) µm, finely granulate, some biconcave – VIETNAM, CAO BANG PROVINCE, Bakalin & Klimova, v-22-4-20.

Monosoleniaceae

Monosolenium tenerum Griff.

Fig. 6: Oil bodies 1 per specialized cell, spherical 45 µm in diameter, segmented, brown – CHINA, GUIZHOU PROVINCE, Bakalin, china-53-25-13_2.

Fig. 7: Oil bodies 1 per specialized cell, oblong, 57×50 µm, segmented, brown – CHINA, GUIZHOU PROVINCE, Bakalin, china-53-25-13_3.

Pelliaceae

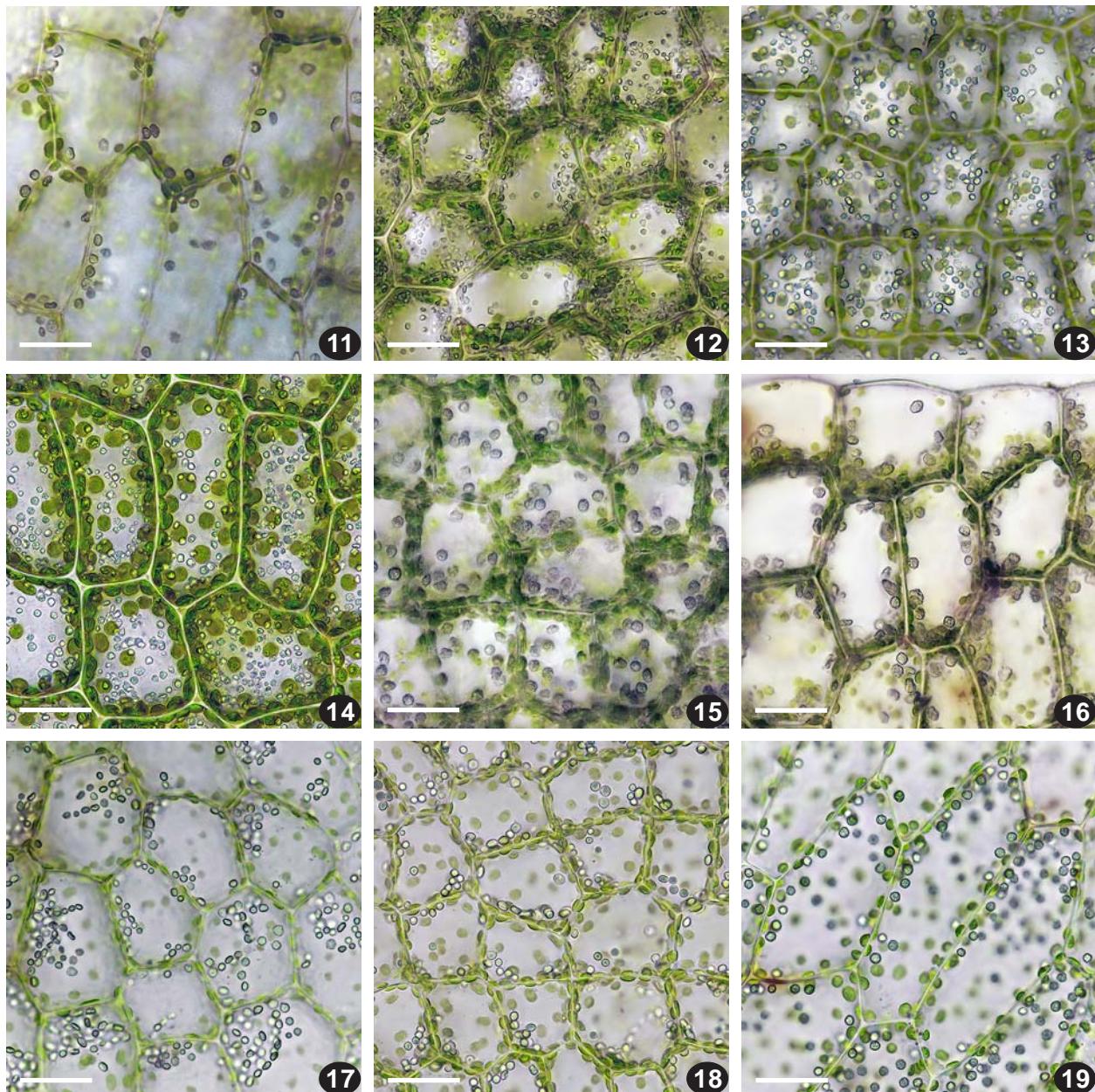
Pellia endiviifolia (Dicks.) Dumort.

Fig. 8: Oil bodies (8–)10–15(–20) per cell, spherical, 4–5 µm in diameter, oblong 5–6×4–5 µm, coarsely granulate – RUSSIA, SAKHALIN PROVINCE, Bakalin, k-72-2-15.

Fig. 9: Oil bodies 10–20 per cell, spherical, 4–6 µm in diameter, oblong 5–8×4–5 µm, finely granulate, sometimes bi-concave – VIETNAM, LAO CAI PROVINCE, Bakalin & Klimova, v-10-30-17.

Pellia neesiana (Gottsche) Limpr.

Fig. 10: Oil bodies 10–20 per cell, spherical, 4–5 µm in diameter, oblong 5–7×4–5 µm, granulate – JAPAN, TOTTORI PREFECTURE, Bakalin, j-1-37-13.



Pellia neesiana (Gottsche) Limpr.

Fig. 11: Oil bodies 10–20 per cell, spherical, 3–4 µm in diameter, oblong 4–5(–6)×3–4 µm, finely granulate, sometimes biconcave – RUSSIA, MAGADAN PROVINCE, Bakalin, mag-21-33-14.

Calyculariaceae

Calycularia crispula Mitt.

Fig. 12: Oil bodies 26–57 per cell, spherical, 1.5–3 µm in diameter to oblong 1.5–2×2–3 µm, granulate – CHINA, YUNNAN PROVINCE, Bakalin, c-75-10-18.

Calycularia laxa Lindb. et Arnell

Fig. 13: Oil bodies 20–36 per cell, spherical, 2–3 µm in diameter, oblong 2–3×1.5–2.5 µm, granulate, but looks as botryoidal since the oil body is composed by only a few granules – REPUBLIC OF KOREA, JEJU-DO, Bakalin, kor-29-29-15.

Fig. 14: Oil bodies 30–48 per cell, spherical, 3–4 µm in diameter, granulate, but looks as botryoidal since the oil body is composed by only a few granules – REPUBLIC OF KOREA, JEOLLABUK-DO, Bakalin, kor-71-3-19.

Makinoaceae

Makinoa crispata (Steph.) Miyake

Fig. 15: Oil bodies 7–15 per cell, spherical, (3–)4–7 µm in diameter, oblong 5–7×4–5(7) µm, granulate – VIETNAM, SON LA PROVINCE, Bakalin & Klimova, v-24-21-19.

Fig. 16: Oil bodies 5–12(18) per cell, spherical, 4–6 µm in diameter, oblong 4–8×4–6 µm, granulate – VIETNAM, SON LA PROVINCE, Bakalin & Klimova, v-24-4-19.

Fossumbroniaceae

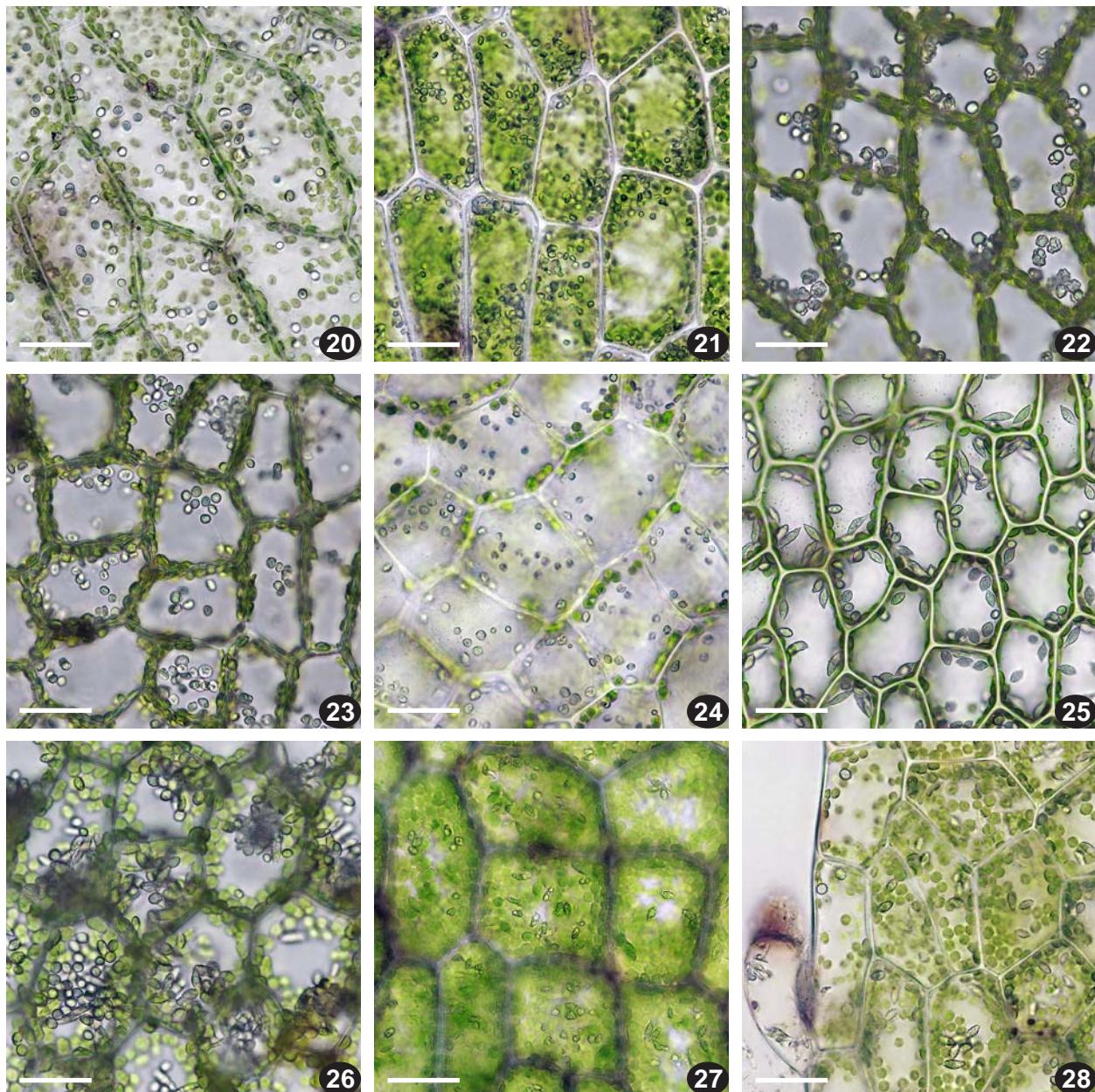
Fossumbronia alaskana Steere et Inoue

Fig. 17: Oil bodies 16–29 per cell, spherical 2–4 µm in diameter, oblong 3–5×1.5–3 µm, loosely segmented – RUSSIA, MAGADAN PROVINCE, Bakalin, mag-30-9-14.

Fig. 18: Oil bodies 8–20 per cell, spherical, 2–5 µm in diameter, oblong 3–5×2–4 µm, smooth – RUSSIA, PRIMORSKY TERRITORY, Klimova, prim-98-3-19.

Fossumbronia japonica Schiffn.

Fig. 19: Oil bodies 25–45 per cell, spherical, 3–5 µm in diameter, granulate – INDONESIA, JAVA ISLAND, Bakalin, java-2-7-15.



Fossumbronia japonica Schiffn.

Fig. 20: Oil bodies 13–23 per cell, spherical, 3–5 µm in diameter, oblong 4–6×3–4(–5) µm, finely granulate, some biconcave – VIETNAM, HA GIANG PROVINCE, Bakalin & Klimova, v-18-8-20.

Moerckiaceae

Hattorianthus erimonus (Steph.) R.M.Schust. et Inoue

Fig. 21: Oil bodies 30–50 per cell, spherical, 1.5–3 µm in diameter, oblong 3–4×1.5–2.5 µm, segmented to botryoidal – RUSSIA, PRIMORSKY TERRITORY, Klimova & Bakalin, prim-19-9-16.

Moerckia blyttii (Müller) Brockm.

Fig. 22: Oil bodies 8–15 per cell, spherical, 4–6 µm in diameter, oblong 4–7×4–6 µm, botryoidal to roughly segmented – RUSSIA, SAKHALIN PROVINCE, Borovichev, be-236-15.

Moerckia flotoviana (Nees) Schiffn.

Fig. 23: Oil bodies 6–20 per cell, spherical, 3–6 µm in diameter, oblong 4–8×3–5 µm, smooth to segmented, biconcave – RUSSIA, KAMCHATKA TERRITORY, Bakalin, k-58-13-15.

Fig. 24: Oil bodies 15–30 per cell, spherical, 2–4 µm in

diameter, oblong 3–5×2–3 µm, granulate, sometimes biconcave – RUSSIA, KAMCHATKA TERRITORY, Klimova, kam-53-39-16.

Pallaviciniaceae

Pallavicinia ambigua (Mitt.) Steph.

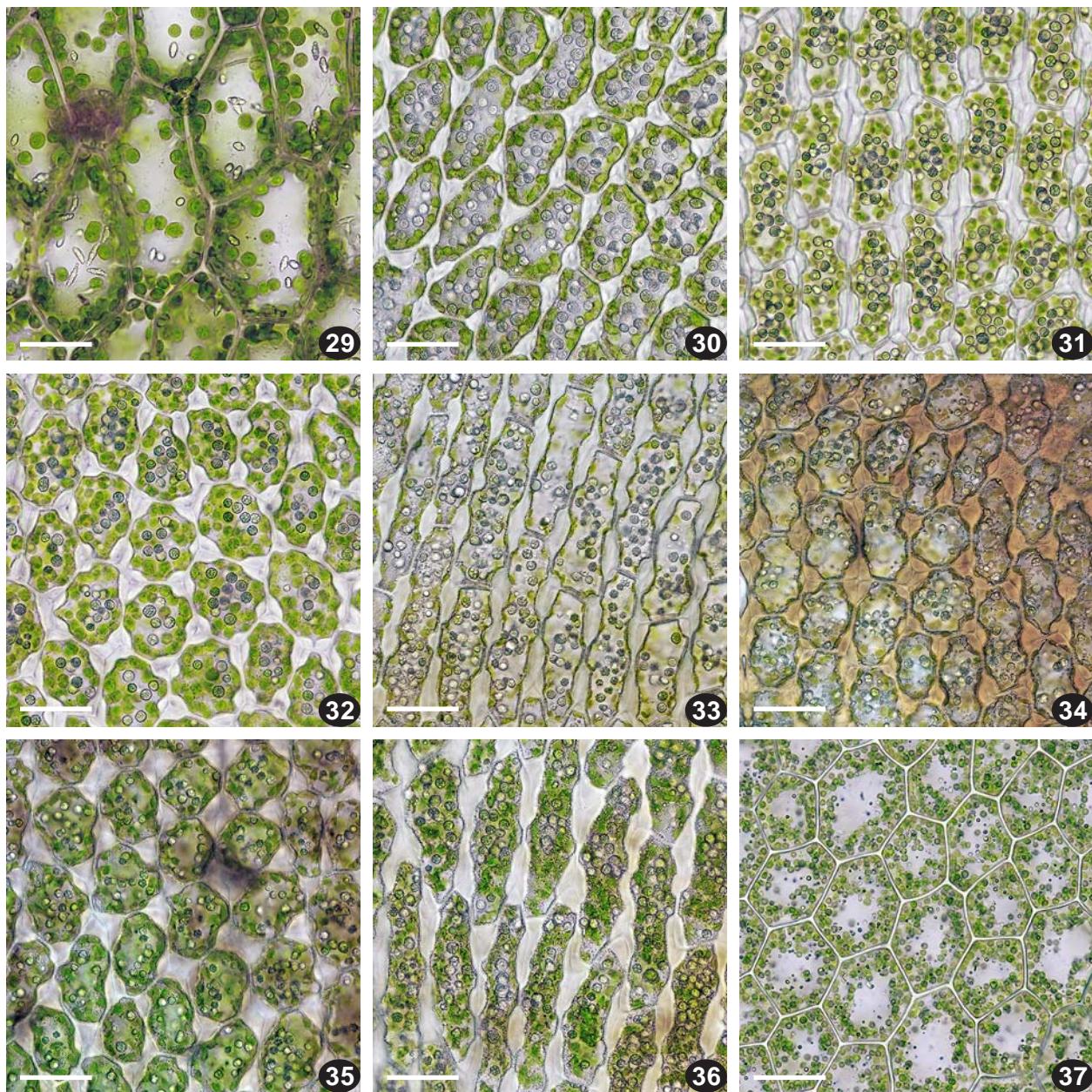
Fig. 25: Oil bodies 7–15 per cell, spherical, 3–4(–5) µm in diameter, oblong 5–16×3–4 µm, granulate – CHINA, GUIZHOU PROVINCE, Bakalin, china-55-44-13.

Pallavicinia levieri Schiffn.

Fig. 26: Oil bodies (15–)20–30 per cell, spherical, (3–)4–5 µm in diameter, oblong 6–12(–16)×4–5 µm, granulate – JAPAN, KOCHI PREFECTURE, Bakalin, j-4-2-15.

Fig. 27: Oil bodies (5–)10–25 per cell, spherical, 2.5–3 µm in diameter, oblong 3–8×2–3 µm, coarsely granulate – VIETNAM, LANG SON PROVINCE, Bakalin & Klimova, v-32-3-20.

Fig. 28: Oil bodies 7–15 per cell, spherical, oblong 5–10×3–4(–5) µm, granulate – VIETNAM, LAO CAI PROVINCE, Bakalin & Klimova, v-3-60-17.



Pallavicinia lyellii (Hook.) Gray

Fig. 29: Oil bodies 10–20 per cell, oblong 4–12×2–3(–4) µm, botryoidal – VIETNAM, SON LA PROVINCE, Bakalin & Klimova, v-19-21-19.

Pleuroziaceae

Pleurozia acinosa (Mitt.) Trevis.

Fig. 30: Oil bodies 9–14 per cell, spherical, 3–5 µm in diameter, rarely oblong 5–7(–8)×4–5 µm, granulate – VIETNAM, CAO BANG PROVINCE, Bakalin & Klimova, v-28-27-20_7.

Pleurozia gigantea (F. Weber) Lindb.

Fig. 31: Oil bodies in the lower part of the leaf 18–25 per cell, spherical, 3–5 µm in diameter, coarsely granulate – VIETNAM, LAI CHAU PROVINCE, Bakalin & Klimova, v-13-6-19_6.

Fig. 32: Oil bodies 6–15 per cell, spherical, 3–5 µm in diameter, coarsely granulate – VIETNAM, LAI CHAU PROVINCE, Bakalin & Klimova, v-13-6-19_9.

Pleurozia subinflata (Austin) Austin

Fig. 33: Oil bodies in lower part of the leaf 10–30 per cell,

spherical, 3–4(–5) µm in diameter, coarsely granulate to botryoidal – VIETNAM, HA GIANG PROVINCE, Bakalin & Klimova, v-14-10-20_2.

Fig. 34: Oil bodies 7–15 per cell, spherical, 3–4 µm in diameter, coarsely granulate to botryoidal – VIETNAM, HA GIANG PROVINCE, Bakalin & Klimova, v-14-10-20_4.

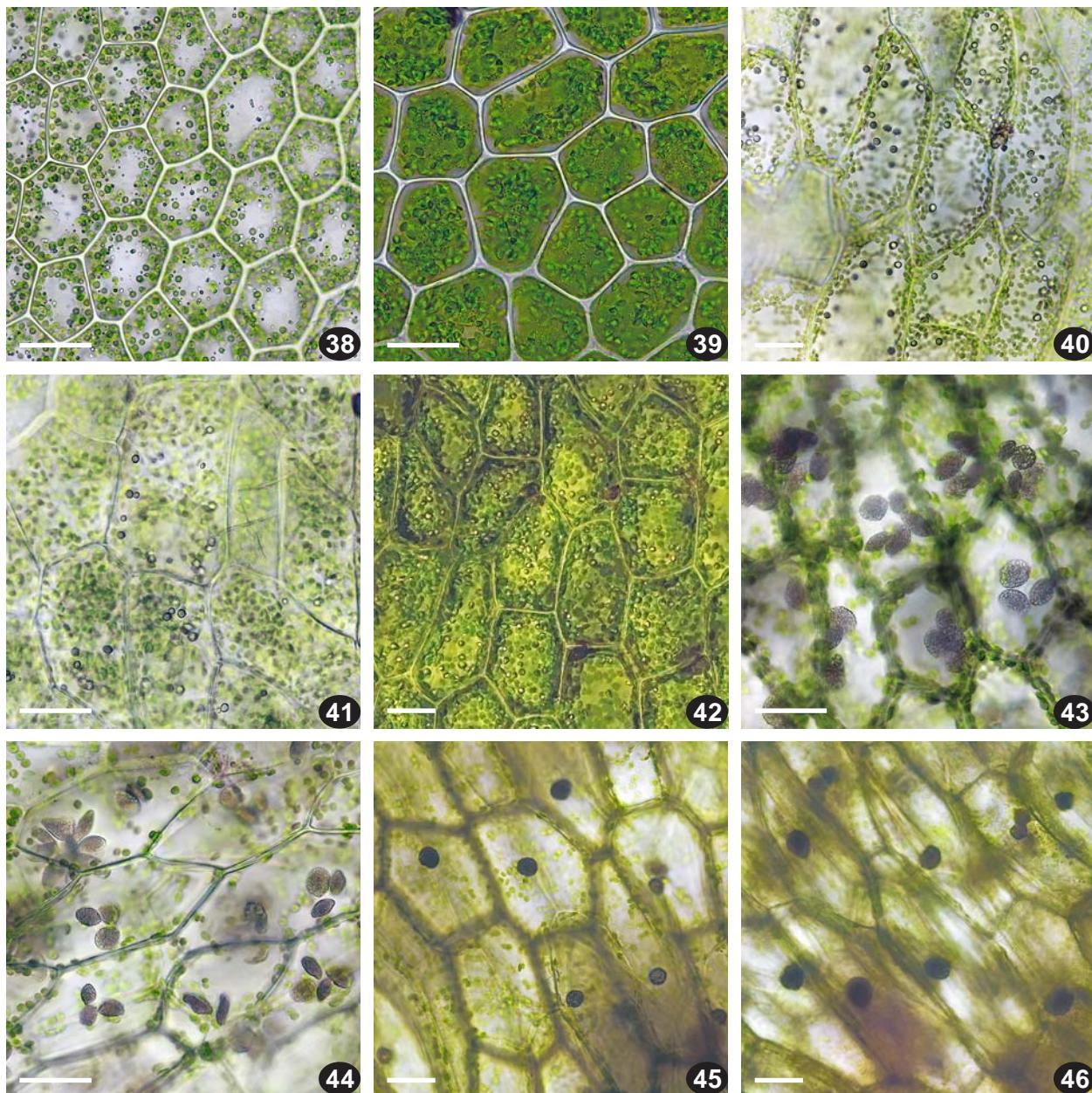
Fig. 35: Oil bodies 6–15 per cell, spherical, 2–4 µm in diameter, coarsely granulate to botryoidal – VIETNAM, LANG SON PROVINCE, Bakalin & Klimova, v-31-27-20_2.

Fig. 36: Oil bodies in lower part of the leaf 11–22 per cell, spherical, 3–5 µm in diameter, coarsely granulate to botryoidal – VIETNAM, LANG SON PROVINCE, Bakalin & Klimova, v-31-27-20_4.

Metzgeriaceae

Metzgeria lindbergii Schiffn.

Fig. 37: Small putative oil bodies 20–30 per cell, spherical, 1–1.5 µm in diameter, smooth – CHINA, YUNNAN PROVINCE, Bakalin, c-88-74-18_7.



Metzgeria lindbergii Schiffn.

Fig. 38: Small putative oil bodies 20–40 per cell, spherical, 0.5–1.5 µm in diameter, smooth – CHINA, YUNNAN PROVINCE, Bakalin, c-88-74-18_9.

Metzgeria temperata Kuwah.

Fig. 39: Small putative oil bodies >40 per cell, spherical, 0.5 µm in diameter, smooth – REPUBLIC OF KOREA, GANGWON-DO, Bakalin, kor-66-7-19.

Aneuraceae

Aneura maxima (Schiffn.) Steph.

Fig. 40: Oil bodies in epidermal cells 15–25 per cell, spherical 2–5 µm in diameter, granulate – REPUBLIC OF KOREA, GYEONGSANGNAM-DO, Bakalin, kor-44-1-14.

Aneura pinguis (L.) Dumort.

Fig. 41: Oil bodies in epidermal cells 15–25 per cell, spherical, 2–4 µm in diameter, granulate – VIETNAM, LAI CHAU PROVINCE, Bakalin & Klimova, v-8-10-18.

Fig. 42: Oil bodies in epidermal cells 15–32 per cell, spherical, 3–4 µm in diameter, oblong 4–5×3–4 µm, botryoidal – REPUBLIC

OF KOREA, GYEONGSANGNAM-DO, Bakalin, kor-69-1-19.

Comment: *Aneura pinguis* s.l. includes cryptic species (cf. Myszczyński et al., 2017), therefore, it is highly likely that our photographs from Korea and Vietnam belong to still undescribed taxa.

Lobatiriccardia coronopus (De Not.) Furuki

Fig. 43: Oil bodies in epidermal cells 3–6 per cell, spherical, 10–13 µm in diameter, oblong 10–18×7–12 µm, granulate, brownish – INDONESIA, JAVA ISLAND, Bakalin, java-3-75-15.

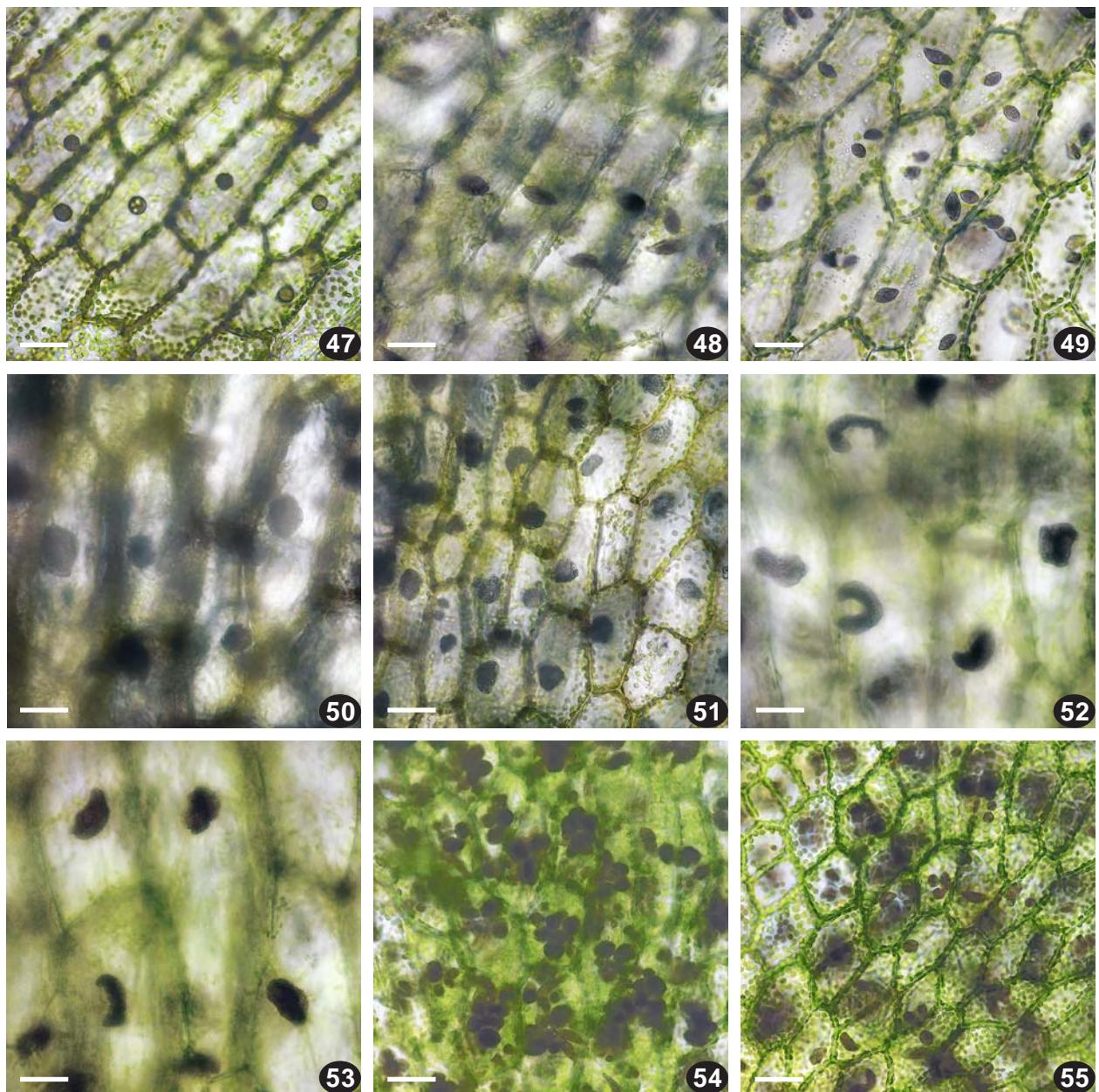
Lobatiriccardia yunnanensis Furuki et D.G.Long

Fig. 44: Oil bodies in epidermal cells 3–4 per cell, oblong 8–15×6–9 µm, 7–9 per inner cell, 14–18×6–8 µm, granulate, brownish – VIETNAM, LAO CAI PROVINCE, Bakalin & Klimova, v-3-91-17.

Riccardia chamedryfolia (With.) Grolle

Fig. 45: Oil bodies in epidermal cells 1 per cell, spherical, 10–14 µm in diameter, granulate, brownish – RUSSIA, SAKHALIN PROVINCE, Borovichev, Be-235-15.

Fig. 46: Oil bodies in inner cells 1–2 per cell, spherical, 10–16 µm in diameter, oblong 14–20×13–16 µm, granulate, brownish – RUSSIA, SAKHALIN PROVINCE, Borovichev, Be-235-15_3



Riccardia chamedryfolia (With.) Grolle

Fig. 47: Oil bodies in epidermal cells 1 per cell, spherical, 10–12 µm in diameter, granulate, brownish, rarely with central eye – RUSSIA, KAMCHATKA TERRITORY, Bakalin, k-58-2-15_6.

Fig. 48: Oil bodies in inner cells 1–2 per cell, oblong 15–25×8–12 µm, granulate, brownish – RUSSIA, SAKHALIN PROVINCE, Bakalin, s-48-28-16_3

Fig. 49: Oil bodies in epidermal cells 1–2 per cell, oblong 10–22×7–10 µm, granulate, brownish – RUSSIA, SAKHALIN PROVINCE, Bakalin, s-48-28-16_6.

Riccardia flavovirens Furuki

Fig. 50: Oil bodies in inner cells 1(–2) per cell, spherical, 15–25 µm in diameter, oblong 18–30×15–22 µm, granulate, brownish – VIETNAM, LAO CAI PROVINCE, Bakalin, v-1-15-16.

Fig. 51: Oil bodies in epidermal cells 1(–3) per cell, spherical, (8)–12–15 µm in diameter, oblong 13–25×10–15 µm,

coarsely granulate, brownish – VIETNAM, LAO CAI PROVINCE, Bakalin, v-1-15-16_2.

Riccardia glauca Furuki

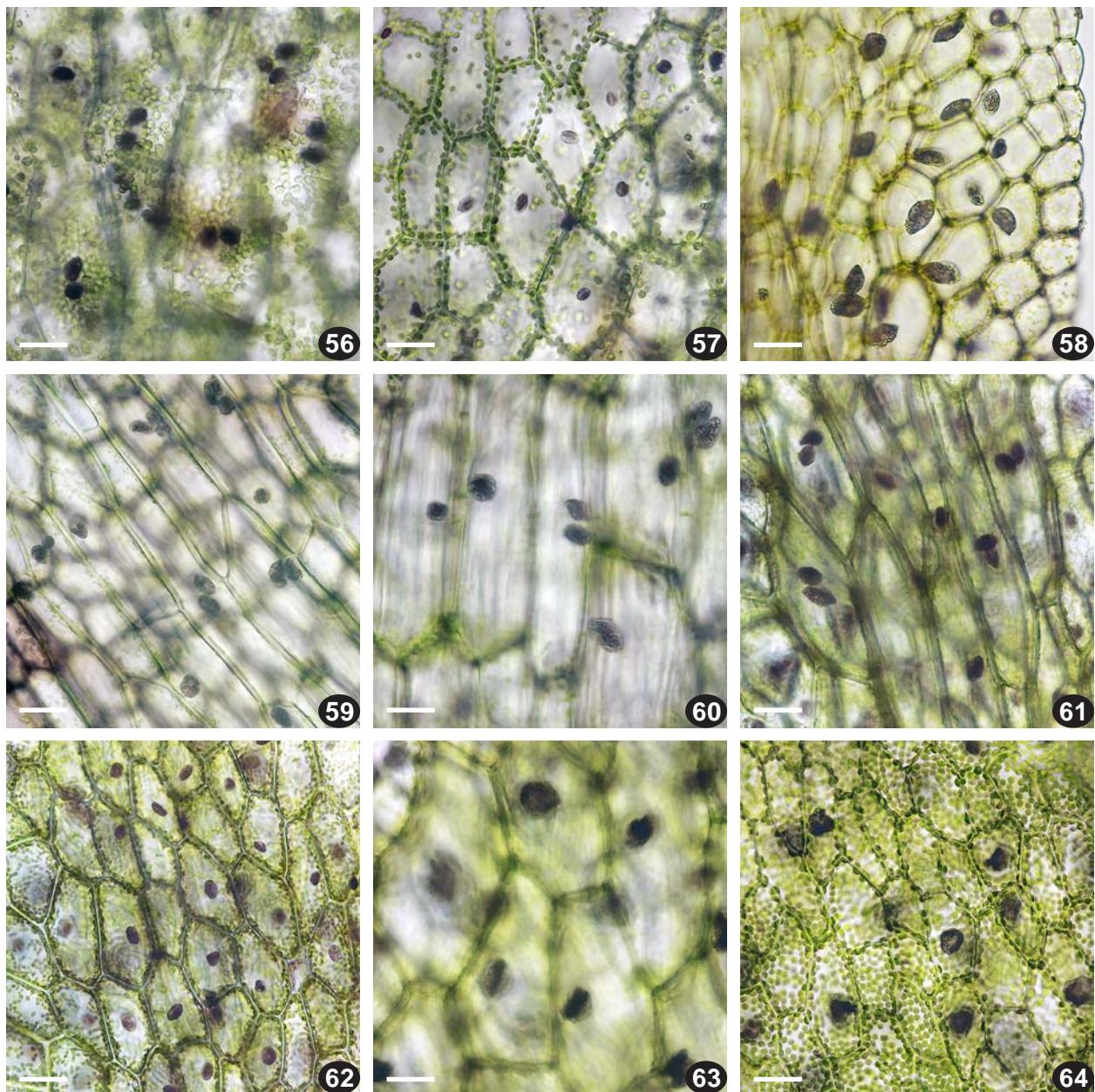
Fig. 52: Oil bodies in inner cells 1 per cell, oblong 22–50×8–20 µm, granulate, brownish, some C-shaped – VIETNAM, LAO CAI PROVINCE, Bakalin & Klimova, v-1-45-17.

Fig. 53: Oil bodies in inner cells 1 per cell, oblong 20–35×10–22 µm, granulate, brownish, rarely C-shaped – VIETNAM, LAO CAI PROVINCE, Bakalin & Klimova, v-1-45-17_3.

Riccardia graeffei (Steph.) Hewson

Fig. 54: Oil bodies in inner cells (2)–4–10 per cell, spherical, (3)–5–12 µm in diameter, oblong 7–20(–35)×5–10 µm, granulate, brownish – CHINA, GUIZHOU PROVINCE, Bakalin, china-55-49-13_3.

Fig. 55: Oil bodies in epidermal cells 1–3 per cell, spherical, 6–10 µm in diameter, oblong 7–17×5–8 µm, granulate, brownish – CHINA, GUIZHOU PROVINCE, Bakalin, china-55-49-13_5.



Riccardia latifronsoides Schiffn.

Fig. 56: Oil bodies in inner cells 2–3 per cell, spherical, 10–13 µm in diameter, oblong 12–16×9–12 µm, granulate, brownish – VIETNAM, LAO CAI PROVINCE, Bakalin & Klimova, v-3-37-17_5.

Fig. 57: Oil bodies in epidermal cells (0–)1 per cell, oblong 8–12×6–8 µm, granulate, brownish – VIETNAM, LAO CAI PROVINCE, Bakalin & Klimova, v-3-37-17_6.

Riccardia multifida subsp. *decrescens* (Steph.) Furuki

Fig. 58: Oil bodies in epidermal cells 1(–)2 per cell, spherical, 9–12 µm in diameter, oblong 12–27×10–16 µm, granulate to coarsely so – VIETNAM, LAO CAI PROVINCE, Bakalin & Klimova, v-5-60-17.

Fig. 59: Oil bodies in inner cells 1–2 per cell, spherical, 8–12 µm in diameter, oblong 12–18×8–10(–12) µm, granulate – VIETNAM, LAO CAI PROVINCE, Bakalin & Klimova, v-5-60-17_2.

Riccardia nagasakiensis (Steph.) S.Hatt.

Fig. 60: Oil bodies in inner cells 1–2 per cell, spherical, 12–18 µm in diameter, oblong 16–24×10–15 µm, granulate – VIETNAM, LAO CAI PROVINCE, Bakalin & Klimova, v-11-29-17.

Riccardia palmata (Hedw.) Carruth.

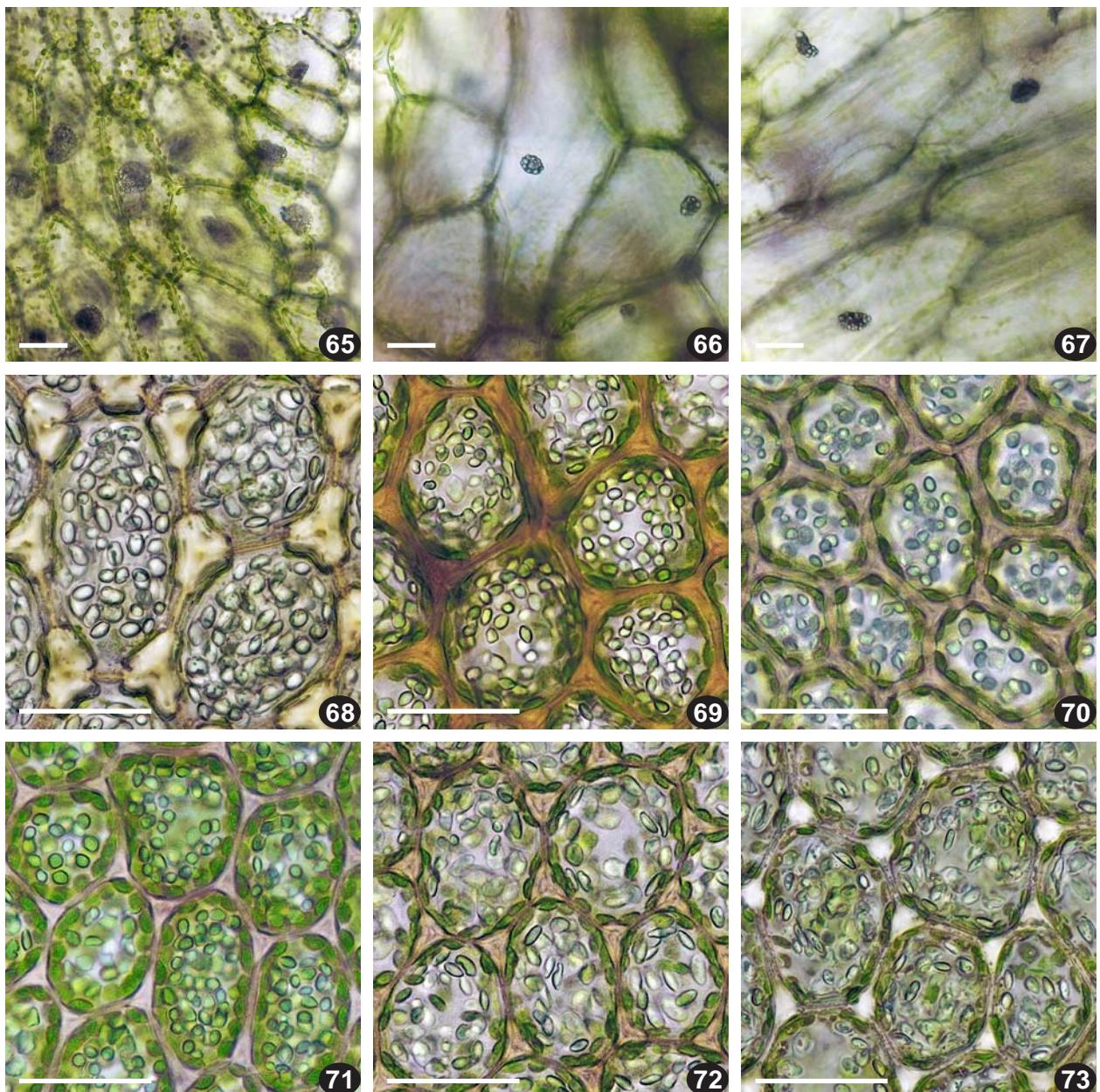
Fig. 61: Oil bodies in inner cells 1–2 per cell, oblong 13–25×7–12 µm, granulate, brownish – CHINA, GUIZHOU PROVINCE, Bakalin, china-56-23-13.

Fig. 62: Oil bodies in epidermal cells 1 per cell, oblong 8–13×6–10 µm, granulate, brownish – CHINA, GUIZHOU PROVINCE, Bakalin, china-56-23-13_2.

Riccardia parvula Schiffn.

Fig. 63: Oil bodies in inner cells 1 per cell, spherical, 15–20 µm in diameter, oblong 18–30×15–20 µm, granulate – VIETNAM, LAO CAI PROVINCE, Bakalin & Klimova, v-1-48-17_2.

Fig. 64: Oil bodies in epidermal cells 0–1 per cell, spherical, 15–18 µm in diameter, oblong 18–22×13–16 µm, granulate, brownish – VIETNAM, LAO CAI PROVINCE, Bakalin & Klimova, v-1-48-17_3.



Riccardia pusilla Grolle

Fig. 65: Oil bodies in inner cells 1 per cell, spherical, 17–20 μm in diameter, oblong 18–25 \times 15–20 μm , granulate – VIETNAM, LAO CAI PROVINCE, Bakalin & Klimova, v-10-7-17.

Riccardia tamariscina (Steph.) Schiffn.

Fig. 66: Oil bodies in inner cells 0–1 per cell, spherical, 12–14 μm in diameter, oblong 15–18 \times 10–12 μm , coarsely granulate to botryoidal – JAPAN, TOTTORI PREFECTURE, Bakalin, j-1-40-13.

Fig. 67: Oil bodies in inner cells 0–1 per cell, oblong 12–22 \times 10–15 μm , coarsely granulate to botryoidal – JAPAN, TOTTORI PREFECTURE, Bakalin, j-1-40-13_2.

Porellaceae

Porella acutifolia (Lehm. et Lindenb.) Trevis.

Fig. 68: Oil bodies 20–40 per cell, rarely spherical, 2–4 μm in diameter, oblong 3–8 \times 2–3 μm , smooth – VIETNAM, CAO BANG PROVINCE, Bakalin & Klimova, v-28-35-20.

Fig. 69: Oil bodies (15–)20–45 per cell, spherical, 2–3

μm in diameter, oblong 3–5 \times 2–3 μm , smooth, biconcave – VIETNAM, HOA BINH PROVINCE, Bakalin & Klimova, v-29-10-19.

Porella caespitans (Steph.) S.Hatt.

Fig. 70: Oil bodies (15–)20–30 per cell, spherical, 1.5–2.5 μm in diameter, oblong 2–4 \times 1.5–2.0 μm , smooth – RUSSIA, PRIMORSKY TERRITORY, Bakalin, p-34-7-14.

Porella caespitans var. *nipponica* S.Hatt.

Fig. 71: Oil bodies (13–)15–35 per cell, spherical, 2–3 μm in diameter, oblong 3–4(–5) \times 2–3 μm , smooth – CHINA, GUIZHOU PROVINCE, Bakalin, china-51-19-13.

Porella campylophylla (Lehm. et Lindenb.) Trevis.

Fig. 72: Oil bodies (12–)15–20 per cell, oblong 3–6(–8) \times 2–3(–4) μm , smooth, biconcave – CHINA, YUNNAN PROVINCE, Bakalin, c-88-6-18.

Fig. 73: Oil bodies 13–30 per cell, oblong 3–8 \times 2–3(–4) μm , smooth, some biconcave – VIETNAM, HA GIANG PROVINCE, Bakalin & Klimova, v-12-1-20.

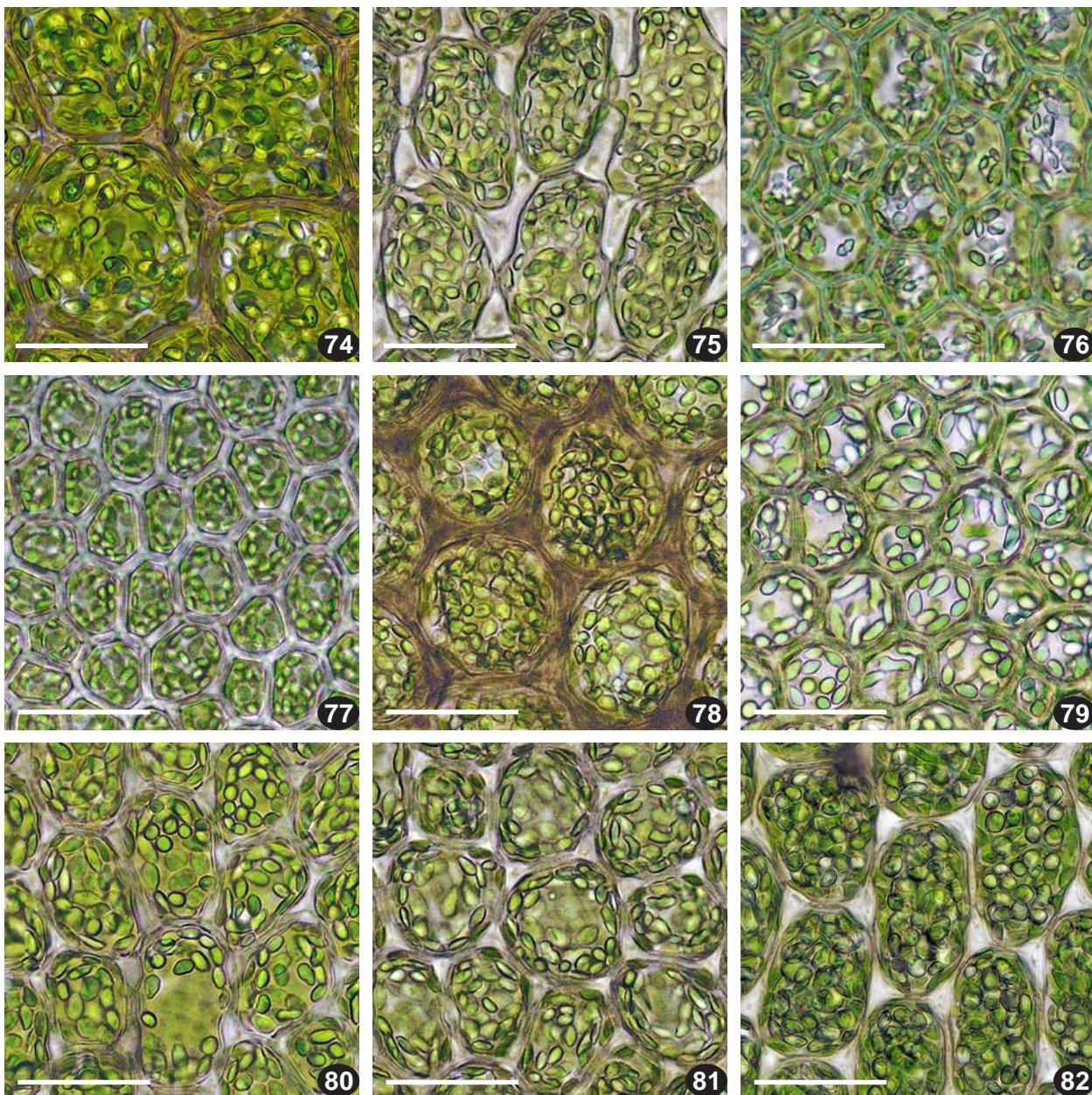
*Porella densifolia* (Steph.) S.Hatt.

Fig. 74: Oil bodies 17–23 per cell, spherical, 3–5 µm in diameter, oblong 4–6×3–5 µm, nearly smooth – REPUBLIC OF KOREA, GANGWON-DO, Bakalin, kor-63-7-19.

Fig. 75: Oil bodies 30–45(–50) per cell, spherical, 2–3 µm in diameter, oblong 3–5×2–3 µm, smooth, biconcave – VIETNAM, HOA BINH PROVINCE, Bakalin & Klimova, v-32-32-19.

Porella faurieri (Steph.) S.Hatt.

Fig. 76: Oil bodies (8–)10–20 per cell, spherical, 1.5–2.0 µm in diameter, oblong 3–5×2–3 µm, smooth, biconcave – RUSSIA, PRIMORSKY TERRITORY, Bakalin, p-36-12-15.

Porella gracillima Mitt.

Fig. 77: Oil bodies 5–10 per cell, spherical, 1.5–2.5 µm in diameter, oblong 2–3(–4)×1.5–2.5 µm, smooth – RUSSIA, PRIMORSKY TERRITORY, Bakalin, p-35-17-15.

Porella grandifolia (Steph.) S.Hatt.

Fig. 78: Oil bodies 30–45 per cell, spherical, 2–3 µm in diameter, oblong 3–4(–5)×2–3 µm, smooth, biconcave –

VIETNAM, HOA BINH PROVINCE, Bakalin & Klimova, v-32-30-19.

Porella japonica (Sande Lac.) Mitt.

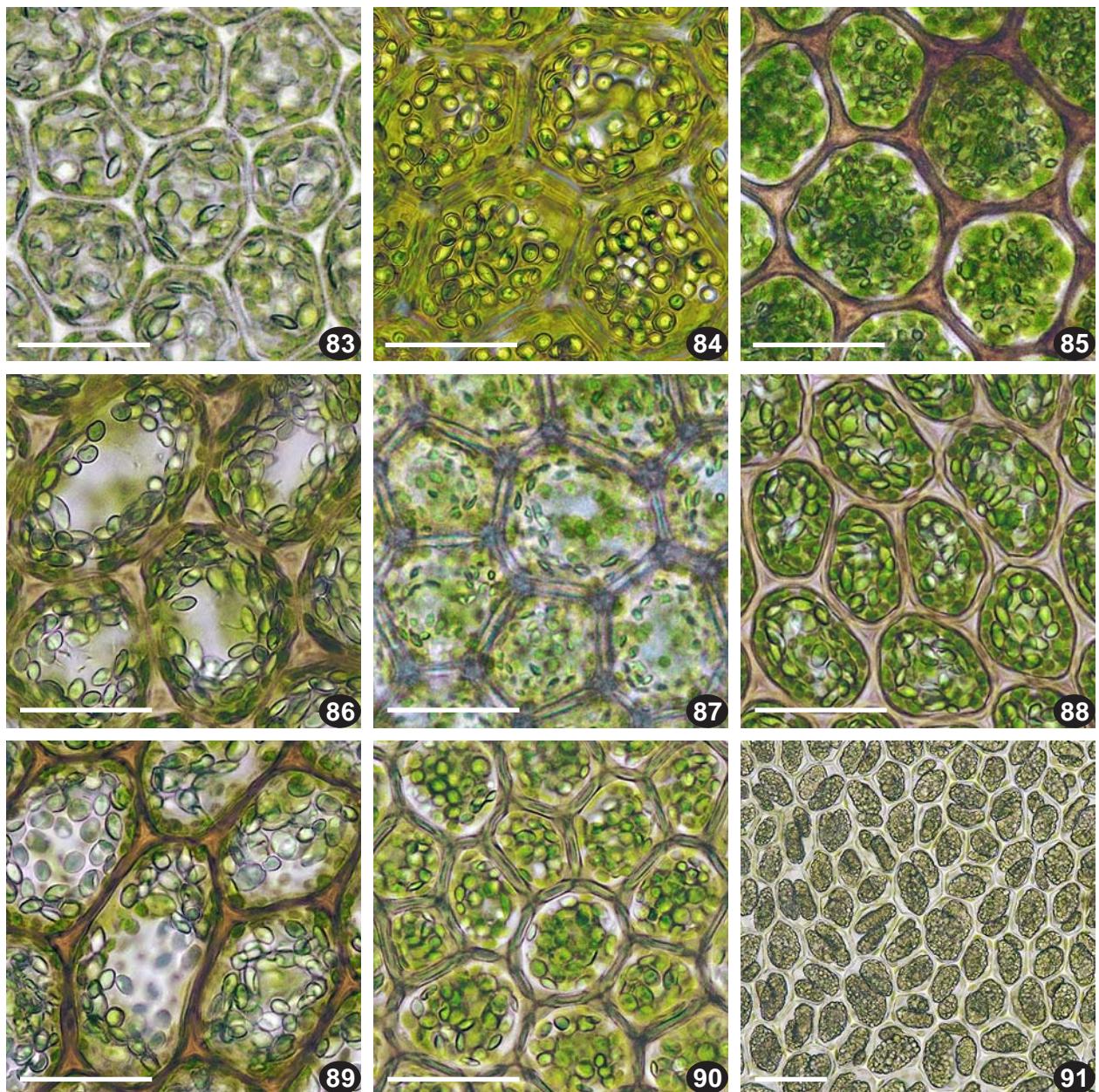
Fig. 79: Oil bodies 7–16(–20) per cell, spherical, (2–)3–4 µm in diameter, oblong 3–5(–6)×3–4(–5) µm, smooth – JAPAN, KOCHI PREFECTURE, Bakalin, j-7-4-13.

Fig. 80: Oil bodies (10–)15–22(–30) per cell, spherical, (2–)3–4 µm in diameter, oblong 3–6(–8)×(2–)3–4 µm, smooth, biconcave – VIETNAM, HOA BINH PROVINCE, Bakalin & Klimova, v-28-5-19.

Fig. 81: Oil bodies 14–25 per cell, spherical, 2–3 µm in diameter, oblong 4–6(–9)×3–4(–5) µm, smooth, biconcave – VIETNAM, HOA BINH PROVINCE, Bakalin & Klimova, v-32-26-19.

Porella nitens (Steph.) S.Hatt.

Fig. 82: Oil bodies 20–30 per cell, spherical, 3–4 µm in diameter, oblong 4–6×3–4(–5) µm, smooth – VIETNAM, HA GIANG PROVINCE, Bakalin & Klimova, v-1-2-20.



Porella oblongifolia S.Hatt.

Fig. 83: Oil bodies (10–)15–20(–25) per cell, spherical, 4–5(–6) μm in diameter, oblong 4–7(–9) \times 3–5 μm , smooth, biconcave – CHINA, YUNNAN PROVINCE, Bakalin, c-82-18-18.

Fig. 84: Oil bodies 22–30 per cell, spherical, (2–)3–4 μm in diameter, oblong 5–7 \times 3–4 μm , nearly smooth – REPUBLIC OF KOREA, GANGWON-DO, Bakalin, kor-67-2-19.

Porella obtusata var. *macroloba* (Steph.) S.Hatt. et M.X.Zhang

Fig. 85: Oil bodies 20–50 per cell, spherical, 1.5–2.0 μm in diameter, oblong 2–3(–4) \times 1.0–1.5 μm , smooth – RUSSIA, AMUR PROVINCE, Bakalin, am-63-5-18.

Porella perrottetiana (Mont.) Trevis.

Fig. 86: Oil bodies 20–40 per cell, spherical, 2–4 μm in diameter, oblong 3–7(–8) \times 2–4(–5) μm , smooth – VIETNAM, HOA BINH PROVINCE, Bakalin & Klimova, v-32-33-19.

Porella platyphylla (L.) Pfeiff.

Fig. 87: Oil bodies 20–35 per cell, spherical, 1–2 μm in diameter, oblong 2–3(–4) \times 1.0–1.5 μm , smooth – RUSSIA, PRIMORSKY TERRITORY, Bakalin, p-42-21-15.

Porella plumosa (Mitt.) Parihar

Fig. 88: Oil bodies 11–22(–25) per cell, spherical, 2–3(–4) μm in diameter, oblong 3–6(–8) \times 2–3(–4) μm , smooth – VIETNAM, LAI CHAU PROVINCE, Bakalin & Klimova, v-14-10-19.

Porella reflexigastria Pycs

Fig. 89: Oil bodies 12–30 per cell, spherical, 3–5 μm in diameter, oblong 4–6(–8) \times 3–4(–5) μm , smooth, biconcave – VIETNAM, HOA BINH PROVINCE, Bakalin & Klimova, v-28-28-19.

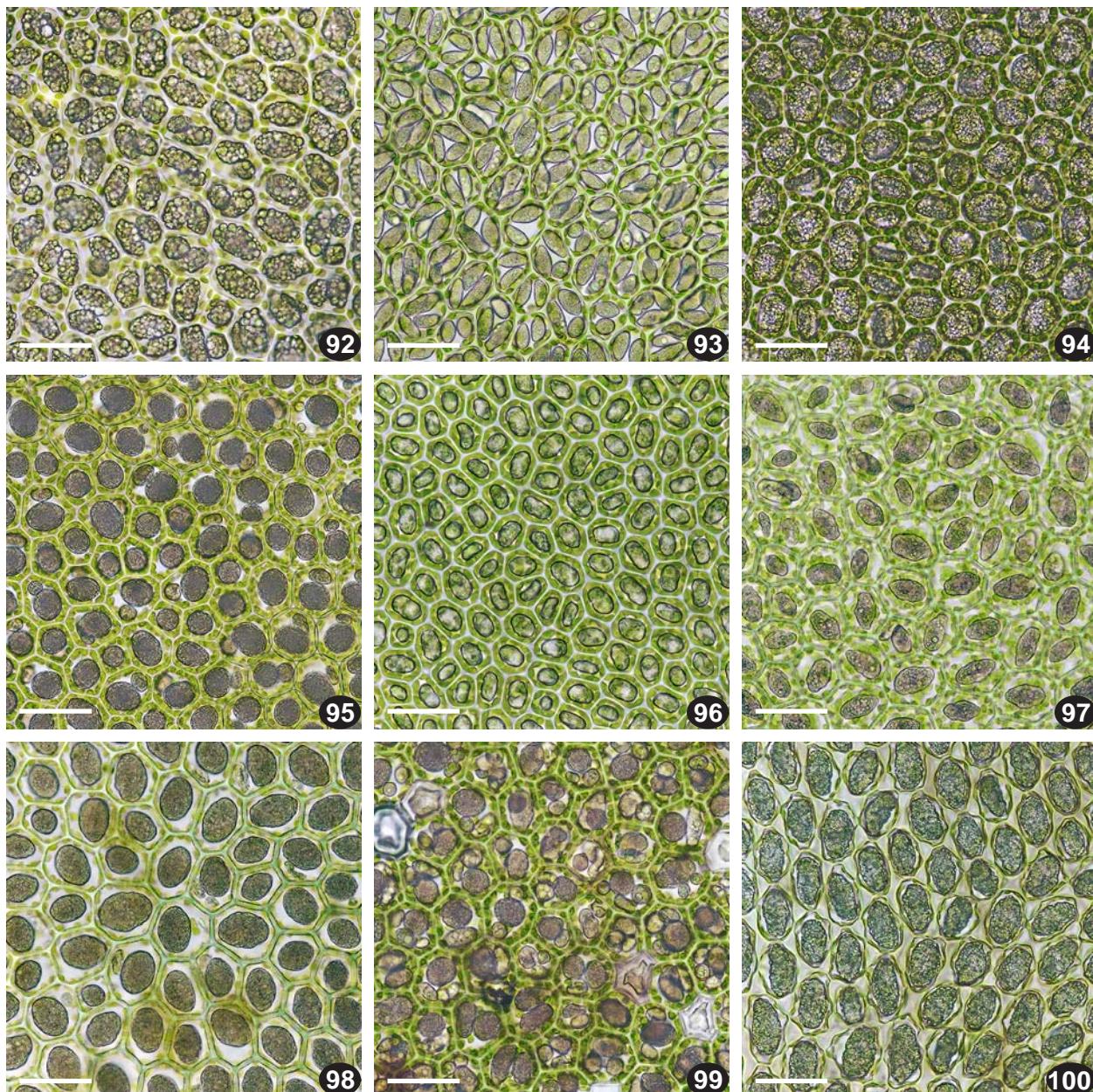
Porella vernicosa Lindb.

Fig. 90: Oil bodies (8–)10–30 per cell, spherical, (2–)3–4(–5) μm in diameter, oblong 4–5(–6) \times (2–)3–4 μm , smooth, biconcave – RUSSIA, KHABAROVSK TERRITORY, Bakalin & Klimova, kh-50-3-19.

Radulaceae

Radula acuminata Steph.

Fig. 91: Oil bodies 1–2(–4) per cell, including 1–3 satellites, spherical, 6–8 μm in diameter, oblong (8–)10–25 \times (5–)7–15 μm , coarsely granulate, brownish – VIETNAM, SON LA PROVINCE, Bakalin & Klimova, v-25-9b-19.



Radula acuminata Steph.

Fig. 92: Oil bodies 1–2 per cell, with one smaller satellite, spherical, 7–9 µm in diameter, oblong 10–21×(7–)9–15 µm, coarsely granulate, brownish – VIETNAM, LAO CAI PROVINCE, Bakalin & Klimova, v-2-6-17.

Radula apiculata Sande Lac. ex Steph.

Fig. 93: Oil bodies 2–3 per cell, rarely spherical, 5–6 µm in diameter, commonly oblong 7–17×5–8 µm, finely granulate, brownish – VIETNAM, LAO CAI PROVINCE, Bakalin & Klimova, v-3-62-17.

Radula auriculata Steph.

Fig. 94: Oil bodies 1 per cell, oblong 10–18×(6–)8–14 µm, coarsely granulate, brownish – JAPAN, YAMANASHI PREFECTURE, Bakalin, j-88-31-15.

Radula caduca K. Yamada

Fig. 95: Oil bodies 1(–2) per cell, spherical, 5–13 µm in diameter, oblong 7–17×(4–)5–13 µm, the second oil body, if present, is a small satellite, granulate, brownish – CHINA, YUNNAN PROVINCE, Bakalin, c-88-28-18.

Radula cavifolia Hampe ex Gottsche

Fig. 96: Oil bodies 1 per cell, oblong 8–15×5–9 µm, finely granulate – CHINA, GUIZHOU PROVINCE, Bakalin, china 55-2-13.

Radula complanata (L.) Dumort.

Fig. 97: Oil bodies 1(–2) per cell, oblong 17–20×7–11 µm, the second oil body, if present, is a small satellite, finely granulate, brownish – RUSSIA, KHABAROVSK TERRITORY, Bakalin & Klimova, kh-55-6-19.

Radula constricta Steph.

Fig. 98: Oil bodies 1(–2) per cell, oblong 11–25×(4–)10–16 µm, the second oil body, if present, is a small satellite, finely granulate, brownish – JAPAN, TOTTORI PREFECTURE, Bakalin, j-3-3-13.

Fig. 99: Oil bodies 2–4 per cell, spherical, 5–10(–14) µm in diameter, oblong 10–18×5–10 µm, granulate, brownish – RUSSIA, SAKHALIN PROVINCE, Bakalin, s-29-2-17.

Radula formosa (C.F.W.Meissn. ex Spreng.) Nees

Fig. 100: Oil bodies 1 per cell, oblong 5–22×(8–)10–12 µm, granulate, brownish – INDONESIA, JAVA ISLAND, Bakalin, java-3-8-15.

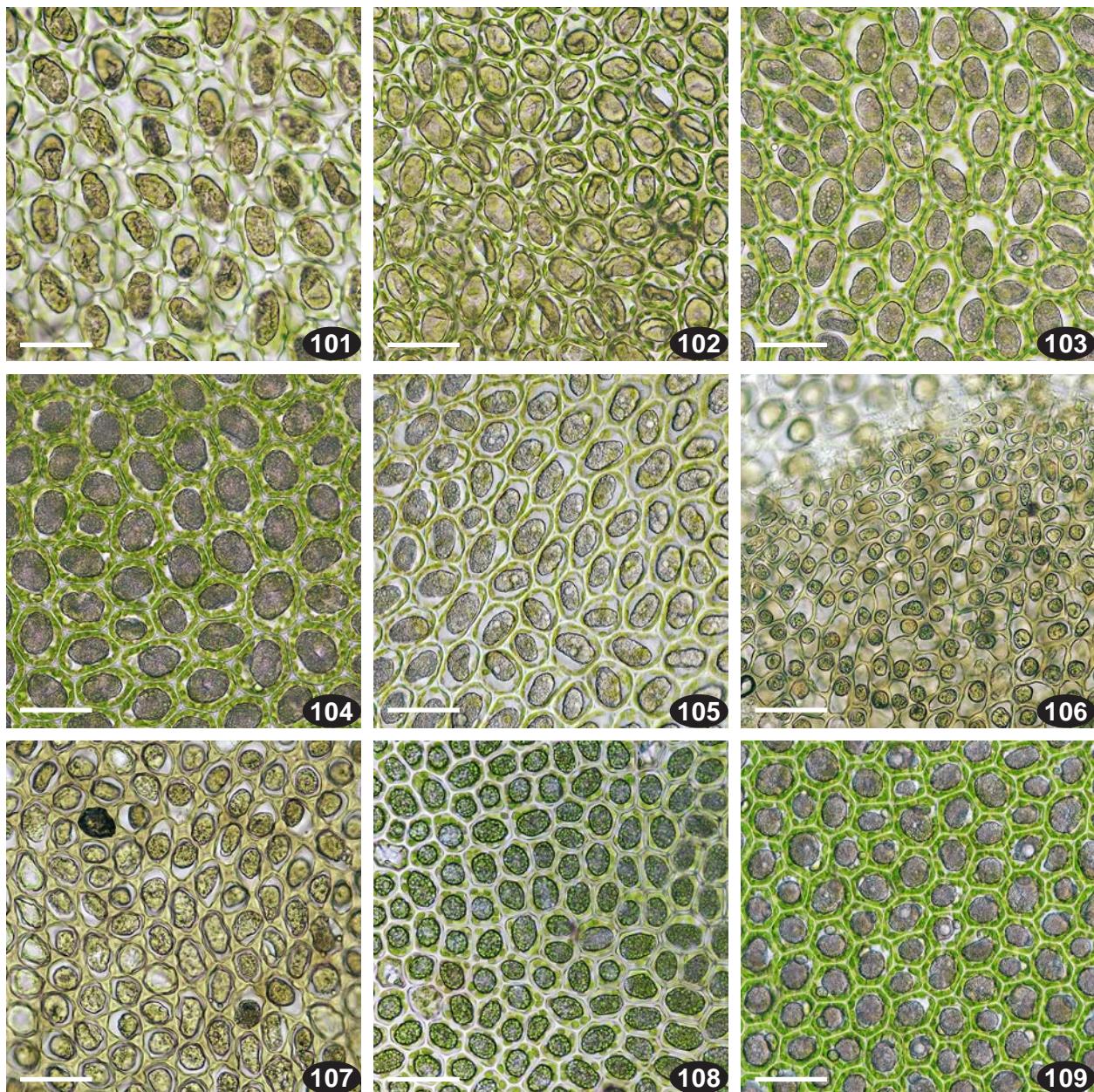


Fig. 101: Oil bodies 1 per cell, oblong 15–25×8–13 µm, granulate, with central eye – VIETNAM, HOA BINH PROVINCE, Bakalin & Klimova, v-28-34a-19.

Fig. 102: Oil bodies 1 per cell, oblong 15–20×6–13 µm, finely granulate, with central eye – VIETNAM, HOA BINH PROVINCE, Bakalin & Klimova, v-28-35-19.

Radula fulvifolia (Hook.f. et Taylor) Gottsche, Lindenb. et Nees

Fig. 103: Oil bodies 1(–2) per cell, oblong 12–22×8–13 µm, granulate, brownish, with 0–several eyes, sometimes additionally with 1(–2) small, 3–4 µm in diameter smooth-surfaced satellites – VIETNAM, SON LA PROVINCE, Bakalin & Klimova, v-21-14-19.

Fig. 104: Oil bodies 1 per cell, oblong 12–20×8–15 µm, granulate, brownish, sometimes additionally with 1–2 satellites, 5–7×3–4 µm, finely granulate – VIETNAM, SON LA PROVINCE, Bakalin & Klimova, v-21-30-19.

Radula inouei K. Yamada

Fig. 105: Oil bodies 1 per cell, oblong 9–19×7–10 µm, granu-

late, some with unclear eye – VIETNAM, HA GIANG PROVINCE, Bakalin & Klimova, v-13-21a-20.

Fig. 106: Oil bodies in leaf lobule 1 per cell, spherical, 4–7 µm in diameter, oblong (3–)5–7(–9)×(2–)3–4(–7) µm, granulate, brownish – VIETNAM, LAO CAI PROVINCE, Bakalin & Klimova, v-14-15-18_4.

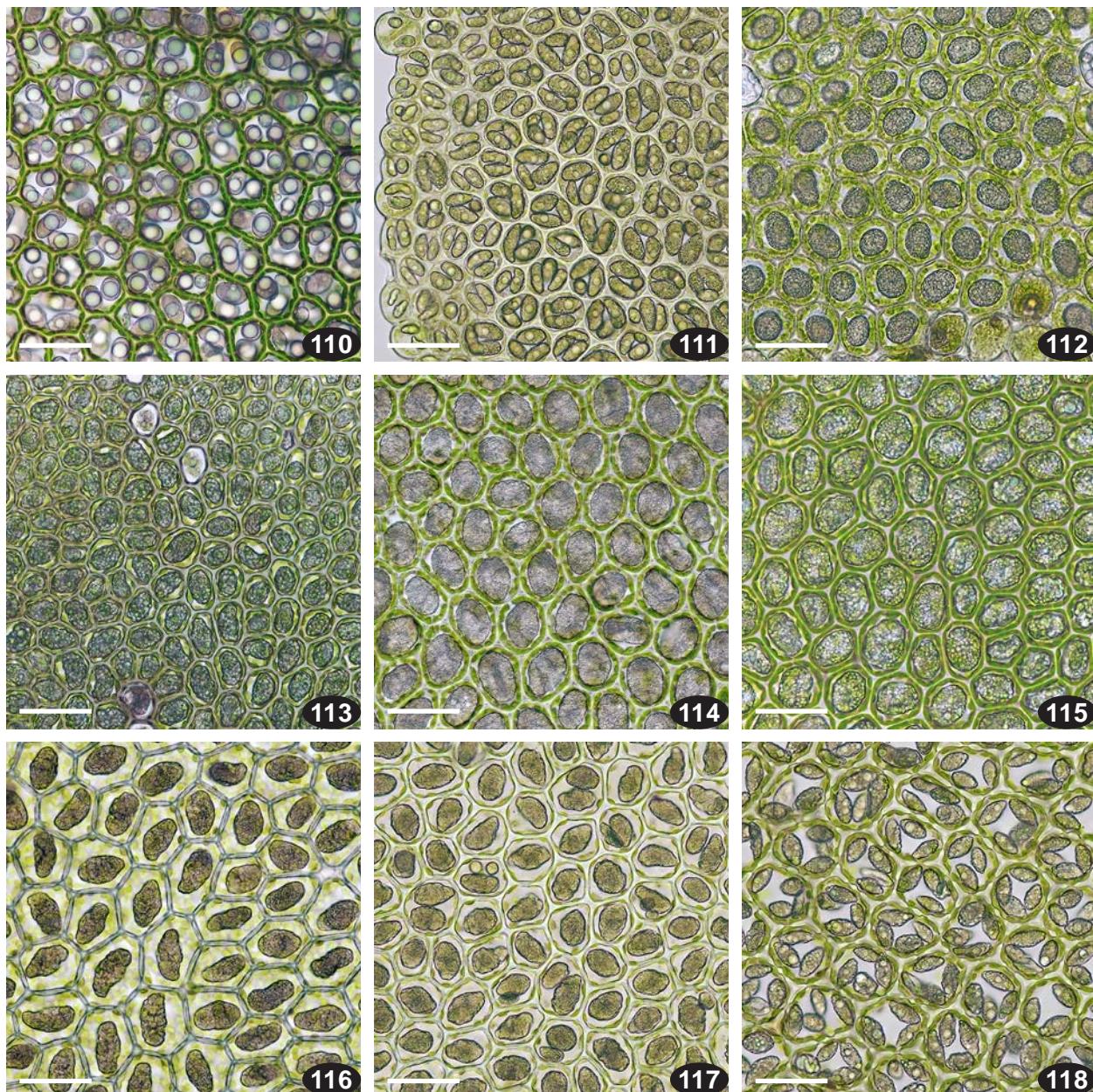
Fig. 107: Oil bodies 1 per cell, spherical, 8–12 µm in diameter, oblong 12–16(–18)×8–10 µm, granulate, brownish – VIETNAM, LAO CAI PROVINCE, Bakalin & Klimova, v-14-15-18_5.

Radula japonica Gottsche

Fig. 108: Oil bodies 1 per cell, spherical, 7–11 µm in diameter, oblong 10–16×8–10(–12) µm, granulate to coarsely so, brownish – JAPAN, TOTTORI PREFECTURE, Bakalin, j-2-6-13.

Radula javanica Gottsche

Fig. 109: Oil bodies 1 per cell, spherical, 8–13 µm in diameter, oblong 10–17×9–13 µm, plus 1(–2) satellite, spherical 4–5 µm in diameter to oblong, 5–7×4–5 µm, granulate, brownish – VIETNAM, HA GIANG PROVINCE, Bakalin & Klimova, v-13-16-20.



Radula kojana Steph.

Fig. 110: Oil bodies 2–3(–4) per cell, spherical, 6–10 µm in diameter, oblong 8–14(–16)×6–9 µm, finely granulate, with central eye – JAPAN, TOTTORI PREFECTURE, Bakalin, j-7-26-13.

Fig. 111: Oil bodies 3(–4) per cell, oblong 7–18×5–8 µm, granulate, brownish, with central eye – VIETNAM, LAI CHAU PROVINCE, Bakalin & Klimova, v-14-17-19.

Radula madagascariensis Gottsche

Fig. 112: Oil bodies 1 per cell, spherical, 10–13 µm in diameter, oblong 12–20×10–13 µm, granulate, brownish – VIETNAM, LAO CAI PROVINCE, Bakalin, v-1-55-16.

Radula obtusiloba Steph.

Fig. 113: Oil bodies 1 per cell, spherical, 7–8 µm in diameter, oblong 7–16×6–10 µm, distinctly smaller to the leaf margin, coarsely granulate, brownish – RUSSIA, MAGADAN PROVINCE, Bakalin, mag-31-40-14.

Radula oyamensis Steph.

Fig. 114: Oil bodies 1 per cell, oblong 13–23×10–15 µm,

granulate – VIETNAM, CAO BANG PROVINCE, Bakalin & Klimova, v-23-27-20.

Radula perrottetii Gottsche

Fig. 115: Oil bodies 1 per cell, oblong 12–22×10–18 µm, coarsely granulate – JAPAN, KOCHI PREFECTURE, Bakalin, j-6-17-15.

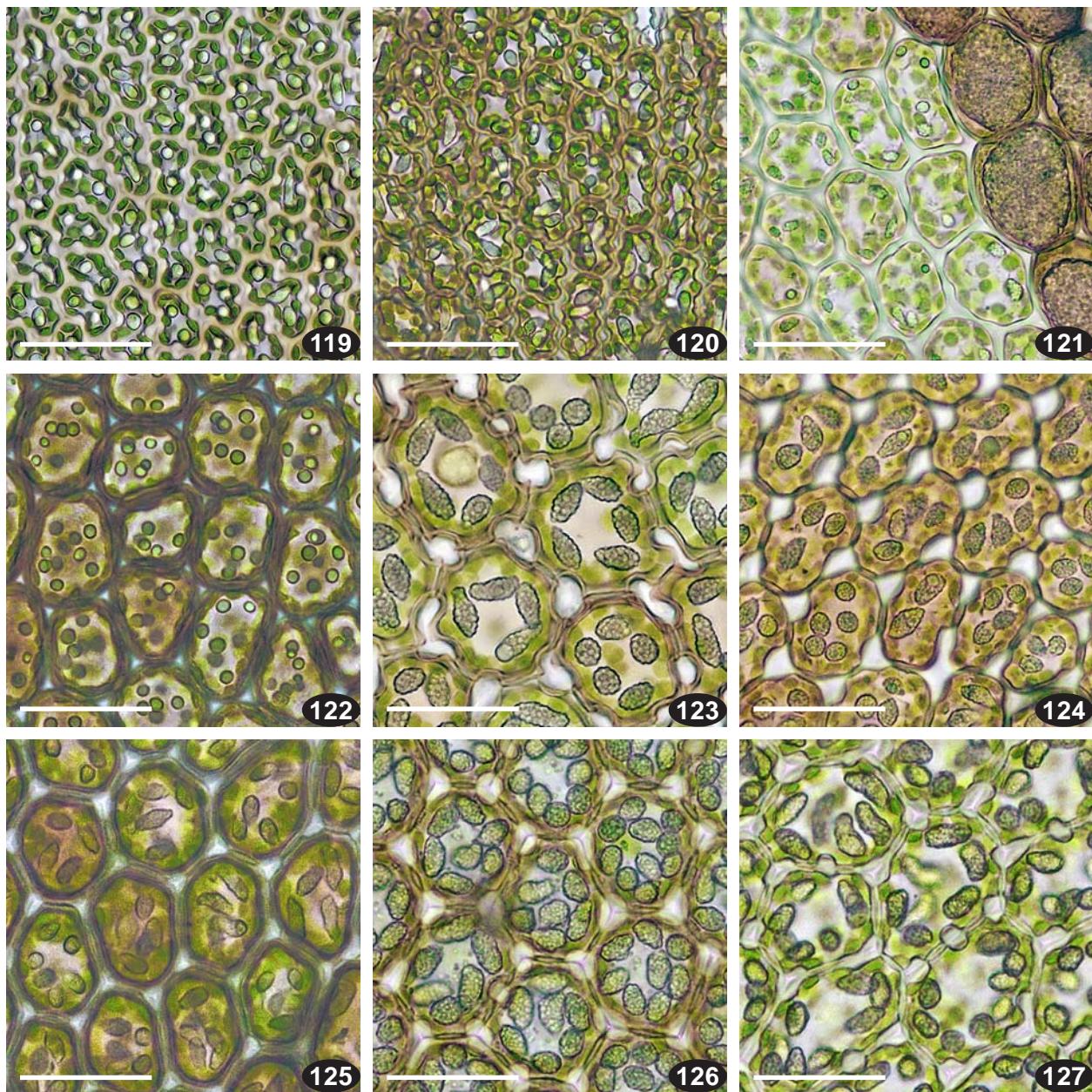
Radula prolifera Arnell

Fig. 116: Oil bodies 1(–2) per cell, oblong 12–20×8–12 µm, finely granulate, brownish – RUSSIA, KHABAROVSK TERRITORY, Bakalin, kh-23-4-16.

Fig. 117: Oil bodies 1(–3) per cell, including 1–2 rarely occurring satellites, (satellites only, 5–6 µm in diameter), oblong (7–)10–18×(5–)7–12 µm, finely granulate, brownish – RUSSIA, KHABAROVSK TERRITORY, Bakalin & Klimova, kh-42-4-19.

Radula retroflexa Taylor

Fig. 118: Oil bodies 3–4 per cell, oblong 10–16×5–9 µm, coarsely granulate, commonly with 1–several eyes – VIETNAM, HOA BINH PROVINCE, Bakalin & Klimova, v-30-11-19.



Frullaniaceae

Frullania apiculata (Reinw., Blume et Nees) Nees

Fig. 119: Oil bodies 2–3 per cell, spherical, 2–3 µm in diameter, oblong 3–8×2–2.5 µm, nearly smooth – VIETNAM, HA GIANG PROVINCE, Bakalin & Klimova, v-13-13-20.

Fig. 120: Oil bodies 2–4 per cell, spherical, 2–3 µm in diameter, oblong 2–4×2–3 µm, smooth to loosely granulate – VIETNAM, LAO CAI PROVINCE, Bakalin, v-2-13-16.

Frullania appendiculata Steph.

Fig. 121: Oil bodies 5–10 per cell, spherical, 1.5–3 µm in diameter, oblong 3–5×1.5–3 µm, granulate; ocelli in biseriate row, 20–30×15–18 µm, granulate, brownish – CHINA, SICHUAN PROVINCE, Bakalin & Klimova, c-32-2-17.

Frullania austini J.J. Atwood, Vilnet, Mamontov & Konstant.

Fig. 122: Oil bodies 6–10 per cell, spherical, 2–4 µm in diameter, nearly smooth – RUSSIA, KAMCHATKA TERRITORY, Bakalin, k-68-1-15.

Comment: the specimens regarded for a long time as *F. bolanderi* from Russian Asia belong in fact to *F. austini*, as shown by Mamontov et al. (2020).

Frullania brotheri Steph.

Fig. 123: Oil bodies 4–6 per cell, spherical, 4–7 µm in diameter, oblong 6–13×4–6 µm, coarsely granulate, brownish – VIETNAM, SON LA PROVINCE, Bakalin & Klimova, v-21-5-19.

Frullania consociata Steph.

Fig. 124: Oil bodies (2–)3–5 per cell, spherical, 4–6 µm in diameter, oblong 6–9×4–6 µm, granulate – CHINA, SICHUAN PROVINCE, Bakalin & Klimova, c-32-4-17.

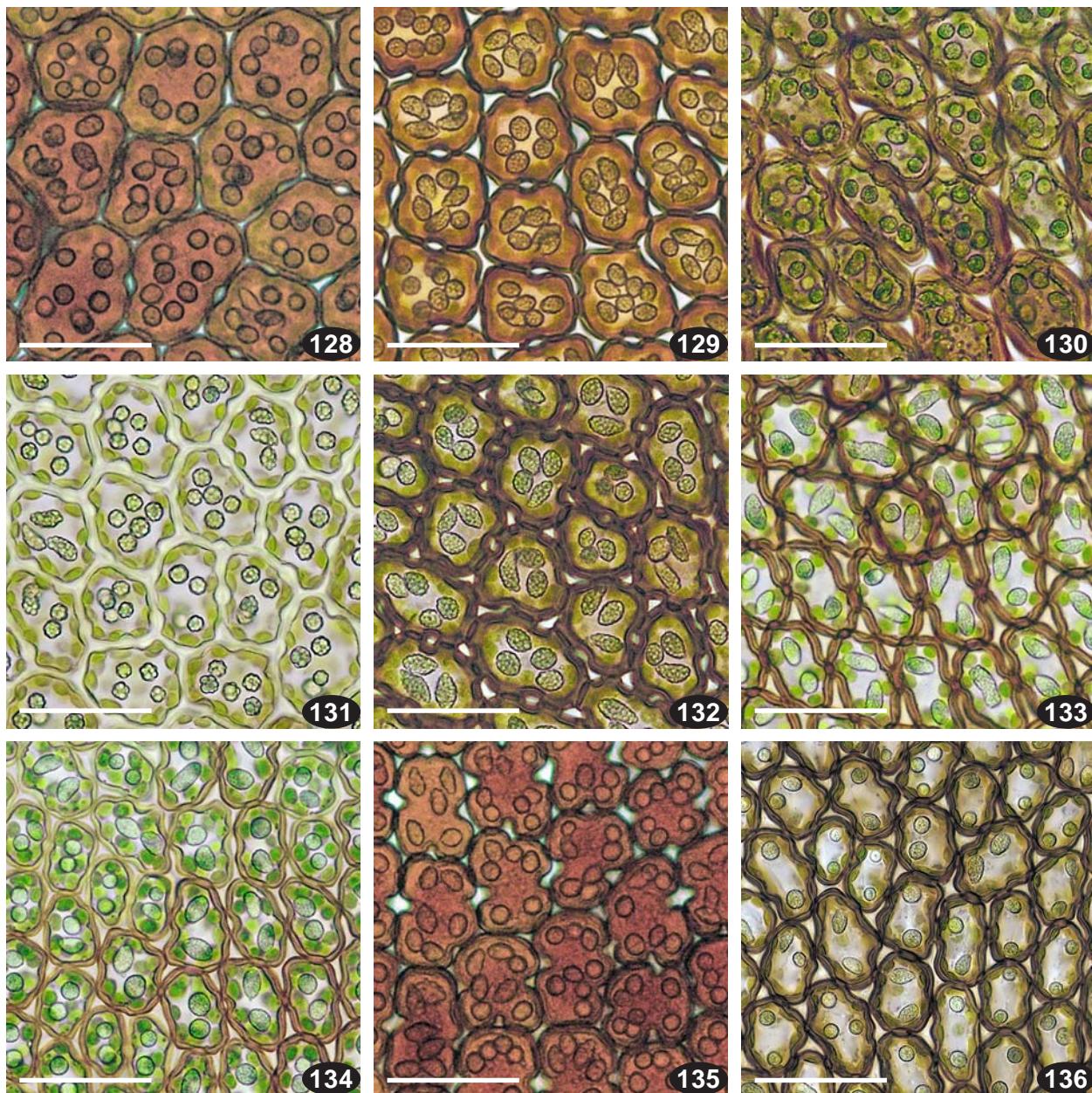
Frullania crispiplicata Yuzawa et S.Hatt.

Fig. 125: Oil bodies 5–6 per cell, spherical, 4–6 µm in diameter, oblong 5–10×4–6 µm, granulate – RUSSIA, PRIMORSKY TERRITORY, Bakalin, p-34-1-16.

Frullania davurica Hampe ex Gottsche

Fig. 126: Oil bodies 6–10 per cell, spherical, 4–6 µm in diameter, oblong 6–10×4–6 µm, granulate – CHINA, SICHUAN PROVINCE, Bakalin & Klimova, c-33-9-17.

Fig. 127: Oil bodies 6–9 per cell, spherical, 4–6 µm in diameter, oblong 5–11×4–6 µm, granulate – RUSSIA, KHABAROVSK TERRITORY, Bakalin, kh-14-21-16.



Frullania davurica Hampe ex Gottsche

Fig. 128: Oil bodies 6–10 per cell, spherical, 4–6 µm in diameter, oblong 5–10×4–6 µm, granulate – RUSSIA, MAGADAN PROVINCE, Bakalin, mag-30-26-14.

Frullania diversitexta Steph.

Fig. 129: Oil bodies 5–8 per cell, spherical, 4–6 µm in diameter, oblong 6–10×4–6 µm, granulate – RUSSIA, PRIMORSKY TERRITORY, Bakalin, p-33-6-16.

Frullania duthiana var. *szechuanensis* S.Hatt. et C.Gao

Fig. 130: Oil bodies 4–8 per cell, spherical, 3–5 µm in diameter, oblong 5–8×3–4 µm, granulate – CHINA, YUNNAN PROVINCE, Bakalin, c-77-32-18.

Frullania ericoides (Nees) Mont.

Fig. 131: Oil bodies 3–6 per cell, spherical, 3–6 µm in diameter, oblong 5–9×3–6 µm, coarsely granulate – VIETNAM, HOA BINH PROVINCE, Bakalin & Klimova, v-29-8-19.

Frullania fuscovirens Steph.

Fig. 132: Oil bodies 2–5 per cell, spherical, 4–6 µm in diameter, oblong 5–13×4–6 µm, coarsely granulate – VIETNAM,

SON LA PROVINCE, Bakalin & Klimova, v-22-1-19.

Frullania hypoleuca Nees

Fig. 133: Oil bodies (1–)2 per cell, spherical, 4–5 µm in diameter, oblong 5–9(–12)×3–5 µm, finely granulate – VIETNAM, SON LA PROVINCE, Bakalin & Klimova, v-19-19-19_13.

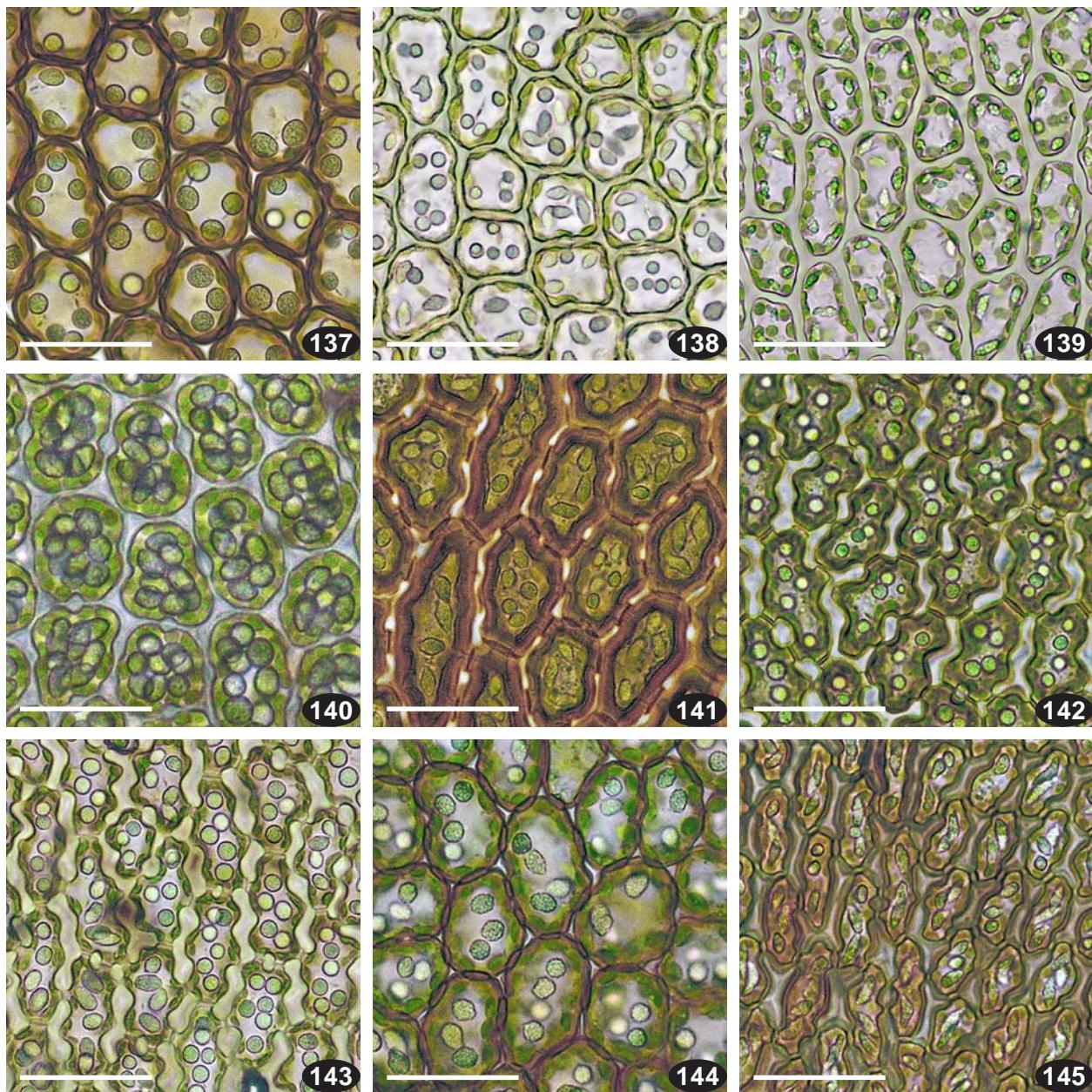
Fig. 134: Oil bodies 2–3 per cell, spherical, 3–6 µm in diameter, oblong 5–9×3–5 µm, finely granulate – VIETNAM, SON LA PROVINCE, Bakalin & Klimova, v-19-19-19_7.

Frullania ignatovii Sofronova, Mamontov et Potemkin

Fig. 135: Oil bodies 5–10 per cell, spherical, 3–5 µm in diameter, oblong 4–8×3–5 µm, granulate – RUSSIA, MAGADAN PROVINCE, Bakalin, mag-30-24-14.

Frullania junghuhniana var. *tenella* (Sande Lac.) Grolle et S.Hatt.

Fig. 136: Oil bodies (1–)2–3 per cell, spherical, (2–)3–4 µm in diameter, oblong 3–6(–10)×2.5–3.5(–4) µm, finely granulate – VIETNAM, CAO BANG PROVINCE, Bakalin & Klimova, v-28-20-20.



Frullania koponenii S.Hatt.

Fig. 137: Oil bodies 2–5 per cell, spherical, 4–7 µm in diameter, oblong 5–8×4–6 µm, finely granulate – CHINA, SICHUAN PROVINCE, Bakalin & Klimova, c-35-16-17.

Fig. 138: Oil bodies 3–6 per cell, spherical, 3–5 µm in diameter, oblong 4–7×2–4 µm, granulate – RUSSIA, KHABAROVSK TERRITORY, Bakalin, kh-31-5-16.

Comment: specimen of *F. koponenii* from Khabarovsk territory was collected near its *locus classicus*. Its areolations differs from that in specimen from Sichuan Province, China. This may imply that Chinese specimen belong to another species, putatively undescribed.

Frullania moniliata (Reinw., Blume et Nees) Mont.

Fig. 139: Oil bodies 3–5 per cell, oblong 4–6×2–3 µm, granulate – VIETNAM, HOA BINH PROVINCE, Bakalin & Klimova, v-30-38-19.

Frullania muscicola Steph.

Fig. 140: Oil bodies 7–10 per cell, spherical, 4–6 µm in diameter, oblong 5–9×4–6 µm, granulate – RUSSIA,

PRIMORSKY TERRITORY, Bakalin, P-34-2-14.

Frullania nepalensis (Spreng.) Lehm. et Lindenb.

Fig. 141: Oil bodies 4–6 per cell, spherical, 3–5 µm in diameter, oblong 4–8×3–5 µm, granulate – CHINA, YUNNAN PROVINCE, Bakalin, c-74-5-18.

Fig. 142: Oil bodies 3–6 per cell, spherical, 3–4 µm in diameter, oblong 4–5×3–4 µm, granulate – VIETNAM, LAO CAI PROVINCE, Bakalin, v-1-37-16.

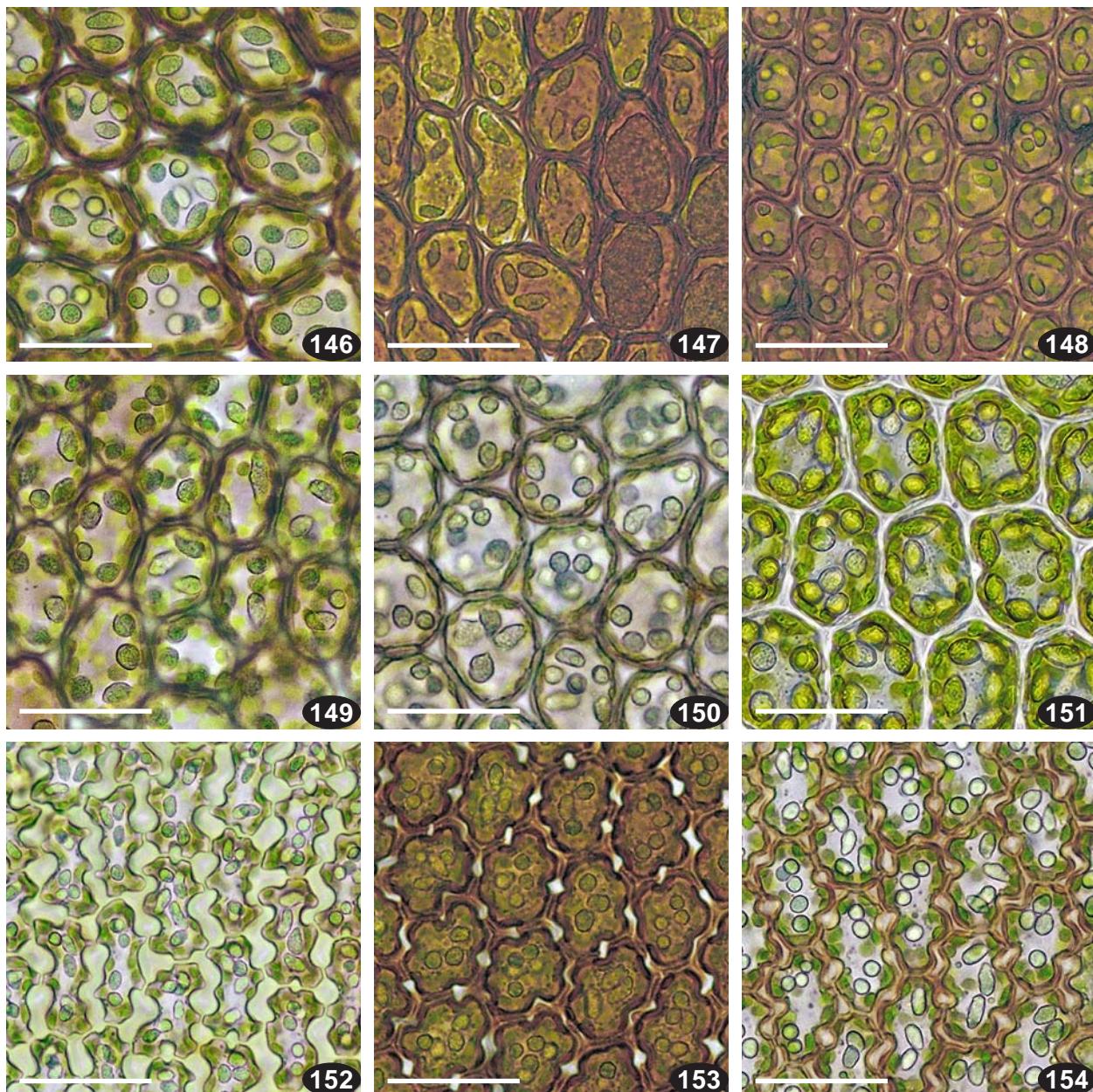
Fig. 143: Oil bodies 3–6 per cell, spherical, 3–5 µm in diameter, oblong 4–6×3–4 µm, finely granulate – VIETNAM, LAI CHAU PROVINCE, Bakalin & Klimova, v-6-10-19.

Frullania parvistipula Steph.

Fig. 144: Oil bodies 3–6 per cell, spherical, 4–6 µm in diameter, oblong 6–8×4–6 µm, granulate – RUSSIA, PRIMORSKY TERRITORY, Klimova, prim-115-6-17.

Frullania serrata Gottsche

Fig. 145: Oil bodies 2–4 per cell, spherical, 2–3 µm in diameter, oblong 3–7×2–3 µm, granulate – VIETNAM, LAO CAI PROVINCE, Bakalin, v-1-41-16.



Frullania sinensis Steph.

Fig. 146: Oil bodies 5–9 per cell, spherical, 4–6 µm in diameter, oblong 6–9×4–6 µm, granulate – RUSSIA, PRIMORSKY TERRITORY, Klimova, prim-111-21-17.

Frullania subarctica Vilnet, Borovich. et Bakalin

Fig. 147: Oil bodies 2–6 per cell, spherical, 3–5 µm in diameter, oblong 4–7×2–4 µm, granulate; ocelli sparse, oblong, 20–25×15–20 µm, granulate – RUSSIA, KAMCHATKA TERRITORY, Bakalin, k-66-6-15.

Frullania tagawana (S.Hatt. et Thaithong) S.Hatt.

Fig. 148: Oil bodies 2–6 per cell, spherical, 3–5 µm in diameter, oblong 4–7×3–4 µm, loosely granulate – CHINA, YUNNAN PROVINCE, Bakalin, c-83-4-18.

Frullania takayuensis Steph.

Fig. 149: Oil bodies 3–7 per cell, spherical, 4–6 µm in diameter, oblong 6–9×4–5 µm, granulate – RUSSIA, PRIMORSKY TERRITORY, Klimova, prim-79-23-17.

Fig. 150: Oil bodies 5–8 per cell, spherical, 3–6 µm in di-

ameter, oblong 6–8×4–6 µm, granulate – RUSSIA, SAKHALIN PROVINCE, Bakalin, s-44-2-16.

Frullania usamiensis Steph.

Fig. 151: Oil bodies 5–8 per cell, spherical, 5–6 µm in diameter, oblong 5–10(–13)×5–6 µm, granulate to finely so – REPUBLIC OF KOREA, GANGWON-DO, Bakalin, kor-65-2-19.

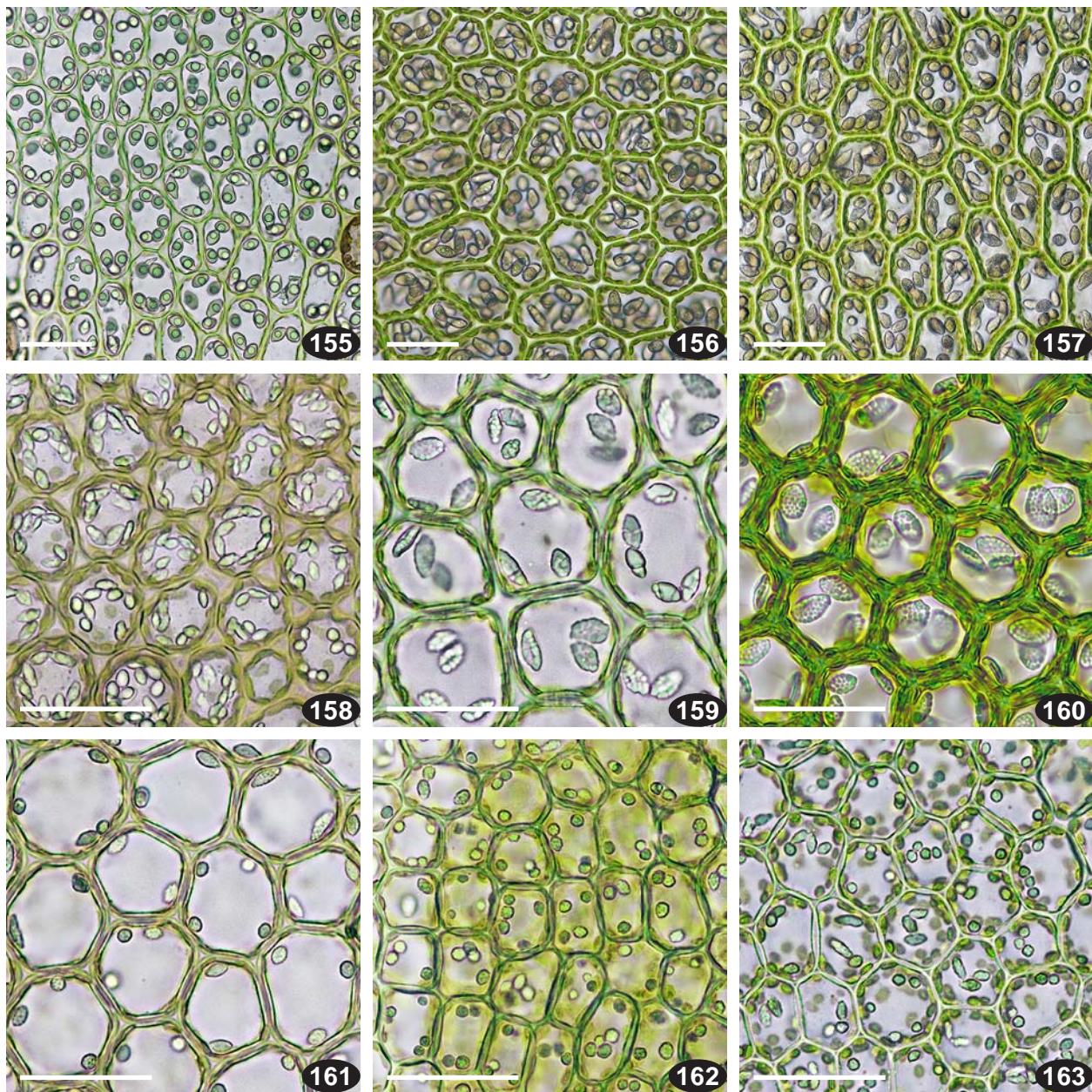
Frullania yuennanensis Steph.

Fig. 152: Oil bodies 4–8 per cell, spherical, 2.5–4 µm in diameter, oblong 3–6×2.5–4 µm, granulate – CHINA, SICHUAN PROVINCE, Bakalin & Klimova, c-32-1-17.

Fig. 153: Oil bodies 3–6 per cell, spherical, 3–4 µm in diameter, oblong 4–9×3–4 µm, granulate – CHINA, YUNNAN PROVINCE, Bakalin, c-88-29-18.

Fig. 154: Oil bodies 3–6 per cell, spherical, 3–5 µm in diameter, oblong 4–8×3–5 µm, finely granulate – VIETNAM, LAI CHAU PROVINCE, Bakalin & Klimova, v-9-6-19.

Comment: Strong variation in cell network was observed in *F. yuennanensis*.



Jubulaceae

Jubula japonica Steph.

Fig. 155: Oil bodies 4–5(6) per cell, spherical, 5–7 µm in diameter, oblong 5–12×5–7 µm, nearly smooth, with central eye – JAPAN, KOCHI PREFECTURE, Bakalin, j-4-24-15.

Comment: the biconcentric oil bodies in *J. japonica* may be the consequence of deterioration process in the specimens, although we inclined to believe that this feature is associated with other differences, including also genetic.

Jubula javanica Steph.

Fig. 156: Oil bodies 5–8(–9) per cell, spherical, 4–6 µm in diameter, oblong 5–13×4–5 µm, granulate, brownish, sometimes with central eye – VIETNAM, LAI CHAU PROVINCE, Bakalin & Klimova, v-15-7-19.

Fig. 157: Oil bodies 6–10 per cell, spherical, 4–6 µm in diameter, oblong 6–12×4–5 µm, finely granulate – VIETNAM, HA GIANG PROVINCE, Bakalin & Klimova, v-9-21-20.

Neohattoria herzogii (S.Hatt.) Kamim.

Fig. 158: Oil bodies 8–17 per cell, spherical, 2–3 µm in diameter, oblong 3–5×2–3 µm, smooth – RUSSIA, SAKHALIN

PROVINCE, Bakalin & Klimova, k-41-18-18.

Nipponelejeunea pilifera (Steph.) S.Hatt.

Fig. 159: Oil bodies 3–4 per cell, oblong 6–12×3–5 µm, botryoidal, sometimes biconcave – RUSSIA, SAKHALIN PROVINCE, Bakalin, k-69-9-15.

Fig. 160: Oil bodies 3–5 per cell, oblong 5–11×3–4(–6) µm, granulate – REPUBLIC OF KOREA, JEOLLABUK-DO, Bakalin, kor-73-13-19.

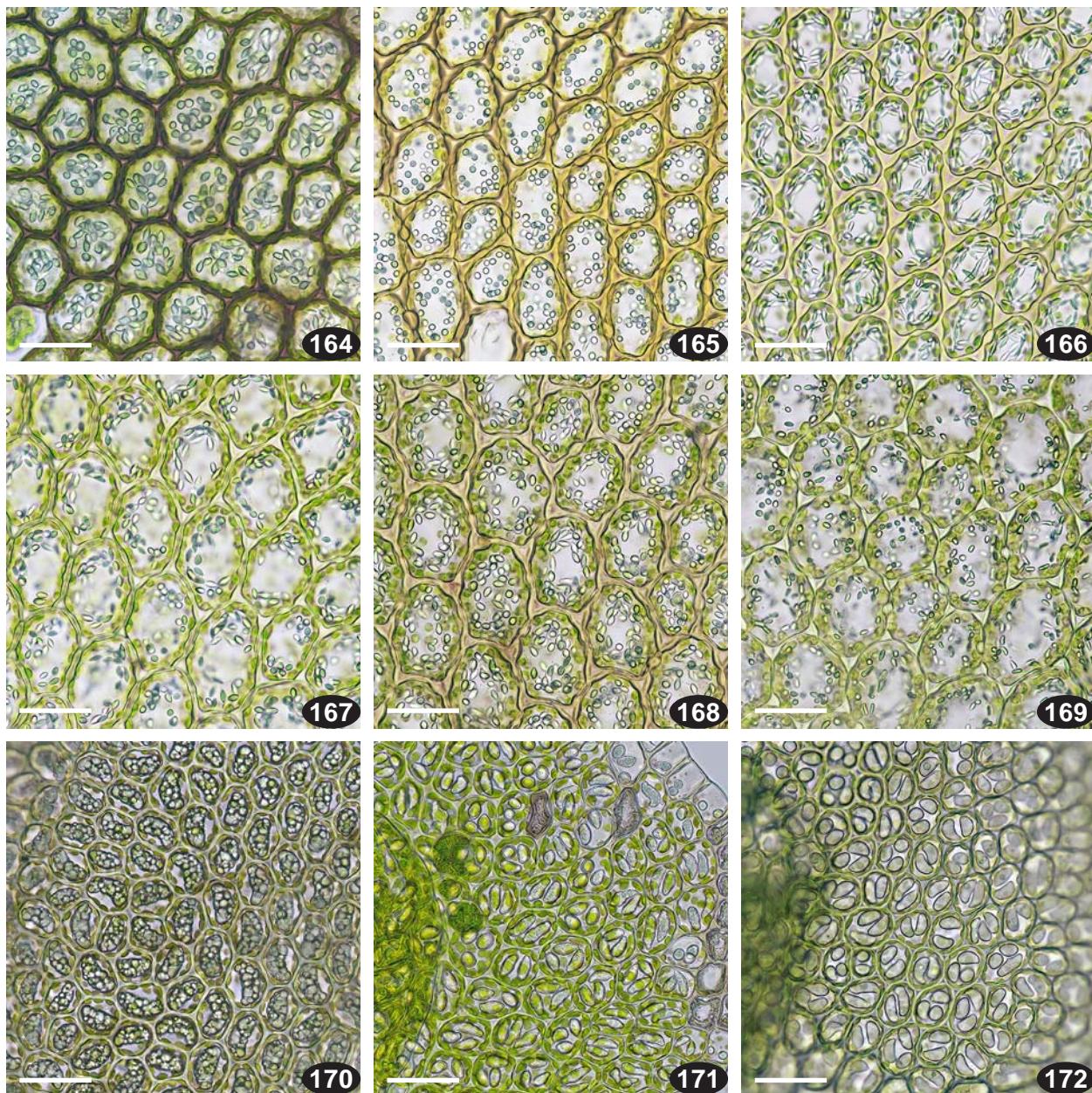
Fig. 161: Oil bodies 2–3 per cell, spherical, 2–3 µm in diameter, oblong 4–7(–9)×2–3 µm, granulate – JAPAN, YAMANASHI PREFECTURE, Bakalin, j-90-13-15.

Comment: *N. pilifera* possesses variation in oil body and leaf cell sizes across distribution area.

Nipponelejeunea subalpina (Horik.) S.Hatt.

Fig. 162: Oil bodies (2–)3–5(–6) per cell, spherical, 2–3 µm in diameter, oblong 3–4(–5)×2.0–2.5 µm, finely granulate – RUSSIA, SAKHALIN PROVINCE, Bakalin & Klimova, k-44-5-18.

Fig. 163: Oil bodies 3–8 per cell, spherical, 1.5–2.5 µm in diameter, oblong 2–4(–5)×1.5–2.5 µm, finely granulate – RUSSIA, SAKHALIN PROVINCE, Bakalin, k-70-49-15.



Lejeuneaceae

Acanthocoleus yoshinaganus (S.Hatt.) Kruijt

Fig. 164: Oil bodies 8–20 per cell, spherical, 3–5 µm in diameter, oblong 4–8×3–5 µm, smooth to finely granulate – JAPAN, KOCHI PREFECTURE, Bakalin, j-11-25-15.

Acrolejeunea infuscata (Mitt.) Jian Wang bis et Gradst.

Fig. 165: Oil bodies 13–24 per cell, spherical, 2.5–4 µm in diameter, smooth – CHINA, YUNNAN PROVINCE, Bakalin, c-88-26-18.

Fig. 166: Oil bodies 8–22 per cell, oblong, 2–3×3–6 µm, smooth – VIETNAM, LAO CAI PROVINCE, Bakalin & Klimova, v-4-64-17.

Acrolejeunea recurvata Gradst.

Fig. 167: Oil bodies 15–23 per cell, spherical, 2.5–4 µm in diameter, oblong 2–3×3–6 µm, smooth – VIETNAM, LAO CAI PROVINCE, Bakalin & Klimova, v-13-15-17.

Acrolejeunea sandvicensis (Gottsche) Steph.

Fig. 168: Oil bodies 22–32 per cell, spherical, 1.5–2.5 µm

in diameter, oblong 2–4×1.5–2 µm, smooth – VIETNAM, SON LA PROVINCE, Bakalin & Klimova, v-23-4-19.

Fig. 169: Oil bodies 15–21 per cell, spherical, 2–3 µm in diameter, oblong 2–3×3–5 µm, smooth – VIETNAM, HOA BINH PROVINCE, Bakalin & Klimova, v-32-1-19.

Cheilolejeunea longiloba (Steph. ex G.Hoffm.) J.J.Engel & B.C.Tan

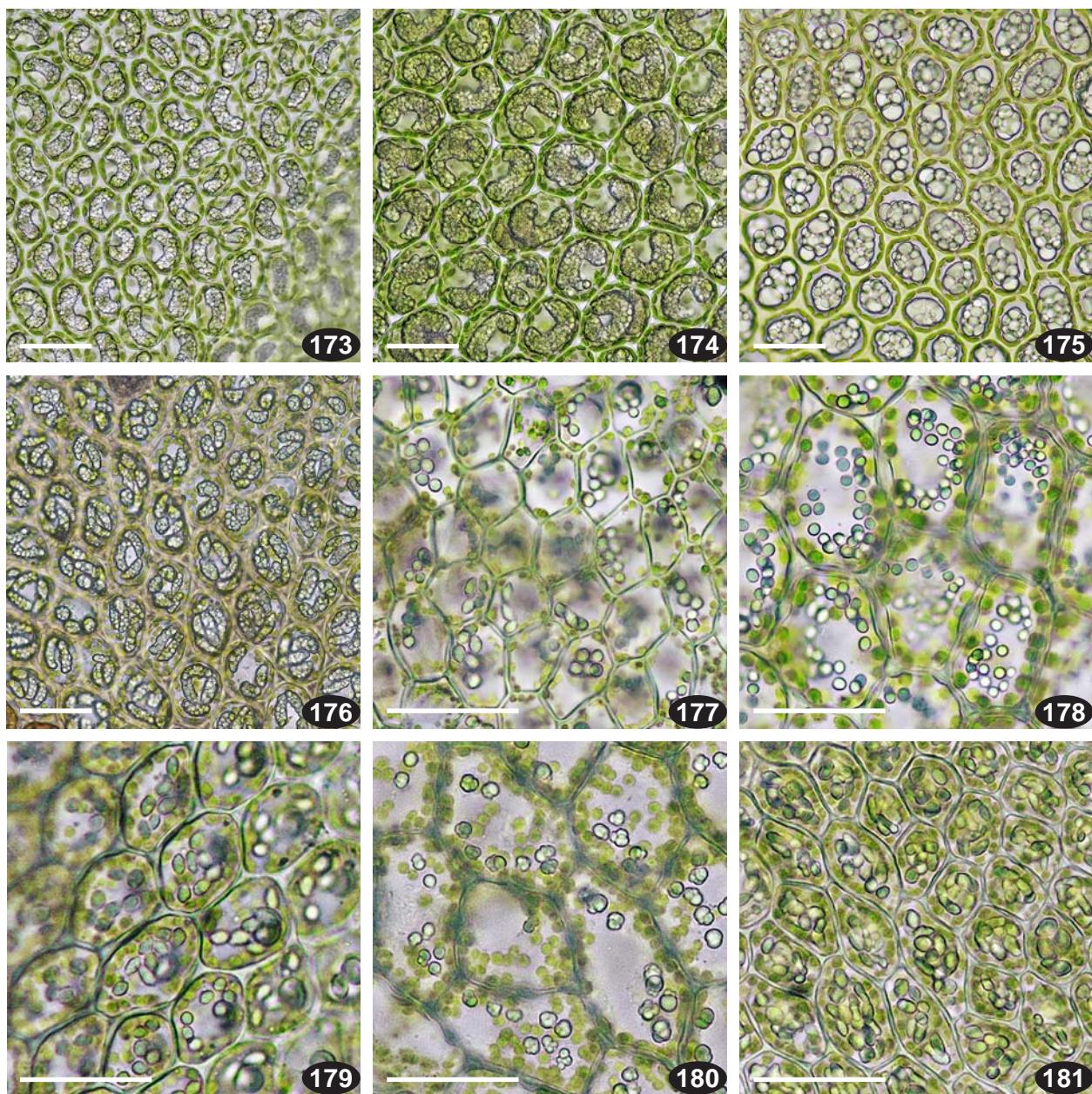
Fig. 170: Oil bodies 2 per cell, oblong 16–22×8–12 µm, botryoidal – VIETNAM, LAO CAI PROVINCE, Bakalin, v-2-64-16.

Comment: Zhu et al. (2002) synonymized *C. longiloba* with *C. trapezia*, but we suggest this issue needs further study.

Cheilolejeunea obtusifolia (Steph.) S.Hatt.

Fig. 171: Oil bodies 2–3 per cell, spherical, 3–5 µm in diameter, oblong (4–)8–12×3–5 µm, granulate – REPUBLIC OF KOREA, GYEONGSANGNAM-DO, Bakalin, kor-70-3-19_0004.

Fig. 172: Oil bodies 2–3 per cell, oblong 8–15×5–7 µm, finely granulate – RUSSIA, SAKHALIN PROVINCE, Bakalin, s-48-8-16.



Cheilolejeunea osumiensis (S.Hatt.) Mizut.

Fig. 173: Oil bodies 1 per cell, oblong 10–23×6–8 µm, coarsely granulate to botryoidal, sausage-shaped – VIETNAM, CAO BANG PROVINCE, Bakalin & Klimova, v-28-26-20_8.

Fig. 174: Oil bodies 1 per cell, oblong 20–35(–45)×7–11 µm, coarsely granulate to botryoidal, sausage-shaped – VIETNAM, CAO BANG PROVINCE, Bakalin & Klimova, v-28-26-20_9.

Cheilolejeunea trapezia (Nees) Kachroo et R.M.Schust.

Fig. 175: Oil bodies 1(–2) per cell, oblong 10–14×12–25 µm, botryoidal – VIETNAM, HOA BINH PROVINCE, Bakalin & Klimova, v-30-7a-19.

Cheilolejeunea trifaria (Reinw., Blume et Nees) Mizut.

Fig. 176: Oil bodies 2–5 per cell, spherical, 6–8 µm in diameter, oblong 6–18×6–8 µm, botryoidal – VIETNAM, LAO CAI PROVINCE, Bakalin, v-2-17c-16.

Coleolejeunea chenii Tixier

Fig. 177: Oil bodies 4–8 per cell, spherical, 2–5 µm in diameter, oblong 3–6×2–4 µm, smooth – VIETNAM, SON LA

PROVINCE, Bakalin & Klimova, v-25-9a-19.

Coleolejeunea denticulata (Horik.) S.Hatt.

Fig. 178: Oil bodies 9–26 per cell, spherical, 2–3 µm in diameter, oblong 2–4×2–3 µm, smooth – VIETNAM, LAO CAI PROVINCE, Bakalin & Klimova, v-3-29-17.

Coleolejeunea dozyana (Sande Lac.) Schiffn.

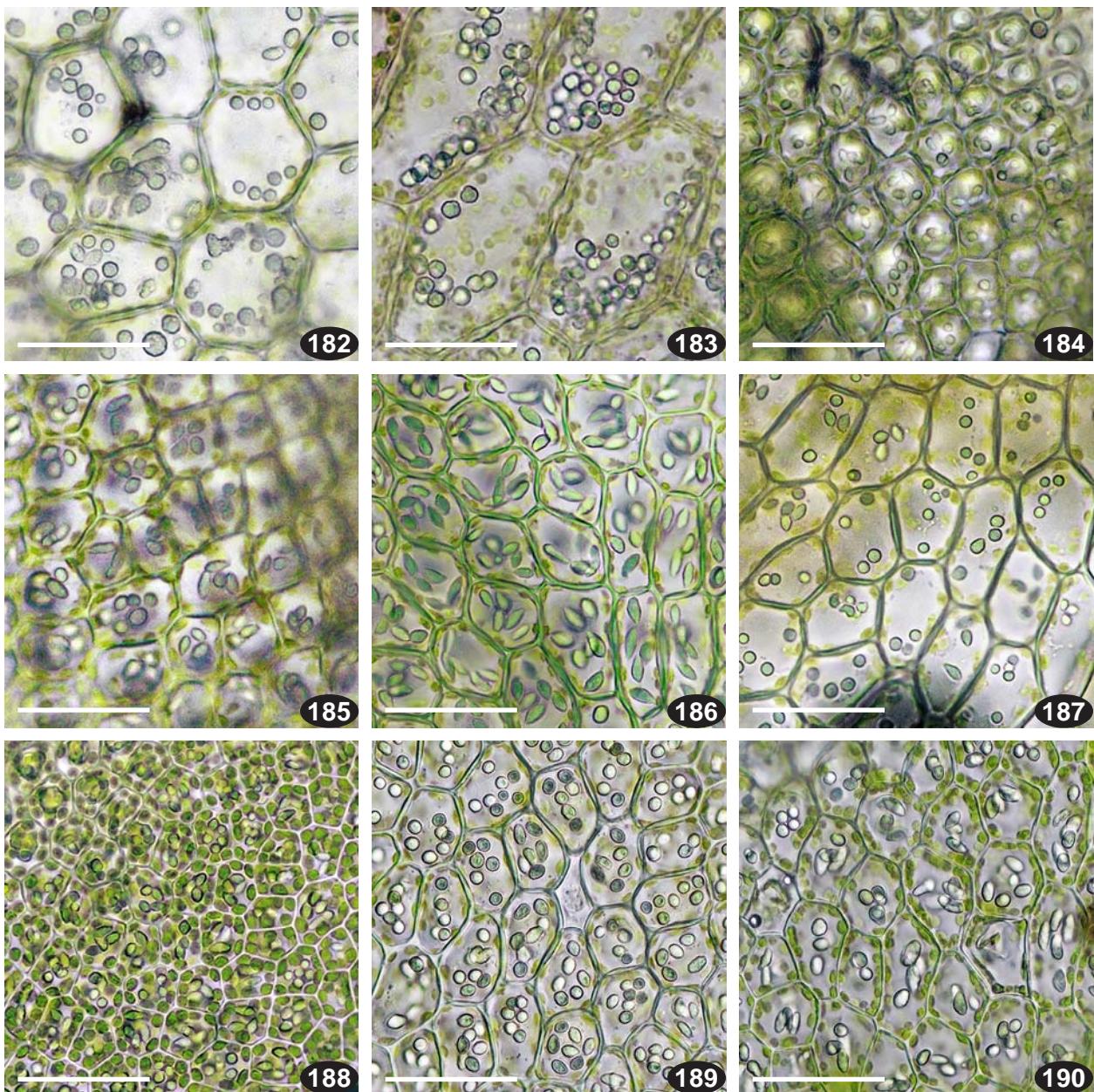
Fig. 179: Oil bodies 5–9 per cell, spherical, 2–5 µm in diameter, oblong 3–7×2–4 µm, finely granulate – VIETNAM, LAO CAI PROVINCE, Bakalin, v-2-20-16.

Coleolejeunea gottschei (Steph.) Pandý, K.P.Srivast. et Ahmad

Fig. 180: Oil bodies 4–10 per cell, spherical, 3–6 µm in diameter, oblong 3–5×4–7 µm, botryoidal – VIETNAM, LAI CHAU PROVINCE, Bakalin & Klimova, v-14-16-19.

Coleolejeunea haskarliana (Lehm.) Schiffn.

Fig. 181: Oil bodies 5–10 per cell, spherical, 2–4 µm in diameter, oblong 2–5×2–4 µm, smooth – VIETNAM, LAI CHAU PROVINCE, Bakalin & Klimova, v-3-2-19.



Cololejeunea japonica (Schiffn.) Mizut.

Fig. 182: Oil bodies 4–8 per cell, spherical, 2–5 µm in diameter, oblong 4–10×3–4 µm, granulate – JAPAN, TOTTORI PREFECTURE, Bakalin, j-1-19-13.

Cololejeunea longifolia (Mitt.) Benedix ex Mizut.

Fig. 183: Oil bodies 6–33 per cell, spherical, 2–5 µm in diameter, oblong 3–4×4–6 µm, coarsely granulate to botryoidal – VIETNAM, SON LA PROVINCE, Bakalin & Klimova, v-23-8a-19.

Cololejeunea macounii (Spruce) A.Evan

Fig. 184: Oil bodies 3–6 per cell, spherical, 1.5–2 µm in diameter, oblong 2–4×1.5–2 µm, smooth – RUSSIA, PRIMORSKY TERRITORY, Klimova & Bakalin, prim-16-36-16.

Cololejeunea ornata A.Evans

Fig. 185: Oil bodies 4–6 per cell, spherical, 2–4 µm in diameter, oblong 4–8×1.5–3 µm, finely granulate – RUSSIA, PRIMORSKY TERRITORY, Bakalin, p-38-5-16.

Cololejeunea schmidti Steph

Fig. 186: Oil bodies 4–9 per cell, rarely spherical, 2–3 µm in diameter, oblong 4–8×2–4 µm, finely granulate – VIETNAM, LAO CAI PROVINCE, Bakalin, v-8-59-16.

Cololejeunea shikokiana (Horik.) S.Hatt.

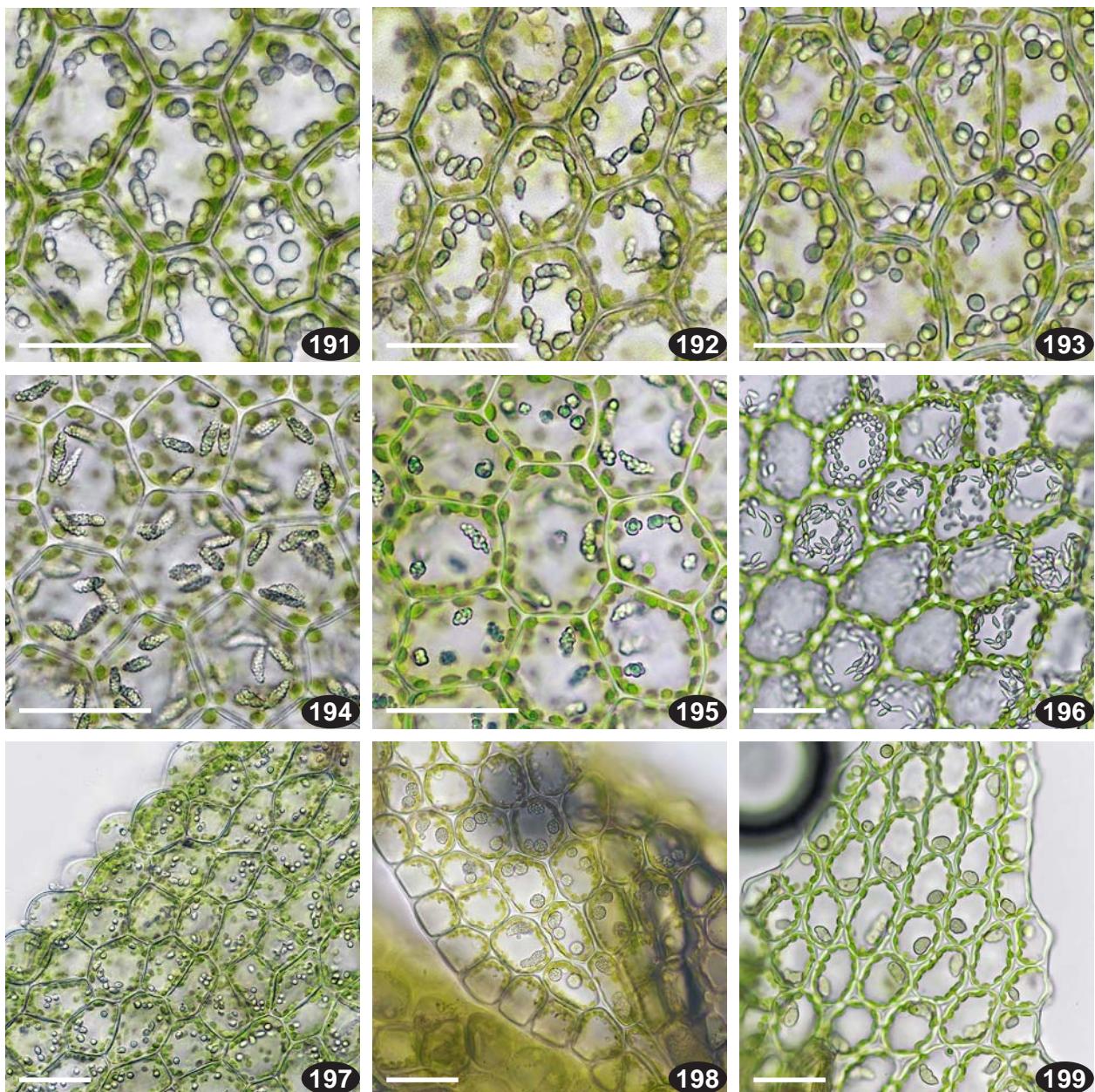
Fig. 187: Oil bodies 3–6 per cell, spherical, 2–3 µm in diameter, oblong 3–5×2–3 µm, finely granulate to nearly smooth – VIETNAM, LAO CAI PROVINCE, Bakalin, v-3-84-16.

Cololejeunea spinosa (Horik.) Pandé et R.N.Misra

Fig. 188: Oil bodies 4–10 per cell, spherical, 2–3 µm in diameter, oblong 3–4×2–3 µm, nearly smooth – VIETNAM, LAI CHAU PROVINCE, Bakalin & Klimova, v-4-6-19.

Fig. 189: Oil bodies 4–8 per cell, spherical, 2–3 µm in diameter, oblong 3–5×2–3 µm, smooth – VIETNAM, HA GIANG PROVINCE, Bakalin & Klimova, v-5-5-20.

Fig. 190: Oil bodies 4–6(–10) per cell, spherical, 2–3 µm in diameter, oblong 3–5×2–3 µm, smooth – VIETNAM, HA GIANG PROVINCE, Bakalin & Klimova, v-5-9-20.



Cololejeunea trichomanis (Gottsche) Besch.

Fig. 191: Oil bodies 7–10 per cell, rarely spherical, 4–5 µm in diameter, oblong 5–10×2.5–4 µm, botryoidal – VIETNAM, HA GIANG PROVINCE, Bakalin & Klimova, v-1-4-20.

Fig. 192: Oil bodies 7–15 per cell, spherical, 3–4 µm in diameter, oblong 3–4×4–8 µm, granulate to botryoidal – VIETNAM, SON LA PROVINCE, Bakalin & Klimova, v-23-8-19.

Fig. 193: Oil bodies 8–19 per cell, spherical, 4–5 µm in diameter, oblong 3–5×5–9 µm, botryoidal – VIETNAM, SON LA PROVINCE, Bakalin & Klimova, v-27-2-19.

Cololejeunea yakusimensis (S.Hatt.) Mizut.

Fig. 194: Oil bodies 6–10 per cell, spherical, 2(–3) µm in diameter, oblong (3–)4–10×2–3 µm, granulate to coarsely so – VIETNAM, HA GIANG PROVINCE, Bakalin & Klimova, v-1-5b-20.

Fig. 195: Oil bodies 3–6 per cell, spherical, 2–4 µm in diameter, oblong 3–10×2–4 µm, botryoidal – VIETNAM, LAO

CAI PROVINCE, Bakalin & Klimova, v-1-7-17.

Colura herzogii Jovet-Ast

Fig. 196: Oil bodies 16–30 per cell, spherical, 2–3 µm in diameter, oblong 4–6×2–3 µm, finely granulate – INDONESIA, JAVA ISLAND, Bakalin, java-3-61b-15.

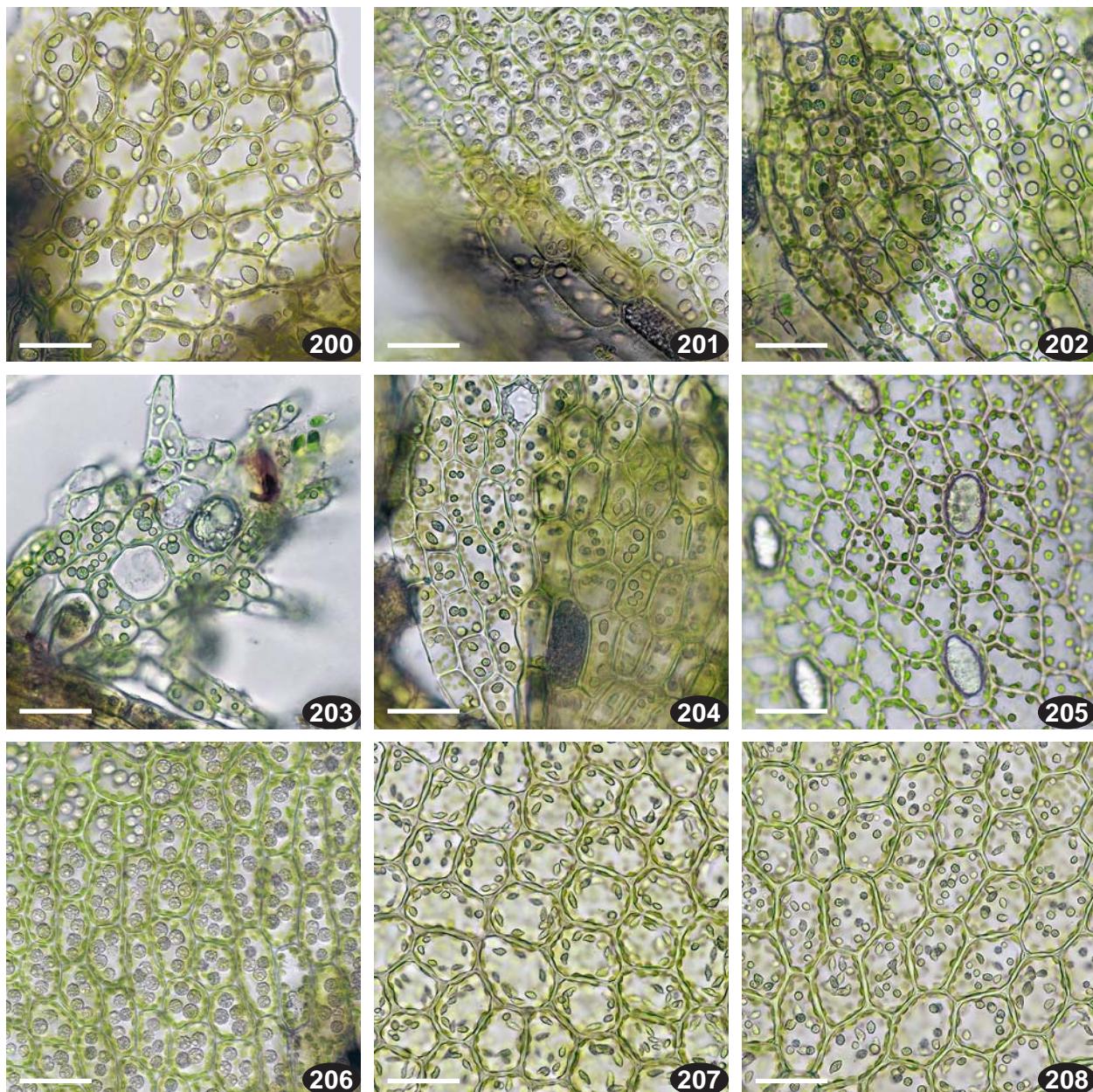
Colura tenuicornis (A.Evans) Steph.

Fig. 197: Oil bodies 6–8 per cell, spherical, 2–3 µm in diameter, oblong 3–4×2–3 µm, smooth – VIETNAM, HA GIANG PROVINCE, Bakalin & Klimova, v-5-12-20.

Drepanolejeunea angustifolia (Mitt.) Grolle

Fig. 198: Oil bodies 2–4 per cell, spherical, 4–7 µm in diameter, oblong 6–15×4–6 µm, granulate – VIETNAM, LAO CAI PROVINCE, Bakalin & Klimova, v-10-37-17.

Fig. 199: Oil bodies 1 per cell, spherical, 5–7 µm in diameter, oblong 6–15×5–7 µm, finely granulate – INDONESIA, JAVA ISLAND, Bakalin, java-3-38-15.



Drepanolejeunea angustifolia (Mitt.) Grolle

Fig. 200: Oil bodies 3–5 per cell, spherical, 4–7 µm in diameter, oblong 5–14×4–6 µm, granulate – VIETNAM, LAO CAI PROVINCE, Bakalin & Klimova, v-10-45-17.

Drepanolejeunea commutata Grolle et R.L.Zhu

Fig. 201: Oil bodies 4–6 per cell, spherical, 3–6(–7) µm in diameter, oblong 5–9×4–5 µm, granulate to finely so – VIETNAM, HA GIANG PROVINCE, Bakalin & Klimova, v-11-44-20_3.

Fig. 202: Oil bodies 2–4 per cell, spherical, 4–7 µm in diameter, oblong 5–10×4–6 µm, granulate – VIETNAM, LAO CAI PROVINCE, Bakalin & Klimova, v-3-29-17.

Drepanolejeunea dactylophora (Nees, Lindenb. et Gottsche) J.B.Jack et Steph.

Fig. 203: Oil bodies 3–5 per cell, spherical, 2–7 µm in diameter, granulate; ocelli 2–4 per leaf lobe, 16–18×22–25 µm – INDONESIA, JAVA ISLAND, Bakalin, java-3-63-15.

Drepanolejeunea herzogii R.L.Zhu et M.L.So

Fig. 204: Oil bodies 2–4 per cell, spherical, 3–5 µm in di-

ameter, oblong 4–8×3–5 µm, granulate; ocelli 1 per leaf lobe, basal, 38×18 µm, granulate – VIETNAM, LAO CAI PROVINCE, Bakalin, v-1-23-b-16.

Drepanolejeunea thwaitesiana (Mitt.) Steph

Fig. 205: Oil bodies absent in unspecialized cells; ocelli several per leaf lobe, 23–28×10–15 µm, loosely granulate – INDONESIA, JAVA ISLAND, Bakalin, java-3-58-15.

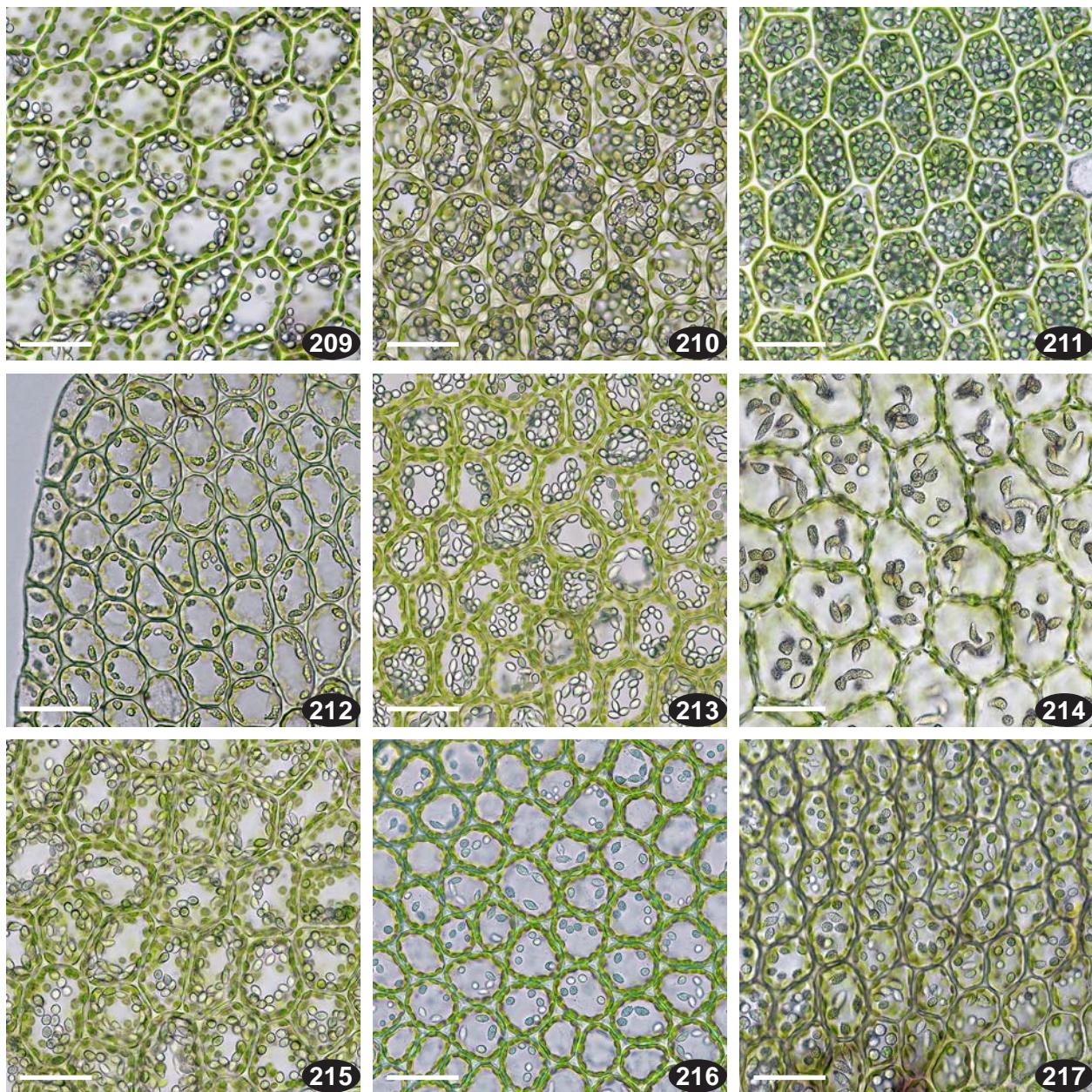
Drepanolejeunea yunnanensis (P.C.Chen) Grolle et R.L.Zhu

Fig. 206: Oil bodies 4–7 per cell, spherical, 4–7 µm in diameter, granulate to coarsely so – VIETNAM, CAO BANG PROVINCE, Bakalin & Klimova, v-26-32-20.

Lejeunea alaskana (R.M.Schust. et Steere) Inoue et Steere

Fig. 207: Oil bodies 6–10(14) per cell, spherical, 2–3 µm in diameter, oblong 4–6×2–3 µm, granulate – RUSSIA, KHABAROVSK TERRITORY, Bakalin, kh-23-4-16.

Fig. 208: Oil bodies 7–10(14) per cell, spherical, 3–5 µm in diameter, oblong 4–7×3–5 µm, granulate – RUSSIA, KHABAROVSK TERRITORY, Bakalin & Klimova, kh-56-24-19.



Lejeunea alata Gottsche

Fig. 209: Oil bodies 8–18(–20) per cell, spherical, 3–5 µm in diameter, oblong 5–8(–10)×3–4 µm, smooth, some biconcave – VIETNAM, HA GIANG PROVINCE, Bakalin & Klimova, v-6-10-20.

Lejeunea anisophylla Mont.

Fig. 210: Oil bodies 9–22 per cell, spherical, 3–5 µm in diameter, oblong 5–7×3–5 µm, coarsely granulate – VIETNAM, SON LA PROVINCE, Bakalin & Klimova, v-30-43-19.

Lejeunea aquatica Horik.

Fig. 211: Oil bodies 11–30 per cell, spherical, 2–5 µm in diameter, oblong 4–10×2–5 µm, smooth – JAPAN, TOTTORI PREFECTURE, Bakalin, j-2-14-13.

Lejeunea cocoes Mitt.

Fig. 212: Oil bodies 4–7 per cell, spherical, 2–4 µm in diameter, oblong 5–12×2–4 µm, granulate – VIETNAM, LAO CAI PROVINCE, Bakalin, v-1-32-16.

Lejeunea aff. discreta Lindenb.

Fig. 213: Oil bodies 10–12(15) per cell, spherical, 3–4 µm in diameter, oblong 5–7(8)×3–4 µm, smooth – VIETNAM, LAI

CHAU PROVINCE, Bakalin & Klimova, v-17-2-19.

Comment. Lee (2013) described finely granulate oil bodies in the species, not completely smooth as in our specimen. We were unable to find the correct name for the specimen cited here as *L. aff. discreta*.

Lejeunea eifrigii Mizut.

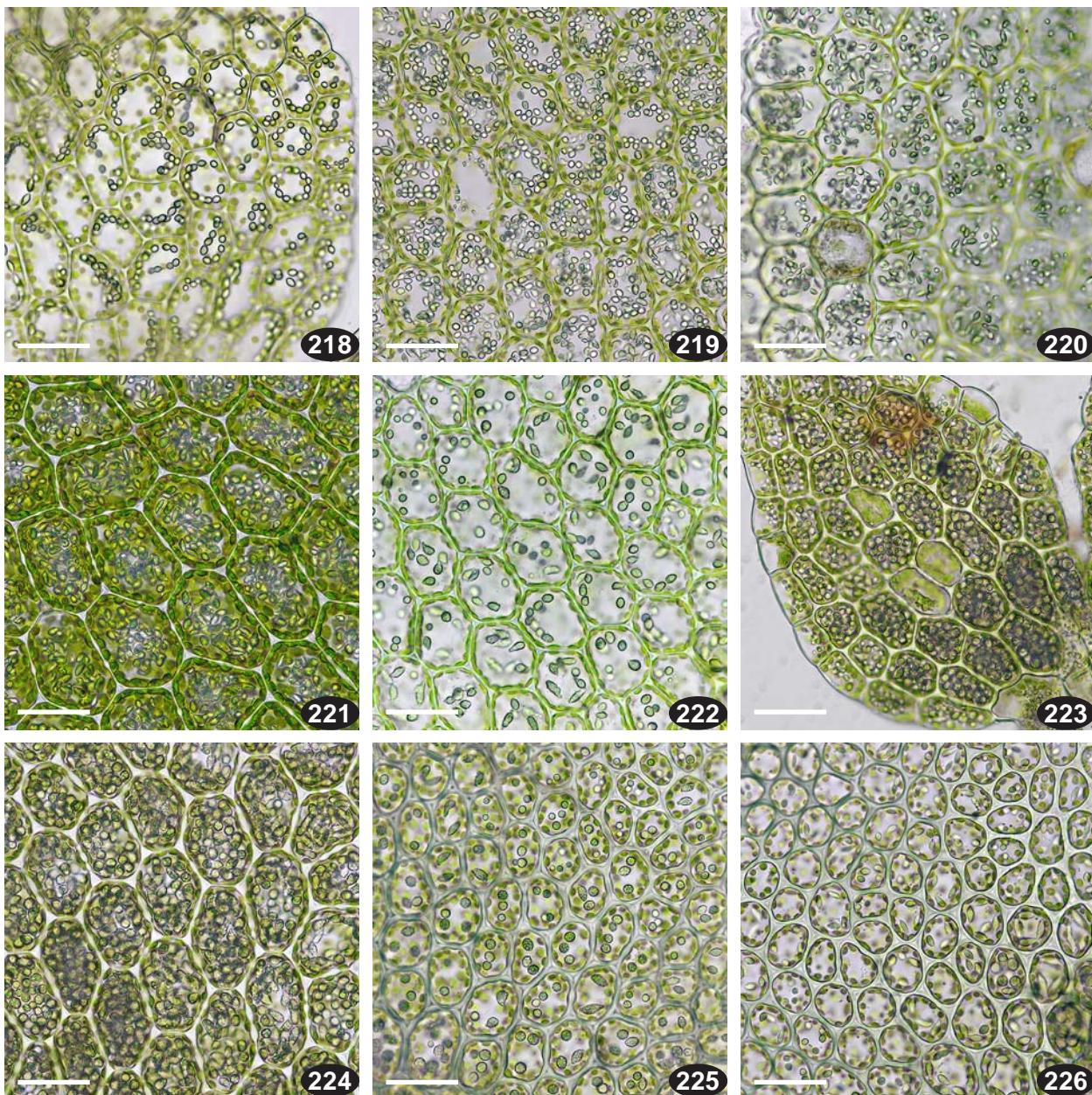
Fig. 214: Oil bodies (4–)6–10 per cell, spherical, 4–5 µm in diameter, oblong 6–14×4–5 µm, granulate – VIETNAM, HA GIANG PROVINCE, Bakalin & Klimova, v-5-6a-20.

Lejeunea flava (Sw.) Nees

Fig. 215: Oil bodies 12–22 per cell, spherical, 3–5 µm in diameter, oblong 5–8×3–5 µm, granulate – CHINA, SICHUAN PROVINCE, Bakalin & Klimova, c-49-12-17.

Fig. 216: Oil bodies in dorsal lobe 4–6 per cell, spherical, 2.5–3.5 µm in diameter, oblong 4–7(–9)×2.5–3.5 µm, granulate – REPUBLIC OF KOREA, JEOLLABUK-DO, Bakalin, kor-79-3a-19.

Fig. 217: Oil bodies (4–)5–6 per cell, spherical, 3–4 µm in diameter, oblong 4–9×3–4 µm, granulate to coarsely so – VIETNAM, CAO BANG PROVINCE, Bakalin & Klimova, v-28-23-20.



Lejeunea hui R.L.Zhu

Fig. 218: Oil bodies 7–13(16) per cell, spherical, 2–3 µm in diameter, oblong 3–5×2–3 µm, smooth – VIETNAM, SON LA PROVINCE, Bakalin & Klimova, v-25-9e-19.

Lejeunea japonica Mitt.

Fig. 219: Oil bodies 15–30 per cell, spherical, 2–3 µm in diameter, oblong 4–5×2–3(4) µm, smooth – CHINA, YUNNAN PROVINCE, Bakalin, c-72-9-18.

Fig. 220: Oil bodies 15–30 per cell, spherical, 2–3 µm in diameter, oblong 3–5×2–3 µm, smooth – JAPAN, TOTTORI PREFECTURE, Bakalin, j-6-1-13.

Fig. 221: Oil bodies in dorsal lobe 20–35 per cell, spherical, 3–4 µm in diameter, oblong 3–7×2.5–3.5 µm, smooth – REPUBLIC OF KOREA, JEOLLABUK-DO, Bakalin, kor-70-20-19.

Lejeunea kodamae Ikegami et Inoue

Fig. 222: Oil bodies 5–7(–10) per cell, spherical, 3–5 µm in

diameter, oblong 4–7(8)×3–4 µm, granulate – JAPAN, KOCHI PREFECTURE, Bakalin, j-8-54-15.

Lejeunea magohukui Mizut.

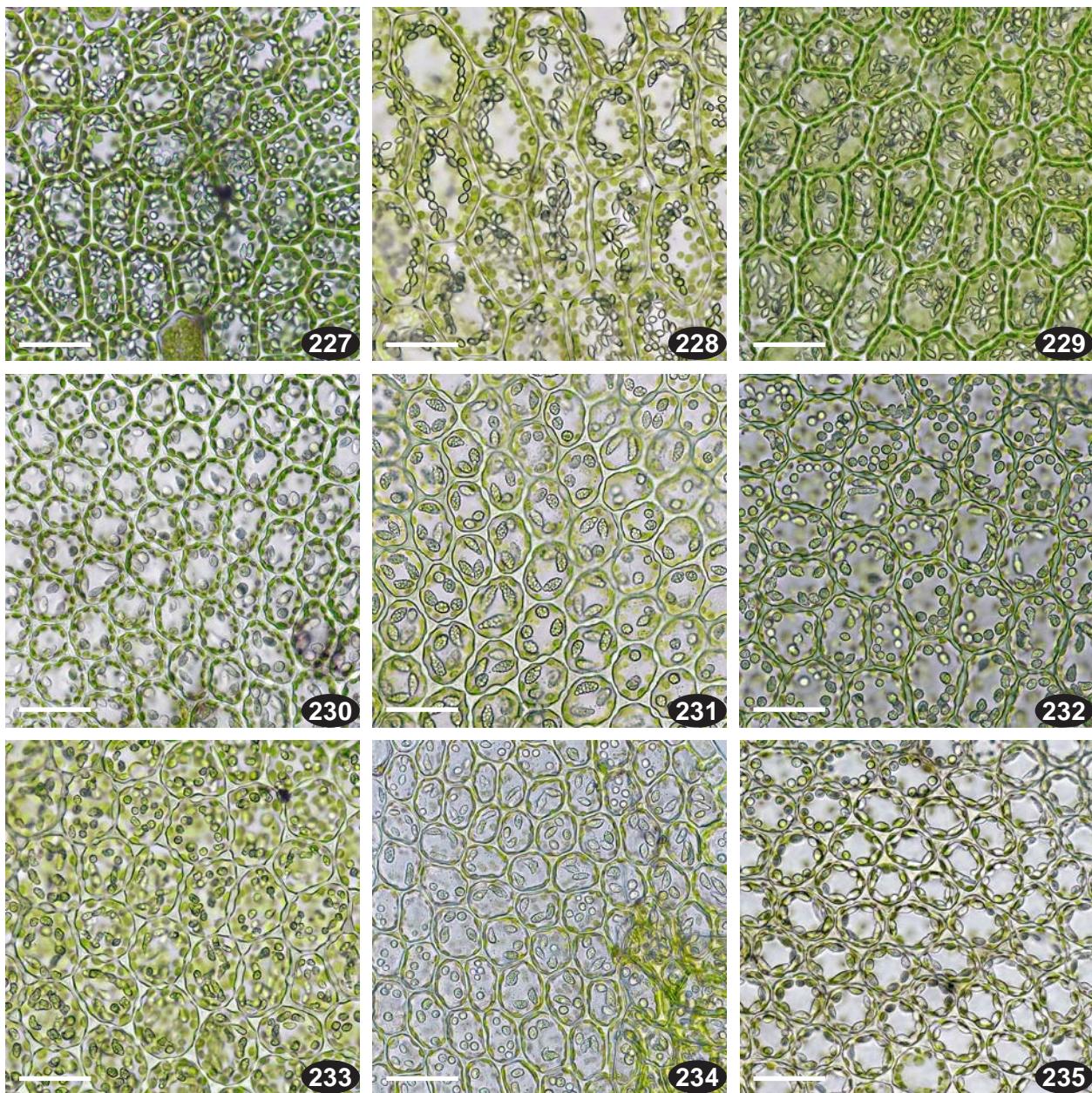
Fig. 223: Oil bodies 10–40 per cell, spherical, 2–3 µm in diameter, granulate, brownish – VIETNAM, LAO CAI PROVINCE, Bakalin & Klimova, v-13-24-17_3.

Fig. 224: Oil bodies 20–40 per cell, spherical, (2–)3–4 µm in diameter, oblong 4–8×2–4 µm, granulate, brownish – VIETNAM, LAO CAI PROVINCE, Bakalin & Klimova, v-13-24-17_6.

Lejeunea neelgherriana Gottsche

Fig. 225: Oil bodies 2–4 per cell, spherical, 3–5 µm in diameter, oblong 5–8×3–4(5) µm, granulate – VIETNAM, HOA BINH PROVINCE, Bakalin & Klimova, v-30-28-19.

Fig. 226: Oil bodies 3–5 per cell, spherical, 2–5 µm in diameter, oblong 4–10×2–4 µm, finely granulate – VIETNAM, LAO CAI PROVINCE, Bakalin & Klimova, v-4-57-17.



Lejeunea obscura Mitt.

Fig. 227: Oil bodies 15–30 per cell, spherical, 2–4 μm in diameter, oblong 4–8 \times 2–4 μm , smooth – CHINA, GUIZHOU PROVINCE, Bakalin, china-50-12-13.

Fig. 228: Oil bodies 20–35 per cell, spherical, 3–4 μm in diameter, oblong 4–7 \times 3–4 μm , smooth – VIETNAM, SON LA PROVINCE, Bakalin & Klimova, v-25-4-19.

Fig. 229: Oil bodies 10–14 per cell, rarely spherical, (2–)3 μm in diameter, oblong 3–7 \times 2–2.5 μm , smooth – VIETNAM, HA GIANG PROVINCE, Bakalin & Klimova, v-6-5-20.

Lejeunea pallidevirens S.Hatt.

Fig. 230: Oil bodies 3–5 per cell, spherical, 4–5 μm in diameter, oblong 5–8 \times 4–5 μm , finely granulate – VIETNAM, HA GIANG PROVINCE, Bakalin & Klimova, v-13-5-20.

Fig. 231: Oil bodies 3–6 per cell, spherical, 4–5 μm in diameter, oblong 6–10 \times 3–4(6) μm , granulate to coarsely so –

VIETNAM, LAI CHAU PROVINCE, Bakalin & Klimova, v-14-2-19.

Fig. 232: Oil bodies 7–15 per cell, spherical, 3–4(5) μm in diameter, oblong 5–10 \times 3–4(5) μm , granulate – VIETNAM, LAO CAI PROVINCE, Bakalin, v-2-59-16.

Lejeunea papilionacea Prantl

Fig. 233: Oil bodies 8–18 per cell, spherical, 3–4(–5) μm in diameter, oblong 4–8(10) \times 3–4 μm , granulate – VIETNAM, LAO CAI PROVINCE, Bakalin & Klimova, v-1-1-17.

Lejeunea parva (S.Hatt.) Mizut.

Fig. 234: Oil bodies 3–5(–6) per cell, spherical, 3–4 μm in diameter, oblong 3–7 \times 2–4 μm , granulate – REPUBLIC OF KOREA, GYEONGSANGNAM-DO, Bakalin, kor-70-3a-19.

Fig. 235: Oil bodies 6–8 per cell, spherical, 3.5–4 μm in diameter, oblong 4–8 \times 3–4 μm , finely granulate – VIETNAM, LAI CHAU PROVINCE, Bakalin & Klimova, v-2-5-19.

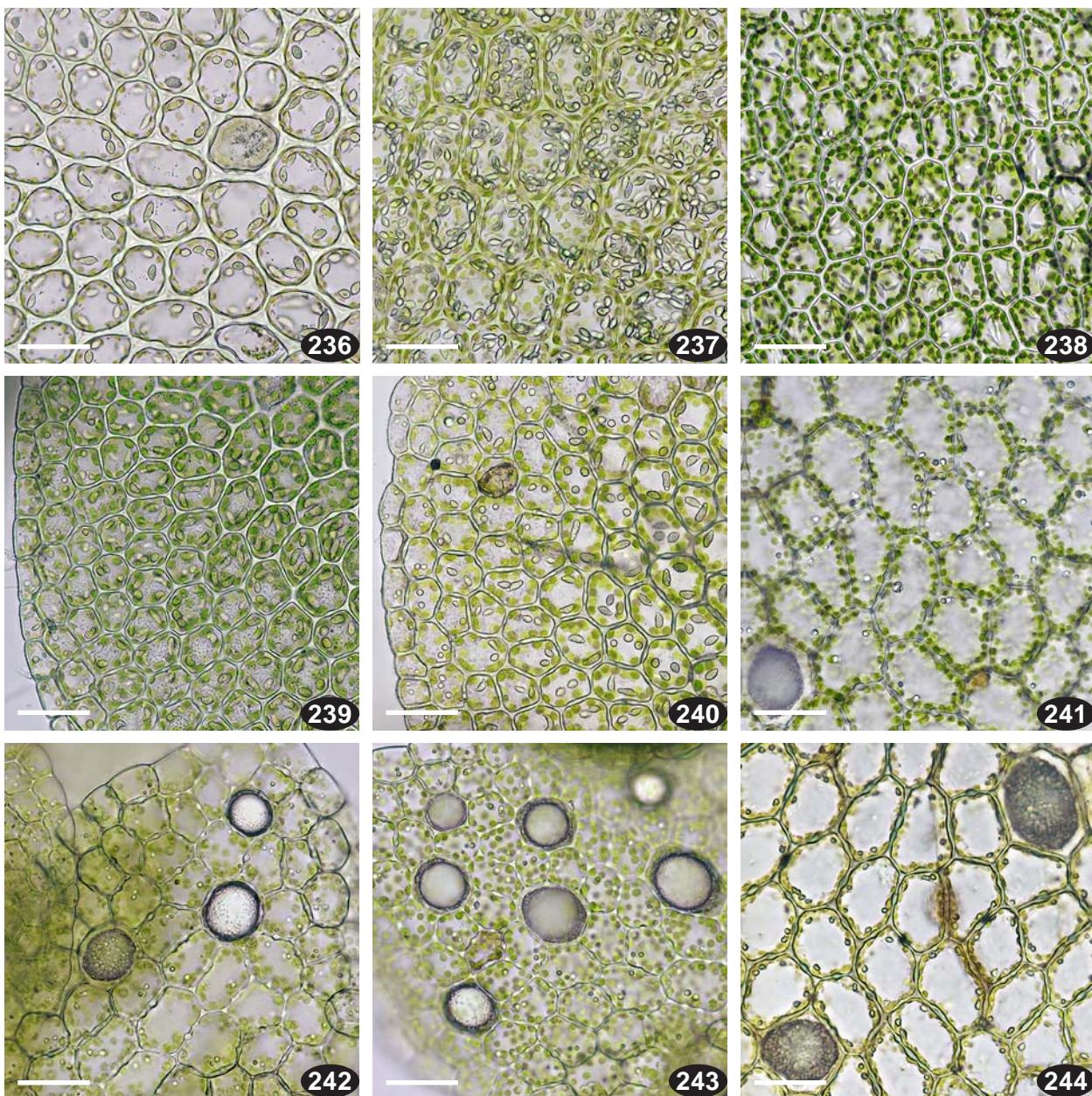
*Lejeunea parva* (S.Hatt.) Mizut.

Fig. 236: Oil bodies 3–5 per cell, spherical, 3–4 μm in diameter, oblong 6–10 \times 3–4(5) μm , finely granulate – VIETNAM, LAI CHAU PROVINCE, Bakalin & Klimova, v-9-5-19.

Lejeunea sordida (Nees)

Fig. 237: Oil bodies 15–25 per cell, spherical, 3–4 μm in diameter, oblong 4–7 \times 3–4 μm , smooth – CHINA, YUNNAN PROVINCE, Bakalin, c-73-19-18.

Lejeunea subacuta Mitt.

Fig. 238: Oil bodies 5–7 per cell, spherical, 1.5–2.5 μm in diameter, oblong 3–5 \times 1.5–2 μm , finely granulate – VIETNAM, CAO BANG PROVINCE, Bakalin & Klimova, v-26-26-20.

Fig. 239: Oil bodies 4–6 per cell, spherical, 3–4 μm in diameter, oblong 6–10 \times 3–4 μm , finely granulate – VIETNAM, LAO CAI PROVINCE, Bakalin & Klimova, v-6-30-17.

Lejeunea tuberculosa Steph.

Fig. 240: Oil bodies 3–5 per cell, spherical, 3–5 μm in diameter, oblong 6–10 \times 3–4 μm , granulate – VIETNAM, LAI CHAU PROVINCE, Bakalin & Klimova, v-12-15-19.

Leptolejeunea balansae Steph.

Fig. 241: Oil bodies 3–5 per cell, spherical, 2–2.5 μm in diameter, smooth – VIETNAM, LAI CHAU PROVINCE, Bakalin & Klimova, v-3-5-20.

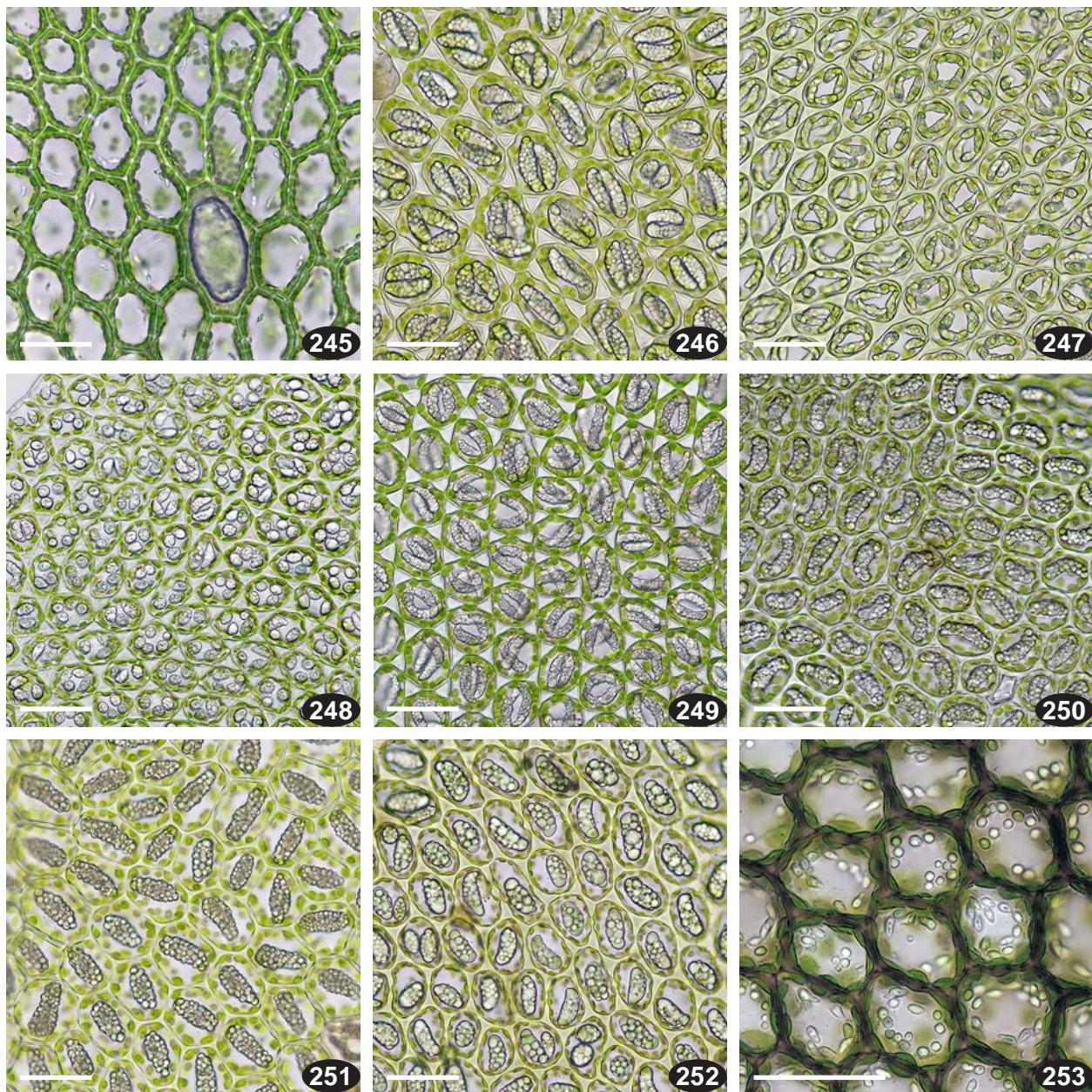
Leptolejeunea elliptica (Lehm. et Lindenb.) Besch.

Fig. 242: Oil bodies 2–4 per cell, spherical, 1–2 μm in diameter, smooth, ocelli less than 8 per leaf lobe, spherical, 15–23 μm in diameter, oblong 20–50 \times 18–35 μm , granulate, brownish – VIETNAM, HOA BINH PROVINCE, Bakalin & Klimova, v-32-20-19_5.

Fig. 243. – Oil bodies 2–4 per cell, spherical, 1–2 μm in diameter, smooth, ocelli 3–5 per leaf lobe, 15–25 \times 15–25 granulate, brownish – VIETNAM, HOA BINH PROVINCE, Bakalin & Klimova, v-32-20-19_8.

Leptolejeunea latifolia Herzog

Fig. 244: Oil bodies 3–6 per cell, spherical, 1.5–3 μm in diameter, oblong 2–4 \times 1–2 μm , ocelli 35–40 \times 26–30, granulate, brownish – VIETNAM, LAO CAI PROVINCE, Bakalin, v-2-18k-16.



Leptolejeunea maculata (Mitt.) Schiffn.

Fig. 245: Oil bodies 2–6(7) per cell, oblong 2–6×1–1.5 µm, botryoidal – INDONESIA, JAVA ISLAND, Bakalin, java-3-48-15.

Leucolejeunea paroica N.Kitag.

Fig. 246: Oil bodies 2(–4) per cell, oblong 16–28×6–8 µm, botryoidal – VIETNAM, LAI CHAU PROVINCE, Bakalin & Klimova, v-13-13-19.

Comment: *Cheilolejeunea kitagawai* W.Ye et R.L.Zhu (Ye & Zhu, 2010) is suggested *nomen novum* for *Leucolejeunea paroica* N.Kitag. if to treat *Leucolejeunea* as the synonym of *Cheilolejeunea*.

Leucolejeunea turgida (Mitt.) Verd.

Fig. 247: Oil bodies 3–6 per cell, oblong 8–16×3–5 µm, granulate – CHINA, YUNNAN PROVINCE, Bakalin, c-82-9-18.

Fig. 248: Oil bodies in lobe margin 3–4 per cell, spherical, 4–5 µm in diameter, oblong 5–9×4–6 µm, botryoidal to loosely segmented – VIETNAM, LAI CHAU PROVINCE, Bakalin &

Klimova, v-13-21-20.

Fig. 249: Oil bodies 2–3 per cell, oblong 13–22×4–5 µm, coarsely granulate – VIETNAM, HOA BINH PROVINCE, Bakalin & Klimova, v-30-10-20.

Leucolejeunea xanthocarpa (Lehm. & Lindenb.) A. Evans

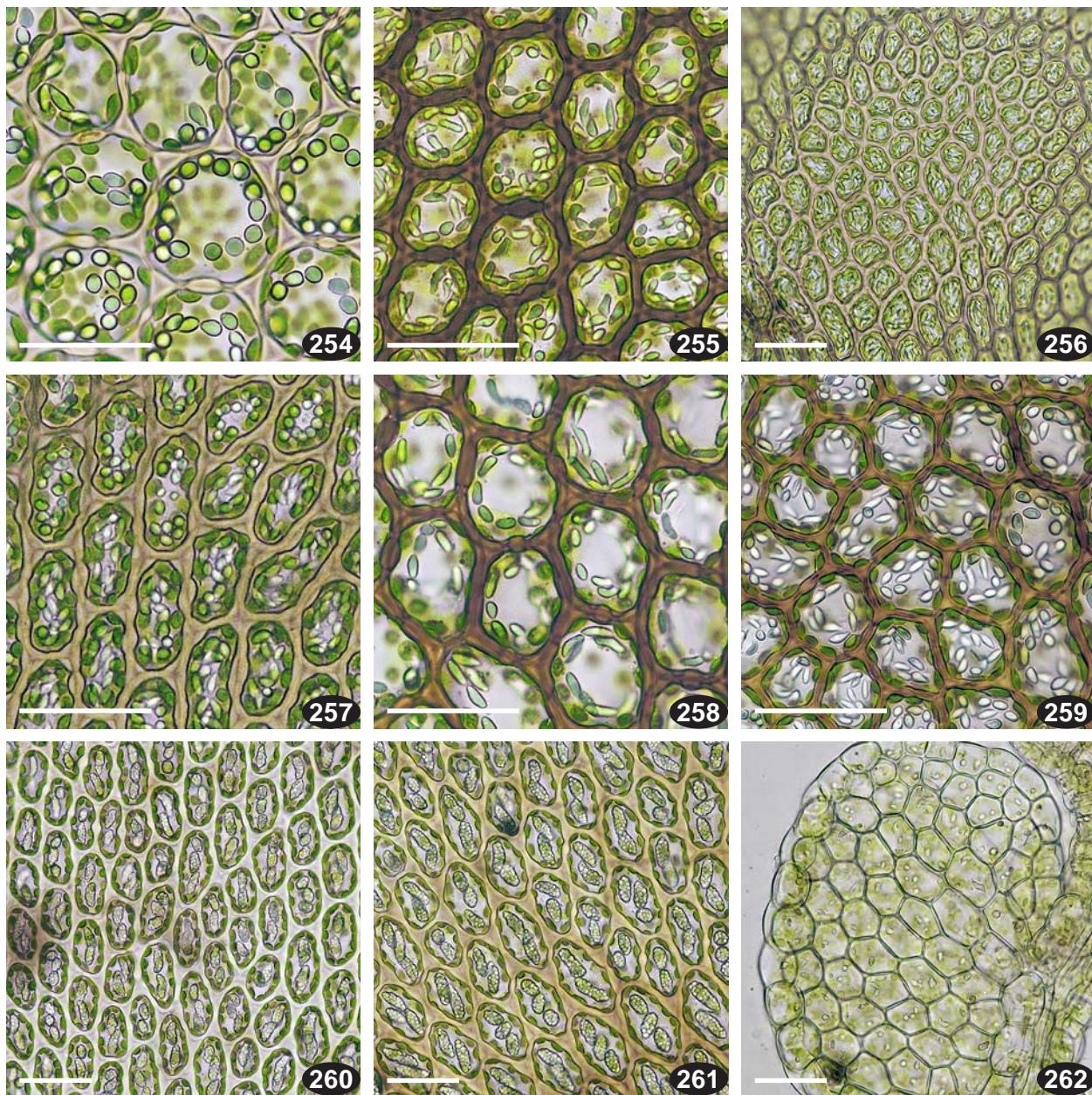
Fig. 250: Oil bodies 1 per cell, oblong 13–25×6–7 µm, coarsely granulate – VIETNAM, LAI CHAU PROVINCE, Bakalin & Klimova, v-13-12-20.

Fig. 251: Oil bodies 1(–2) per cell, oblong 17–24×7–10 µm, botryoidal to coarsely granulate – VIETNAM, HOA BINH PROVINCE, Bakalin & Klimova, v-30-42-19.

Fig. 252: Oil bodies 1(–3) per cell, spherical, 8–12 µm in diameter, oblong 12–18×6–10 µm, botryoidal – VIETNAM, LAO CAI PROVINCE, Bakalin & Klimova, v-6-38-17.

Lopholejeunea applanata (Reinw., Blume et Nees) Schiffn.

Fig. 253: Oil bodies 7–12 per cell, spherical, 1.5–2 µm in diameter, oblong 2–3(–4)×1.5–2 µm, smooth – VIETNAM, CAO BANG PROVINCE, Bakalin & Klimova, v-28-22-20.



Lopholejeunea appplanata (Reinw., Blume et Nees) Schiffn.

Fig. 254: Oil bodies (8)12–15 per cell, spherical, 3–4 μm in diameter, oblong 4–8 \times 3–4 μm , smooth – VIETNAM, HOA BINH PROVINCE, Bakalin & Klimova, v-30-19-19.

Lopholejeunea eulopha (Taylor) Schiffn.

Fig. 255: Oil bodies (8)10–12(14) per cell, spherical, 2–3 μm in diameter, oblong 3–5(6) \times 2–3 μm , smooth – VIETNAM, LAI CHAU PROVINCE, Bakalin & Klimova, v-14-5-19.

Lopholejeunea nigricans (Lindenb.) Schiffn.

Fig. 256: Oil bodies 9–13(15) per cell, oblong 3–5 \times 1–1.5 μm , smooth to loosely segmented – VIETNAM, HOA BINH PROVINCE, Bakalin & Klimova, v-28-7-19.

Fig. 257: Oil bodies 7–15 per cell, spherical, 1.5–2 μm in diameter, oblong 3–4 \times 1.5–2 μm , smooth to loosely segmented – VIETNAM, HOA BINH PROVINCE, Bakalin & Klimova, v-30-20-19.

Lopholejeunea subfusca (Nees) Schiffn.

Fig. 258: Oil bodies 5–12 per cell, spherical, 1.5–2 μm in

diameter, oblong 4–7 \times 1.5–2 μm , nearly smooth – VIETNAM, LAO CAI PROVINCE, Bakalin & Klimova, v-1-12-17.

Lopholejeunea zollingeri (Steph.) Schiffn.

Fig. 259: Oil bodies (6)–8–14 per cell, spherical, 1.5–2 μm in diameter, oblong 2–4 \times 1.5–2 μm , smooth – VIETNAM, CAO BANG PROVINCE, Bakalin & Klimova, v-21-8-20.

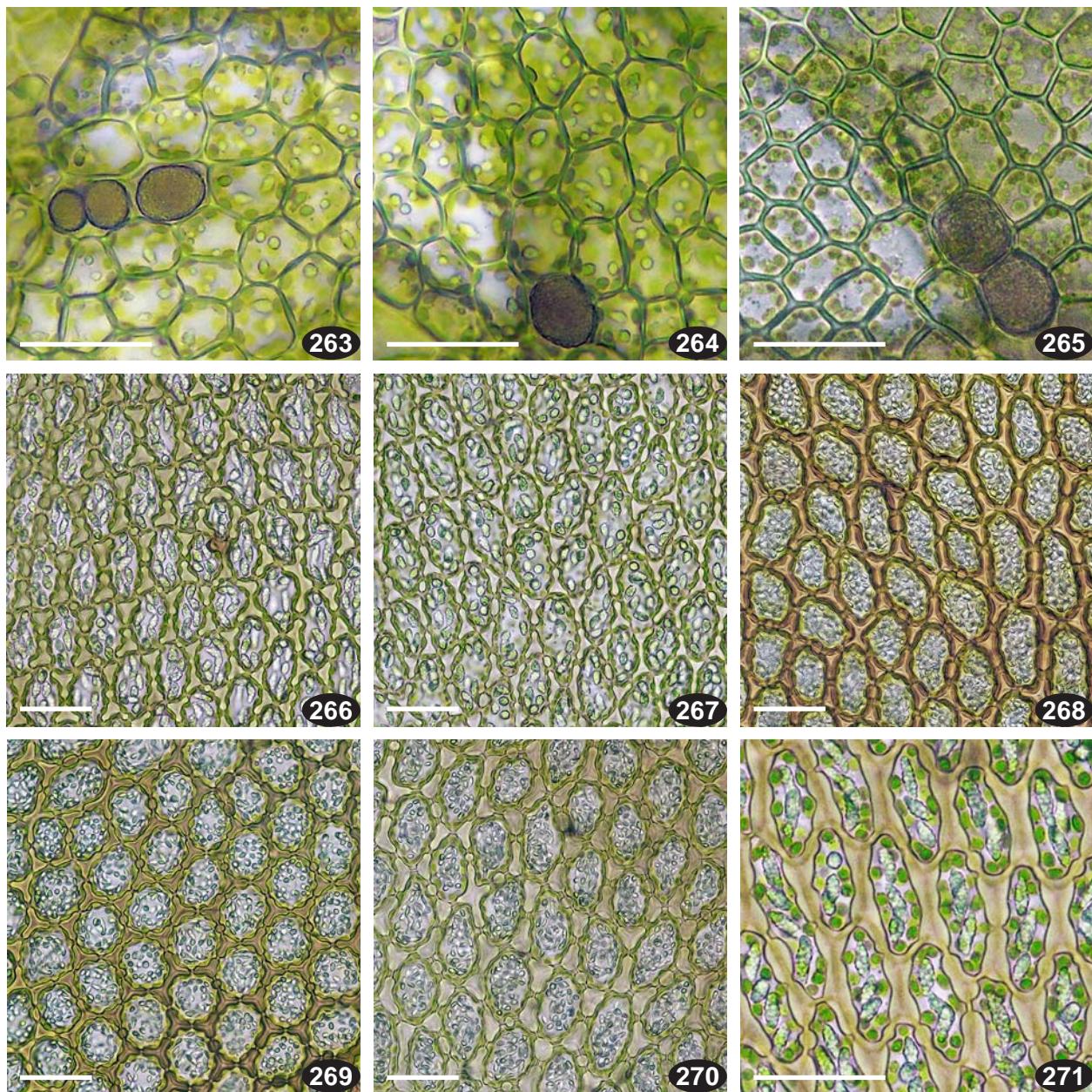
Mastigolejeunea humilis (Gottsche) Schiffn.

Fig. 260: Oil bodies 2–4 per cell, oblong 4–11 \times 3–5 μm , coarsely granulate – VIETNAM, HOA BINH PROVINCE, Bakalin & Klimova, v-30-10-19.

Fig. 261: Oil bodies 2–3 per cell, spherical, 4–5(7) μm in diameter, oblong 5–15(17) \times 4–6 μm , coarsely granulate – VIETNAM, HOA BINH PROVINCE, Bakalin & Klimova, v-32-11-19.

Metalejeunea cucullata (Reinw., Blume et Nees) Grolle

Fig. 262: Oil bodies 2–3(–4) per cell, spherical, 1–2 μm in diameter, oblong 2–3 \times 1–2 μm , finely granulate – VIETNAM, SON LA PROVINCE, Bakalin & Klimova, v-19-5-19.



Microlejeunea punctiformis (Taylor) Steph.

Fig. 263: Oil bodies in dorsal lobe 2–4 per cell, spherical, 1.5–2.0 µm in diameter, oblong 2–3×1.5–2.0 µm, nearly smooth, ocelli 1–3 per leaf dorsal lobe, finely granulate, 10–12 µm in diameter to oblong 15×12 µm, brownish – REPUBLIC OF KOREA, JEJU-DO, Bakalin, kor-30-7-15_3.

Fig. 264: Oil bodies in dorsal lobe 2–4 per cell, spherical, 2.0–2.5 µm in diameter, oblong 2.5–4.0×2.0–2.5 µm, nearly smooth, ocelli 1 per leaf dorsal lobe, finely granulate, 16×13 µm, brownish – REPUBLIC OF KOREA, JEJU-DO, Bakalin, kor-30-7-15_4.

Fig. 265: Oil bodies absent, ocelli 1–2 per leaf, 17–20×14–16 µm, granulate – VIETNAM, LAO CAI PROVINCE, Bakalin, v-2-18j-16.

Ptychanthus striatus (Lehm. et Lindenb.) Nees

Fig. 266: Oil bodies (4–)7–9 per cell, oblong 4–6×3–4 µm, botryoidal – VIETNAM, HOA BINH PROVINCE, Bakalin & Klimova, v-32-18-19.

Fig. 267: Oil bodies 5–9 per cell, spherical, 3–4 µm in diameter, oblong 4–6×(2–)3–4 µm, botryoidal to coarsely granulate – VIETNAM, LAO CAI PROVINCE, Bakalin & Klimova, v-4-59-17.

Spruceanthus semirepandus (Nees) Verd.

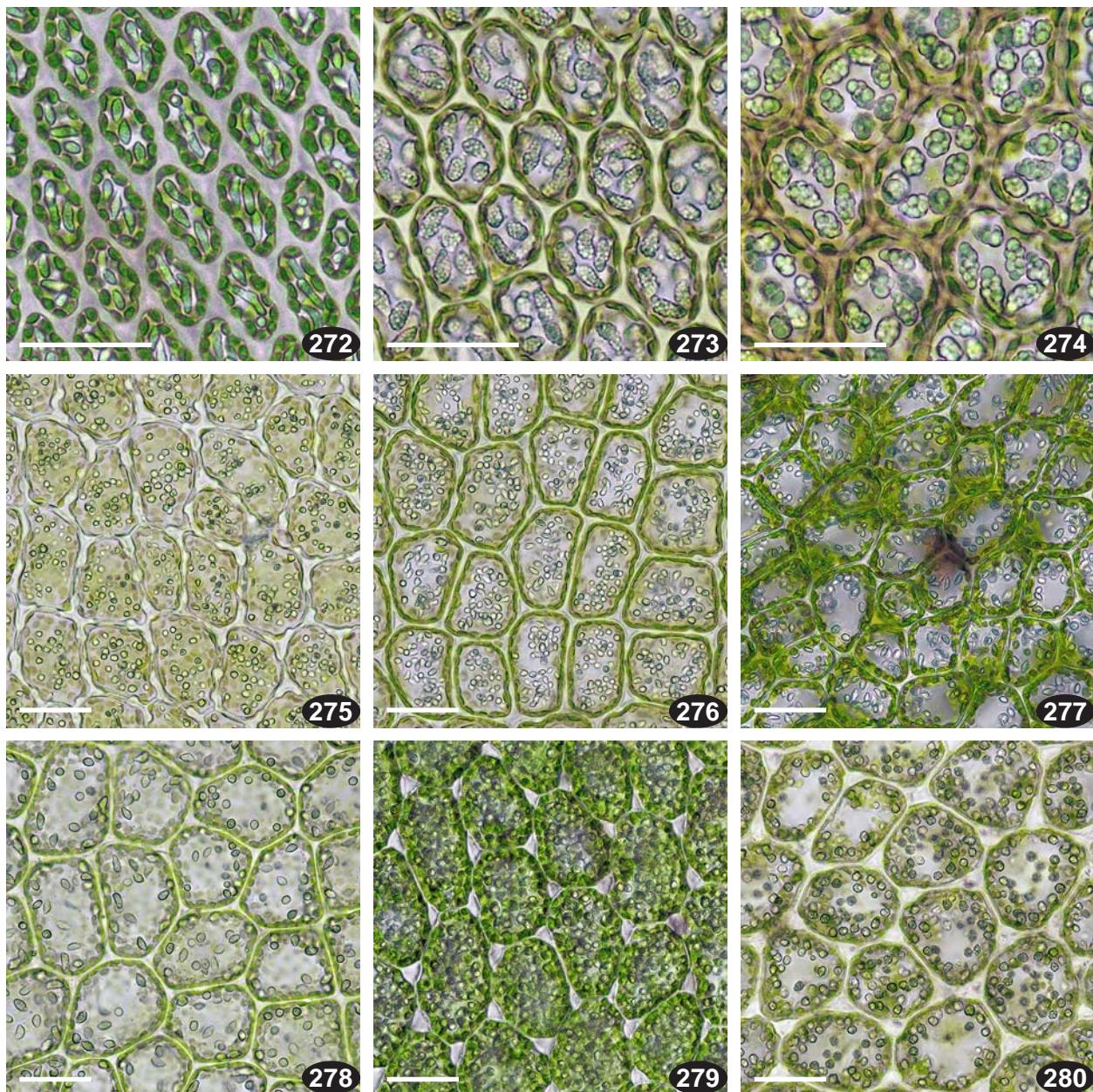
Fig. 268: Oil bodies 20–35 per cell, rarely spherical, 1.5–2 µm in diameter, oblong 2–4×1.5–2 µm, smooth – VIETNAM, HA GIANG PROVINCE, Bakalin & Klimova, v-13-8-20.

Fig. 269: Oil bodies 20–35 per cell, spherical, 1.5–2(–2.5) µm in diameter, oblong 2–3(–4)×(1–)1.5–2 µm, smooth – VIETNAM, LAO CAI PROVINCE, Bakalin, v-2-132-16.

Fig. 270: Oil bodies 23–35 per cell, spherical, 1.5–2 µm in diameter, oblong 2–4×(1–)1.5–2 µm, smooth – VIETNAM, LAI CHAU PROVINCE, Bakalin & Klimova, v-4-19-19.

Thysananthus aculeatus Herzog

Fig. 271: Oil bodies in lower half of leaf dorsal lobe 3–6 per cell, rarely spherical, 3–4 µm in diameter, oblong 4–12×3(–4) µm, granulate – VIETNAM, HOA BINH PROVINCE, Bakalin & Klimova, v-30-39-19.



Thysananthus spathulistipus (Reinw., Blume et Nees) Lindenb.

Fig. 272: Oil bodies (2-)3-4 per cell, oblong 3-6×2-3 µm, finely granulate – INDONESIA, JAVA ISLAND, Bakalin, java-3-35-15.

Tuzibeanthus chinensis (Steph.) Mizut.

Fig. 273: Oil bodies 4-6 per cell, rarely spherical, 3-4 µm in diameter, oblong 4-8×3-4 µm, granulate – CHINA, YUNNAN PROVINCE, Bakalin, c-72-2-18.

Fig. 274: Oil bodies 7-9 per cell, spherical, 4-6 µm in diameter, oblong 5-12×4-5 µm, botryoidal – VIETNAM, LAO CAI PROVINCE, Bakalin & Klimova, v-13-1-17.

Ptilidiaceae

Ptilidium ciliare (L.) Hampe

Fig. 275: Oil bodies 20-32 per cell, spherical, 2-3 µm in diameter, botryoidal – RUSSIA, AMUR PROVINCE, Bakalin, am-69-6-18.

Ptilidium pulcherrimum (Weber) Vain.

Fig. 276: Oil bodies 20-30-(35) per cell, spherical, 2-3 µm in diameter, oblong 3-4-(5)×2.0-2.5 µm, loosely botryoidal –

RUSSIA, SAKHALIN PROVINCE, Bakalin & Klimova, k-37-9-18.

Neotrichocoleaceae

Neotrichocolea bissetii (Mitt.) S.Hatt.

Fig. 277: Oil bodies (8-)13-15 per cell, spherical, (3-)4-5 µm in diameter, oblong 4-8×3-5 µm, nearly smooth, some bi-concave – REPUBLIC OF KOREA, JEOLLABUK-DO, Bakalin, kor-71-4-19.

Trichocoleopsis sacculata (Mitt.) S.Okamura

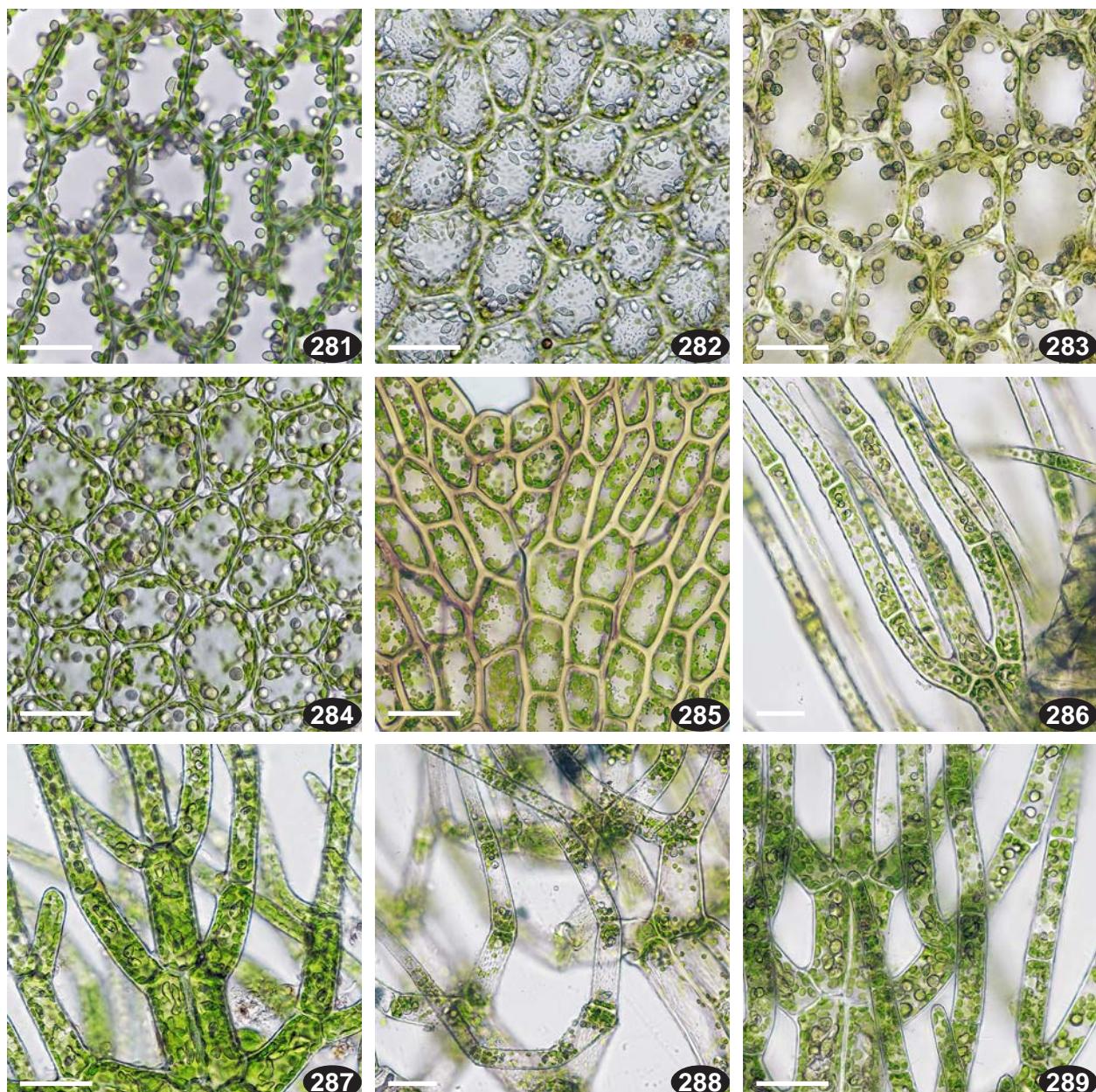
Fig. 278: Oil bodies 8-20 per cell, spherical, (2-)3-(4) µm in diameter, oblong 3-5-(8)×2-3 µm, finely granulate – RUSSIA, PRIMORSKY TERRITORY, Klimova & Bakalin, prim-16-5-16.

Schistochilaceae

Schistochila aligera (Nees et Blume) J.B.Jack et Steph

Fig. 279: Oil bodies 24-35 per cell, spherical, 2.5-4 µm in diameter, coarsely granulate – VIETNAM, CAO BANG PROVINCE, Bakalin & Klimova, v-26-24-20.

Fig. 280: Oil bodies 15-27 per cell, spherical, 3-4-(5) µm in diameter, coarsely granulate – VIETNAM, LAI CHAU PROVINCE, Bakalin & Klimova, v-3-10-19.



Schistochila blumei (Nees) Trevis.

Fig. 281: Oil bodies 9–17 per cell, spherical, 3–5 µm in diameter, oblong 5–7(–9)×3–4(–5) µm, finely granulate – INDONESIA, JAVA ISLAND, Bakalin, java-3-29-15.

Fig. 282: Oil bodies 6–17 per cell, spherical, 3–4 µm in diameter, oblong 3–8×2–3 µm, finely granulate – VIETNAM, HA GIANG PROVINCE, Bakalin & Klimova, v-11-39-20.

Fig. 283: Oil bodies 12–18 per cell, spherical, (3)–4–5 µm in diameter, oblong 5–6(–8)×4–5 µm, granulate to finely so – VIETNAM, SON LA PROVINCE, Bakalin & Klimova, v-23-9-19.

Schistochila sciurea (Nees) Schiffn.

Fig. 284: Oil bodies 9–14 per cell, spherical, 4–5 µm in diameter, rarely oblong 5–6×4–5 µm, granulate – VIETNAM, HA GIANG PROVINCE, Bakalin & Klimova, v-14-17-20.

Pseudolepicoleaceae

Pseudolepicolea andoi (R.M.Schust.) Inoue

Fig. 285: Small putative oil bodies 13–50 per cell, spherical, 0.5(–1.0) µm in diameter, smooth – VIETNAM, LAO CAI PROVINCE, Bakalin & Klimova, v-7-7a-17.

Trichocoleaceae

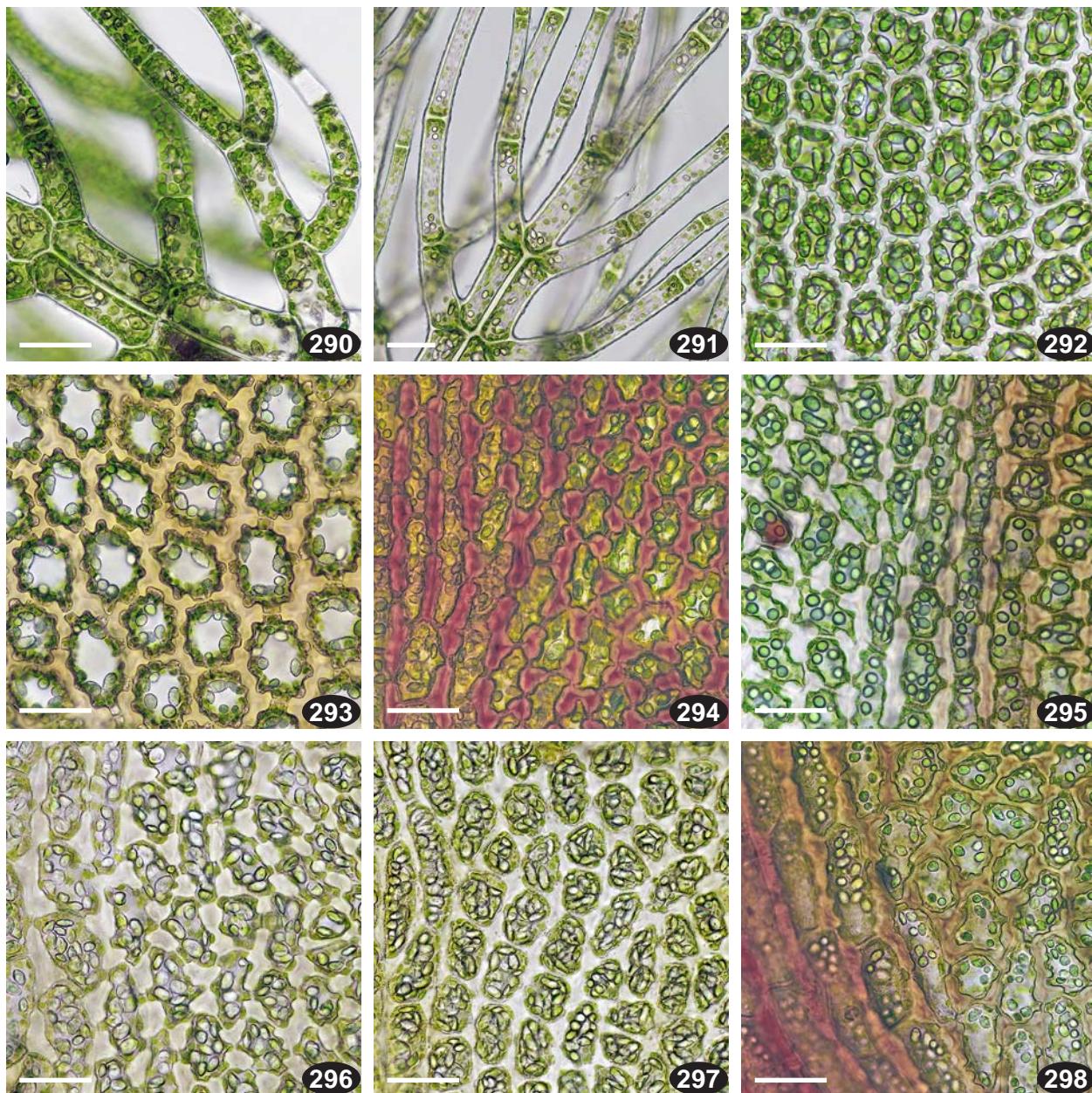
Trichoclea pluma (Reinw., Blume et Nees) Mont.

Fig. 286: Oil bodies 5–7 per cell, spherical, 4–5 µm in diameter, oblong 5–8(–11)×4–5 µm, finely granulate to smooth, some with 1–2 eyes – VIETNAM, SON LA PROVINCE, Bakalin & Klimova, v-24-1-19.

Fig. 287: Oil bodies 4–6 per cell, oblong 5–10×3–4 µm, finely granulate or spherical, 2–4 µm in diameter to oblong 3–7×2–4 µm, with 1–2 eyes, nearly smooth – VIETNAM, CAO BANG PROVINCE, Bakalin & Klimova, v-26-1-20.

Fig. 288: Oil bodies 3–6 per cell, spherical, 3–4 µm in diameter, nearly smooth, with 1(–2) eyes – VIETNAM, LAO CAI PROVINCE, Bakalin, v-2-89-16.

Fig. 289: Oil bodies 5–10 per cell, spherical, 4–6 µm in diameter, oblong 5–10×4–6 µm, finely granulate or spherical, 2–4(–6) µm in diameter, with 1 eye, nearly smooth – VIETNAM, LANG SON PROVINCE, Bakalin & Klimova, v-32-5-20_6.



Trichocolea pluma (Reinw., Blume et Nees) Mont.

Fig. 290: Oil bodies 5–7 per cell, oblong 4–12×3–5 µm, finely granulate or spherical, 3–4 µm in diameter to oblong, 4–10×3–5 µm, with 1–2 eyes, nearly smooth – VIETNAM, LANG SON PROVINCE, Bakalin & Klimova, v-32-5-20 9.

Fig. 291: Oil bodies 5–7 per cell, spherical, 3–4 µm in diameter, oblong 4–6×3–4 µm, nearly smooth to very finely granulate – VIETNAM, LAI CHAU PROVINCE, Bakalin & Klimova, v-7-9-19.

Comment: The distinction of *T. pluma* from *T. tomentella* based on smooth-surfaced biconcentric oil bodies in the former versus finely granulate nonbiconcentric in the latter (Katagiri, 2013) is unreliable since both ‘types’ may occur within the same leaf.

Mastigophoraceae

Mastigophora diclados (Brid. ex F. Weber) Nees

Fig. 292: Oil bodies 4–6(7) per cell, rarely spherical, 4–6 µm in diameter, commonly oblong 6–18×4–6(–8) µm, smooth to segmented – INDONESIA, JAVA ISLAND, Bakalin, java-3-13-15.

Comment: *M. diclados* from Java possesses smooth to segmented oil bodies without the traces of deterioration. If it is the feature of regional population is unclear for us.

Mastigophora woodsii (Hook.) Nees

Fig. 293: Oil bodies 5–7(8) per cell, spherical, 4–6 µm in diameter, oblong 5–12×4–6 µm, finely granulate – VIETNAM,

LAO CAI PROVINCE, Bakalin & Klimova, v-7-12-17.

Herbertaceae

Herbertus arcticus (Inoue et Steere) Schljakov

Fig. 294: Oil bodies 4–7 per cell, to 10 per vitta cell, spherical, 3–5(6) µm in diameter, oblong 5–8×3–4 µm, smooth to unclearly segmented – RUSSIA, KHABAROVSK TERRITORY, Bakalin, kh-23-4-16.

Fig. 295: Oil bodies 2–6 per cell, to 10 per vitta cell, spherical, 4–6 µm in diameter, oblong 5–8×4–6 µm, smooth – RUS-SIA, MAGADAN PROVINCE, Bakalin, mag-30-34-14.

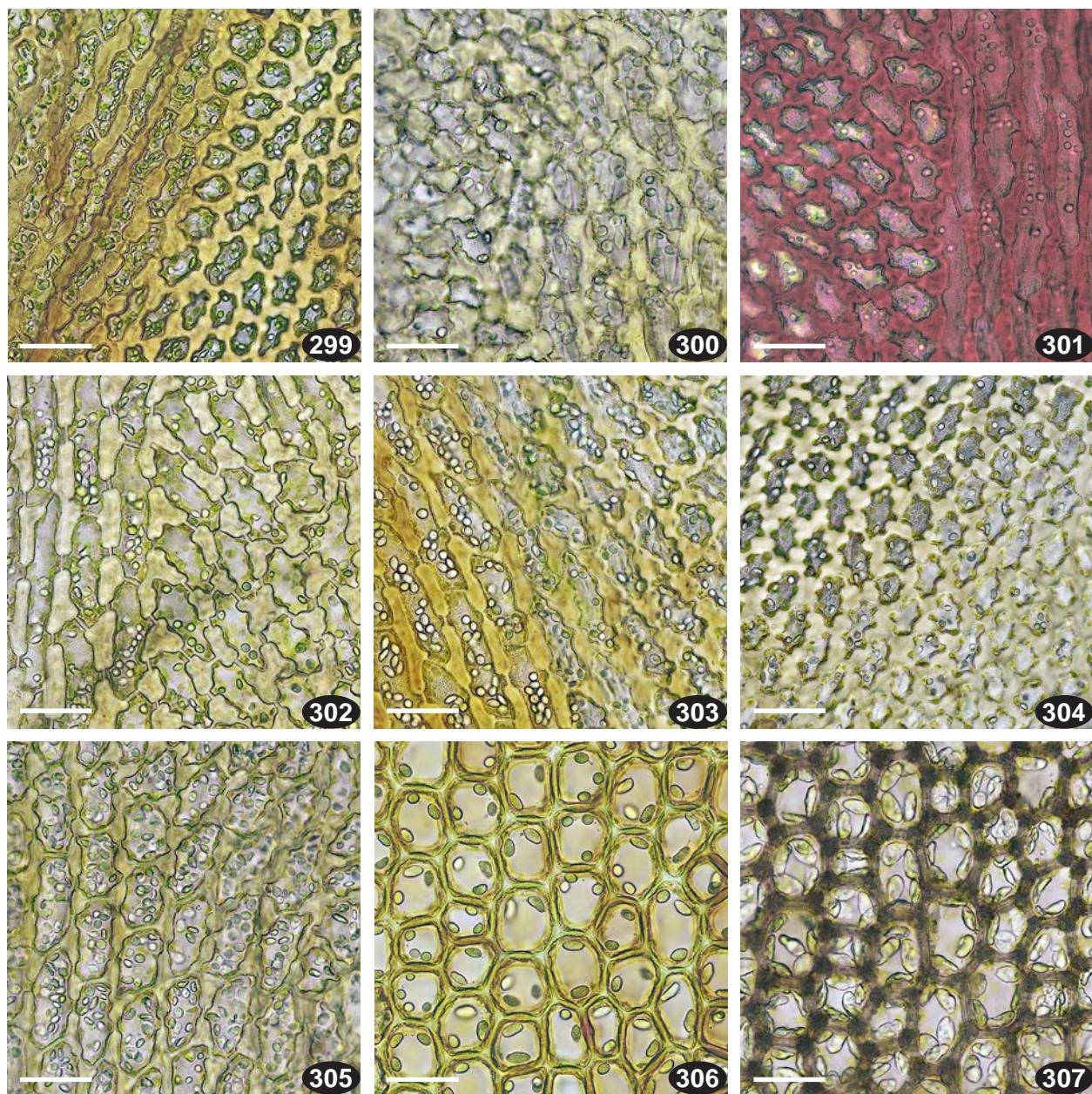
Herbertus armitanus (Steph.) H.A.Mill.

Fig. 296: Oil bodies 7–11 per cell, to 18 per vitta cell, spherical, 4–6 µm in diameter, oblong 6–10×4–6 µm, smooth, biconcave – CHINA, SICHUAN PROVINCE, Bakalin & Klimova, c-36-16-17.

Fig. 297: Oil bodies 6–12 per cell, spherical, 2–3 µm in diameter, oblong 5–10×(2–)3–4 µm, smooth to loosely seg-mented – VIETNAM, HA GIANG PROVINCE, Bakalin & Klimova, v-15-12a-20.

Herbertus delavayi (Steph.) Steph.

Fig. 298: Oil bodies 8–15 per cell, to 26 per vitta cell, spherical, 3–6 µm in diameter, oblong 6–8×3–5 µm, loosely granu-late, sometimes biconcave – CHINA, YUNNAN PROVINCE, Bakalin, c-81-28-18.



Herbertus delavayi (Steph.) Steph.

Fig. 299: Oil bodies 4–7(9) per cell, to 13 per vitta cell, spherical, 2–4 μm in diameter, oblong 3–5 \times 2–3 μm , smooth, biconcave – VIETNAM, LAI CHAU PROVINCE, Bakalin & Klimova, v-3-12-19.

Herbertus kurzii (Steph.) R.S.Chopra

Fig. 300: Oil bodies 3–6 per cell, to 12 per vitta cell, spherical, 4–6 μm in diameter, oblong 4–8 \times 3–5 μm , smooth, sometimes biconcave – CHINA, SICHUAN PROVINCE, Bakalin & Klimova, c-44-6-17.

Fig. 301: Oil bodies 3–4(6) per cell, to 10 per vitta cell, spherical, 2–4 μm in diameter, nearly smooth – CHINA, YUNNAN PROVINCE, Bakalin, c-81-37-18.

Herbertus ramosus (Steph.) H.A.Mill.

Fig. 302: Oil bodies 5–8 per cell, to 18 per vitta cell, spherical, 3–4 μm in diameter, oblong 4–6 \times 3–4 μm , smooth, sometimes biconcave – CHINA, YUNNAN PROVINCE, Bakalin, c-73-26-18.

Fig. 303: Oil bodies (3–)5–8, in vitta cells to 18 per cell,

spherical, 2.5–4 μm in diameter, oblong 3–7 \times 2–4 μm , smooth – VIETNAM, CAO BANG PROVINCE, Bakalin & Klimova, v-23-5-20.

Fig. 304. – Oil bodies 2–4(–5) per cell, spherical, 2–2.5 μm in diameter, oblong 2–5 \times 1.5–2.5 μm , smooth – VIETNAM, CAO BANG PROVINCE, Bakalin & Klimova, v-23-5-20.

Herbertus aff. sendtneri (Nees) Lindb.

Fig. 305: Oil bodies 10–21 per cell, spherical, 3–4 μm in diameter, oblong 4–6 \times 2–4 μm , nearly smooth, biconcave – CHINA, SICHUAN PROVINCE, Bakalin, c-85-40-18.

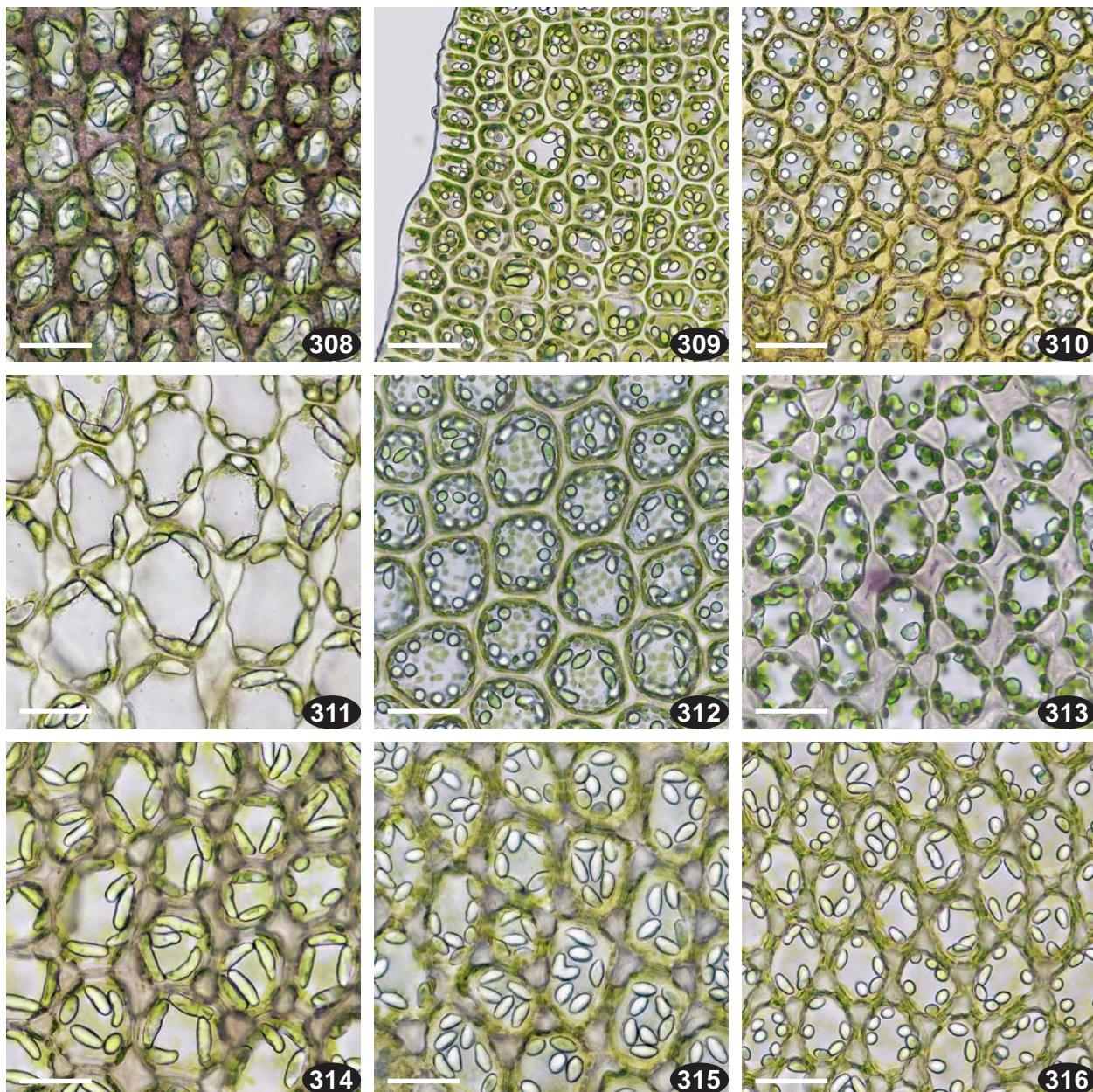
Lepidoziaceae

Bazzania angustistipula N.Kitag.

Fig. 306: Oil bodies 2–3 per cell, spherical, 4–6 μm in diameter, oblong 4–6 \times 5–11 μm , finely granulate – CHINA, YUNNAN PROVINCE, Bakalin, c-78-8-18.

Bazzania asperrima Steph

Fig. 307: Oil bodies 4–6 per cell, oblong 5–8 \times 10–15 μm , somewhat biconcave, smooth – VIETNAM, HOA BINH PROVINCE, Bakalin & Klimova, v-32-23-19.



Bazzania asperrima Steph

Fig. 308: Oil bodies 4–5 per cell, oblong 7–18×4–9 µm, smooth, some biconcave – VIETNAM, LANG SON PROVINCE, Bakalin & Klimova, v-32-4-20.

Bazzania bidentula (Steph.) Yasuda

Fig. 309: Oil bodies 2–6 per cell, spherical, (2–)3–4(–5) µm in diameter, oblong 3–5×4(5)–8(10) µm, smooth – VIETNAM, SON LA PROVINCE, Bakalin & Klimova, v-22-2-19.

Fig. 310: Oil bodies 4–6 per cell, spherical, 2–5 µm in diameter, rarely oblong 4–6×3–5 µm, smooth – VIETNAM, HA GIANG PROVINCE, Bakalin & Klimova, v-14-18-20.

Comment: *B. bidentula* shows so strong morphological variation that suggests some new taxa should be segregated from it. The similar great variation was observed in midleaf cells trigone sizes, although the latter parameter is varied also within the same specimen, including type (*Pleuroschisma bidentulum* Steph., G00264760!).

Bazzania calcarata (Sande Lac.) Schiffn.

Fig. 311: Oil bodies 3–6(–7) per cell, oblong 6–8×12–25 µm, smooth – VIETNAM, HOA BINH PROVINCE, Bakalin &

Klimova, v-31-31-19.

Bazzania denudata (Lindenb. et Gottsche) Trevis.

Fig. 312: Oil bodies 6–10 per cell, spherical, 3–5 µm in diameter, oblong 3–5×4–11 µm, smooth – RUSSIA, PRIMORSKY TERRITORY, Bakalin, p-35-28-14.

Bazzania erosa (Reinw., Blume et Nees) Trevis.

Fig. 313: Oil bodies 2–4(–7) per cell, oblong, 4–8×5–11 µm, smooth – INDONESIA, JAVA ISLAND, Bakalin, java-3-87-15.

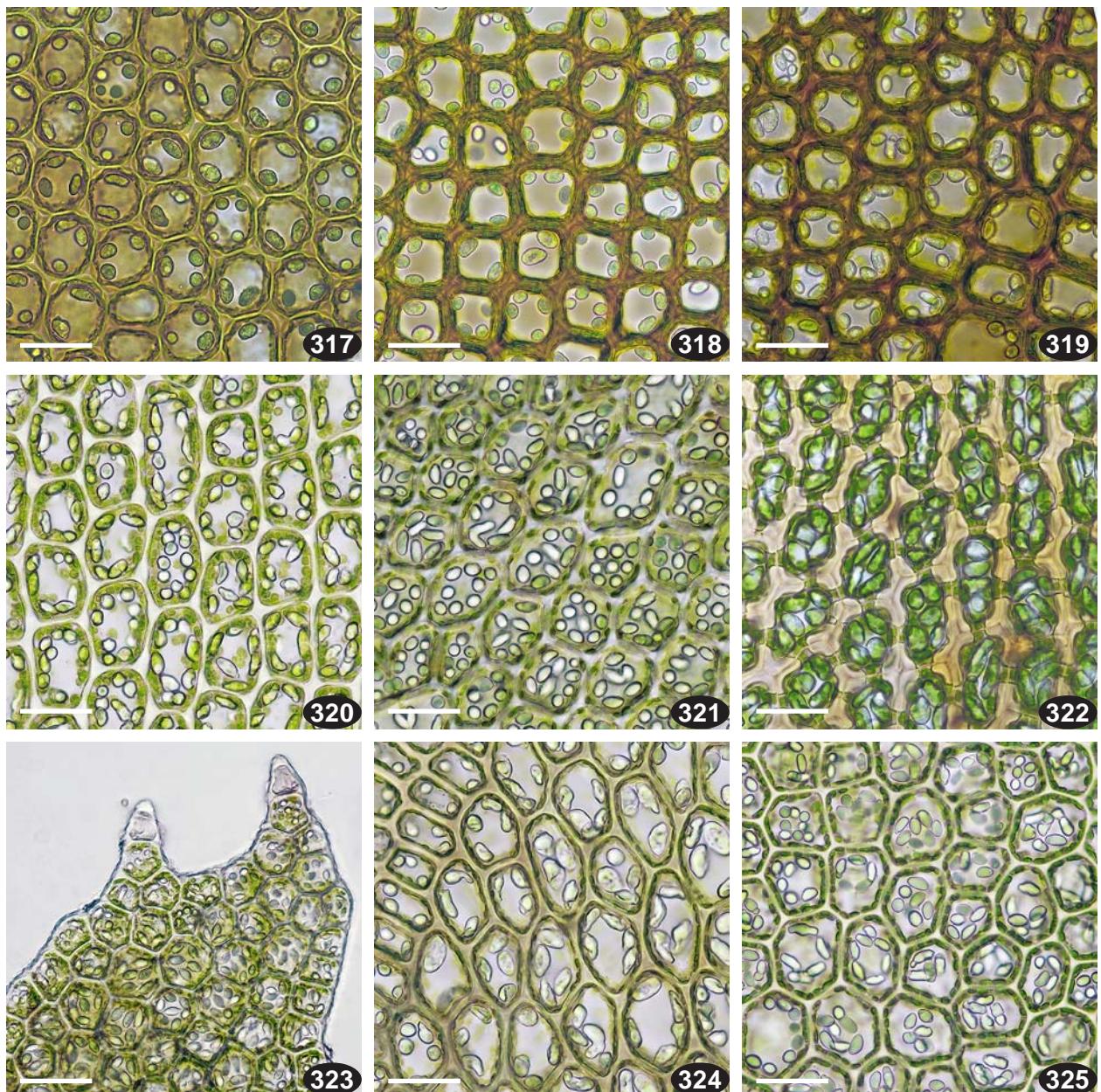
Bazzania fauriana (Steph.) S.Hatt.

Fig. 314: Oil bodies 3–5(–7) per cell, oblong 5–7×10–20 µm, smooth to loosely segmented – VIETNAM, HOA BINH PROVINCE, Bakalin & Klimova, v-30-13-19.

Bazzania himalayana (Mitt.) Schiffn.

Fig. 315: Oil bodies 6–8 per cell, oblong 7–13×4–7 µm, smooth – VIETNAM, HA GIANG PROVINCE, Bakalin & Klimova, v-13-17-20.

Fig. 316: Oil bodies 3–7(8) per cell, spherical, 4–7 µm in diameter, oblong 4–6×6–12 µm, smooth – VIETNAM, LAI CHAU PROVINCE, Bakalin & Klimova, v-3-19-19.



Bazzania imbricata (Mitt.) S. Hatt.

Fig. 317: Oil bodies 2–3(–5) per cell, spherical, 3–7 µm in diameter, oblong, 4–6×6–11 µm, granulate – JAPAN, YAMANASHI PREFECTURE, Bakalin, j-87-37-15.

Fig. 318: Oil bodies 2–4 per cell, rarely spherical, 5–7 µm in diameter, oblong 5–8×4–5 µm, finely granulate – REPUBLIC OF KOREA, JEOLLABUK-DO, Bakalin, kor-73-10-19.

Fig. 319: Oil bodies 3–4(–5) per cell, rarely spherical, (3–)4–5 µm in diameter, oblong 6–11×4–6 µm, finely granulate – REPUBLIC OF KOREA, JEOLLABUK-DO, Bakalin, kor-75-3-19.

Comment: We accept this species following Furuki (2015), Zhou et al. (2021) and Söderström et al. (2016) don't accept it.

Bazzania japonica (Sande Lac.) Lindb.

Fig. 320: Oil bodies 6–14 per cell, spherical, 4–7 µm in diameter, oblong 4–6×5–13 µm, smooth – VIETNAM, SON LA PROVINCE, Bakalin & Klimova, v-21-24-19.

Fig. 321: Oil bodies 6–8 per cell, spherical, 4–6 µm in diameter, oblong 6–12×4–6 µm, smooth – VIETNAM, CAO BANG PROVINCE, Bakalin & Klimova, v-21-25-20.

Bazzania linguiformis (Sande Lac.) Trevis.

Fig. 322: Oil bodies 3–6 per cell, oblong, 5–10×6–18 µm, smooth – INDONESIA, JAVA ISLAND, Bakalin, java-3-17-15

Bazzania aff. mayebarae S.Hatt.

Fig. 323: Oil bodies 5–8 per cell, oblong 4–8×3–4 µm, smooth to loosely segmented – VIETNAM, HA GIANG PROVINCE, Bakalin & Klimova, v-9-8-20.

Comment: We admit that *B. mayebarae* (described from Japan) and *B. debilis* N. Kitag. (from Thailand) are conspecific.

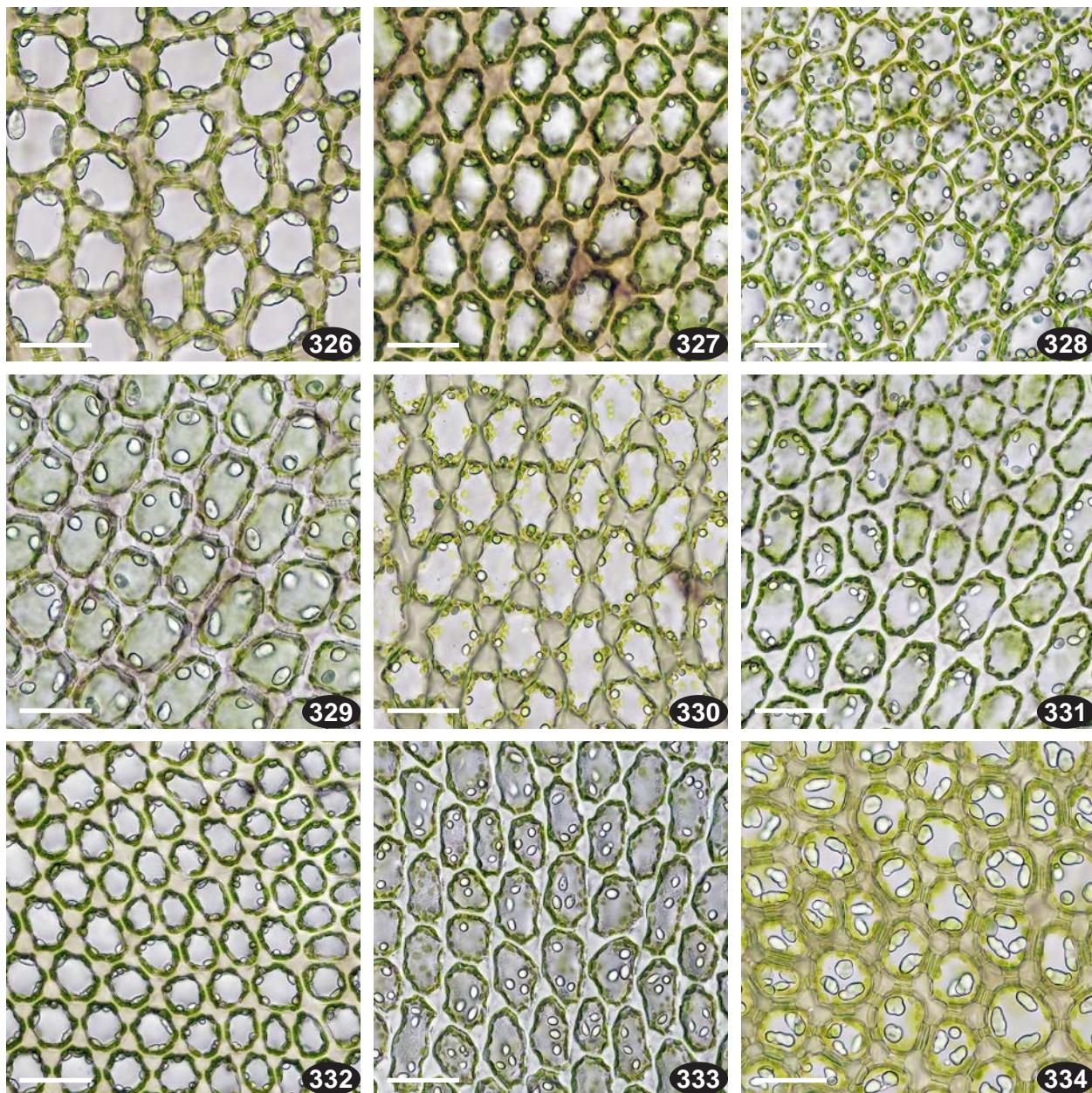
Bazzania oshimensis (Steph.) Horik.

Fig. 324: Oil bodies 3–6 per cell, spherical, 3–7 µm in diameter, oblong 5–8×6–15 µm, smooth, sometimes biconcave – VIETNAM, SON LA PROVINCE, Bakalin & Klimova, v-20-9-19.

Comment: *B. oshimensis* may be conspecific with *B. tridens*. We retain it here awaiting for further revision.

Bazzania parabidentula Bakalin

Fig. 325: Oil bodies 3–8 per cell, spherical, 4–6 µm in diameter, oblong, 3–4×4–14 µm, smooth to loosely segmented – RUSSIA, PRIMORSKY TERRITORY, Klimova, prim-49-9-17.



Bazzania pearsonii Steph.

Fig. 326: Oil bodies 2–4(–5) per cell, oblong 4–8×5–14 µm, smooth to loosely segmented – VIETNAM, LAI CHAU PROVINCE, Bakalin & Klimova, v-8-9-19.

Fig. 327: Oil bodies 3–4 per cell, spherical, 2–3 µm in diameter, oblong 3–7×2–3(–4) µm, smooth – VIETNAM, CAO BANG PROVINCE, Bakalin & Klimova, v-25-30-20_2.

Fig. 328: Oil bodies 3–6 per cell, spherical, 2.5–4 µm in diameter, oblong 4–7×3–4 µm, smooth – VIETNAM, CAO BANG PROVINCE, Bakalin & Klimova, v-25-30-20_4.

Fig. 329: Oil bodies 2–4 per cell, spherical, 4–5 µm in diameter, oblong 5–10×3–6 µm, smooth, some biconcave – VIETNAM, HA GIANG PROVINCE, Bakalin & Klimova, v-11-27-20_2.

Bazzania praerupta (Reinw., Blume et Nees) Trevis.

Fig. 330: Oil bodies 2–5 per cell, spherical, 3–4 µm in diameter, oblong 3–4×4–7 µm, smooth – VIETNAM, HOA BINH PROVINCE, Bakalin & Klimova, v-32-27-19.

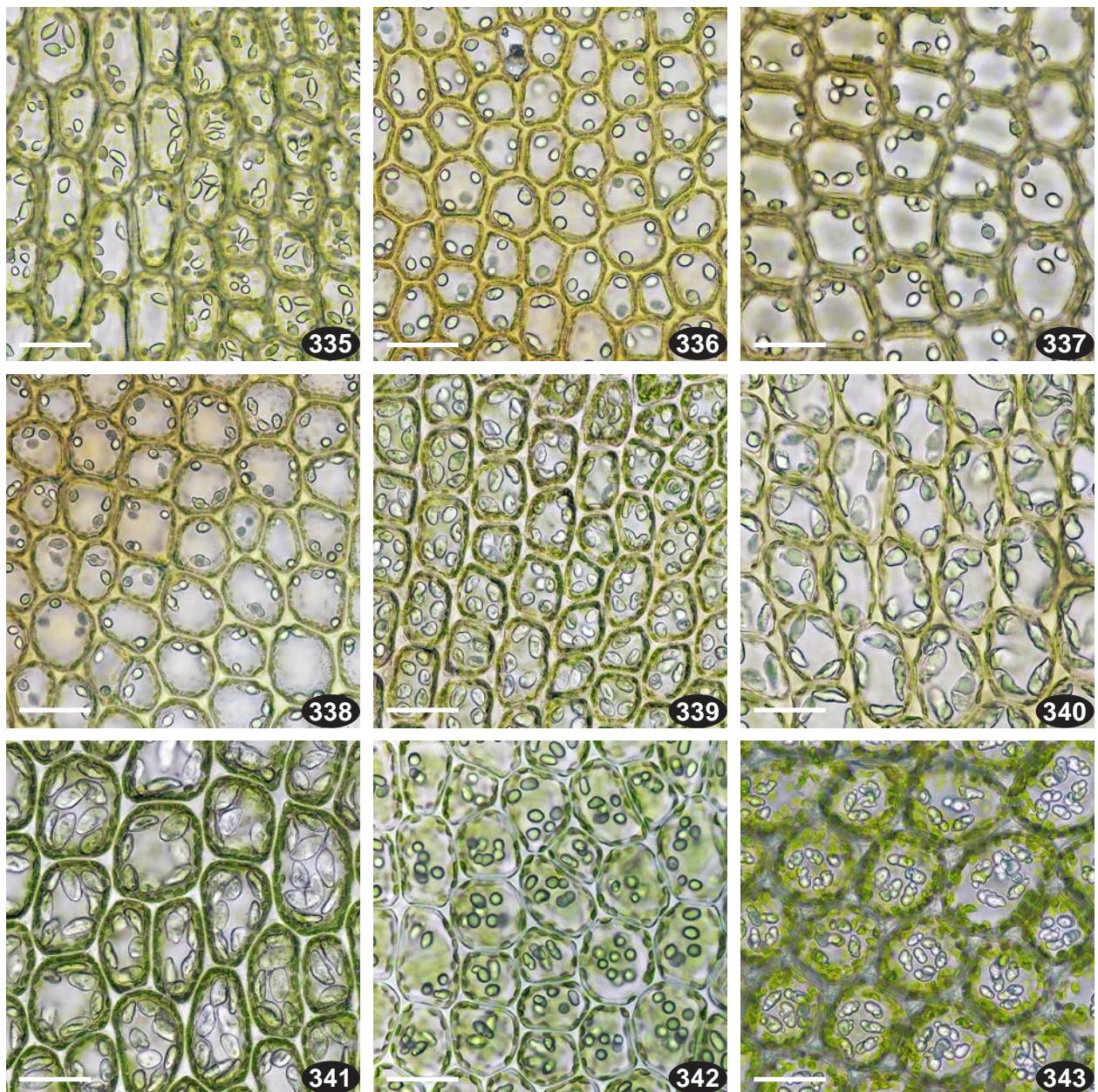
Fig. 331: Oil bodies 3–5 per cell, spherical, 2.5–4 µm in diameter, oblong 4–7×3–4 µm, smooth to loosely segmented – VIETNAM, CAO BANG PROVINCE, Bakalin & Klimova, v-26-13-20.

Fig. 332: Oil bodies 2–5 per cell, spherical, 2–3 µm in diameter, oblong 3–8×2–3 µm, smooth to loosely segmented – VIETNAM, LANG SON PROVINCE, Bakalin & Klimova, v-31-34-20.

Fig. 333: Oil bodies 2–3 per cell, spherical, 3–4(–5) µm in diameter, oblong 4–7×3–4 µm, smooth – VIETNAM, HA GIANG PROVINCE, Bakalin & Klimova, v-8-3-20.

Bazzania revoluta (Steph.) N.Kitag.

Fig. 334: Oil bodies 2–4 per cell, spherical, 4–6 µm in diameter, oblong 5–8×6–12 µm, smooth to roughly segmented – VIETNAM, SON LA PROVINCE, Bakalin & Klimova, v-21-11-19.



Bazzania sikkimensis (Steph.) Herzog

Fig. 335: Oil bodies (2–)3–6 per cell, spherical, 2–4 μm in diameter, oblong 4–6 \times 5–10 μm , smooth to segmented – VIETNAM, LAI CHAU PROVINCE, Bakalin & Klimova, v-8-15-19.

Bazzania tricrenata (Wahlenb.) Lindb.

Fig. 336: Oil bodies 2–4 per cell, spherical, 3–5 μm in diameter, oblong 4–5 \times 5–8 μm , smooth, with very big central eye – RUSSIA, KHABAROVSK TERRITORY, Bakalin & Klimova, kh-50-23-19.

Fig. 337: Oil bodies 3–5 per cell, spherical, 4–6 μm in diameter, oblong 4–6 \times 5–10 μm , smooth with very big central eye – CHINA, SICHUAN PROVINCE, Bakalin & Klimova, c-44-7-17.

Fig. 338: Oil bodies 2–6 per cell, spherical, 4–6 μm in diameter, oblong 3–5 \times 6–8 μm , smooth, with very big central eye – RUSSIA, KHABAROVSK TERRITORY, Bakalin & Klimova, kh-50-49-19.

Comment: East Asian populations of *B. tricrenata* always have prominently biconcentric oil bodies, where the ‘eye’ may be as wide or wider than the width of the main body of oil body

(Bakalin, 2016).

Bazzania tridens (Reinw., Blume et Nees) Trevis.

Fig. 339: Oil bodies (3–)5–6 per cell, spherical, 4–7 μm in diameter, oblong 6–11 \times 5–7 μm , nearly smooth, sometimes biconcave – VIETNAM, HA GIANG PROVINCE, Bakalin & Klimova, v-11-1-20.

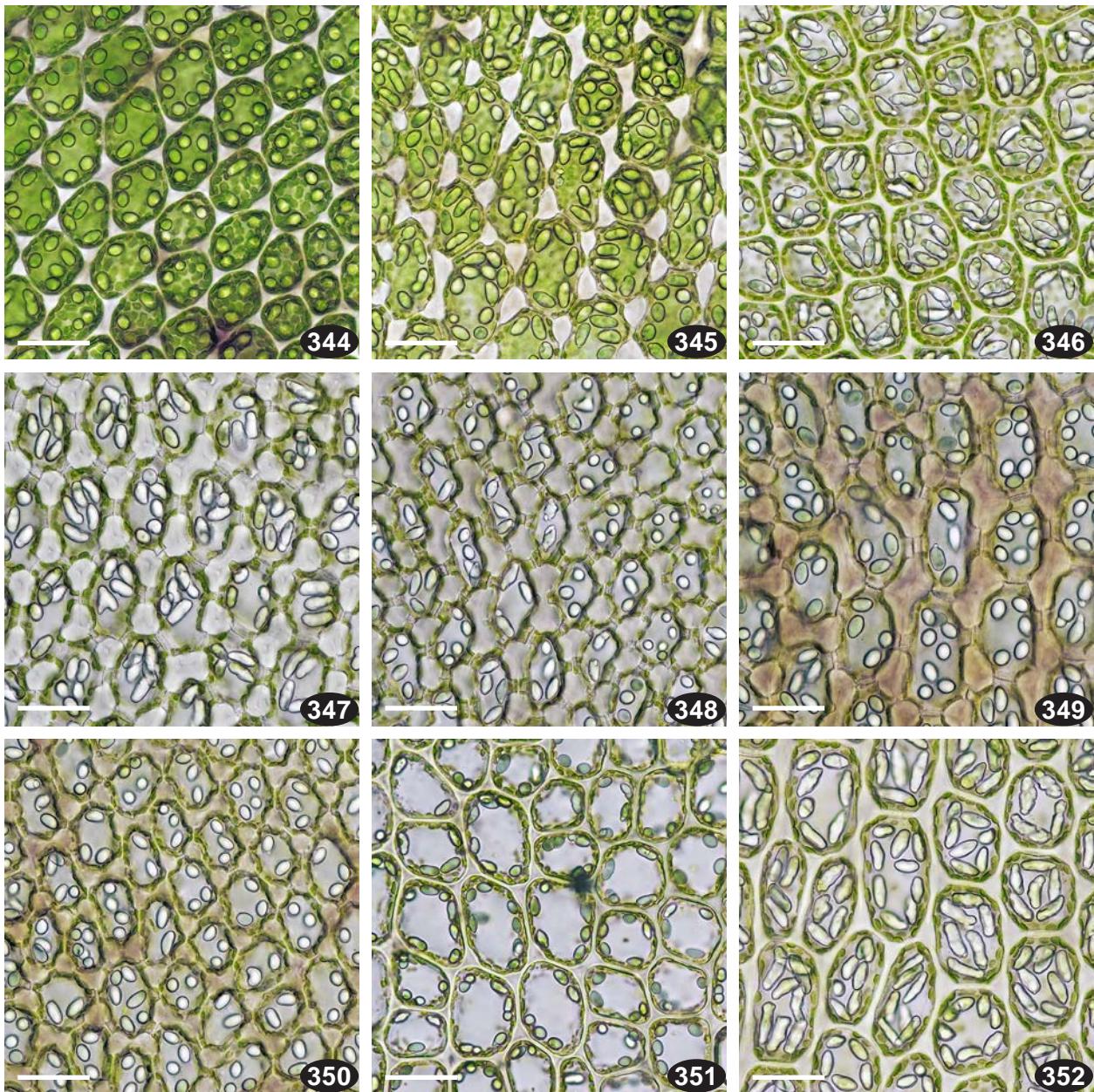
Fig. 340: Oil bodies 3–5 per cell, spherical, 3–5 μm in diameter, oblong 4–8 \times 8–18 μm , smooth, biconcave – VIETNAM, SON LA PROVINCE, Bakalin & Klimova, v-20-14-19.

Fig. 341: Oil bodies 7–9 per cell, oblong 7–15 \times 4–8(–10) μm , nearly smooth, sometimes biconcave – VIETNAM, LANG SON PROVINCE, Bakalin & Klimova, v-30-6-20.

Bazzania trilobata (L.) Gray

Fig. 342: Oil bodies 6–12 per cell, spherical, 4–7 μm in diameter, oblong, 3–6 \times 5–10 μm , smooth to loosely segmented – RUSSIA, PRIMORSKY TERRITORY, Bakalin, p-39-14-14.

Fig. 343: Oil bodies 5–8 per cell, oblong 6–12(–14) \times 4–6 μm , segmented – REPUBLIC OF KOREA, GANGWON-DO, Bakalin, kor-66-10-19.



Bazzania uncigera (Reinw., Blume et Nees) Trevis.

Fig. 344: Oil bodies 5–10 per cell, spherical, (4–)5–7 µm in diameter, oblong 6–10(–12)×4–6(–7) µm, nearly smooth – VIETNAM, HOA BINH PROVINCE, Bakalin & Klimova, v-2-1-20_10.

Fig. 345: Oil bodies 5–8 per cell, rarely spherical, 4–5 µm in diameter, oblong 6–13×(4–)5–7 µm, nearly smooth to slightly segmented – VIETNAM, HOA BINH PROVINCE, Bakalin & Klimova, v-2-1-20_8.

Fig. 346: Oil bodies 4–7 per cell, rarely spherical, 4–5 µm in diameter, oblong 7–13×4–5 µm, smooth to segmented – VIETNAM, HOA BINH PROVINCE, Bakalin & Klimova, v-9-11-20.

Bazzania vietnamica Pócs

Fig. 347: Oil bodies 4–6 per cell, spherical, 5–6(–7) µm in diameter, oblong 7–15×5–6 µm, smooth to segmented – VIETNAM, LANG SON PROVINCE, Bakalin & Klimova, v-30-31-20.

Fig. 348: Oil bodies 2–4 per cell, spherical, 4–6 µm in di-

ameter, oblong 6–13×4–5 µm, smooth, sometimes segmented – VIETNAM, LANG SON PROVINCE, Bakalin & Klimova, v-31-30a-20.

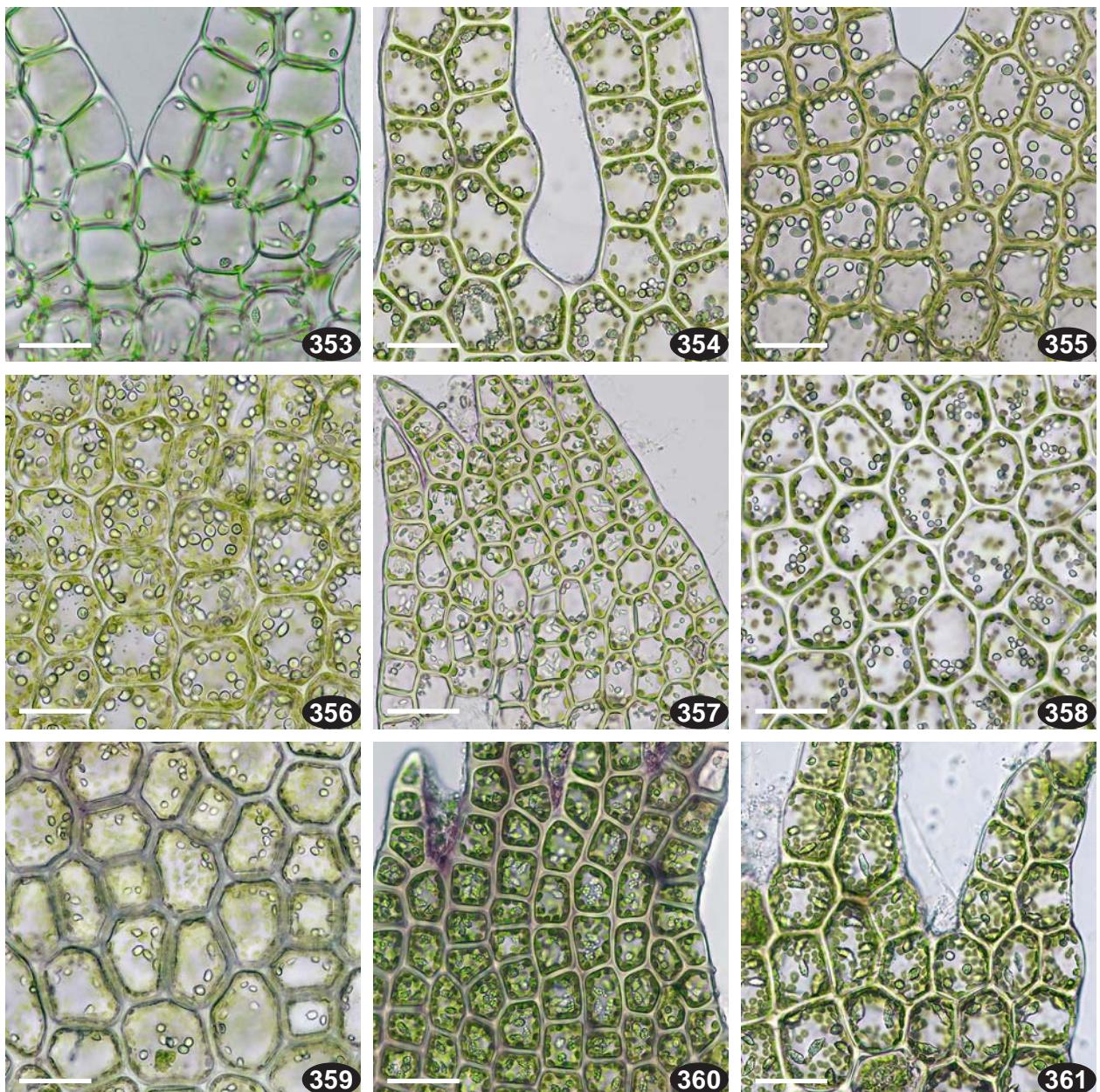
Fig. 349: Oil bodies 4–7(–8) per cell, spherical, 4–6 µm in diameter, oblong 7–13×5–6 µm, smooth to segmented – VIETNAM, HOA BINH PROVINCE, Bakalin & Klimova, v-8-4-20_14.

Fig. 350: Oil bodies (2–)3–6(–7) per cell, spherical, 4–6 µm in diameter, oblong 6–10(–12)×4–5(–6) µm, smooth – VIETNAM, LAO CAI PROVINCE, Bakalin & Klimova, v-8-4-20_16.

Bazzania yoshinagana (Steph.) Yasuda

Fig. 351: Oil bodies 4–8 per cell, spherical, 4–6 µm in diameter, oblong, 3–6×5–12 µm, smooth to loosely segmented – JAPAN, YAMANASHI PREFECTURE, Bakalin, j-88-15-15.

Fig. 352: Oil bodies 5–10 per cell, very rarely spherical, 5–7 µm in diameter, oblong 4–6×10–20 µm, smooth to segmented – VIETNAM, HOA BINH PROVINCE, Bakalin & Klimova, v-32-25-19.



Lepidozia fauriana Steph.

Fig. 353: Oil bodies 3–6 per cell, spherical, 3–4 μm in diameter, oblong 4–8(10)×3–4 μm , granulate – CHINA, GUIZHOU PROVINCE, Bakalin, china-56-80-13.

Fig. 354: Oil bodies 5–10 per cell, spherical, 4–6 μm in diameter, oblong 5–10(–16)×4–6 μm , botryoidal – VIETNAM, LAI CHAU PROVINCE, Bakalin & Klimova, v-1-9-19.

Lepidozia omeiensis P.C.Chen ex Mizut. et K.C.Chang

Fig. 355: Oil bodies 7–10 per cell, spherical, 4–6 μm in diameter, oblong 5–9×4–5 μm , smooth – CHINA, YUNNAN PROVINCE, Bakalin, c-73-25-18.

Lepidozia reptans (L.) Dumort.

Fig. 356: Oil bodies 10–25 per cell, spherical, 4–5 μm in diameter, oblong 6–10×3–5 μm , smooth, sometimes biconcave – CHINA, SICHUAN PROVINCE, Bakalin & Klimova, c-35-10-17.

Lepidozia subintegra Lindenb.

Fig. 357: Oil bodies 3–8 per cell, spherical, 2–3 μm in diameter, oblong 2–5×1.5–3 μm , botryoidal to segmented – VIET-

NAM, LAO CAI PROVINCE, Bakalin & Klimova, v-3-57-17.

Lepidozia subtransversa Steph.

Fig. 358: Oil bodies 4–10(15) per cell, spherical, 2–4 μm in diameter, oblong 3–6×2–4 μm , smooth – RUSSIA, KHABAROVSK TERRITORY, Bakalin, kh-24-6-16.

Lepidozia suyungii C.Gao et X.L.Bai

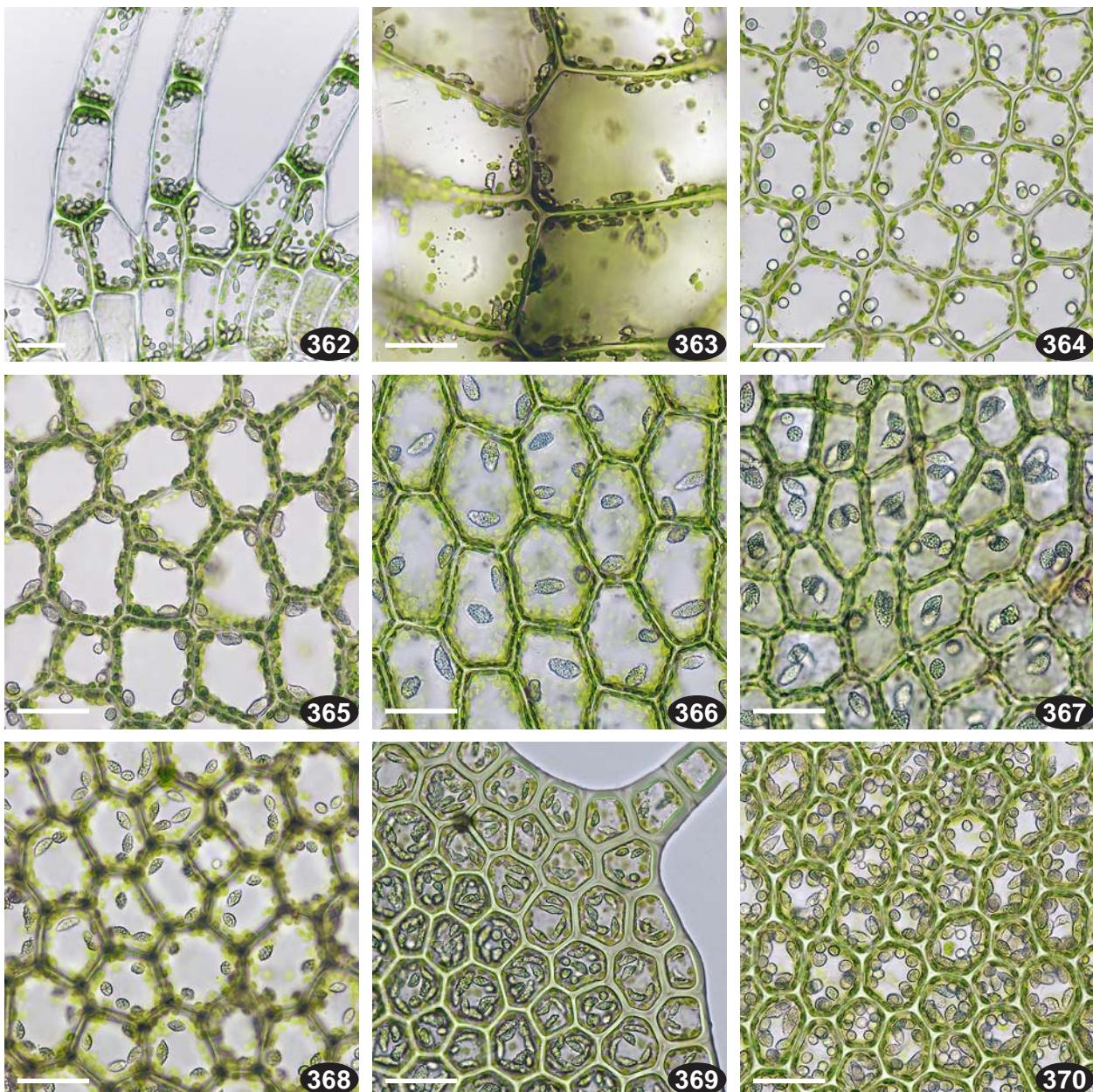
Fig. 359: Oil bodies 5–8 per cell, spherical, 3–4 μm in diameter, oblong 4–8×3–4 μm , smooth to segmented and loosely botryoidal – CHINA, YUNNAN PROVINCE, Bakalin, c-81-27-18.

Lepidozia trichodes (Reinw., Blume et Nees) Nees

Fig. 360: Oil bodies 3–6(8) per cell, spherical, 2–4 μm in diameter, oblong 3–8×2–4 μm , botryoidal – INDONESIA, JAVA ISLAND, Bakalin, java-3-33-15.

Lepidozia vitrea Steph.

Fig. 361: Oil bodies 3–5(7) per cell, oblong 5–12×3–5 μm , finely granulate – VIETNAM, LAO CAI PROVINCE, Bakalin, v-1-99-16.



Tricholepidiozia neesii (Lindenb.) E.D.Cooper

Fig. 362: Oil bodies 6–9 per cell, spherical, 3–4 µm in diameter, oblong 5–10(–12)×3–4 µm, granulate – INDONESIA, JAVA ISLAND, Bakalin, java-3-90-15.

Comment: the species is widely known under *Telaranea neesii* (Lindenb.) Fulford.

Zoopsis liukiuensis Horik.

Fig. 363: Oil bodies 5–7 per cell, oblong 7–10×3–4 µm, granulate with some large granules; with numerous small putative oil bodies 0.5–1.0 µm in diameter, smooth – VIETNAM, LAI CHAU PROVINCE, Bakalin & Klimova, v-13-4-19.

Lophocoleaceae

Chiloscyphus pallescens (Ehrh.) Dumort.

Fig. 364: Oil bodies 2–5 per cell, spherical, 4–7 µm in diameter, oblong 4–7×5–10 µm, finely granulate – RUSSIA, KRASNOYARSK TERRITORY, Fedosov, v/47a.

Chiloscyphus polyanthos (L.) Corda

Fig. 365: Oil bodies 1–3 per cell, spherical, 5–7 µm in diameter, oblong 5–14×4–7 µm, granulate – CHINA, YUNNAN

PROVINCE, Bakalin, c-71-13-18.

Fig. 366: Oil bodies (2–)3 per cell, oblong 6–14×5–7 µm, granulate – REPUBLIC OF KOREA, GYEONGSANGNAM-DO, Bakalin, kor-69-2-19.

Chiloscyphus rivularis (Schrad.) Hazsl.

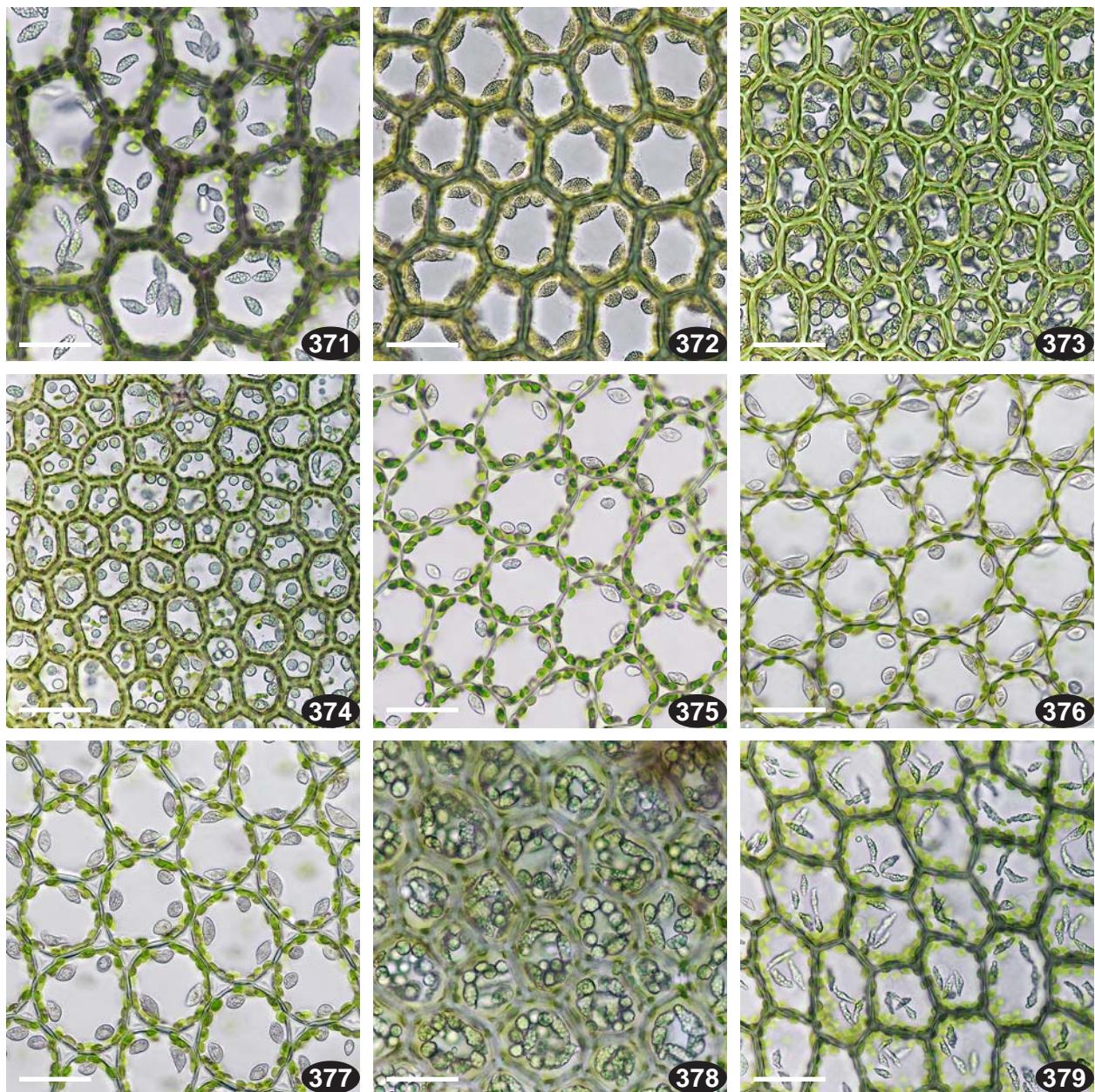
Fig. 367: Oil bodies 2–3 per cell, spherical, 5–8 µm in diameter, oblong 8–18×6–8 µm, coarsely granulate – RUSSIA, PRIMORSKY TERRITORY, Bakalin, p-8-2-16.

Heteroscyphus argutus (Reinw., Blume et Nees) Schiffn.

Fig. 368: Oil bodies 3–6 per cell, spherical, 4–5 µm in diameter, oblong 6–12×4–5 µm, granulate – VIETNAM, LAO CAI PROVINCE, Bakalin & Klimova, v-2-31-17.

Fig. 369: Oil bodies 4–6(–7) per cell, rarely spherical, 4–6 µm in diameter, oblong 6–12(14)×4–5 µm, granulate – VIETNAM, LAO CAI PROVINCE, Bakalin, v-2-72-16.

Fig. 370: Oil bodies 8–10(14) per cell, spherical, 4–6 µm in diameter, oblong 6–10(12)×4–6 µm, granulate, brownish – VIETNAM, LAI CHAU PROVINCE, Bakalin & Klimova, v-3-8-19.



Heteroscyphus coalitus (Hook.) Schiffn.

Fig. 371: Oil bodies 4–5(–6) per cell, oblong 6–8(20)×5–7 µm, coarsely granulate – INDONESIA, JAVA ISLAND, Bakalin, java-3-82-15.

Fig. 372: Oil bodies (3)4–6 per cell, spherical, 5–6 µm in diameter, oblong 7–14(16)×5–6(7) µm, granulate, brownish – VIETNAM, LAO CAI PROVINCE, Bakalin, v-2-28-16.

Heteroscyphus planus (Mitt.) Schiffn.

Fig. 373: Oil bodies 8–10 per cell, spherical, 4–6 µm in diameter, oblong 6–10(–12)×4–6 µm, granulate to coarsely so – JAPAN, KOCHI PREFECTURE, Bakalin, j-4-19-15.

Fig. 374: Oil bodies (2)3–7(8) per cell, spherical, 3–5 µm in diameter, oblong 6–10×4–5 µm, granulate to coarsely so – RUSSIA, PRIMORSKY TERRITORY, Bakalin, p-31-4-15.

Heteroscyphus tener (Steph.) Schiffn.

Fig. 375: Oil bodies 2–3 per cell, oblong 5–12×4–6 µm,

finely granulate – CHINA, SICHUAN PROVINCE, Bakalin & Klimova, c-40-2-17.

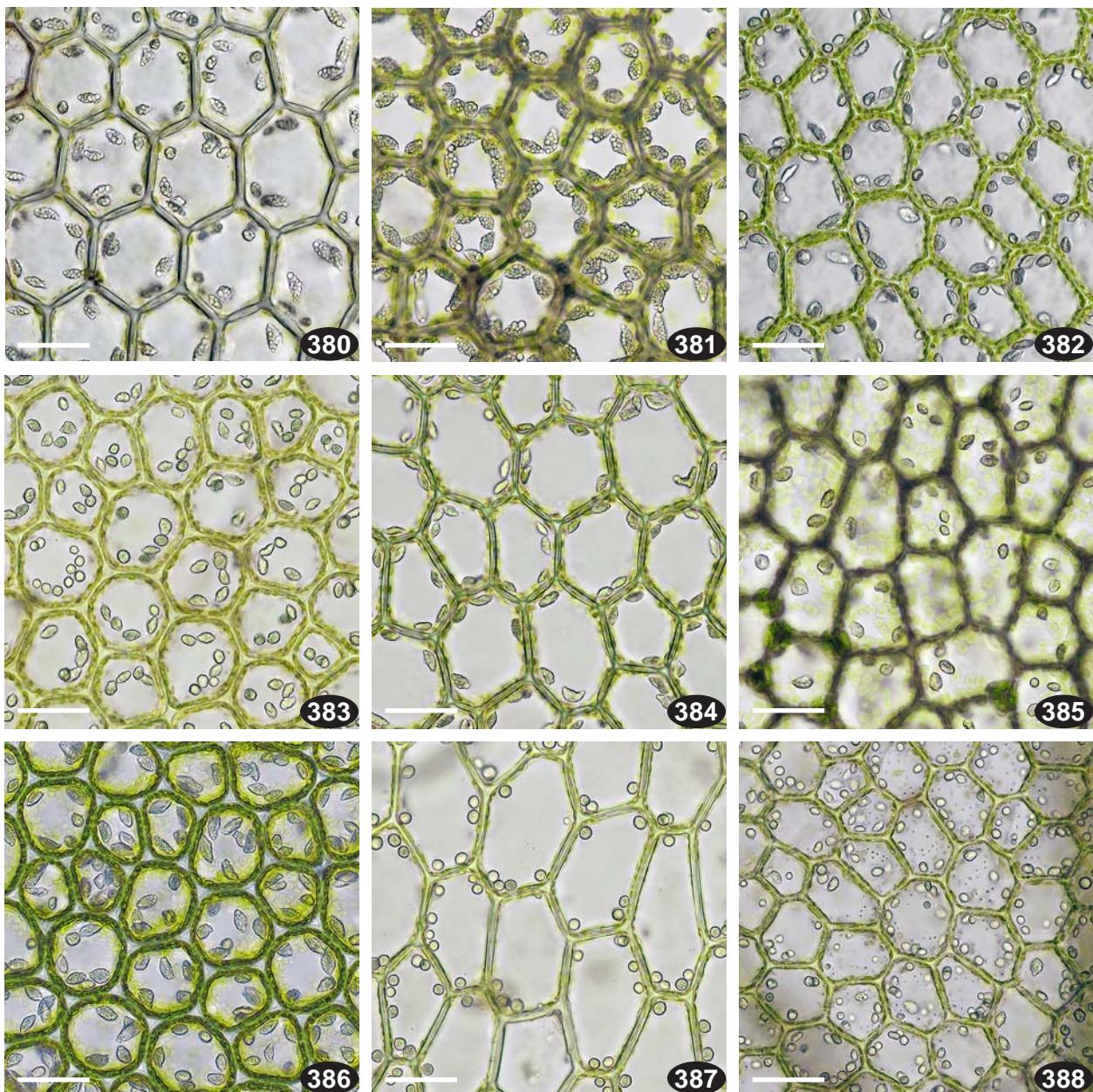
Fig. 376: Oil bodies 2–4 per cell, rarely spherical, 5–7 µm in diameter, oblong 6–14(–16)×5–6(–7) µm, finely granulate, some biconcave – VIETNAM, CAO BANG PROVINCE, Bakalin & Klimova, v-25-19-20.

Fig. 377: Oil bodies 2–4 per cell, rarely spherical, 5–6 µm in diameter, oblong 7–15×5–6 µm, finely granulate, some biconcave – VIETNAM, CAO BANG PROVINCE, Bakalin & Klimova, v-25-36-20.

Heteroscyphus zollingeri (Gottsch.) Schiffn.

Fig. 378: Oil bodies 6–11 per cell, spherical, 5–7 µm in diameter, oblong 6–12(14)×5–7 µm, botryoidal – CHINA, GUIZHOU PROVINCE, Bakalin, china-51-8-13.

Fig. 379: Oil bodies 4–5(6) per cell, oblong 8–15(17)×3–4 µm, coarsely granulate – INDONESIA, JAVA ISLAND, Bakalin, java-1-2-15.



Heteroscyphus zollingeri (Gottsche) Schiffn.

Fig. 380: Oil bodies 5–7 per cell, rarely spherical, 4–5 µm in diameter, oblong 5–10(–12)×(3)–4–6 µm, coarsely granulate to almost botryoidal – VIETNAM, LANG SON PROVINCE, Bakalin & Klimova, v-31-3-20.

Fig. 381: Oil bodies 6–7(9) per cell, spherical, 5–7 µm in diameter, oblong 6–16×5–7 µm, botryoidal to coarsely granulate – VIETNAM, LAO CAI PROVINCE, Bakalin & Klimova, v-3-71-17.

Comment: the name *H. zollingerii* is likely applied to a complex of several species, and the oil bodies variation support this. The species was described from Java, thus oil bodies shown in Fig. 379 may likely characterize *H. zollingerii* s.str.

Lophocolea bidentata (L.) Dumort.

Fig. 382: Oil bodies (3)–4–7 per cell, rarely spherical, 3–4 µm in diameter, oblong 4–9×3–4 µm, finely granulate – VIETNAM, HA GIANG PROVINCE, Bakalin & Klimova, v-13-15-20.

Fig. 383: Oil bodies 5–10 per cell, spherical, 3–5 µm in diameter, oblong 6–10×3–5 µm, granulate – VIETNAM, LAI CHAU PROVINCE, Bakalin & Klimova, v-6-9-19.

Lophocolea cuspidata (Nees) Limpr.

Fig. 384: Oil bodies 4–7 per cell, spherical, oblong 7–12×3–5 µm, granulate – CHINA, SICHUAN PROVINCE, Bakalin & Klimova, c-36-14-17.

Comment: *L. cuspidata* may be a synonym of *L. bidentata*. *Lophocolea heterophylla* (Schrad.) Dumort.

Fig. 385: Oil bodies 3–5 per cell, spherical, 3–5 µm in diameter, oblong 5–12×3–6 µm, granulate – RUSSIA, SAKHALIN PROVINCE, Bakalin, s-43-1-16.

Lophocolea horikawana S.Hatt.

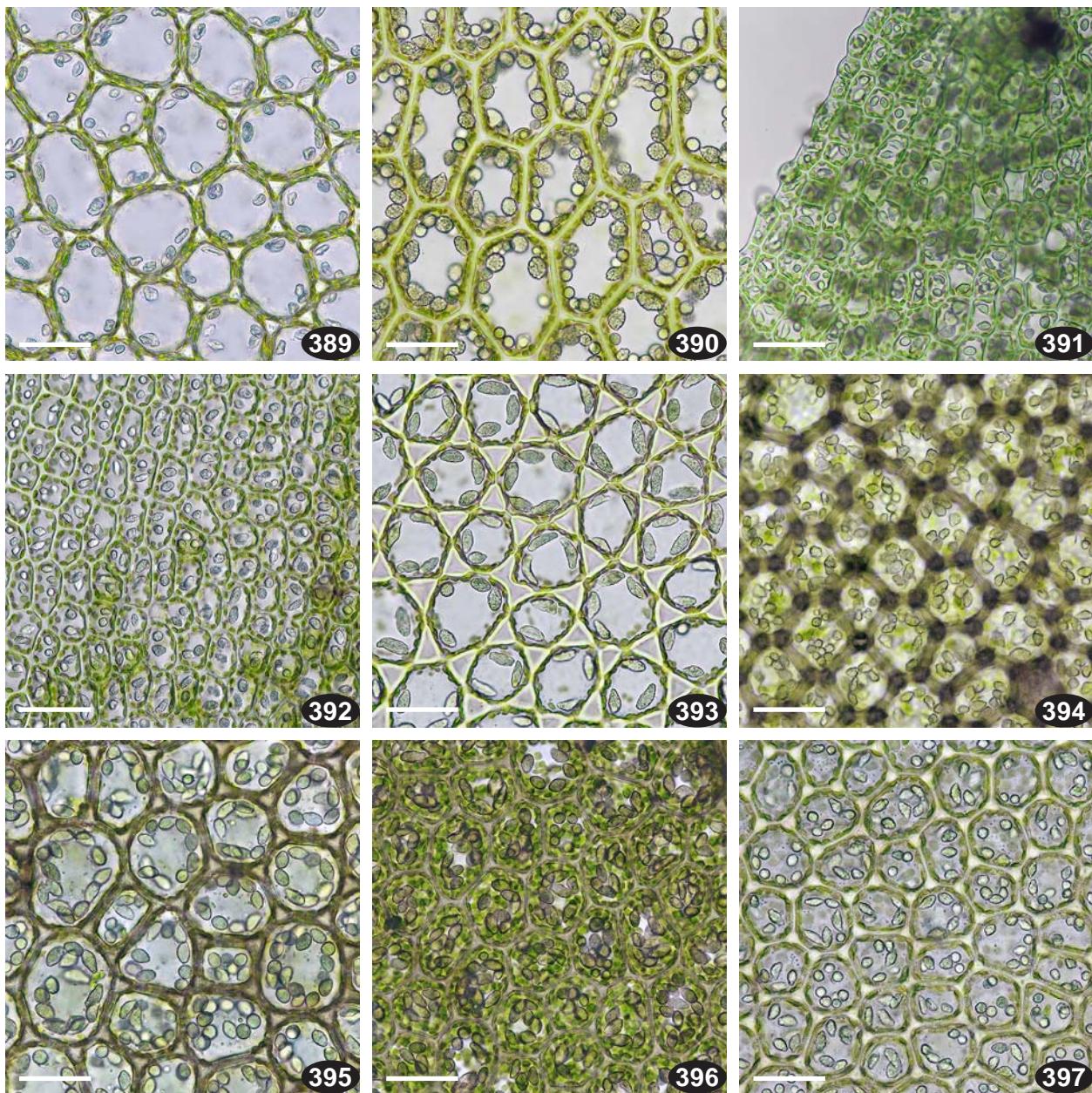
Fig. 386: Oil bodies 4–6(–7) per cell, spherical, 4–5 µm in diameter, oblong 6–13×4–5 µm, granulate – REPUBLIC OF KOREA, JEOLLABUK-DO, Bakalin, kor-80-17-19.

Lophocolea kurzii Sande Lac.

Fig. 387: Oil bodies 5–8(9) per cell, spherical, (3)–4–6 µm in diameter, finely granulate – VIETNAM, LAI CHAU PROVINCE, Bakalin & Klimova, v-8-12a-19.

Lophocolea minor Nees

Fig. 388: Oil bodies 5–9 per cell, spherical, 3–4(–5) µm in diameter, oblong 5–8×3–4 µm, granulate – RUSSIA, KHABAROVSK TERRITORY, Bakalin & Klimova, kh-36-10-19.



Lophocolea minor Nees

Fig. 389: Oil bodies 4–6 per cell, spherical, 4–5 µm in diameter, oblong 5–10×3–4(–5) µm, finely granulate, some bi-concave – REPUBLIC OF KOREA, GANGWON-DO, Bakalin, kor-66-20-19.

Fig. 390: Oil bodies 9–13(16) per cell, spherical, 4–7(8) µm in diameter, oblong 5–12(14)×4–6 µm, coarsely granulate – VIETNAM, LAO CAI PROVINCE, Bakalin & Klimova, v-5-22-17.

Comment: in *L. minor* oil body surface features, number per cell, and sizes, and also cell sizes are variable. We suspect that plants from Khabarovsk Territory, Korean Peninsula and Vietnam may be not conspecific.

Lophocolea muricata (Lehm.) Nees

Fig. 391: Oil bodies 2–5 per cell, spherical, 3–4 µm in diameter, oblong 4–7(8)×2–5 µm, finely granulate – CHINA, GUIZHOU PROVINCE, Bakalin, china-56-34-13.

Fig. 392: Oil bodies 2–3 per cell, spherical, 2.5–3.5(–4) µm in diameter, oblong 3–8×2.5–3.5 µm, granulate – VIETNAM, CAO BANG PROVINCE, Bakalin & Klimova, v-28-6-20.

Lophocolea sikkimensis (Steph.) Herzog et Grolle

Fig. 393: Oil bodies 2–5 per cell, spherical, 5–7 µm in diameter, oblong 7–18×4–8 µm, granulate, brownish – VIETNAM, LAO CAI PROVINCE, Bakalin, v-3-64-16.

Plagiochilaceae

Pedinophyllum interruptum (Nees) Kaal.

Fig. 394: Oil bodies 8–13(–15) per cell, spherical, 3–4(–5) µm in diameter, oblong 4–6(–7)×3–4 µm, granulate – RUSSIA, PRIMORSKY TERRITORY, Bakalin, p-37-8-16.

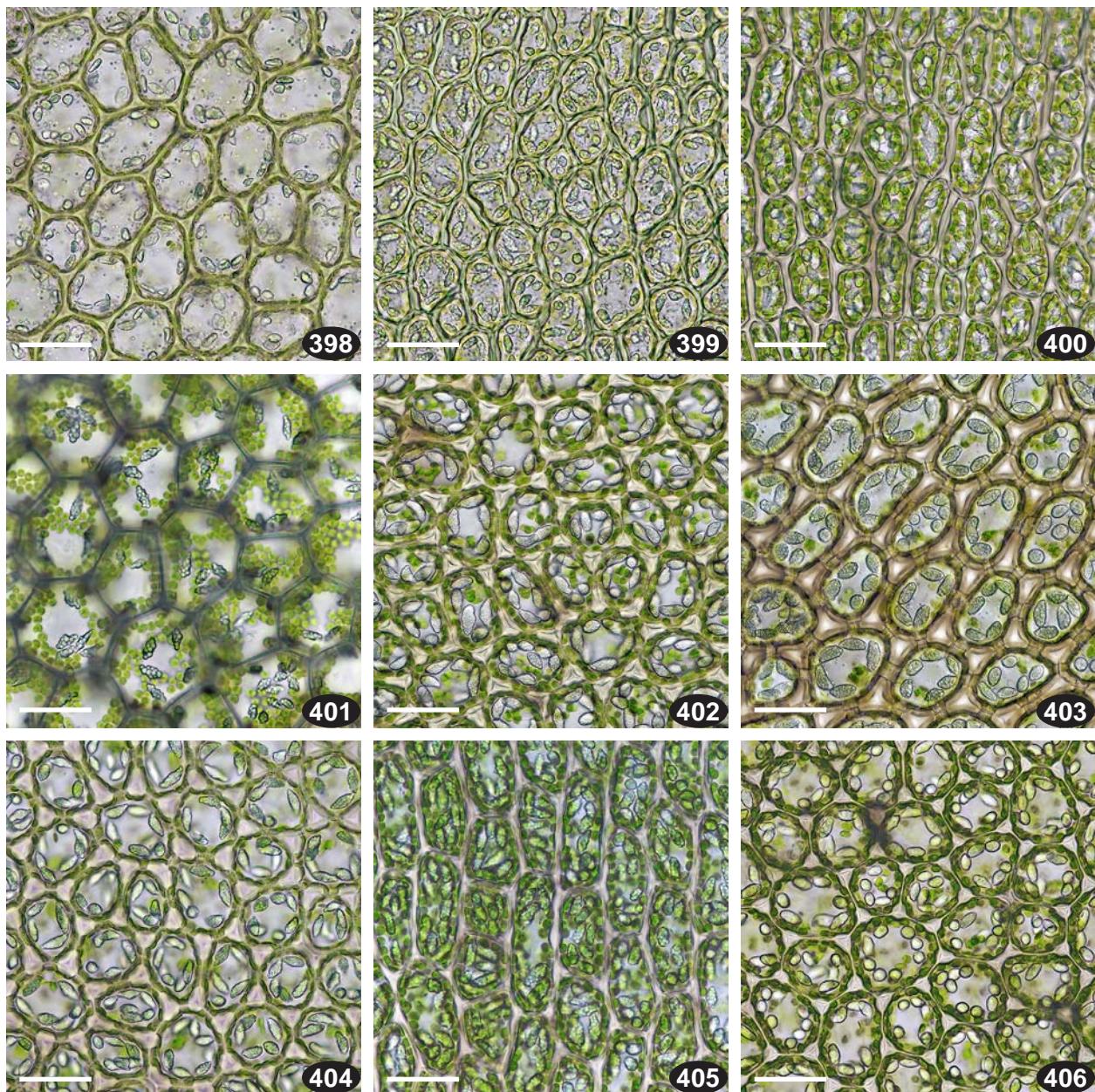
Pedinophyllum truncatum (Steph.) Inoue

Fig. 395: Oil bodies 7–12(–13) per cell, spherical, 5–6 µm in diameter, oblong 5–13×4–5(–6) µm, finely granulate – RUSSIA, PRIMORSKY TERRITORY, Bakalin, p-31-8-15.

Fig. 396: Oil bodies 10–15 per cell, spherical, 4–5(–6) µm in diameter, oblong 7–10(–13)×4–5 µm, finely granulate, brownish – RUSSIA, PRIMORSKY TERRITORY, Klimova & Bakalin, prim-19-9-16.

Plagiochila arctica Bryhn et Kaal.

Fig. 397: Oil bodies 5–8 per cell, spherical, 4–5 µm in diameter, oblong 4–10×3–4 µm, botryoidal to coarsely granulate – RUSSIA, KHBAROVSK TERRITORY, Bakalin & Klimova, kh-41-8-19.



Plagiochila arctica Bryhn et Kaal.

Fig. 398: Oil bodies 4–6(–7) per cell, spherical, 4–5 µm in diameter, oblong 5–10×3–4 µm, botryoidal to coarsely granulate – RUSSIA, KRASNOYARSK TERRITORY, Fedosov, v/83.

Plagiochila assamica Steph.

Fig. 399: Oil bodies 4–8 per cell, spherical, 3–5 µm in diameter, oblong 4–12×3–4 µm, botryoidal – VIETNAM, LAO CAI PROVINCE, Bakalin, v-1-48-16.

Fig. 400: Oil bodies in leaf base 5–9(–11) per cell, spherical, 3–4 µm in diameter, oblong 5–12(–14)×3–4(–5) µm, coarsely granulate – VIETNAM, HOA BINH PROVINCE, Bakalin & Klimova, v-30-29-19.

Plagiochila bantamensis (Reinw., Blume et Nees) Mont.

Fig. 401: Oil bodies 4–6(–7) per cell, oblong 6–13×4–5 µm, botryoidal – INDONESIA, JAVA ISLAND, Bakalin, java-3-20-15.

Plagiochila beddomei Steph.

Fig. 402: Oil bodies 5–8(–12) per cell, rarely spherical, 5–

6 µm in diameter, oblong 5–13×4–6 µm, granulate to coarsely so – VIETNAM, HA GIANG PROVINCE, Bakalin & Klimova, v-13-34-20.

Fig. 403: Oil bodies 4–7(–9) per cell, rarely spherical, 5–6 µm in diameter, oblong 5–14×4–5(–6) µm, granulate – VIETNAM, CAO BANG PROVINCE, Bakalin & Klimova, v-23-26-20.

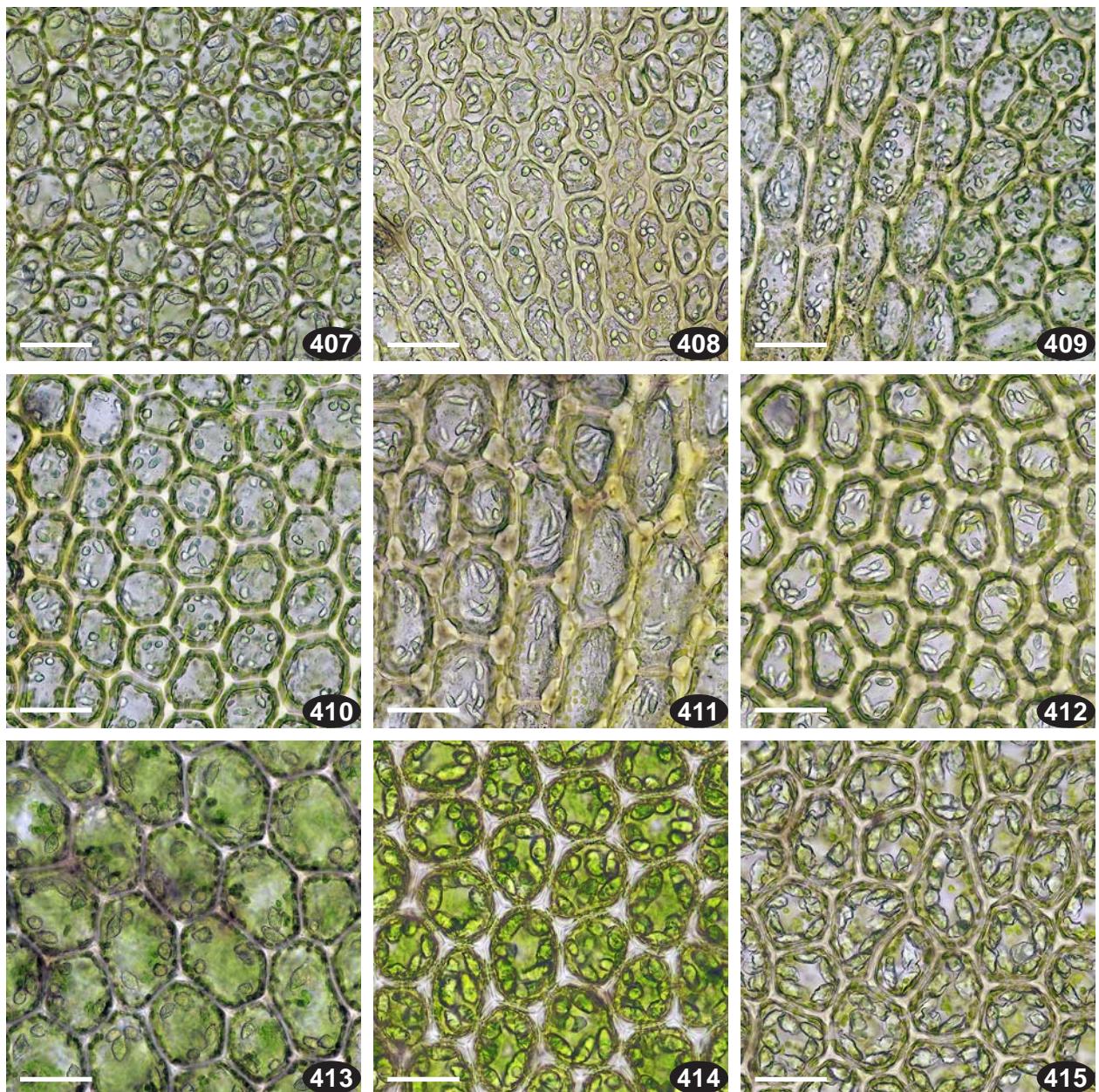
Fig. 404: Oil bodies 5–8 per cell, spherical, 4–5 µm in diameter, oblong 7–12×4–5 µm, granulate to coarsely so – VIETNAM, LAO CAI PROVINCE, Bakalin & Klimova, v-4-49-17.

Plagiochila bicornuta Steph.

Fig. 405: Oil bodies 10–14 per cell, spherical, 4–6 µm in diameter, oblong 8–12(–14)×4–5 µm, botryoidal – INDONESIA, JAVA ISLAND, Bakalin, java-3-36-15.

Plagiochila chinensis Steph.

Fig. 406: Oil bodies 5–10 per cell, spherical, 4–5 µm in diameter, oblong 7–10(–12)×4–5(–6) µm, loosely granulate – VIETNAM, LAI CHAU PROVINCE, Bakalin & Klimova, v-4-14-19.



Plagiochila chinensis Steph.

Fig. 407: Oil bodies 3–5 per cell, spherical, 4–5 µm in diameter, oblong 6–15×4–5 µm, granulate to coarsely so – VIETNAM, HA GIANG PROVINCE, Bakalin & Klimova, v-7-4-20.

Plagiochila devexa Steph.

Fig. 408: Oil bodies 2–4 per cell, spherical, 3–4 µm in diameter, oblong 4–5(–6)×(2–)3–4 µm, in vitta cells 6–8 per cell, 5–10×2–3 µm, loosely granulate – VIETNAM, LAI CHAU PROVINCE, Bakalin & Klimova, v-7-11-19.

Plagiochila durellii Schiffn.

Fig. 409: Oil bodies 4–8 per midleaf cell, spherical, 3–4(–5) µm in diameter, oblong 4–7×3–4 µm, loosely botryoidal – CHINA, YUNNAN PROVINCE, Bakalin, c-82-17-18_8.

Fig. 410: Oil bodies in lower part of leaf 8–11 per cell, spherical, 3–4 µm in diameter, oblong 4–6×(2–)3–4 µm, in vitta cells 10–13 per cell, similar in size, loosely botryoidal – CHINA, YUNNAN PROVINCE, Bakalin, c-82-17-18_10.

Fig. 411: Oil bodies in lower part of leaf 8–10(–12) per cell, oblong 10–15×3–4 µm, loosely botryoidal – VIETNAM, LAI CHAU PROVINCE, Bakalin & Klimova, v-8-10-19_12.

Fig. 412: Oil bodies 5–7 per cell, spherical, 3–4 µm in diameter, oblong 4–10(–12)×(2–)3–4 µm, loosely botryoidal – VIETNAM, LAI CHAU PROVINCE, Bakalin & Klimova, v-8-10-19_14.

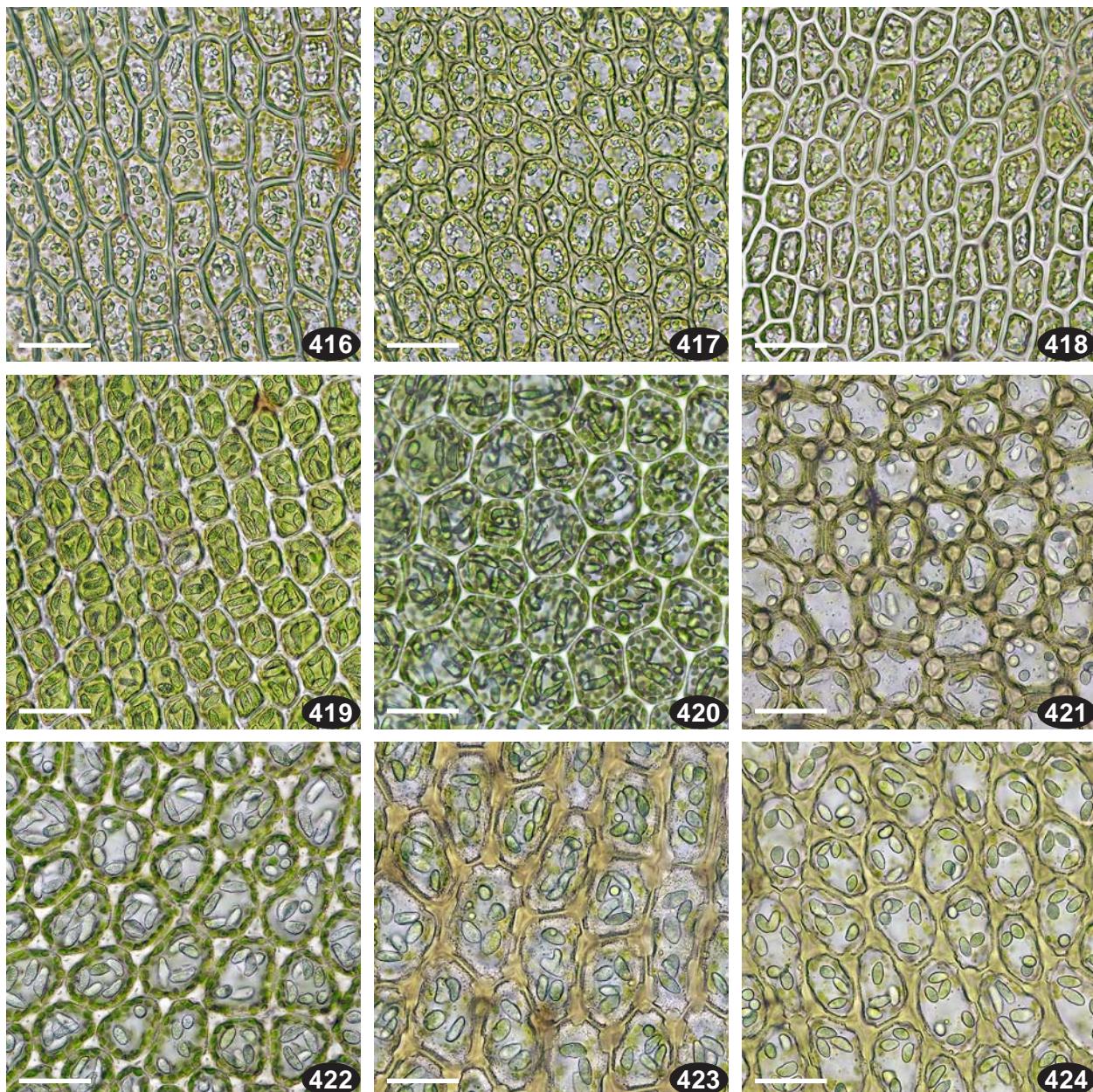
Plagiochila elegans Mitt.

Fig. 413: Oil bodies 4–6 per cell, spherical, (4–)5–6 µm in diameter, oblong 6–12(–14)×(4–)5–6 µm, granulate – VIETNAM, HA GIANG PROVINCE, Bakalin & Klimova, v-9-24-20.

Plagiochila flexuosa Mitt.

Fig. 414: Oil bodies 6–8 per cell, oblong 7–17×5–7(–8) µm, smooth to segmented – VIETNAM, LAO CAI PROVINCE, Bakalin, v-1-124-16.

Fig. 415: Oil bodies 5–8(–10) per cell, oblong 10–16(–18)×6–9 µm, segmented – VIETNAM, LAI CHAU PROVINCE, Bakalin & Klimova, v-14-1-19.



Plagiochila fruticosa Mitt.

Fig. 416: Oil bodies 7–10 per cell, spherical, 3–4 μm in diameter, oblong (4–)7–12(–14) \times 3–4 μm , botryoidal – VIETNAM, LAO CAI PROVINCE, Bakalin, v-1-82-16.

Fig. 417: Oil bodies 5–8 per cell, spherical, 2.5–4.0 μm in diameter, oblong 4–5 \times 2.5–3.5 μm , botryoidal – VIETNAM, LAO CAI PROVINCE, Bakalin, v-2-33-16.

Fig. 418: Oil bodies 5–7 per cell, oblong 5–7 \times (3–)4–5 μm , botryoidal – VIETNAM, LAO CAI PROVINCE, Bakalin & Klimova, v-5-76-17.

Fig. 419: Oil bodies 3–4(–5) per cell, oblong 5–13 \times 3–4 μm , granulate – VIETNAM, HA GIANG PROVINCE, Bakalin & Klimova, v-8-2-20.

Plagiochila fusca Sande Lac.

Fig. 420: Oil bodies 4–7 per cell, oblong 14–18(–20) \times 4–5 μm ,

segmented – INDONESIA, JAVA ISLAND, Bakalin, java-3-83-15.

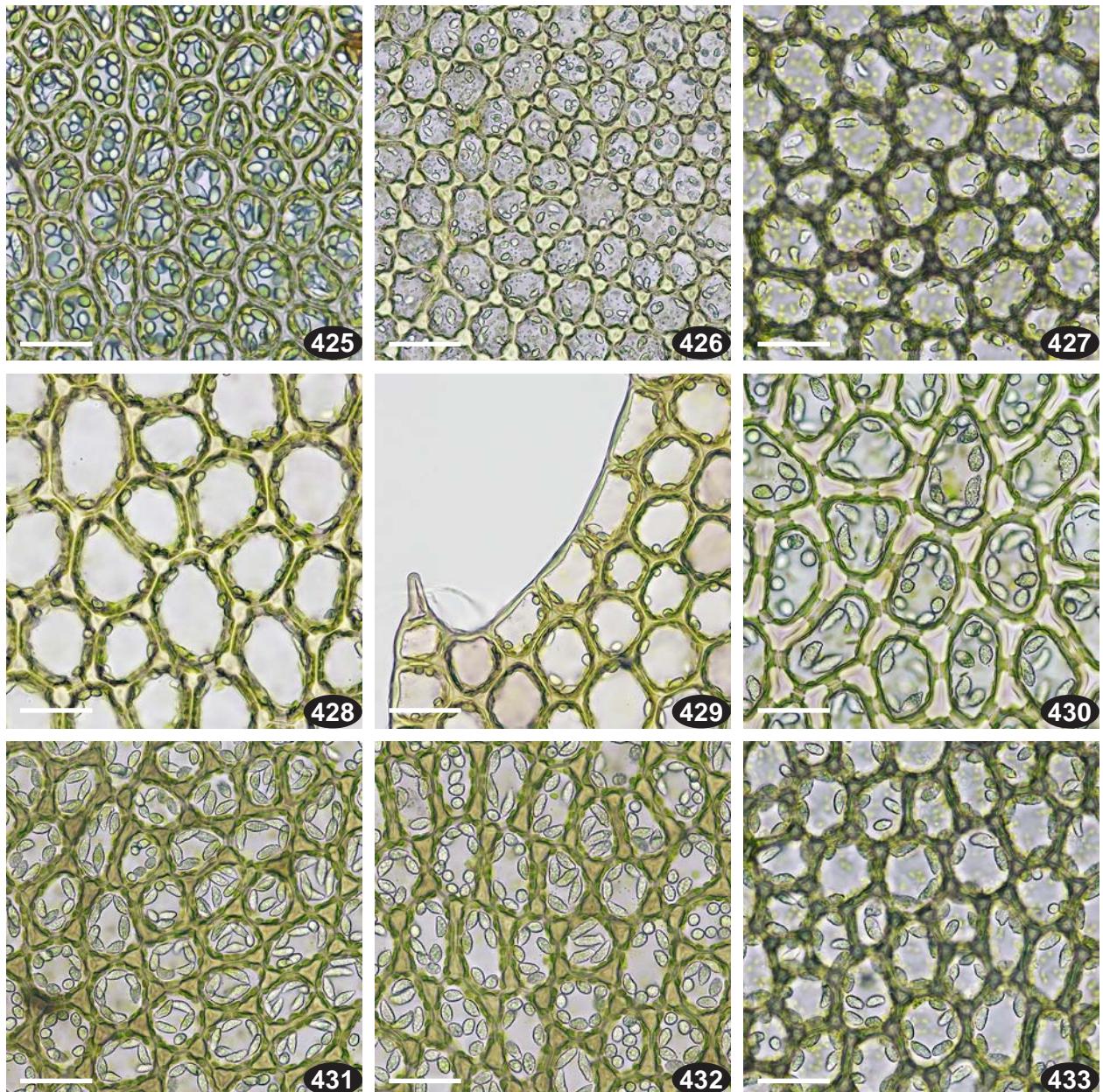
Plagiochila gracilis Lindenb. et Gottsche

Fig. 421: Oil bodies 5–8 per cell, spherical, 4–5 μm in diameter, oblong 6–10(–14) \times 4–6 μm , granulate – CHINA, YUNNAN PROVINCE, Bakalin, c-81-3-18.

Fig. 422: Oil bodies (2–)4–6 per cell, spherical, 5–6 μm in diameter, oblong 6–12 \times 4–6 μm , granulate – VIETNAM, CAO BANG PROVINCE, Bakalin & Klimova, v-25-3-20.

Fig. 423: Oil bodies in lower part of the leaf 5–9(–10) per cell, spherical, 5–6 μm in diameter, oblong 7–12 \times 5–8 μm , granulate – VIETNAM, LAI CHAU PROVINCE, Bakalin & Klimova, v-9-9-19_2.

Fig. 424: Oil bodies 4–6 per cell, spherical, 4–5 μm in diameter, oblong 6–12(–14) \times 4–5 μm , finely granulate – VIETNAM, LAI CHAU PROVINCE, Bakalin & Klimova, v-9-9-19_4.



Plagiochila gymnochlada Sande Lac.

Fig. 425: Oil bodies (5–)6–7(–8) per cell, spherical, 4–6 µm in diameter, oblong 6–12(–14)×4–6 µm, smooth to segmented – INDONESIA, JAVA ISLAND, Bakalin, java-3-6-15.

Plagiochila hakkodensis Steph.

Fig. 426: Oil bodies 4–6 per cell, spherical, 2–3 µm in diameter, oblong 4–5×2–3 µm, coarsely granulate – CHINA, YUNNAN PROVINCE, Bakalin, c-78-6-18.

Fig. 427: Oil bodies 4–6 per cell, spherical, 4–5 µm in diameter, oblong 5–12×(3–)4–5 µm, coarsely granulate – JAPAN, YAMANASHI PREFECTURE, Bakalin, j-88-29-15.

Plagiochila hyalodermica Grolle et M.L.So

Fig. 428: Oil bodies 3–6 per cell, oblong 6–8(–10)×(2–)3–4 µm, unclearly granulate – VIETNAM, LAI CHAU PROVINCE, Bakalin & Klimova, v-8-13-19_13.

Fig. 429: Oil bodies 3–4 per midleaf cell, spherical, 3–4 µm in diameter, oblong 4–7×3–4 µm, smooth – VIETNAM, LAI CHAU PROVINCE, Bakalin & Klimova, v-8-13-19_4.

Plagiochila khasiana Mitt.

Fig. 430: Oil bodies 5–11 per cell, spherical, 5–7 µm in diameter, oblong 8–16×4–6 µm, coarsely granulate – VIETNAM, LAO CAI PROVINCE, Bakalin & Klimova, v-5-79-17.

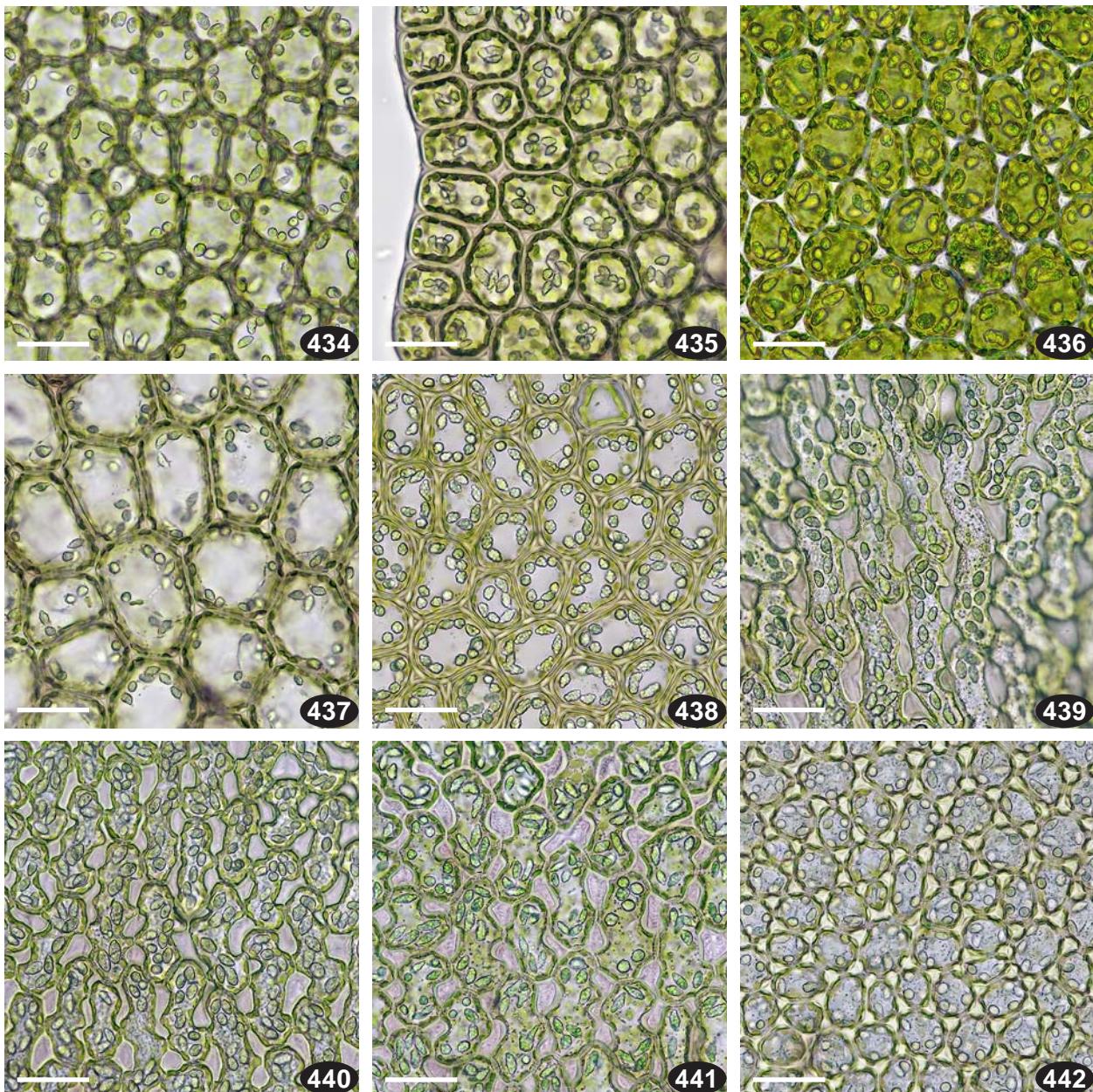
Plagiochila nepalensis Lindenb.

Fig. 431: Oil bodies 7–10(–12) per cell, spherical, 4–5 µm in diameter, oblong 6–13(–15)×3–4(–5) µm, coarsely granulate – VIETNAM, LAI CHAU PROVINCE, Bakalin & Klimova, v-12-16-19_2.

Fig. 432: Oil bodies 6–11 per cell, spherical, 4–5 µm in diameter, oblong 8–11(–13)×4–5(–6) µm, coarsely granulate – VIETNAM, LAI CHAU PROVINCE, Bakalin & Klimova, v-12-16-19_4.

Plagiochila orbicularis (S.Hatt.) S.Hatt.

Fig. 433: Oil bodies 5–7 per cell, spherical, 4–6 µm in diameter, oblong (8–)10–14×4–5 µm, coarsely granulate – JAPAN, YAMANASHI PREFECTURE, Bakalin, j-88-2-15.



Plagiochila ovalifolia Mitt.

Fig. 434: Oil bodies 4–6(–7) per cell, spherical, 4–5 µm in diameter, oblong 5–10×(3–)4–5 µm, granulate – CHINA, SICHUAN PROVINCE, Bakalin & Klimova, c-34-3-17.

Fig. 435: Oil bodies 4–7 per cell, spherical, 3–4 µm in diameter, oblong 4–8(–10)×3–4(–5) µm, granulate – RUSSIA, KHABAROVSK TERRITORY, Bakalin, kh-27-9-16.

Fig. 436: Oil bodies 3–6 per cell, spherical, (4–)5–6 µm in diameter, oblong 5–12×4–5(–6) µm, granulate – REPUBLIC OF KOREA, JEOLLABUK-DO, Bakalin, kor-71-11-19.

Fig. 437: Oil bodies 7–12 per cell, spherical, (3–)4–5 µm in diameter, oblong 5–8(–12)×3–4 µm, granulate – RUSSIA, SAKHALIN PROVINCE, Bakalin, s-14-11-17.

Plagiochila parvifolia Lindenb.

Fig. 438: Oil bodies 7–9 per cell, spherical, 5–6 µm in diameter, oblong 5–8(–10)×4–5 µm, botryoidal – VIETNAM,

HOA BINH PROVINCE, Bakalin & Klimova, v-28-24-19.

Plagiochila peculiaris Schiffn.

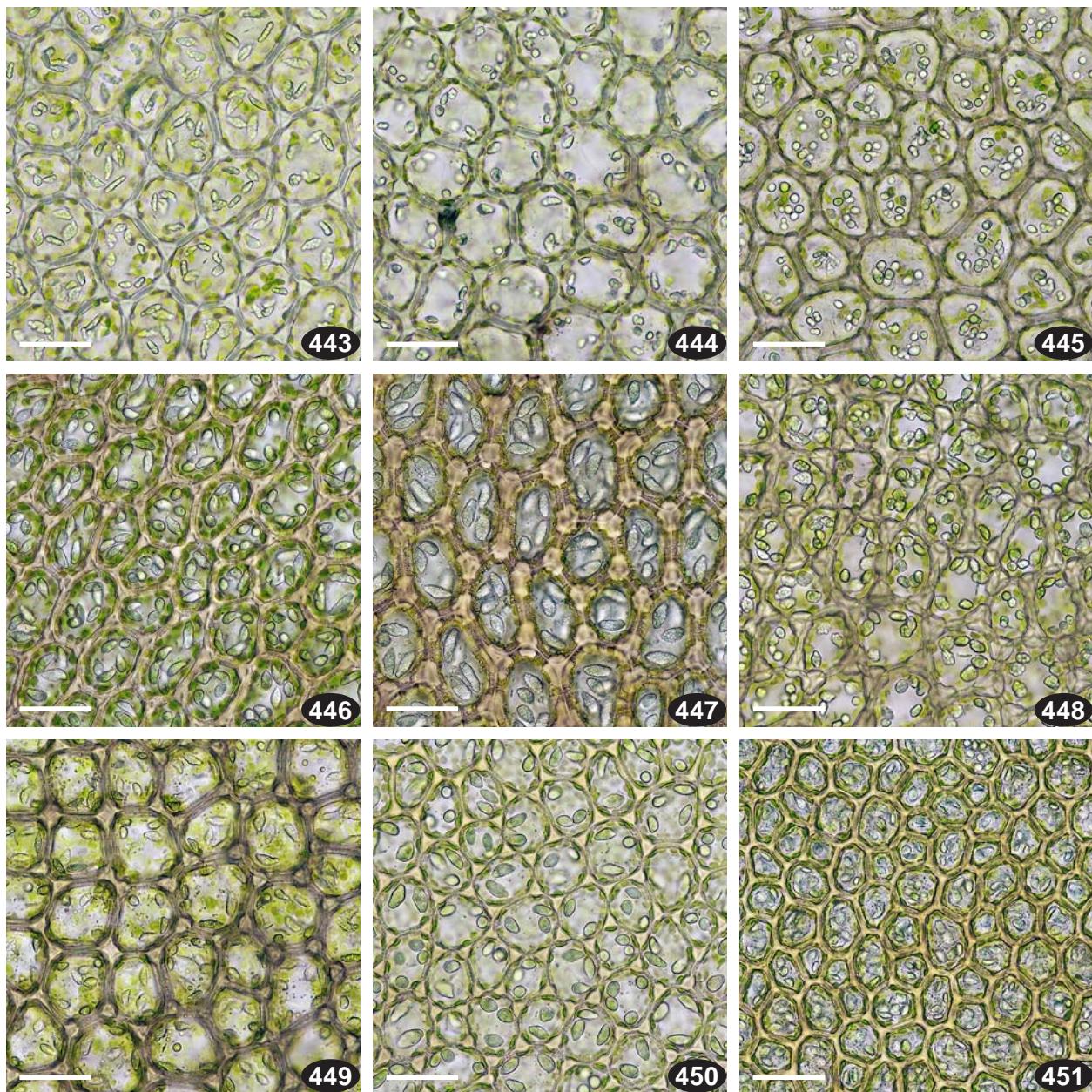
Fig. 439. – Oil bodies in vitta 10–14 per cell, oblong (5–)7–9(–12)×4–5 µm, granulate – VIETNAM, LAO CAI PROVINCE, Bakalin, v-1-10-16_7.

Fig. 440. – Oil bodies 8–11 per cell, spherical, (3–)4–5 µm in diameter, oblong 5–8(–10)×(3–)4–5 µm, granulate – VIETNAM, LAO CAI PROVINCE, Bakalin, v-1-10-16_8.

Fig. 441: Oil bodies 6–10 per cell, spherical, 4–5(–6) µm in diameter, oblong 6–11(–14)×4–5 µm, granulate – VIETNAM, LAO CAI PROVINCE, Bakalin & Klimova, v-3-38-17.

Plagiochila poeltii Inoue et Grolle

Fig. 442: Oil bodies 3–6 per cell, spherical, 3–4 µm in diameter, oblong 4–7×3–4 µm, finely granulate – CHINA, YUNNAN PROVINCE, Bakalin, c-83-28-18.



Plagiochila poreloides (Torr. ex Nees) Lindenb.

Fig. 443: Oil bodies 3–6 per cell, oblong 5–12(–17)×3–4(–5) µm, botryoidal – RUSSIA, AMUR PROVINCE, Bakalin, am-69-7-18.

Fig. 444: Oil bodies 4–8 per cell, spherical, 3–4 µm in diameter, oblong 4–6(–8)×3–4 µm, botryoidal – CHINA, SICHUAN PROVINCE, Bakalin & Klimova, c-32-5-17.

Fig. 445: Oil bodies 4–10 per cell, spherical, 3–4(–5) µm in diameter, oblong 4–8×3–4(–5) µm, botryoidal – RUSSIA, KHABAROVSK TERRITORY, Bakalin & Klimova, kh-33-1-19.

Plagiochila pseudofirma Herzog

Fig. 446: Oil bodies 4–8 per cell, spherical, 4–5 µm in diameter, oblong 5–12×3–5 µm, granulate – VIETNAM, HA GIANG PROVINCE, Bakalin & Klimova, v-10-14-20.

Fig. 447: Oil bodies 4–6(–7) per cell, rarely spherical, 5 µm in diameter, oblong 7–14×4–6 µm, granulate to coarsely so – VIETNAM, CAO BANG PROVINCE, Bakalin & Klimova, v-25-3a-20.

Comment: *P. pseudofirma* shows variation in oil bodies and cell wall features that may suspect the taxonomic differences between plants in different specimens.

Plagiochila pseudopoeltii Inoue

Fig. 448: Oil bodies 4–8(–10) per cell, spherical, 4–5(–6) µm in diameter, oblong 4–7(–10)×3–5 µm, botryoidal – VIETNAM, SON LA PROVINCE, Bakalin & Klimova, v-21-12-19.

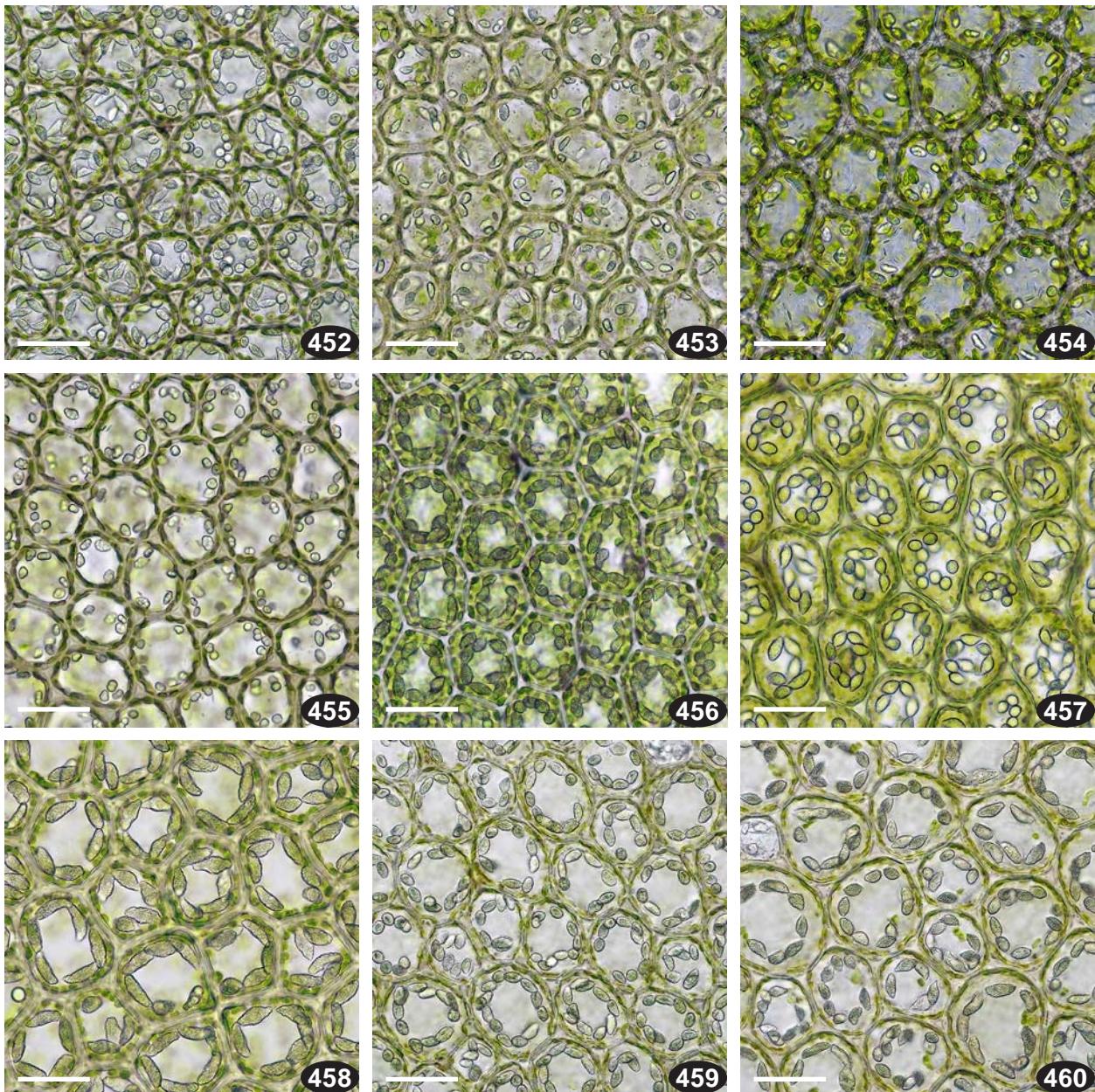
Fig. 449: Oil bodies 6–8 per cell, spherical, 3–4 µm in diameter, oblong 6–10(–12)×3–4 µm, granulate – VIETNAM, LAI CHAU PROVINCE, Bakalin & Klimova, v-4-13-19.

Plagiochila recurvata (W.E.Nicholson) Grolle

Fig. 450: Oil bodies (2–)3–4 per cell, spherical, 4–5 µm in diameter, oblong 8–12(–15)×4–5 µm, granulate – CHINA, YUNNAN PROVINCE, Bakalin, c-85-5-18.

Plagiochila retusa Mitt.

Fig. 451: Oil bodies 2–5 per cell, spherical, 3–4 µm in diameter, oblong 4–7×2–3(–4) µm, loosely granulate – CHINA, YUNNAN PROVINCE, Bakalin, c-81-7-18.



Plagiochila salacensis Gottsche

Fig. 452: Oil bodies (6–)8–13 per cell, spherical, 3–4(–5) μm in diameter, oblong 5–10 \times 3–4 μm , granulate – VIETNAM, HA GIANG PROVINCE, Bakalin & Klimova, v-6-23-20.

Plagiochila satoi S. Hatt.

Fig. 453: Oil bodies 6–9 per cell, spherical, 3–4 μm in diameter, oblong 4–8 \times 3–4 μm , loosely botryoidal – CHINA, YUNNAN PROVINCE, Bakalin, c-83-11-18.

Comment: the species status is questionable, but we suggest it is better to recognize it until integrative research will be done.

Fig. 454: Oil bodies 4–7 per cell, spherical, 3–4 μm in diameter, oblong 5–10 \times 3–4 μm , botryoidal – REPUBLIC OF KOREA, JEOLLABUK-DO, Bakalin, kor-79-3-19.

Fig. 455: Oil bodies 5–8 per cell, spherical, 3–4 μm in diameter, oblong 5–7 \times 3–5 μm , botryoidal – RUSSIA, PRIMORSKY TERRITORY, Bakalin, p-37-1-16.

Plagiochila sciophila Nees

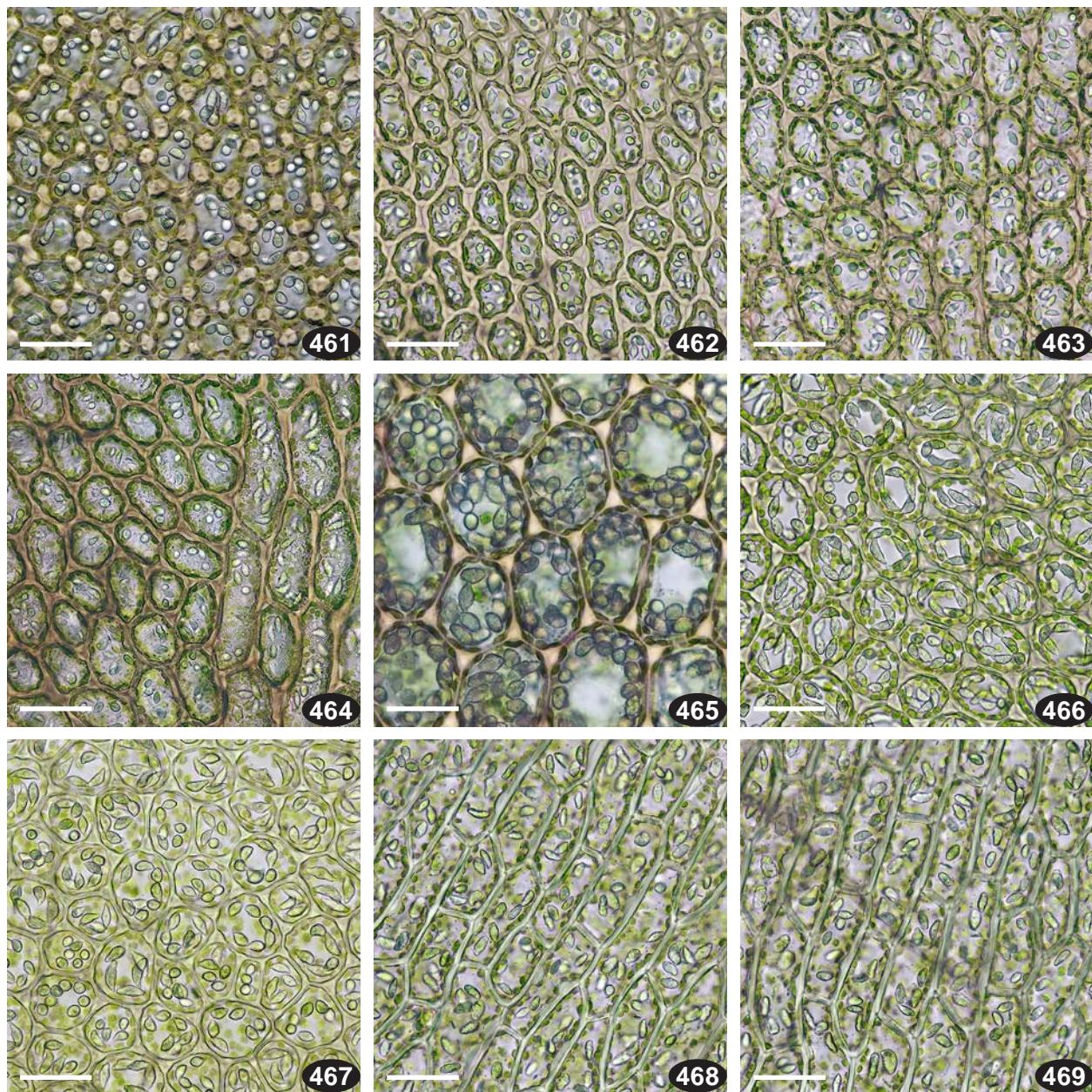
Fig. 456: Oil bodies 7–12 per cell, spherical, 4–5 μm in diameter, oblong 6–12(–14) \times 4–5 μm , granulate, brownish – CHINA, GUIZHOU PROVINCE, Bakalin, china-51-24-13.

Fig. 457: Oil bodies 7–11 per cell, spherical, 4–5 μm in diameter, oblong 7–12 \times 4–5 μm , granulate – REPUBLIC OF KOREA, JEJU-DO, Bakalin, kor-30-4-15.

Fig. 458: (mod. *laxiretis*) Oil bodies 5–6 per cell, oblong 12–18(–20) \times 5–6 μm , granulate, brownish – VIETNAM, HOA BINH PROVINCE, Bakalin & Klimova, v-30-8-19.

Fig. 459: Oil bodies (6–)8–10 per cell, spherical, 4–5 μm in diameter, oblong 5–9 \times 3–5 μm , granulate – VIETNAM, HA GIANG PROVINCE, Bakalin & Klimova, v-11-31-20.

Fig. 460: Oil bodies 6–10 per cell, spherical, 4–6 μm in diameter, oblong 5–10(–12) \times 3–5 μm , granulate – VIETNAM, CAO BANG PROVINCE, Bakalin & Klimova, v-25-3a-20.



Plagiochila semidecurrens (Lehm. et Lindenb.) Lindenb.

Fig. 461: Oil bodies 5–8(–11) per cell, spherical, 3–4(–5) μm in diameter, oblong 5–8(–12) \times (3)–4–5 μm , granulate – VIETNAM, CAO BANG PROVINCE, Bakalin & Klimova, v-25-36-20.

Fig. 462: Oil bodies 4–7 per cell, spherical, 2–3 μm in diameter, oblong 3–4(–5) \times 2–3 μm , loosely granulate – VIETNAM, LAO CAI PROVINCE, Bakalin & Klimova, v-5-32-17.

Fig. 463: Oil bodies 6–9 per cell, spherical, 3–4 μm in diameter, oblong 4–6 \times 3–4 μm , loosely granulate – VIETNAM, LAO CAI PROVINCE, Bakalin & Klimova, v-8-3-17.

Fig. 464: Oil bodies 4–7 per cell, to 12 per vitta cell, spherical, 3–4 μm in diameter, oblong 4–6(–8) \times 3–4 μm , loosely granulate – VIETNAM, LAO CAI PROVINCE, Bakalin & Klimova, v-8-3-17.

Plagiochila sichotensis Bakalin & Vilnet

Fig. 465: Oil bodies 10–18 per cell, spherical, 6–8 μm in

diameter, oblong 6–14 \times 5–7 μm , granulate, brownish – RUSSIA, PRIMORSKY TERRITORY, Bakalin & Arutinov, Arutinov-1-15-13.

Plagiochila subtropica Steph.

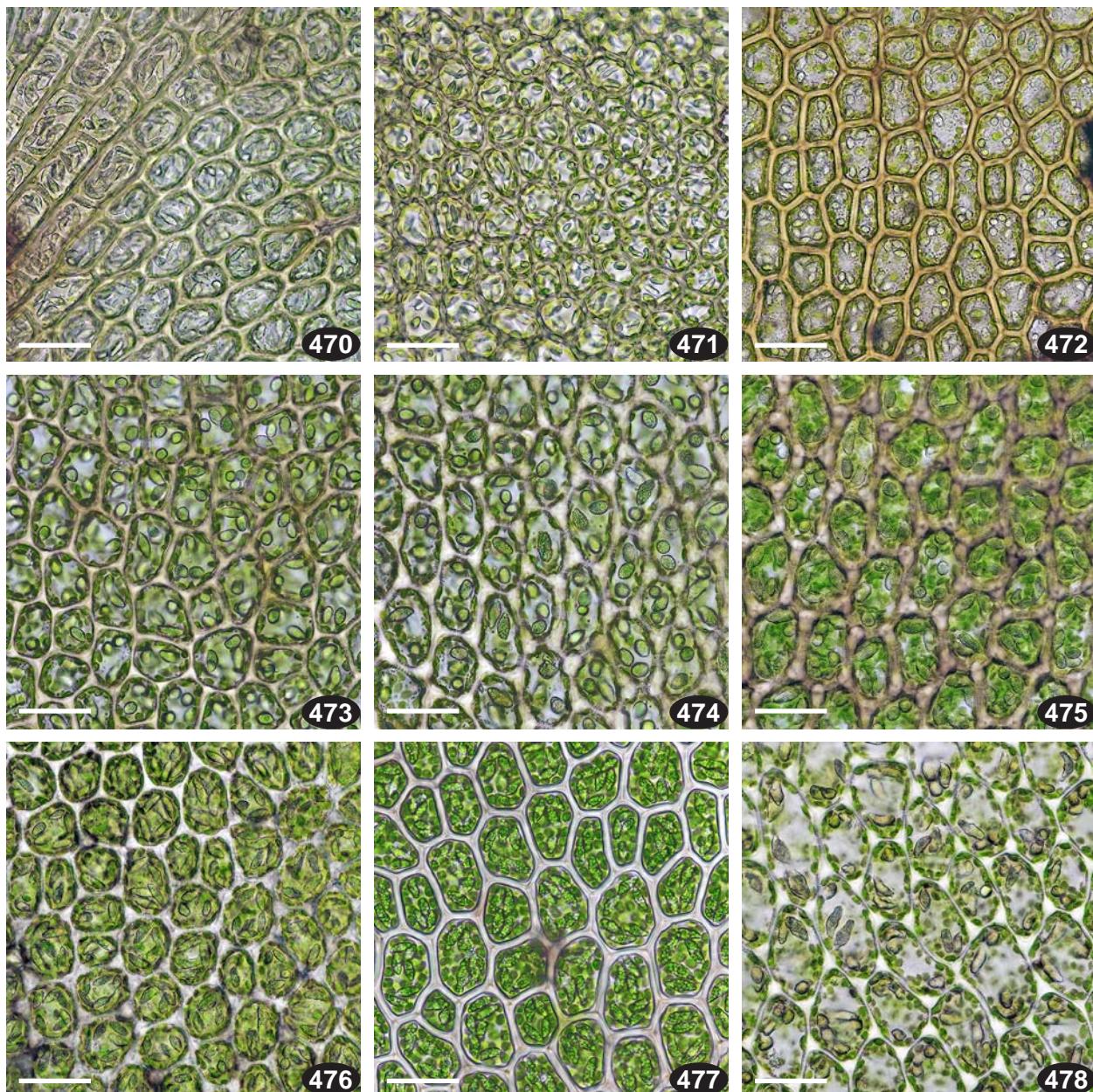
Fig. 466: Oil bodies 5–8 per cell, spherical, 4–6 μm in diameter, oblong 6–12(–16) \times 4–5 μm , granulate – VIETNAM, LAO CAI PROVINCE, Bakalin, v-1-87-16.

Fig. 467: Oil bodies 4–8 per cell, spherical, 4–5 μm in diameter, oblong 5–13 \times 4–5 μm , granulate – VIETNAM, SON LA PROVINCE, Bakalin & Klimova, v-21-3-19.

Plagiochila trabeculata Steph.

Fig. 468: Oil bodies 5–8 per cell, oblong 5–10 \times 4–5 μm , granulate – VIETNAM, LAO CAI PROVINCE, Bakalin & Klimova, v-9-25-17_4.

Fig. 469: Oil bodies 6–8 per cell, oblong 5–10(–12) \times 4–5 μm , granulate – VIETNAM, LAO CAI PROVINCE, Bakalin & Klimova, v-9-25-17_5.



Plagiochila vexans Schiffn. ex Steph.

Fig. 470. – Oil bodies 3–8 per cell, to 10 per vitta cell, oblong 5–10×3–4 µm, granulate – CHINA, YUNNAN PROVINCE, Bakalin, c-88-25-18_7.

Fig. 471. – Oil bodies 4–7 per cell, spherical, 3–4 µm in diameter, oblong 3–4(–5)×(2–)3–4 µm, loosely granulate – CHINA, YUNNAN PROVINCE, Bakalin, c-88-25-18_8.

Plagiochila zonata Steph.

Fig. 472. – Oil bodies 4–7 per cell, spherical, 2–4 µm in diameter, oblong (3–)4–5×(2–)3–4 µm, granulate – CHINA, YUNNAN PROVINCE, Bakalin, c-81-18b-18.

Plagiochilum fimbriatum (Mitt.) Inoue

Fig. 473. – Oil bodies (3–)4–6 per cell, spherical, 4–5 µm in diameter, oblong 6–10(–14)×4–5 µm, granulate – VIETNAM, LAO CAI PROVINCE, Bakalin & Klimova, v-10-43-17_2.

Fig. 474. – Oil bodies 3–5 per cell, spherical, 4–6 µm in diameter, oblong 7–12(–14)×4–5(–6) µm, granulate – VIETNAM, LAO CAI PROVINCE, Bakalin & Klimova, v-10-43-17_3.

Fig. 475. – Oil bodies 4–6 per cell, spherical, 4–5 µm in diameter, oblong 5–15×4–5 µm, granulate – VIETNAM, HA GIANG PROVINCE, Bakalin & Klimova, v-13-28-20_3.

Plagiochilum mayebae S.Hatt.

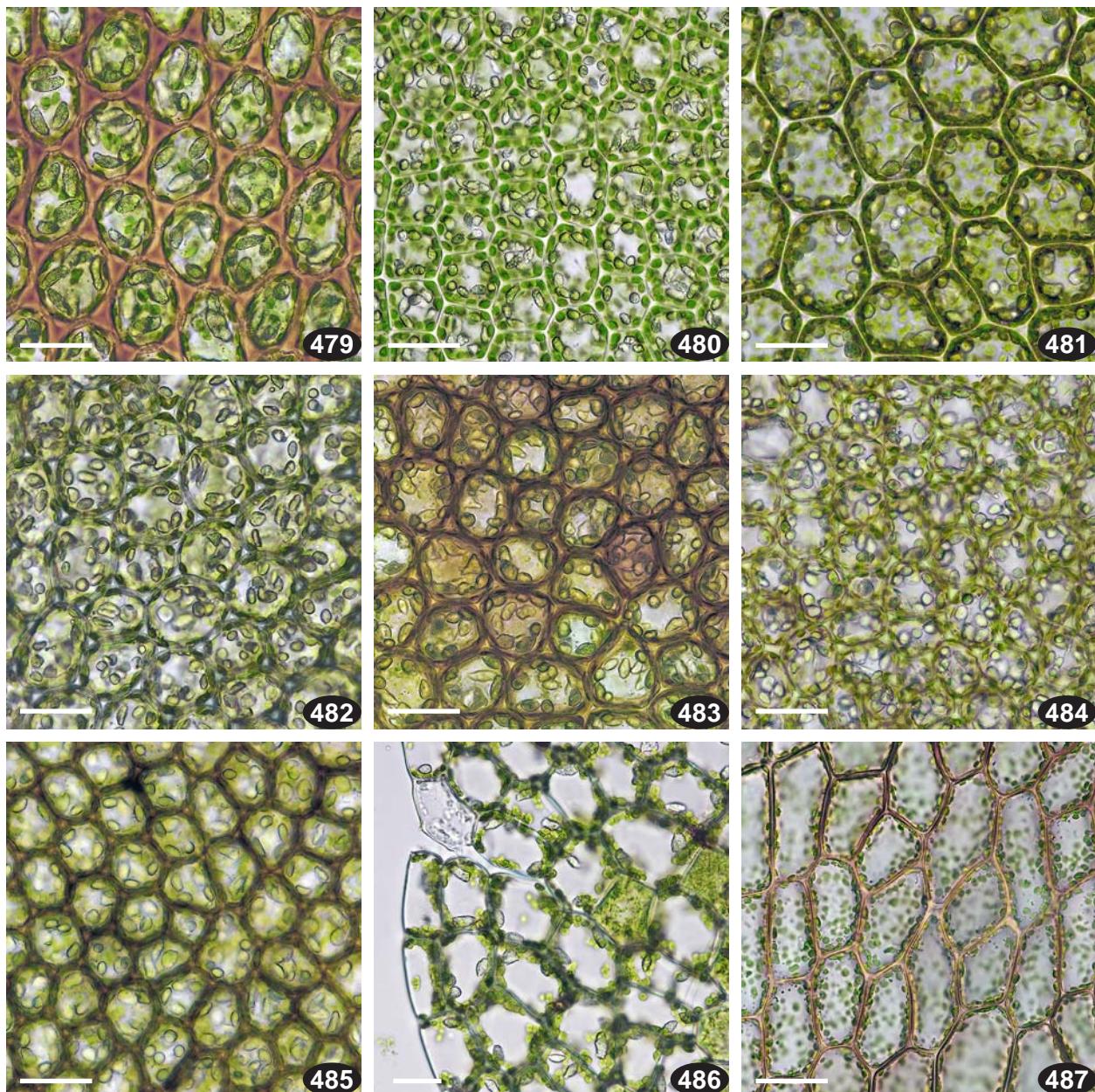
Fig. 476. – Oil bodies (2–)3–6 per cell, oblong 4–13×3–5 µm, granulate – VIETNAM, HA GIANG PROVINCE, Bakalin & Klimova, v-13-28-20_8.

Plagiochilum oppositum (Reinw., Blume et Nees) S.Hatt.

Fig. 477. – Oil bodies 5–7 per cell, oblong 8–13(–16)×4–5 µm, botryoidal – INDONESIA, JAVA ISLAND, Bakalin, java-3-12-15.

Fig. 478. – Oil bodies 3–4 per cell, rarely spherical, 5 µm in diameter, oblong 6–15×4–6 µm, granulate to finely so – VIETNAM, CAO BANG PROVINCE, Bakalin & Klimova, v-28-39-20.

Comment: *P. oppositum* shows botryoidal oil bodies in Java Island (from where described), while the oil bodies in Vietnam are granulate that may suspect taxonomical differences of Vietnamese (or all continental mainland) populations from Javanese ones.



Plagiochilion theriotanum (Steph.) Inoue

Fig. 479: Oil bodies 4–7 per cell, oblong 8–13(–15)×4–5 µm, granulate – VIETNAM, LAO CAI PROVINCE, Bakalin & Klimova, v-6-4-17.

Jamesoniellaceae

Cuspidatula contracta (Reinw., Blume et Nees) Steph.

Fig. 480: Oil bodies (3–)5–8 per cell, spherical, 3–5 µm in diameter, oblong 4–8×3–4 µm, granulate – VIETNAM, CAO BANG PROVINCE, Bakalin & Klimova, v-28-29-20.

Syzygiella autumnalis (DC.) K.Feldberg, Váňa, Hentschel et Heinrichs

Fig. 481: Oil bodies 5–10(–12) per cell, spherical, 4–8 µm in diameter, oblong 8–15×4–7 µm, granulate to finely so – REPUBLIC OF KOREA, GANGWON-DO, Bakalin, kor-65-1-19.

Fig. 482: Oil bodies 5–8 per cell, spherical, 4–6 µm in diameter, oblong 5–10×4–5(6) µm, granulate – RUSSIA, PRIMORSKY TERRITORY, Bakalin, p-10-8-16.

Syzygiella elongella (Taylor) K.Feldberg, Váňa, Hentschel et Heinrichs

Fig. 483: Oil bodies 8–10 per cell, spherical, 4–6 µm in diameter, oblong 6–10×4–5 µm, finely granulate – CHINA, YUNNAN PROVINCE, Bakalin, c-88-67-18.

Syzygiella nipponica (S.Hatt.) K.Feldberg, Váňa, Hentschel et Heinrichs

Fig. 484: Oil bodies 6–9(10) per cell, spherical, 4–6 µm in diameter, oblong 6–10×4–6 µm, finely granulate – CHINA, SICHUAN PROVINCE, Bakalin & Klimova, c-35-11-17.

Fig. 485: Oil bodies (3–)4–6 per cell, spherical, 4–5 µm in diameter, oblong 5–12×4–6 µm, nearly smooth to segmented – REPUBLIC OF KOREA, GYEONGSANGNAM-DO, Bakalin, kor-24-13-15.

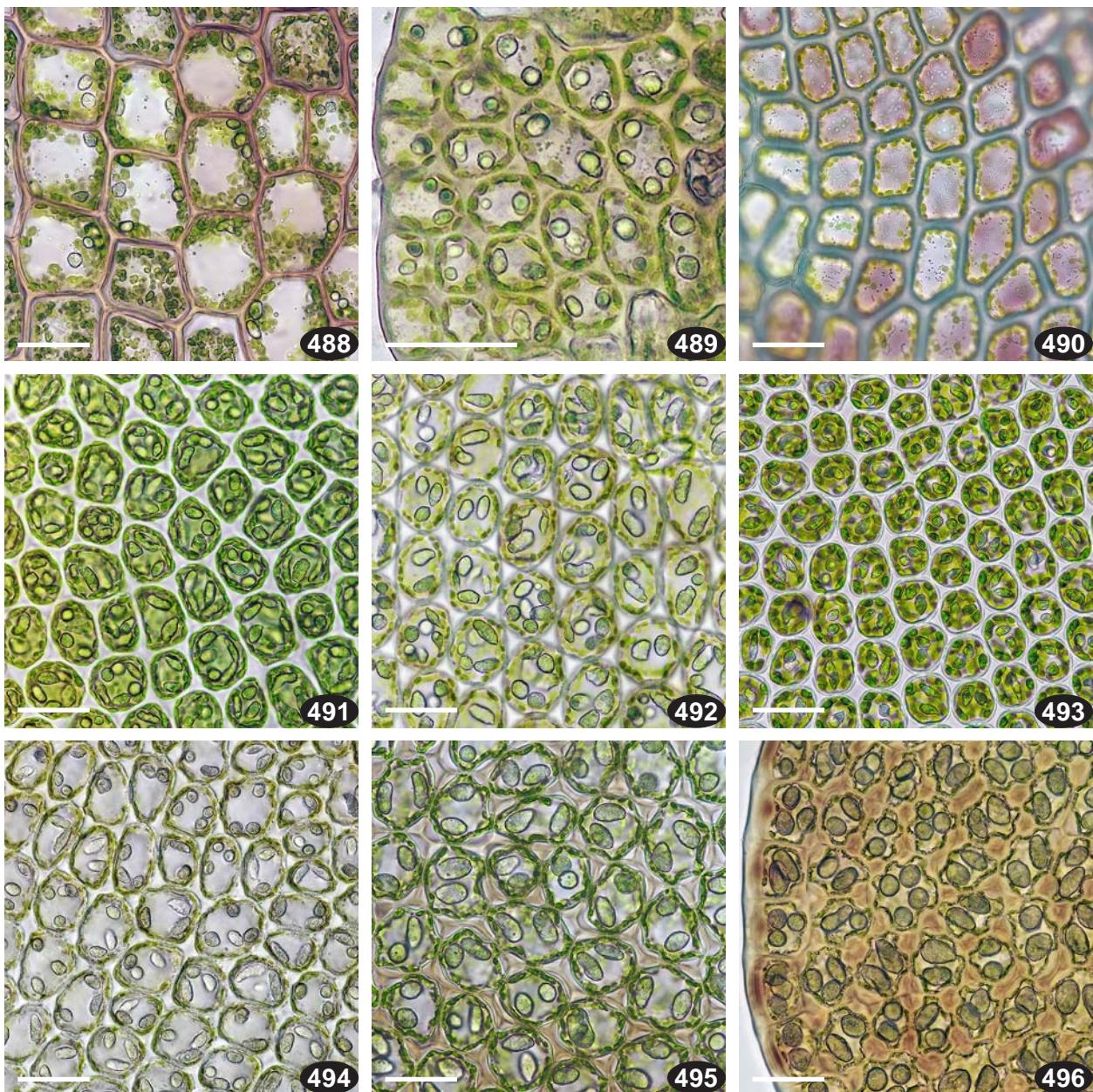
Cephaloziaceae

Alobiellopsis parvifolia (Steph.) R.M.Schust.

Fig. 486: Oil bodies 2–3 per cell, oblong, 5–7×9–13 µm, granulate, grayish – RUSSIA, SAKHALIN PROVINCE, Bakalin, k-78-3-15.

Cephalozia conchata (Grolle et Váňa) Váňa

Fig. 487: Small putative oil bodies 20–40 per cell, spherical, 0.5–1 µm in diameter, smooth – VIETNAM, LAO CAI PROVINCE, Bakalin, v-1-126-16.



Cladopodiella fluitans (Nees) H. Buch

Fig. 488: Oil bodies 2–4 per cell, spherical, 4–6 µm in diameter, oblong 4–5×5–10 µm, granulate – RUSSIA, SAKHALIN PROVINCE, Bakalin & Klimova, k-57-2-18.

Cladopodiella francisci (Hook.) Jfrg.

Fig. 489: Oil bodies 2–4 per cell, spherical, 3–5 µm in diameter, oblong 3–5×4–6 µm, granulate, some with large central eye – RUSSIA, KHABAROVSK TERRITORY, Bakalin & Klimova, kh-44-4-19.

Nowellia curvifolia (Dicks.) Mitt.

Fig. 490: Small putative oil bodies >20 per cell, spherical, 0.5 µm in diameter, smooth – REPUBLIC OF KOREA, JEOLLABUK-DO, Bakalin, kor-80-9-19.

Odontoschisma denudatum (Mart.) Dumort.

Fig. 491: Oil bodies 5–6(–7) per cell, spherical, 4–6 µm in diameter, oblong 6–14×4–6 µm, loosely granulate – CHINA, GUIZHOU PROVINCE, Bakalin, china-56-25-13.

Fig. 492: Oil bodies 2–5 per cell, spherical, 4–7 µm in diameter, oblong 8–14×4–7 µm, granulate – JAPAN, TOTTORI PREFECTURE, Bakalin, j-1-5-13.

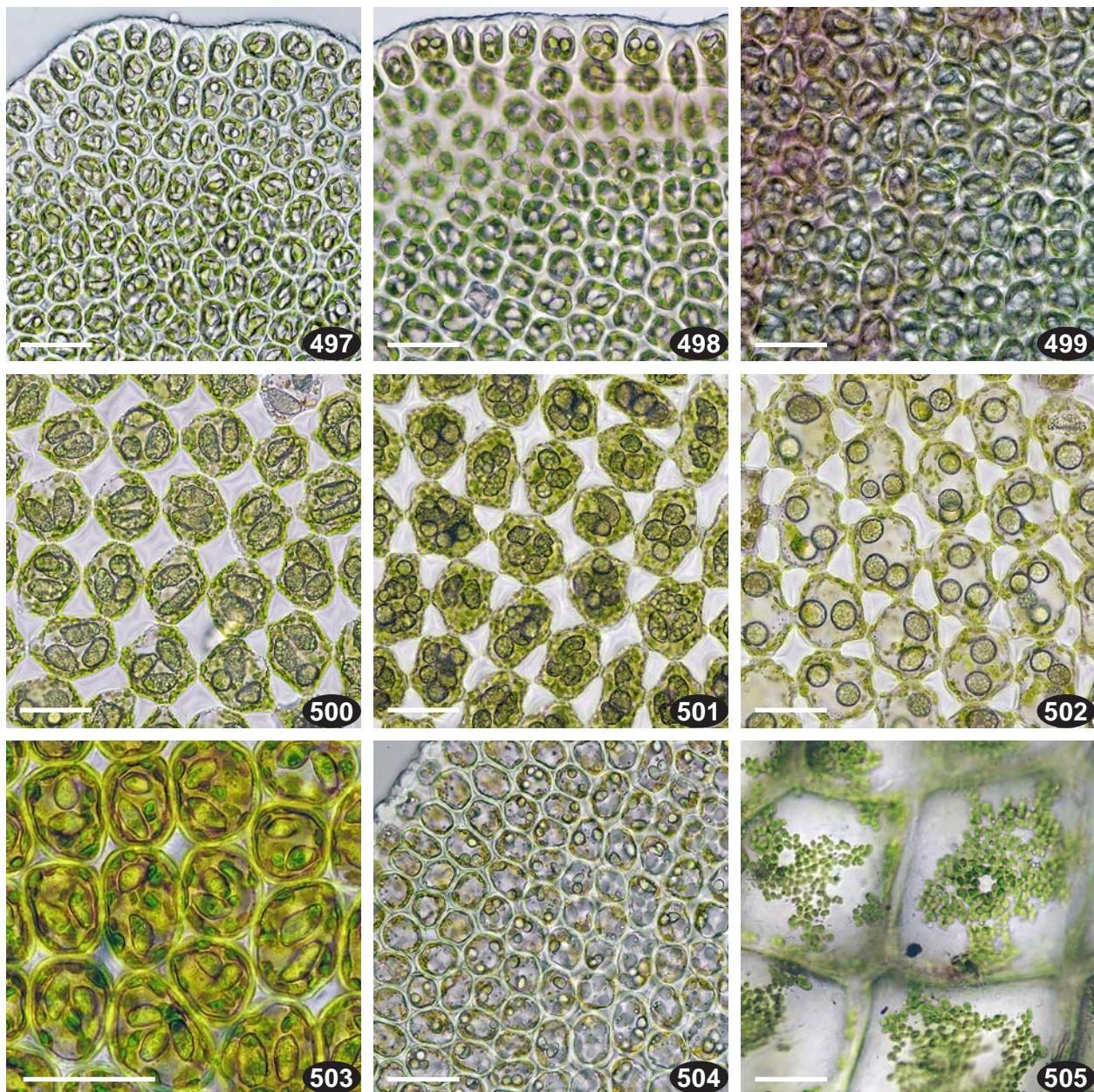
Fig. 493: Oil bodies 2–5 per cell, spherical, 4–5 µm in diameter, oblong 5–10×4–5 µm, finely granulate – REPUBLIC OF KOREA, JEOLLABUK-DO, Bakalin, kor-79-14-19.

Fig. 494: Oil bodies (2–)3–4 per cell, spherical, (4–)5–7 µm in diameter, oblong 5–14×4–5(–6) µm, finely granulate – VIETNAM, LANG SON PROVINCE, Bakalin & Klimova, v-30-7-20.

Odontoschisma elongatum (Lindb.) A.Evans

Fig. 495: Oil bodies 2–3 per cell, spherical, 6–8 µm in diameter, oblong 8–15×7–10 µm, finely granulate – RUSSIA, SAKHALIN PROVINCE, Bakalin, k-70-17-15.

Fig. 496: Oil bodies 2(–4) per cell, spherical, 6–8 µm in diameter, oblong 8–18×6–10 µm, finely granulate, brownish – RUSSIA, KAMCHATKA TERRITORY, Klimova, kam-75-85-16.



Odontoschisma grosseverrucosum Steph.

Fig. 497: Oil bodies in leaf margin 2–4 per cell, spherical, 3–4 µm in diameter, oblong 4–8×3–4 µm, finely granulate – VIETNAM, HA GIANG PROVINCE, Bakalin & Klimova, v-15-5-20.

Fig. 498: Oil bodies 2(–3) per cell, spherical, 4–5 µm in diameter, oblong 5–8(–12)×4–5 µm, finely granulate – VIETNAM, SON LA PROVINCE, Bakalin & Klimova, v-21-6-19.

Fig. 499: Oil bodies 2(–3) per cell, rarely spherical, 4(–5) µm in diameter, oblong 5–13×4–5(–6) µm, finely granulate – VIETNAM, CAO BANG PROVINCE, Bakalin & Klimova, v-23-29-20.

Odontoschisma macounii (Austin) Underw.

Fig. 500: Oil bodies 2–3 per cell, spherical, 8–13 µm in diameter, oblong 10–16(–18)×8–11 µm, granulate to coarsely so – RUSSIA, KAMCHATKA TERRITORY, Bakalin, k-66-16-15.

Fig. 501: Oil bodies 2–5(–6) per cell, spherical, 7–10 µm in

diameter, oblong 8–14×7–10 µm, coarsely granulate – RUSSIA, SAKHALIN PROVINCE, Bakalin, s-18-17-17.

Fig. 502: Oil bodies 2–3(–4) per cell, spherical, 7–12 µm in diameter, oblong 9–15×9–10 µm, coarsely granulate, brownish – RUSSIA, KRASNOYARSK TERRITORY, Fedosov, vj51a.

Odontoschisma pseudogrosseverrucosum Gradst., S.C.Aranda et Vanderp.

Fig. 503: Oil bodies 2–3 per cell, oblong 7–12×5–6(–7) µm, finely granulate – REPUBLIC OF KOREA, GANGWON-DO, Bakalin, kor-66-5-19.

Fig. 504: Oil bodies 2–4 per cell, spherical, (2)–3–4 µm in diameter, oblong 5–8×3–4 µm, finely granulate – JAPAN, YAMANASHI PREFECTURE, Bakalin, j-91-40-15.

Schiffneria hyalina Steph.

Fig. 505: Small putative oil bodies 10–40 and more per cell, spherical, 0.5–1.0 µm in diameter, smooth – VIETNAM, LAI CHAU PROVINCE, Bakalin & Klimova, v-7-10-19.

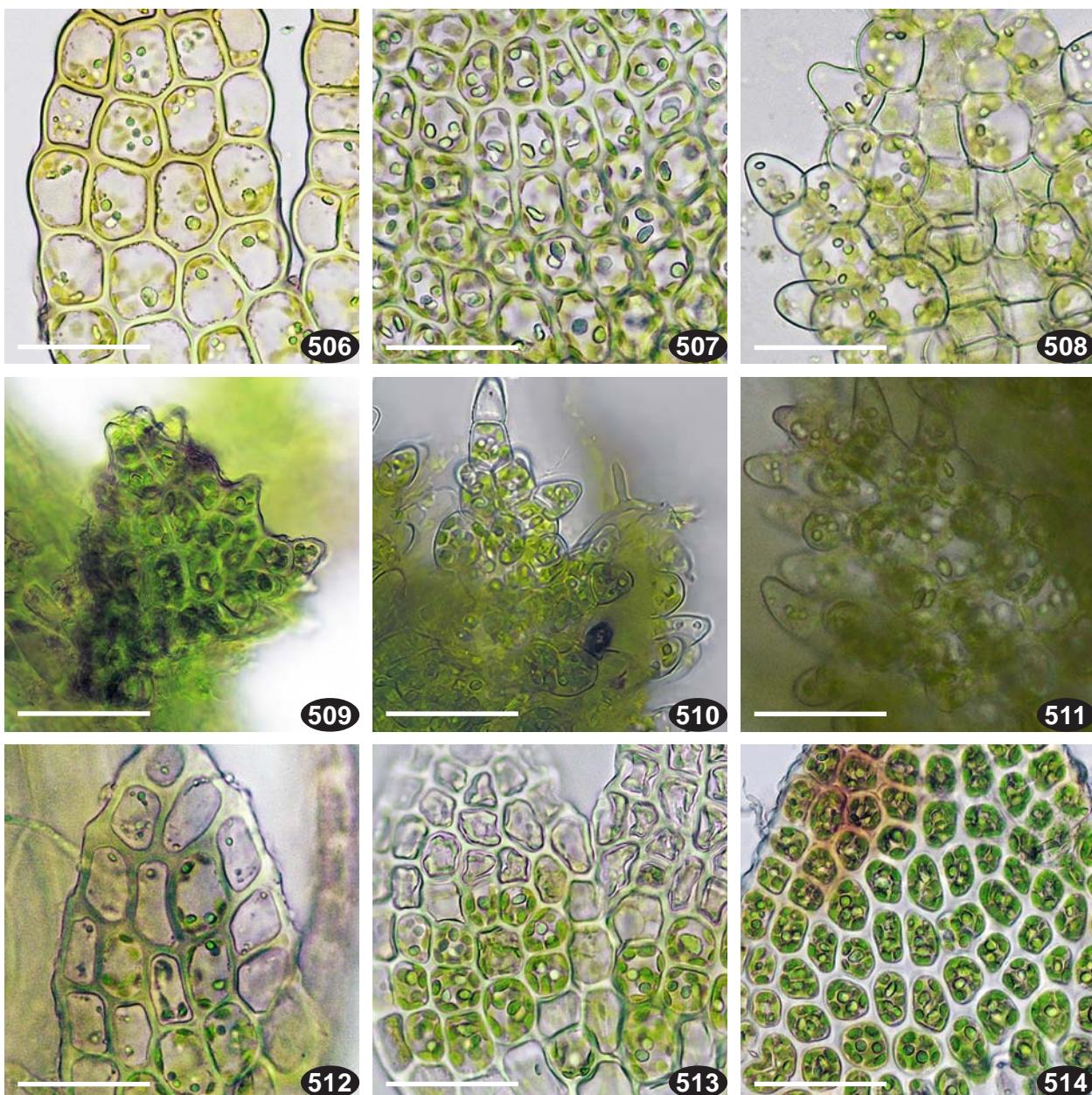
**Cephaloziellaceae***Cephaloziella crispata* N.Kitag.

Fig. 506: Oil bodies 2–5 per cell, spherical, 1–4 μm in diameter, oblong 3–5 \times 2–4 μm , finely granulate to smooth, with several additional small putative oil bodies – VIETNAM, SON LA PROVINCE, Bakalin & Klimova, v-18-4-19.

Comment: *Cephaloziopsis exigua* (Inoue) R.M.Schust. & Inoue. represents the form of *Cephaloziella crispata* with undeveloped perianth (Katagiri & Furuki, 2012).

Cephaloziella divaricata (Sm.) Schiffn.

Fig. 507: Oil bodies 2–4 per cell, spherical, 2–4 μm in diameter, oblong 2–4 \times 3–5 μm , nearly smooth – RUSSIA, KHABAROVSK TERRITORY, Bakalin & Klimova, kh-49-22-19.

Cephaloziella konstantinovae Mamontov & Vilnet

Fig. 508: Oil bodies 3–7 per cell, spherical, 1.5–2 μm in diameter, oblong 1–2 \times 2–3 μm , smooth – RUSSIA, KHABAROVSK TERRITORY, Bakalin, kh-11-11-16.

Cephaloziella microphylla (Steph.) Douin

Fig. 509: Oil bodies 1–2 per cell, spherical, 1.5–2 μm in diameter, oblong 2–2.5 \times 1.5–2 μm , smooth – VIETNAM, CAO BANG PROVINCE, Bakalin & Klimova, v-21-16a-20.

Cephaloziella spinicaulis Douin

Fig. 510: Oil bodies 2–6 per cell, spherical, 1.5–2.5 μm in diameter, nearly smooth – REPUBLIC OF KOREA, JEOLLABUK-DO, Bakalin, kor-71-2-19.

Fig. 511: Oil bodies 2–6 per cell, spherical, 2–3 μm in diameter, oblong 2–3 \times 3–5 μm , nearly smooth – RUSSIA, PRIMORSKY TERRITORY, Bakalin, p-31-3-15.

Cephaloziella spinigera (Lindb.) Jrg

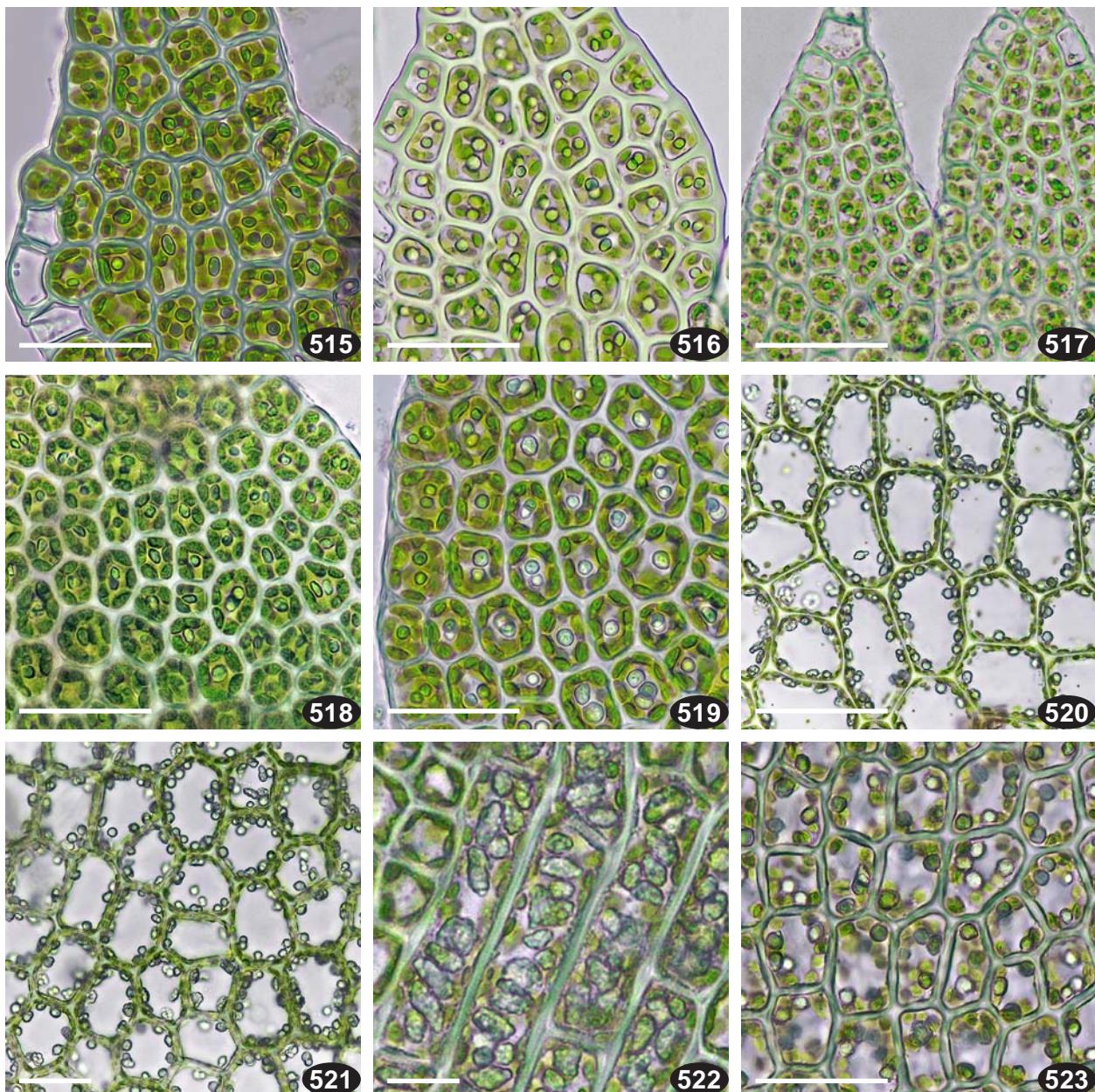
Fig. 512: Oil bodies 2–5 per cell, spherical, 1.5–2 μm in diameter, oblong 2–3 \times 1.5–2 μm , smooth – RUSSIA, KRASNOYARSK TERRITORY, Fedosov, Vf39a.

Cephaloziella willisiana (Steph.) N. Kitag.

Fig. 513: Oil bodies 2–4 per cell, spherical, 2–3 μm in diameter, oblong 2–3 \times 2–4 μm , smooth – VIETNAM, LAI CHAU PROVINCE, Bakalin & Klimova, v-11-1-19.

Fig. 514: Oil bodies (1–)3–5 per cell, spherical, 1.5–2 μm in diameter, oblong 2–2.5 \times 1.5–2 μm , smooth – VIETNAM, CAO BANG PROVINCE, Bakalin & Klimova, v-21-21-20.

Comment: this species actually belongs to *Cylindrocolea*, and replaces *Cylindrocolea kiaerii* in East Asia. However, we refrain from suggesting new combinations right now.



Cylindrocolea aff. *kiaeri* (Austin) Váňa

Fig. 515: Oil bodies 1–3 per cell, spherical, (1.5)–2–3 µm in diameter, oblong 2–4×1.5–2.5 µm, nearly smooth – REPUBLIC OF KOREA, JEOLLABUK-DO, Bakalin, kor-72-3-19.

Fig. 516: Oil bodies (1)–2–5 per cell, spherical, 204 µm in diameter, oblong 2–4×2–3 µm, smooth – VIETNAM, LAO CAI PROVINCE, Bakalin & Klimova, v-4-2-17.

Fig. 517: Oil bodies 2–6 per cell, spherical, 1.5–2 µm in diameter, oblong 1.5–2×2–3 µm, smooth – VIETNAM, LAO CAI PROVINCE, Bakalin & Klimova, v-4-16-17.

Comment: all reports of *C. kiaerii* in East Asia may belong to *Cephaloziella willisiana* (see above), a neglected species, likely of the *Cylindrocolea*.

Cylindrocolea recurvifolia (Steph.) Inoue

Fig. 518: Oil bodies (1)–2–4 per cell, spherical, 1.5–2 µm in diameter, oblong 1.5–2×2–4 µm, smooth to granulate – REPUBLIC OF KOREA, GYEONGSANGNAM-DO, Bakalin, kor-43-7-14.

Fig. 519: Oil bodies (1)–2–3 per cell, spherical, 3–4 µm in diameter, oblong 4–7×3–4 µm, nearly smooth to loosely

botryoidal – REPUBLIC OF KOREA, GYEONGSANGNAM-DO, Bakalin, kor-70-13-19.

Obtusifoliaceae

Obtusifolium obtusum (Lindb.) S.W.Arnell

Fig. 520: Oil bodies 15–20 per cell, spherical, 3–4(–5) µm in diameter, oblong 4–6×3–4 µm, botryoidal – RUSSIA, MAGADAN PROVINCE, Bakalin, mag-21-34-14.

Fig. 521: Oil bodies 12–22 per cell, spherical, 3–4 µm in diameter, oblong 4–6×3–4 µm, botryoidal – RUSSIA, MAGADAN PROVINCE, Bakalin, mag-21-34-14_2.

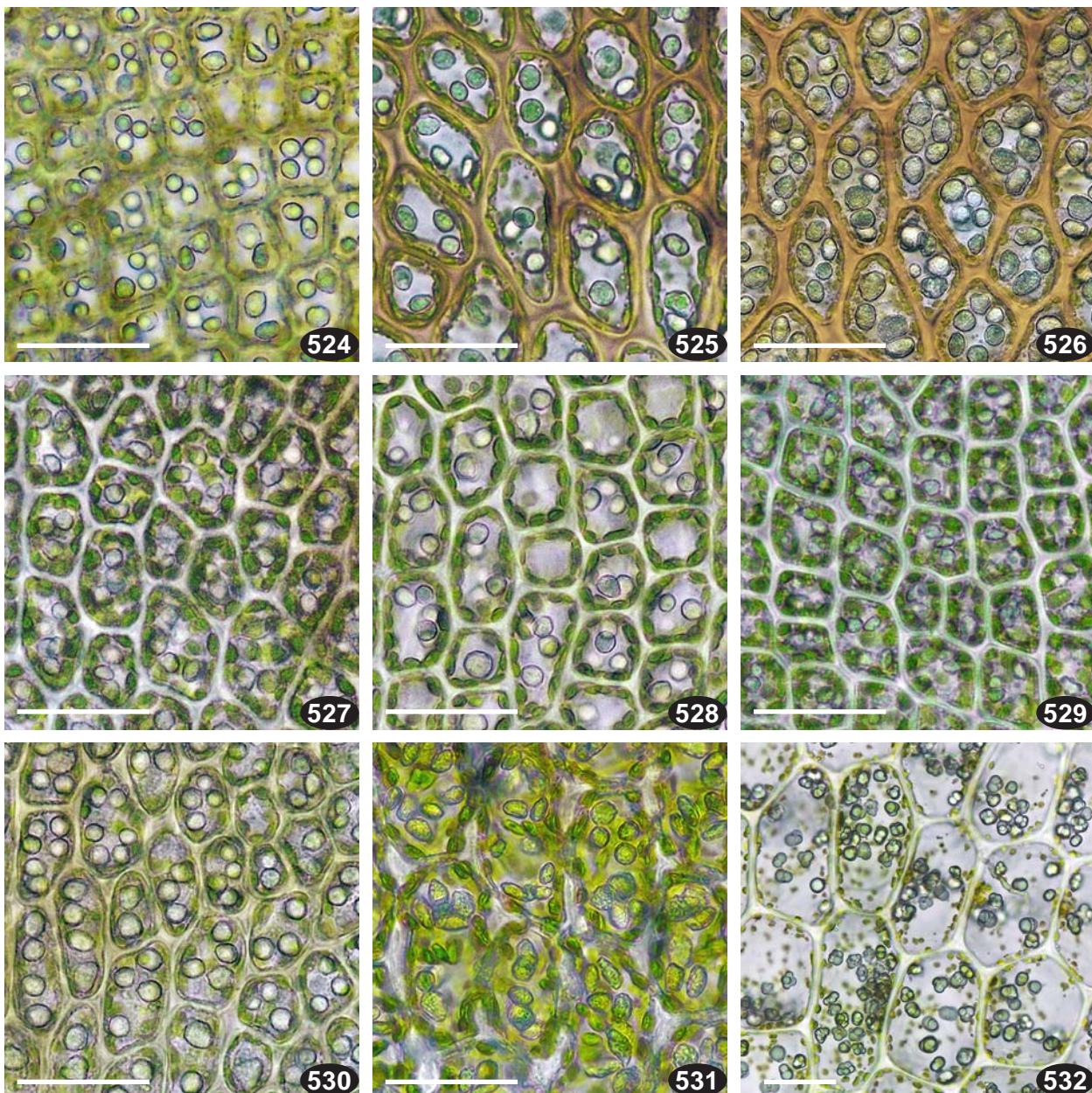
Scapaniaceae

Diplophyllum albicans (L.) Dumort.

Fig. 522: Oil bodies in vitta cells 15–20 per cell, spherical, 2–3 µm in diameter, oblong 2–4×2–3 µm, granulate – JAPAN, KOCHI PREFECTURE, Bakalin, j-8-9-15.

Diplophyllum andrewsii A.Evans

Fig. 523: Oil bodies 3–8 per cell, spherical, 3–4 µm in diameter, oblong 4–5×3–4 µm, smooth to granulate – RUSSIA, SAKHALIN PROVINCE, Bakalin, k-70-44-15.



Diplophyllum andrewsii A.Evans

Fig. 524: Oil bodies 2–3 per cell, spherical, 3–5 µm in diameter, oblong 4–7×3–5 µm, nearly smooth, mostly with central eye – REPUBLIC OF KOREA, GYEONGSANGNAM-DO, Bakalin, kor-17-3-15.

Diplophyllum nanum Herzog

Fig. 525: Oil bodies 3–8 per cell, spherical, 4–7 µm in diameter, oblong 4–10×4–6 µm, granulate – VIETNAM, LAO CAI PROVINCE, Bakalin, v-1-114-16.

Fig. 526: Oil bodies (3–)5–9 per cell, spherical, 3–6 µm in diameter, oblong 5–8×4–5(–6) µm, finely granulate – VIETNAM, CAO BANG PROVINCE, Bakalin & Klimova, v-25-14-20.

Diplophyllum sibiricum Vilnet & Bakalin

Fig. 527: Oil bodies 3–6 per cell, spherical, 4–6 µm in diameter, oblong 5–8×4–6 µm, granulate – RUSSIA, KHABAROVSK TERRITORY, Bakalin, kh-28-3-16.

Fig. 528: Oil bodies 2–6 per cell, spherical, 4–6 µm in diameter, oblong 4–8×4–6 µm, smooth to loosely granulate –

RUSSIA, KHBABROVSK TERRITORY, Bakalin & Klimova, kh-49-16-19.

Diplophyllum taxifolium (Wahlenb.) Dumort.

Fig. 529: Oil bodies 4–7 per cell, spherical, 3–5 µm in diameter, oblong 4–6×3–5 µm, loosely granulate – JAPAN, TOTTORI PREFECTURE, Bakalin, j-1-10-13.

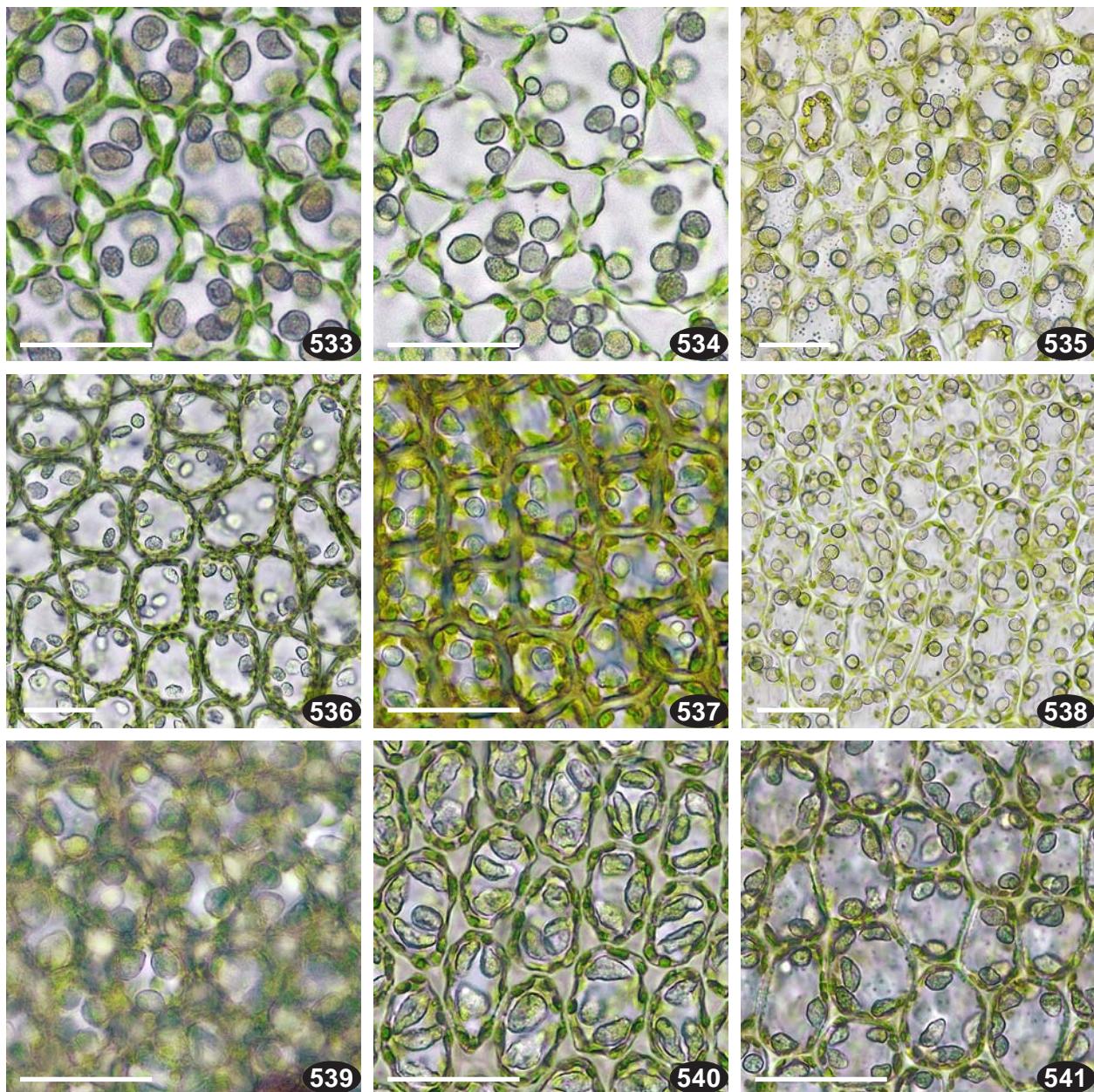
Fig. 530: Oil bodies 3–12 per cell, spherical, 4–6 µm in diameter, oblong 5–8×4–5 µm, loosely granulate – VIETNAM, LAO CAI PROVINCE, Bakalin & Klimova, v-9-26-17.

Douinia plicata (Lindb.) Konstant. et Vilnet

Fig. 531: Oil bodies 10–15 per cell, spherical, 5–6 µm in diameter, oblong 5–10×4–6 µm, granulate to finely so – REPUBLIC OF KOREA, GANGWON-DO, Bakalin, kor-66-9-19.

Protociliopsis grandiretis (Lindb. ex Kaal.) A.V. Troitsky, Bakalin & Fedosov

Fig. 532: Oil bodies 8–20 per cell, spherical, 5–8 µm in diameter, oblong 6–10×(4–)5–7(–9) µm, botryoidal – RUSSIA, MAGADAN PROVINCE, Bakalin, mag-21-1-14.



Pseudotritomaria heterophylla (R.M.Schust.) Konstant. et Vilnet

Fig. 533: Oil bodies 3–5 per cell, spherical, 5–7 µm in diameter, oblong 5–10(–12)×4–8 µm, finely granulate, brownish – RUSSIA, MAGADAN PROVINCE, Bakalin, mag-29-5-14.

Fig. 534: Oil bodies 4–8 per cell, spherical, 3–7 µm in diameter, oblong 5–10×4–6 µm, granulate, brownish – RUSSIA, MAGADAN PROVINCE, Bakalin, mag-30-3-14.

Fig. 535. – Oil bodies (2–)4–7 per cell, spherical, 5–8 µm in diameter, oblong 6–11×5–8 µm, granulate – RUSSIA, KRASNOYARSK TERRITORY, Fedosov, vj65b.

Saccobasis polita (Nees) H.Buch

Fig. 536: Oil bodies 4–7(–8) per cell, spherical, 5–9(–10) µm in diameter, oblong 5–12×3–8(–8) µm, granulate – RUSSIA, MURMANSK PROVINCE, Bakalin, mur-33-20-15.

Scapania ampliata Steph.

Fig. 537: Oil bodies 2–3(–4) per cell, spherical, (3–)4–5(–6) µm in diameter, oblong 5–8×4–5 µm, finely granulate – RE-

PUBLIC OF KOREA, GANGWON-DO, Bakalin, kor-66-13-19.

Scapania apiculata Spruce

Fig. 538: Oil bodies (3–)4–6 per cell, spherical, 5–8 µm in diameter, oblong 6–10×5–6(–7) µm, finely granulate – CHINA, SICHUAN PROVINCE, Bakalin & Klimova, c-38-1-17.

Scapania bhutanensis Amakawa

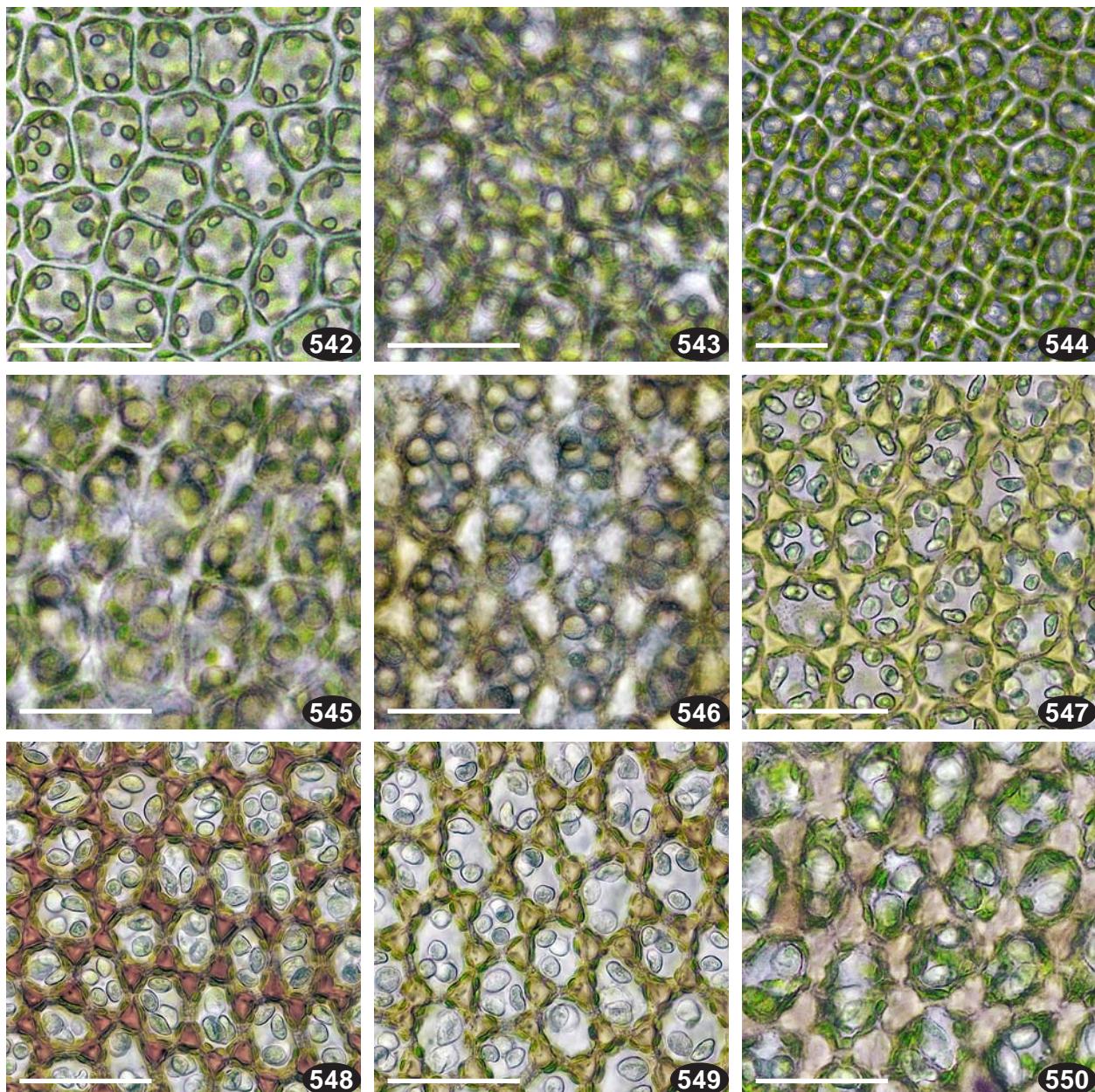
Fig. 539: Oil bodies 3–5 per cell, spherical, 5–7 µm in diameter, oblong 6–10×5–6 µm, finely granulate to nearly smooth – CHINA, SICHUAN PROVINCE, Bakalin & Klimova, c-41-1-17.

Scapania bolanderi Austin

Fig. 540: Oil bodies 2–4(–7) per cell, oblong 5–12(–15)×4–7 µm, finely granulate, biconcave – JAPAN, YAMANASHI PREFECTURE, Bakalin, j-88-18-15.

Scapania carinthiaca J.B.Jack ex Lindb.

Fig. 541: Oil bodies 3–5 per cell, spherical, (3–)4–5 µm in diameter, oblong 5–7(–10)×(3–)4–5 µm, finely granulate – JAPAN, YAMANASHI PREFECTURE, Bakalin, j-88-55-15.



Scapania carinthiaca J.B.Jack ex Lindb.

Fig. 542: Oil bodies 3–5 per cell, spherical, (2–)3–4 μm in diameter, oblong 3–5 \times 2–3(–4) μm , finely granulate – RUSSIA, PRIMORSKY TERRITORY, Bakalin, p-34-19-14.

Scapania ciliata Sande Lac.

Fig. 543: Oil bodies 3–5 per cell, spherical, 5–7 μm in diameter, nearly smooth – JAPAN, YAMANASHI PREFECTURE, Bakalin, j-91-39-15.

Fig. 544: Oil bodies 2–4 per cell, spherical, 3–7 μm in diameter, oblong 6–11 \times 5–7 μm , finely granulate – REPUBLIC OF KOREA, JEOLLABUK-DO, Bakalin, kor-81-2-19.

Fig. 545: Oil bodies 3–5 per cell, spherical, 5–8(–10) μm in diameter, oblong 6–10 \times 5–7 μm , finely granulate – VIETNAM, SON LA PROVINCE, Bakalin & Klimova, v-21-8-19.

Fig. 546: Oil bodies 5–9 per cell, spherical, 4–7 μm in diameter, oblong 5–7 \times 4–5 μm , granulate – VIETNAM, CAO BANG PROVINCE, Bakalin & Klimova, v-28-5-20.

Scapania ciliatospinosa Horik.

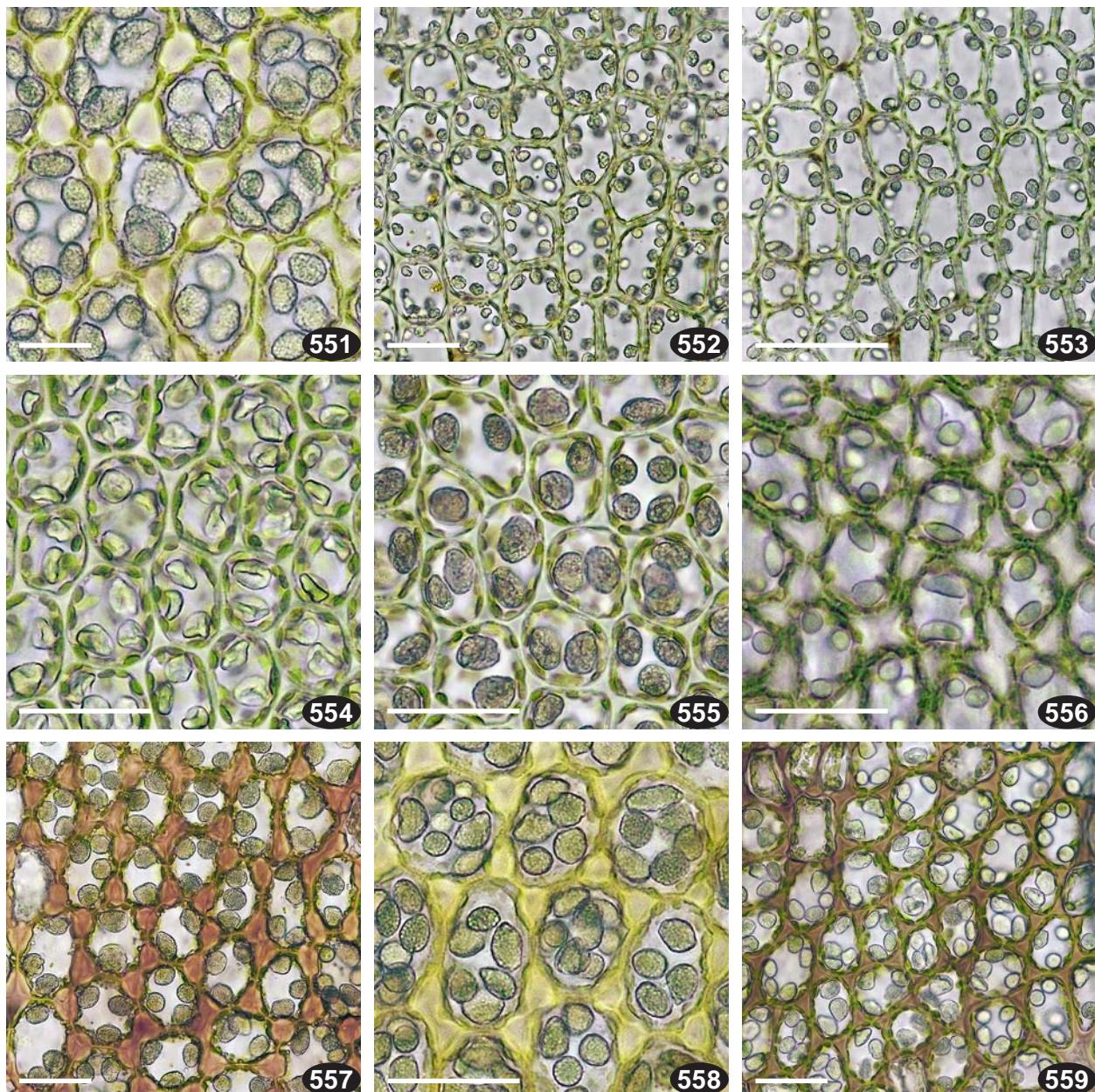
Fig. 547: Oil bodies 2–6 per cell, spherical, (3–)4–5 μm in diameter, oblong 4–6(–8) \times 3–4(–5) μm , nearly smooth, biconcave – CHINA, YUNNAN PROVINCE, Bakalin, c-73-35-18.

Fig. 548: Oil bodies (2–)3–4(–5) per cell, spherical, 3–5 μm in diameter, oblong 4–7 \times 3–4 μm , finely granulate, some biconcave – VIETNAM, CAO BANG PROVINCE, Bakalin & Klimova, v-23-28-20.

Fig. 549: Oil bodies 2–4 per cell, spherical, 3–5 μm in diameter, oblong 4–8 \times (2–)3–5 μm , finely granulate, some bi-concave – VIETNAM, CAO BANG PROVINCE, Bakalin & Klimova, v-24-13-20_8.

Scapania contorta Mitt.

Fig. 550: Oil bodies 2–3 per cell, spherical, 4–8 μm in diameter, oblong 6–12(–15) \times 5–6(–7) μm , nearly smooth – VIETNAM, LAO CAI PROVINCE, Bakalin & Klimova, v-9-12-17.



Scapania crassiretis Bryhn

Fig. 551: Oil bodies 3–8 per cell, spherical, 6–10 µm in diameter, oblong 6–12(–15)×5–8(–13) µm, granulate – RUSSIA, KAMCHATKA TERRITORY, Klimova, kam-53-77-16.

Scapania curta (Mart.) Dumort.

Fig. 552: Oil bodies (5–)6–10 per cell, spherical, (4–)5–6 µm in diameter, oblong 5–8(–10)×4–6 µm, coarsely granulate – RUSSIA, SAKHALIN PROVINCE, Bakalin, k-81-4-15.

Fig. 553: Oil bodies 3–6 per cell, spherical, 4–6(–7) µm in diameter, oblong 5–9×4–5 µm, granulate – RUSSIA, MURMANSK PROVINCE, Bakalin, mur-32-8-15.

Scapania cuspiduligera (Nees) Müll.Frib.

Fig. 554: Oil bodies 2–3 per cell, spherical, 6–9 µm in diameter, oblong 7–11(–13)×(5–)6–8 µm, nearly smooth, biconcave – CHINA, YUNNAN PROVINCE, Bakalin, c-83-11-18.

Fig. 555: Oil bodies 2–3 per cell, spherical, 5–8 µm in diameter, oblong 6–12×5–8 µm, finely granulate – RUSSIA, KAMCHATKA TERRITORY, Klimova, kam-53-77-16.

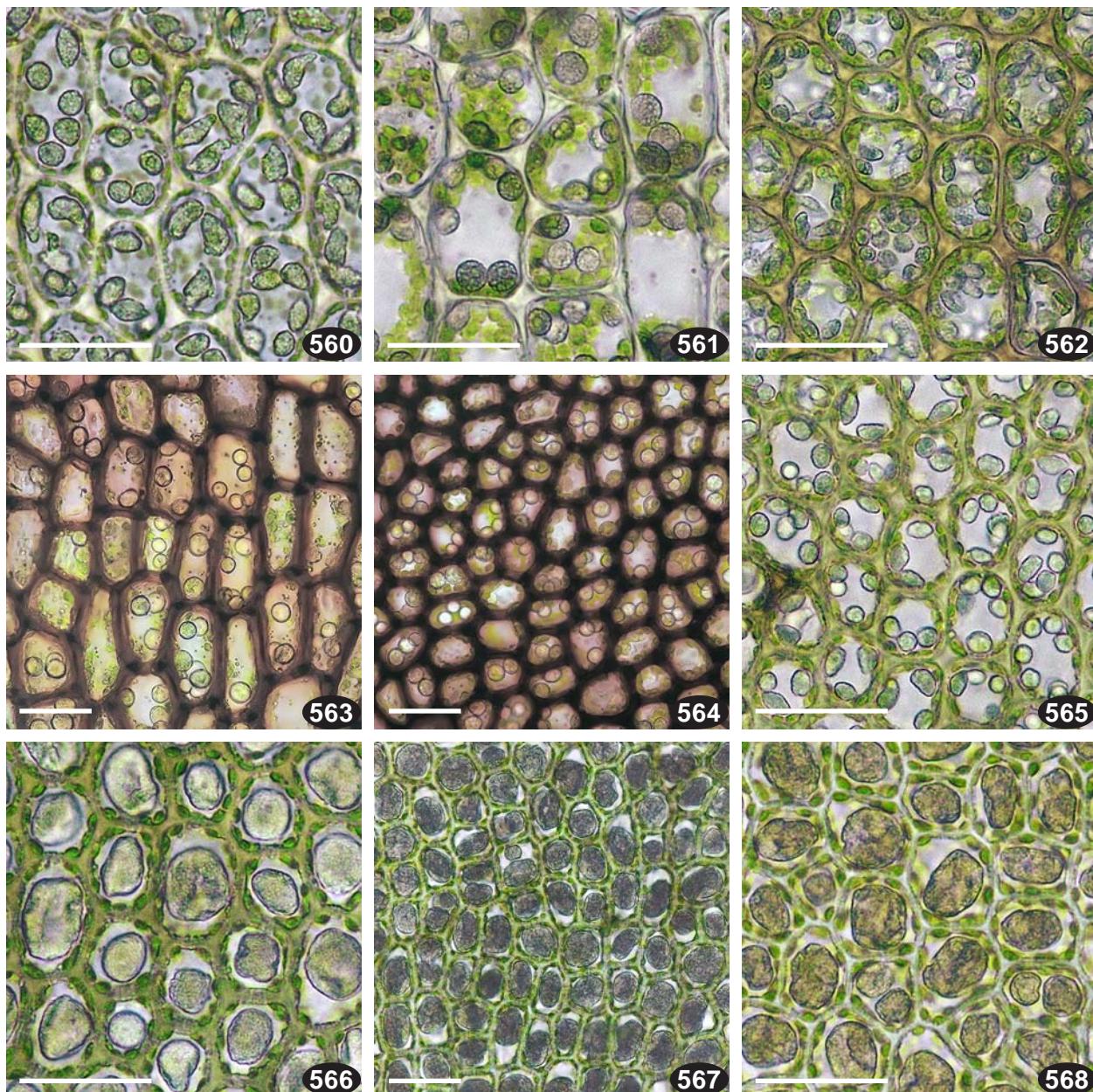
Fig. 556: Oil bodies 2–4 per cell, spherical, 4–6 µm in diameter, oblong 5–10(–12)×4–5 µm, finely granulate – CHINA, YUNNAN PROVINCE, Bakalin, c-83-31a-18.

Scapania degenerii Schiffn. ex Müll.Frib.

Fig. 557: Oil bodies (2–)3–5(–7) per cell, spherical, (6–)8–12 µm in diameter, oblong 8–14(–16)×6–8(–10) µm, granulate, brownish – RUSSIA, KHABAROVSK TERRITORY, Bakalin & Klimova, kh-38-11-19.

Fig. 558: Oil bodies 4–7(–10) per cell, spherical, 5–10 µm in diameter, oblong 6–13×5–10 µm, granulate, brownish – RUSSIA, KHABAROVSK TERRITORY, Bakalin & Klimova, kh-41-10-19.

Fig. 559: Oil bodies 3–5 per cell, spherical, 5–7 µm in diameter, oblong 6–12×5–8 µm, finely granulate – RUSSIA, KRASNOYARSK TERRITORY, Fedosov, vf52a.



Scapania diplophyloides Amakawa et S.Hatt.

Fig. 560: Oil bodies (4–)5–6(–7) per cell, spherical, 5–7 μm in diameter, oblong 5–12 \times 4–6 μm , granulate – JAPAN, YAMANASHI PREFECTURE, Bakalin, j-89-27-15.

Fig. 561: Oil bodies (2–)4–7 per cell, spherical, 5–8(–9) μm in diameter, granulate, brownish – RUSSIA, SAKHALIN PROVINCE, Bakalin & Klimova, k-46-1-18.

Scapania ferruginea (Lehm. et Lindenb.) Lehm. et Lindenb.

Fig. 562: Oil bodies 8–13 per cell, spherical, 3–5 μm in diameter, oblong 4–5(–6) \times 3–4(–5) μm , granulate – CHINA, YUNNAN PROVINCE, Bakalin, c-88-8-18.

Scapania gigantea Horik.

Fig. 563: Oil bodies in basal part of the ventral lobe 3–7(–10) per cell, spherical, 5–10 μm in diameter, finely granulate – RUSSIA, SAKHALIN PROVINCE, Bakalin & Klimova, k-23-1-18_5.

Fig. 564: Oil bodies in upper part of the ventral lobe 2–3 per cell, spherical, 4–8 μm in diameter, oblong 7–8 \times 6–7 μm ,

granulate to finely so – RUSSIA, SAKHALIN PROVINCE, Bakalin & Klimova, k-23-1-18_8.

Scapania griffithii Schiffn.

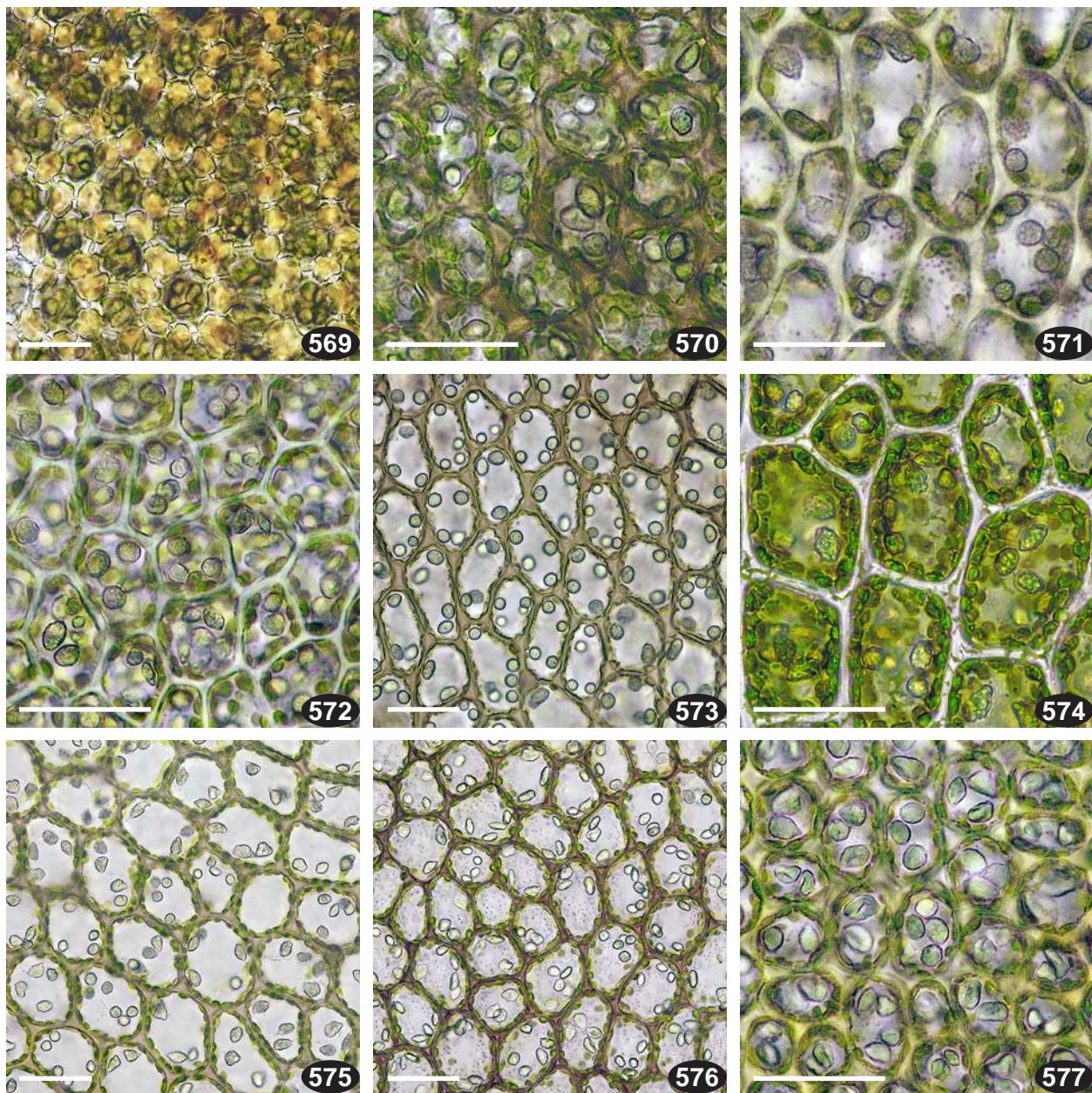
Fig. 565: Oil bodies (2–)3–5 per cell, spherical, 3–5 μm in diameter, oblong 4–7 \times 3–4 μm , finely granulate – CHINA, SICHUAN PROVINCE, Bakalin & Klimova, c-35-1-17.

Scapania gymnostomophila Kaal.

Fig. 566: Oil bodies 1 per cell, spherical, (6–)8–17 μm in diameter, oblong 10–18 \times 8–14 μm , granulate, brownish, sometimes biconcave – RUSSIA, KHABAROVSK TERRITORY, Bakalin & Klimova, kh-56-22-19.

Fig. 567: Oil bodies 1(–2) per cell, spherical, (7–)9–16(–18) μm in diameter, oblong 12–20 \times 7–16 μm , granulate, brownish – RUSSIA, MAGADAN PROVINCE, Bakalin, mag-31-6-14.

Fig. 568: Oil bodies 1(–2) per cell, spherical, 8–12(–16) μm in diameter, oblong 9–18 \times 8–13 μm , granulate, brownish, sometimes biconcave – RUSSIA, SAKHALIN PROVINCE, Bakalin, s-46-13-16.



Scapania harae Amakawa

Fig. 569: Oil bodies 4–5(–6) per cell, spherical, 5–7 µm in diameter, oblong 5–10×4–5 µm, finely granulate – CHINA, YUNNAN PROVINCE, Bakalin, c-83-8-18.

Scapania hians Steph. ex Müll.Frib.

Fig. 570: Oil bodies (2–)3–4(–5) per cell, spherical, 4–6 µm in diameter, oblong 5–10×4–5 µm, finely granulate – CHINA, YUNNAN PROVINCE, Bakalin, c-81-31a-18.

Scapania hiroakiensis Steph. ex Müll.Frib.

Fig. 571: Oil bodies (1–)3–6(–7) per cell, spherical, 4–6 µm in diameter, oblong 5–12×4–6 µm, granulate – RUSSIA, SAKHALIN PROVINCE, Bakalin & Klimova, k-44-22-18.

Fig. 572: Oil bodies 3–6(–7) per cell, spherical, (3–)4–6 µm in diameter, oblong 5–8×4–5 µm, granulate – RUSSIA, SAKHALIN PROVINCE, Bakalin, s-43-22-16.

Scapania hyperborea Jfrg.

Fig. 573: Oil bodies 4–6 per cell, spherical, 3–6 µm in di-

ameter, oblong 5–11×4–5 µm, finely granulate – RUSSIA, KAMCHATKA TERRITORY, Klimova, kam-68-17-16.

Scapania integrifolia Steph.

Fig. 574: Oil bodies (2–)3–5 per cell, spherical, (3–)4–5 µm in diameter, oblong 4–7(–8)×3–5 µm, granulate – REPUBLIC OF KOREA, GYEONGSANGNAM-DO, Bakalin, kor-70-6-19.

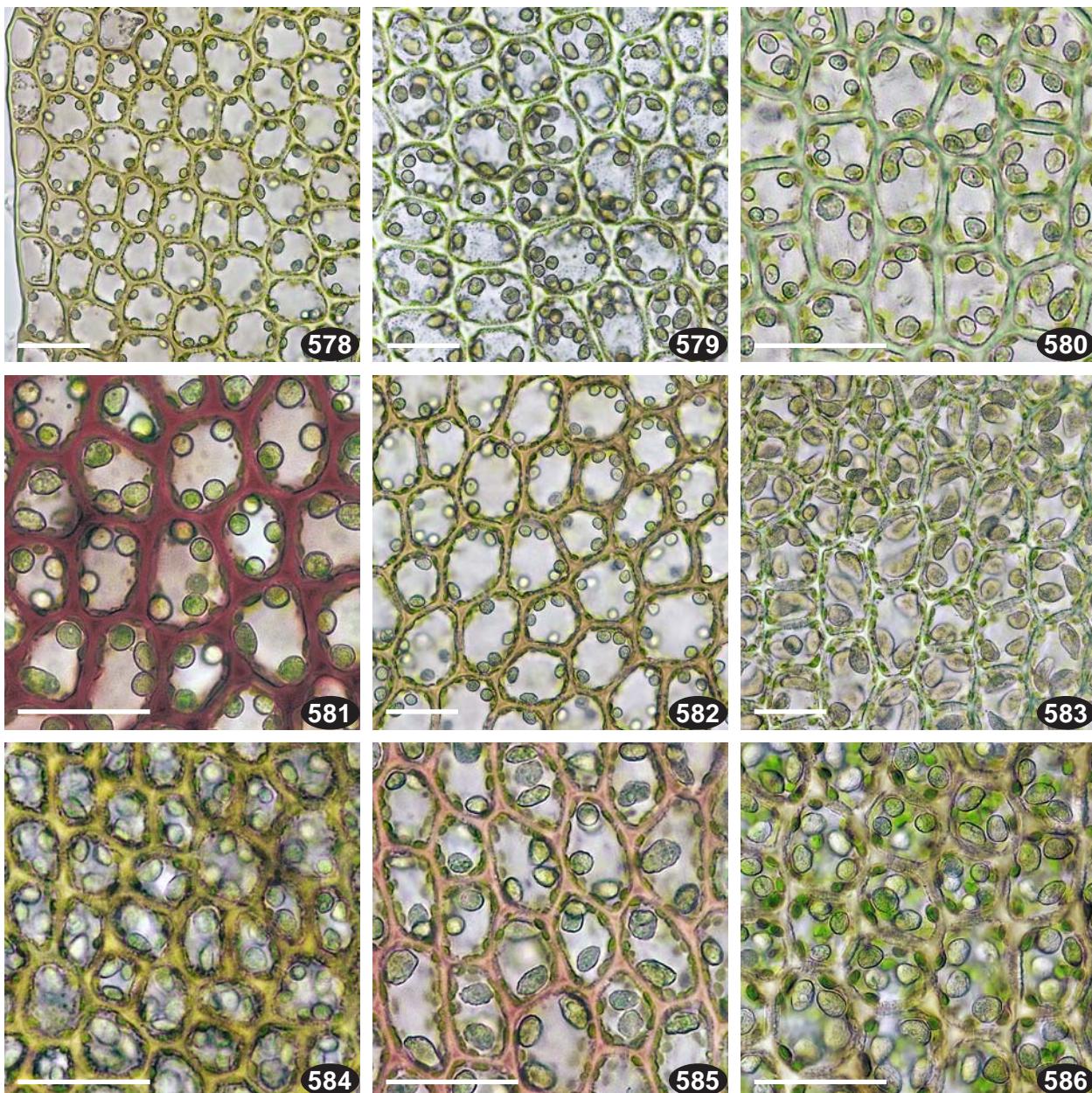
Scapania irrigua (Nees) Nees

Fig. 575: Oil bodies 3–5 per cell, spherical, 3–5 µm in diameter, oblong 4–10×3–5(–7) µm, granulate – RUSSIA, KHABAROVSK TERRITORY, Bakalin & Klimova, kh-45-1-19.

Fig. 576: Oil bodies (3–)4–6 per cell, spherical, 3–5(–6) µm in diameter, oblong 5–8(–10)×3–4 µm, Bakalin & Klimova, kh-53-8-19.

Scapania karl-muelleri Grolle

Fig. 577: Oil bodies 3–4 per cell, spherical, 5–8 µm in diameter, oblong 5–8×4–6 µm, nearly smooth, biconcave – CHINA, YUNNAN PROVINCE, Bakalin, c-83-18-18.



Scapania kaurinii Ryan

Fig. 578: Oil bodies (2–)3–4 per cell, spherical, 3–5 µm in diameter, oblong 4–7(–9)×3–5(–7) µm, granulate – RUSSIA, KAMCHATKA TERRITORY, Klimova, kam-58-37-16.

Fig. 579: Oil bodies (4–)6–10 per cell, spherical, 4–8 µm in diameter, oblong 6–10×4–6 µm, finely granulate – RUSSIA, MAGADAN PROVINCE, Bakalin, mag-25-35-14.

Scapania ligulata Steph.

Fig. 580: Oil bodies 3–4 per cell, spherical, 3–5 µm in diameter, oblong 4–7×3–4 µm, finely granulate – CHINA, YUNNAN PROVINCE, Bakalin, c-76-1-18.

Fig. 581: Oil bodies 3–4 per cell, spherical, 4–6(–8) µm in diameter, oblong 5–9×4–6 µm, finely granulate – VIETNAM, LAO CAI PROVINCE, Bakalin & Klimova, v-9-18-17.

Scapania magadanica S.S.Chi, Bakalin et B.Y.Sun

Fig. 582: Oil bodies 3–8(–9) per cell, spherical, 4–6(–7)

µm in diameter, oblong 5–7×4–5 µm, finely granulate – RUSSIA, KAMCHATKA TERRITORY, Klimova, kam-62-4-16.

Scapania maxima Horik

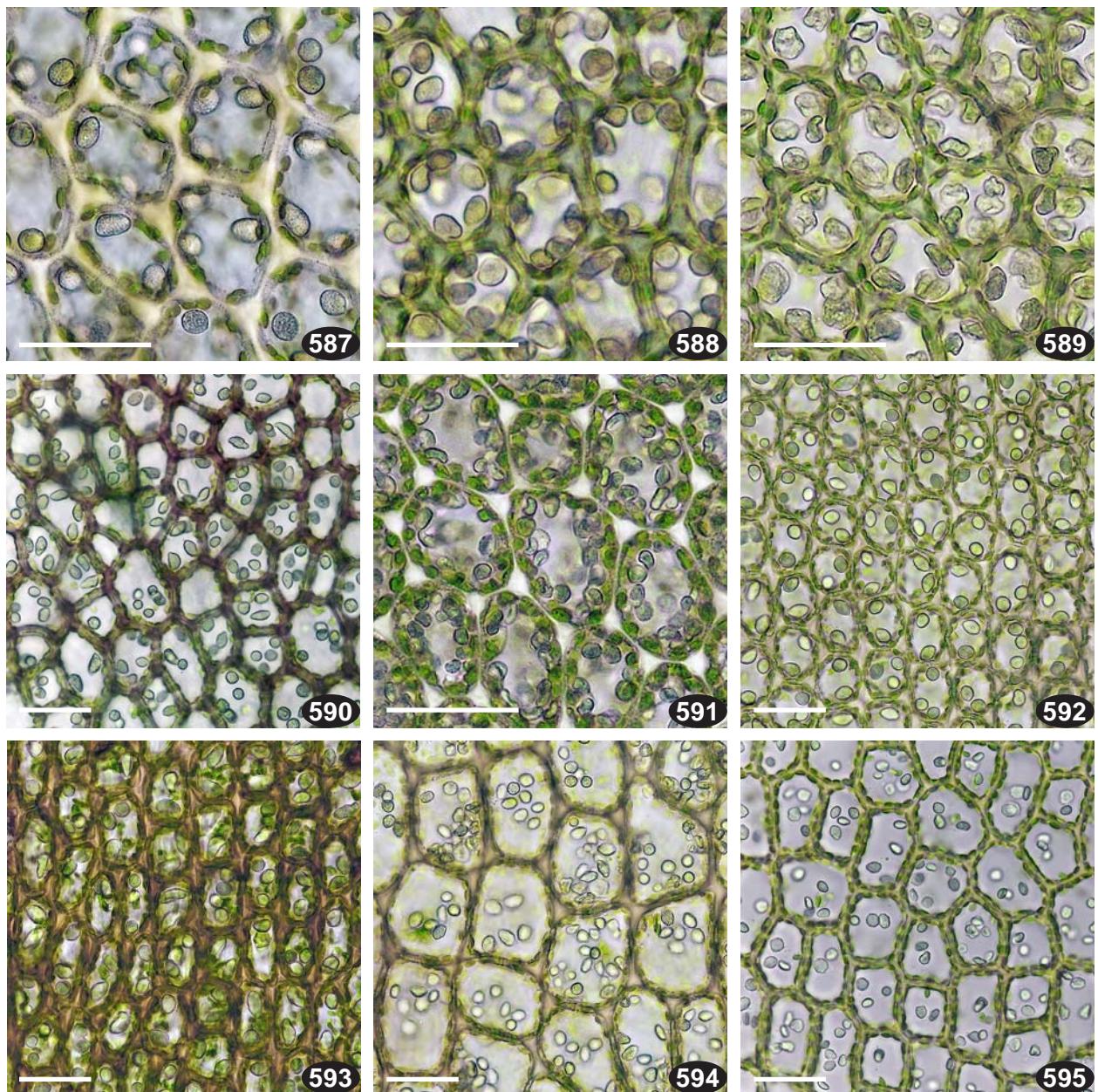
Fig. 583: Oil bodies 2–4 per cell, spherical, 7–10 µm in diameter, oblong 7–20×6–8(–10) µm, finely granulate – CHINA, YUNNAN PROVINCE, Bakalin, c-88-4-18_12.

Scapania metahimalayana Vilnet & Bakalin

Fig. 584: Oil bodies 3–7 per cell, spherical, 3–4 µm in diameter, oblong 4–7×3–5 µm, nearly smooth – CHINA, YUNNAN PROVINCE, Bakalin, c-88-60-18.

Fig. 585: Oil bodies (2–)3–4 per cell, spherical, 4–6 µm in diameter, oblong 5–8×4–6 µm, granulate to finely so – VIETNAM, LAI CHAU PROVINCE, Bakalin & Klimova, v-10-12-19.

Fig. 586: Oil bodies 4–6 per cell, spherical, 4–5(–6) µm in diameter, oblong 5–9×4–5 µm, finely granulate – VIETNAM, CAO BANG PROVINCE, Bakalin & Klimova, v-21-19-20.



Scapania metahimalayana Vilnet & Bakalin

Fig. 587: Oil bodies 3–5 per cell, spherical, 4–5 µm in diameter, oblong 5–11×4–5(–6) µm, granulate – VIETNAM, CAO BANG PROVINCE, Bakalin & Klimova, v-25-4-20.

Scapania mucronata H.Buch

Fig. 588: Oil bodies (3–)5–8 per cell, spherical, 5–9 µm in diameter, oblong 6–10×5–7 µm, finely granulate, slightly brownish – RUSSIA, KHABAROVSK TERRITORY, Bakalin, kh-29-2-16.

Fig. 589: Oil bodies 3–5 per cell, spherical, 5–7 µm in diameter, oblong 5–10(–11)×4–6 µm, finely granulate, biconcave – RUSSIA, KHABAROVSK TERRITORY, Bakalin & Klimova, kh-56-6-19.

Scapania obovata (Berggr.) S.W.Arnell

Fig. 590: Oil bodies (3–)4–6 per cell, spherical, (2–)4–5 µm in diameter, oblong 5–10(–12)×4–5 µm, finely granulate – RUSSIA, MAGADAN PROVINCE, Bakalin, mag-25-21-14.

Scapania orientalis Steph. ex Müll.Frib.

Fig. 591: Oil bodies 12–19 per cell, spherical, 3–5 µm in

diameter, oblong 4–7×3–4 µm, finely granulate, some with central eye – CHINA, YUNNAN PROVINCE, Bakalin, c-88-75-18.

Scapania ornithopoides (With.) Waddell

Fig. 592: Oil bodies 2(–3) per cell, spherical, 5–7 µm in diameter, oblong 6–10×5–7 µm, very finely granulate – CHINA, YUNNAN PROVINCE, Bakalin, c-73-10-18.

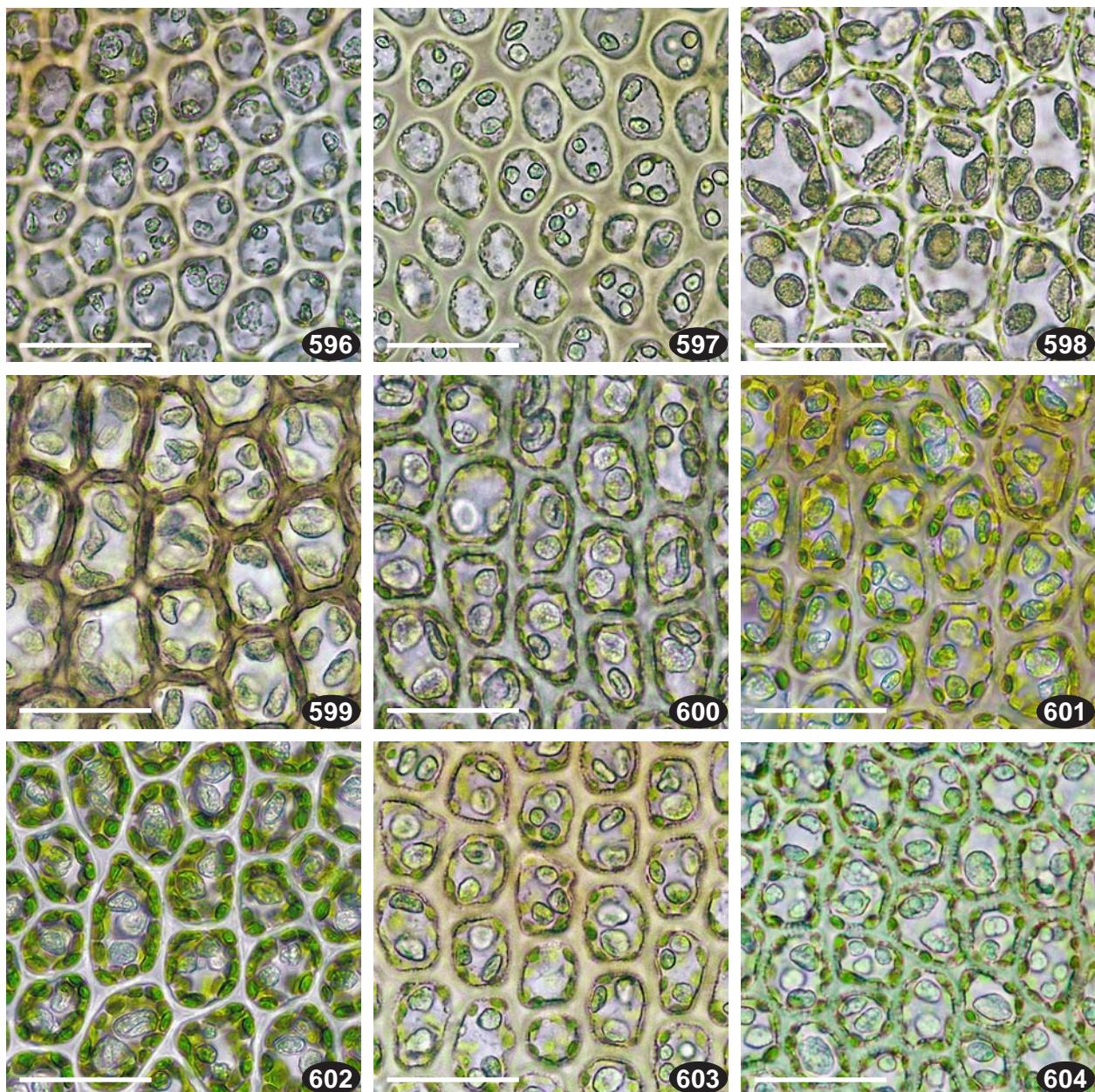
Fig. 593: Oil bodies 2–3 per cell, spherical, 5–8 µm in diameter, oblong 8–12×5–7 µm, very finely granulate to nearly smooth – VIETNAM, LAI CHAU PROVINCE, Bakalin & Klimova, v-5-11-19.

Scapania paludicola Loeske et Müll.Frib.

Fig. 594: Oil bodies (5–)8–19 per cell, spherical, 4–6(–10) µm in diameter, oblong 5–8(–10)×4–6 µm, granulate – RUSSIA, KHABAROVSK TERRITORY, Bakalin & Klimova, kh-45-1a-19.

Scapania paludosa (Müll.Frib.) Müll.Frib.

Fig. 595: Oil bodies 3–7 per cell, spherical, 4–6 µm in diameter, oblong 5–7(–8)×(3–)4–5(–6) µm, finely granulate – RUSSIA, MURMANSK PROVINCE, Bakalin, mur-34-6-15.



Scapania parvidens Steph.

Fig. 596: Oil bodies 2–3 per cell, spherical, 2–5 µm in diameter, oblong 3–5×2–3 µm, finely granulate – JAPAN, YAMANASHI PREFECTURE, *Bakalin*, *j-87-11-15*.

Fig. 597: Oil bodies 2–3 per cell, spherical, 2–3(–5) µm in diameter, oblong 3–4(–5)×2–3(–4) µm, finely granulate – JAPAN, YAMANASHI PREFECTURE, *Bakalin*, *j-87-51-15*.

Scapania parvifolia Warnst.

Fig. 598: Oil bodies 4–5 per cell, spherical, 6–7 µm in diameter, oblong 6–13×(4–)5–7(–8) µm, granulate to finely so – RUSSIA, SAKHALIN PROVINCE, *Borovichev*, *Be-242-15*.

Fig. 599: Oil bodies (2–)3–5 per cell, spherical, 5–8 µm in diameter, oblong 6–12×(4–)5–8(–10) µm, finely granulate, sometimes biconcave – RUSSIA, KHABAROVSK TERRITORY, *Bakalin & Klimova*, *kh-33-9-19*.

Scapania parvitexta Steph.

Fig. 600: Oil bodies 2–3 per cell, spherical, 5–8 µm in di-

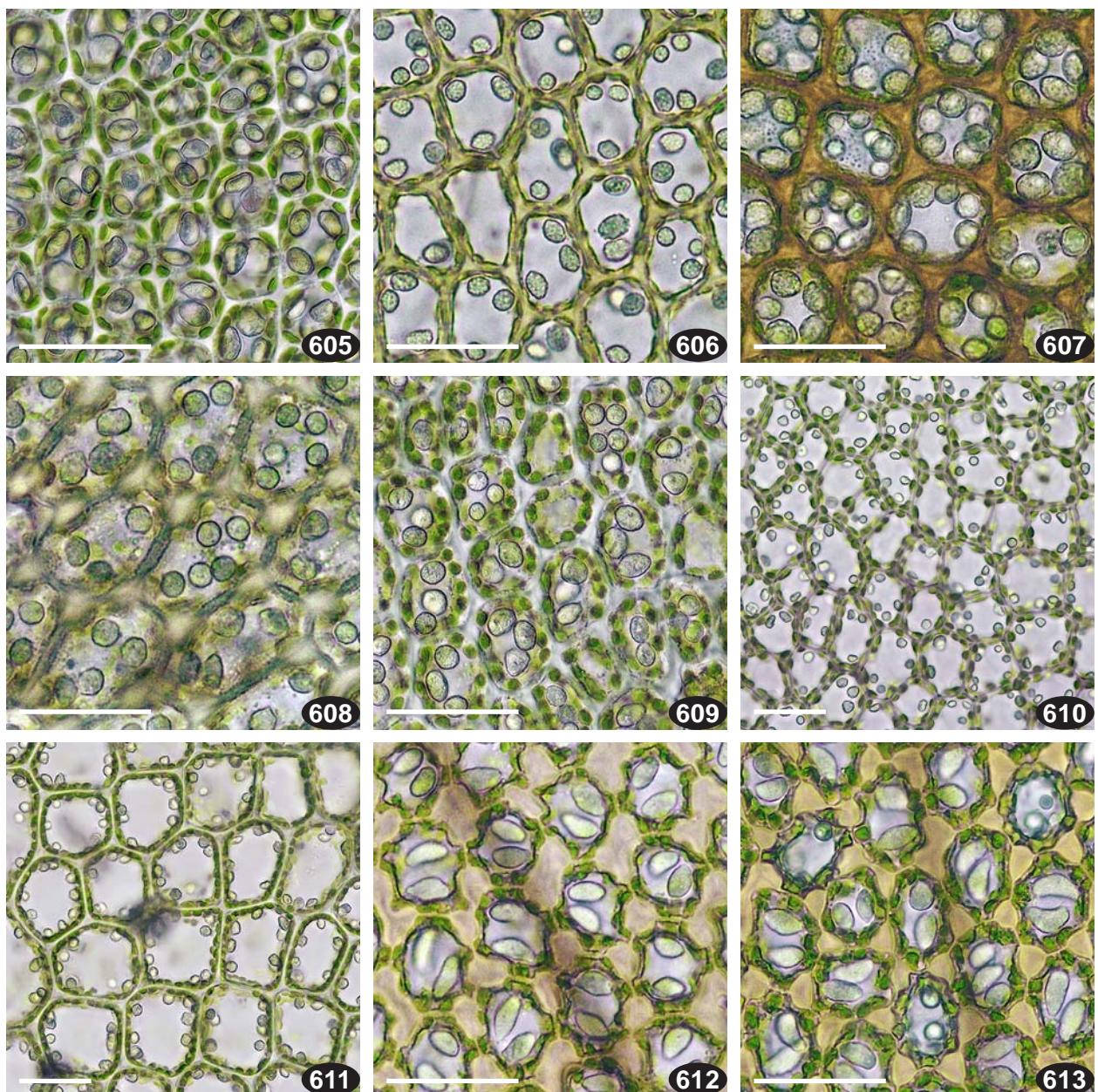
ameter, oblong 5–12(–14)×(3–)4–7(–9) µm, finely granulate, sometimes biconcave – RUSSIA, SAKHALIN PROVINCE, *Bakalin*, *k-78-27-15*.

Fig. 601: Oil bodies 2–3(–5) per cell, spherical, 4–7 µm in diameter, oblong 4–8×3–6 µm, finely granulate, some biconcave – REPUBLIC OF KOREA, JEOLLABUK-DO, *Bakalin*, *kor-73-4-19*.

Fig. 602: Oil bodies 2–3(–4) per cell, spherical, 4–7(–8) µm in diameter, oblong 5–10×(3–)4–6 µm, finely granulate, some bioconcave – REPUBLIC OF KOREA, JEOLLABUK-DO, *Bakalin*, *kor-73-9-19*.

Fig. 603: Oil bodies 2–3(–4) per cell, spherical, (3–)4–6 µm in diameter, oblong 4–8×3–5 µm, finely granulate – RUSSIA, PRIMORSKY TERRITORY, *Klimova, prim-111-19-17*.

Fig. 604: Oil bodies 2–4 per cell, spherical, 2–5(–6) µm in diameter, oblong 3–8(–11)×2–4(–7) µm, finely granulate – VIETNAM, LAO CAI PROVINCE, *Bakalin*, *v-2-29-16*.



Scapania parvitexta Steph.

Fig. 605: Oil bodies (2–)3–4 per cell, spherical, (3–)4–5 μm in diameter, oblong 5–8 \times 3–4(–5) μm , finely granulate, some biconcave – VIETNAM, CAO BANG PROVINCE, Bakalin & Klimova, v-27-6-20.

Scapania praetervisa Meyl.

Fig. 606: Oil bodies 3–5 per cell, spherical, 3–5 μm in diameter, oblong 4–7 \times 3–5 μm , granulate – RUSSIA, KAMCHATKA TERRITORY, Bakalin, k-48-14-15.

Fig. 607: Oil bodies (2–)5–7 per cell, spherical, 4–8 μm in diameter, oblong 5–10 \times 4–6(–8) μm , granulate – RUSSIA, PRIMORSKY TERRITORY, Klimova, prim-61-4-17.

Scapania pseudojavanica Vilnet & Bakalin

Fig. 608: Oil bodies (2–)4–10 per cell, spherical, 4–6 μm in diameter, oblong 5–9(–12) \times 4–6(–8) μm , finely granulate – VIETNAM, LAI CHAU PROVINCE, Bakalin & Klimova, v-12-12-19.

Fig. 609: Oil bodies (0–)2–5 per cell, spherical, 3–5 μm in diameter, oblong 5–8(–10) \times 3–4(–6) μm , finely granulate, some

with very small eye – VIETNAM, HA GIANG PROVINCE, Bakalin & Klimova, v-17-4-20.

Scapania rufidula Warnst.

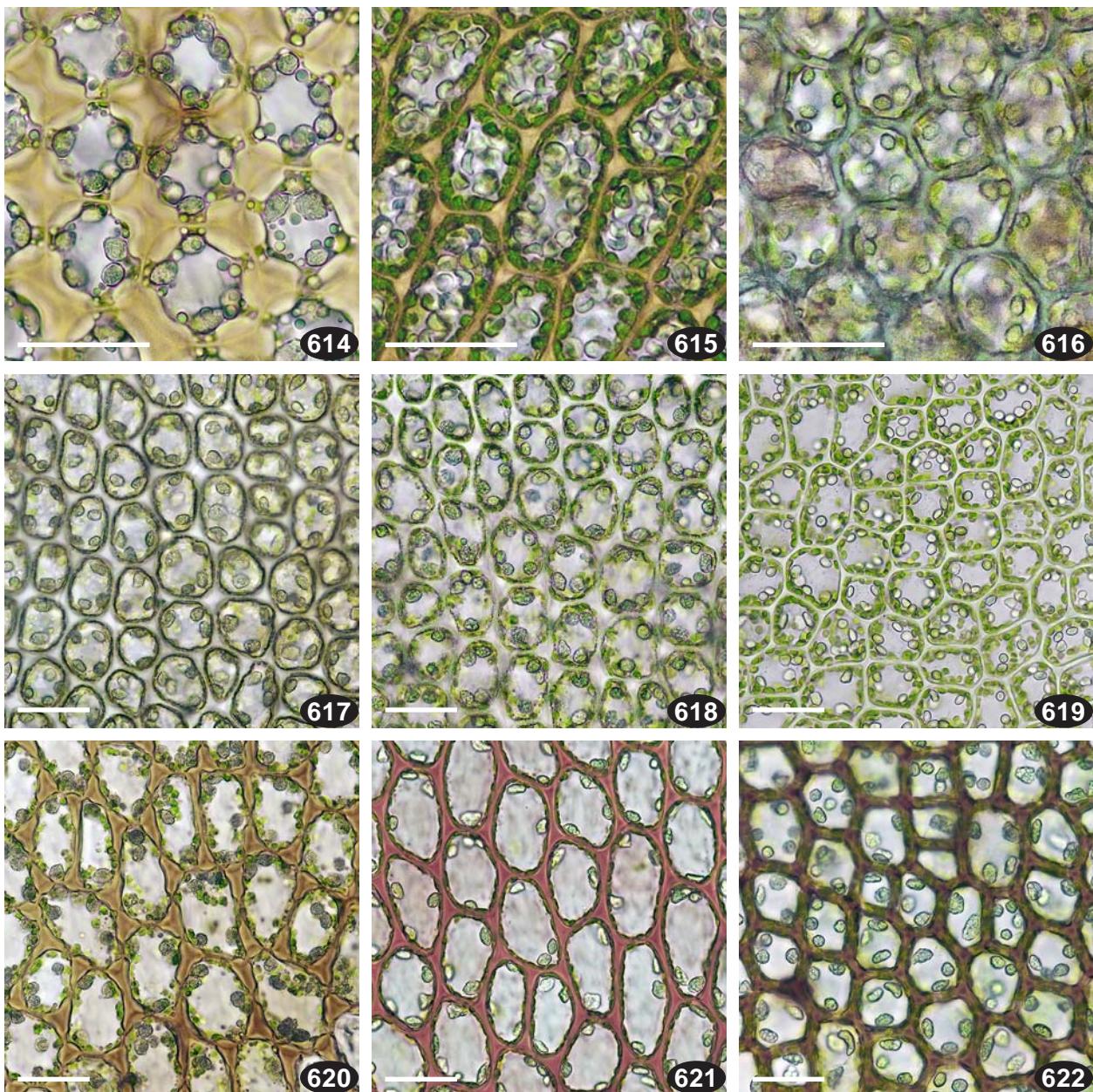
Fig. 610: Oil bodies (1–)3–5(–7) per cell, spherical, (2–)3–4(–5) μm in diameter, oblong 4–5 \times (2–)3–4 μm , finely granulate – RUSSIA, KHABAROVSK TERRITORY, Bakalin, kh-26-1-16.

Fig. 611: Oil bodies (5–)7–10(–13) per cell, spherical, 3–5 μm in diameter, oblong 4–6 \times 3–4 μm , finely granulate – RUSSIA, KHABAROVSK TERRITORY, Bakalin & Klimova, kh-35-4-19.

Scapania secunda Steph.

Fig. 612: Oil bodies 2(–3) per cell, rarely spherical, 2–6 μm in diameter, smooth, commonly oblong 5–12(–14) \times 4–6 μm , finely granulate – CHINA, YUNNAN PROVINCE, Bakalin, c-83-32-18.

Fig. 613: Oil bodies 2–3 per cell, rarely spherical, 4–5 μm in diameter, oblong 5–12 \times 4–6 μm , finely granulate – CHINA, YUNNAN PROVINCE, Bakalin, c-83-32-18.



Scapania simmonsii Bryhn et Kaal.

Fig. 614: Oil bodies 3–5 per cell, spherical, 5–6 µm in diameter, oblong 5–10×4–5(–7) µm, finely granulate, with numerous small putative oil bodies 1–2 µm in diameter, nearly smooth-surfaced – RUSSIA, KRAZNOYARSK TERRITORY, Fedosov, vf60.

Scapania sinikkae Potemkin

Fig. 615: Oil bodies 7–13(–17) per cell, spherical, 4–5 µm in diameter, oblong 4–6(–7)×3–5 µm, nearly smooth, commonly biconcave – CHINA, YUNNAN PROVINCE, Bakalin, c-86-6-18.

Scapania sphaerifera H.Buch et Tuom.

Fig. 616: Oil bodies 3–5 per cell, spherical, (3)–4–5 µm in diameter, oblong 4–5(–6)×3–4(–5) µm, finely granulate – RUSSIA, PRIMORSKY TERRITORY, Bakalin, p-35-39-14.

Scapania spitsbergensis (Lindb.) Müll.Frib.

Fig. 617: Oil bodies (2)–3–4(–5) per cell, spherical, (4)–5–7 µm in diameter, oblong 5–10(–13)×4–6(–7) µm, granulate – RUSSIA, KAMCHATKA TERRITORY, Klimova, kam-62-28-16.

Fig. 618: Oil bodies (2)–3–4 per cell, spherical, 4–6(–8) µm in diameter, oblong 5–8(–11)×4–5(–6) µm, granulate – RUSSIA, KRAZNOYARSK TERRITORY, Fedosov, vf11b.

Scapania subalpina (Nees ex Lindenb.) Dumort.

Fig. 619: Oil bodies 4–7(–10) per cell, spherical, (2)–3–4 µm in diameter, oblong 4–6×3–4 µm, finely granulate – RUSSIA, SAKHALIN PROVINCE, Bakalin & Klimova, k-35-20-18.

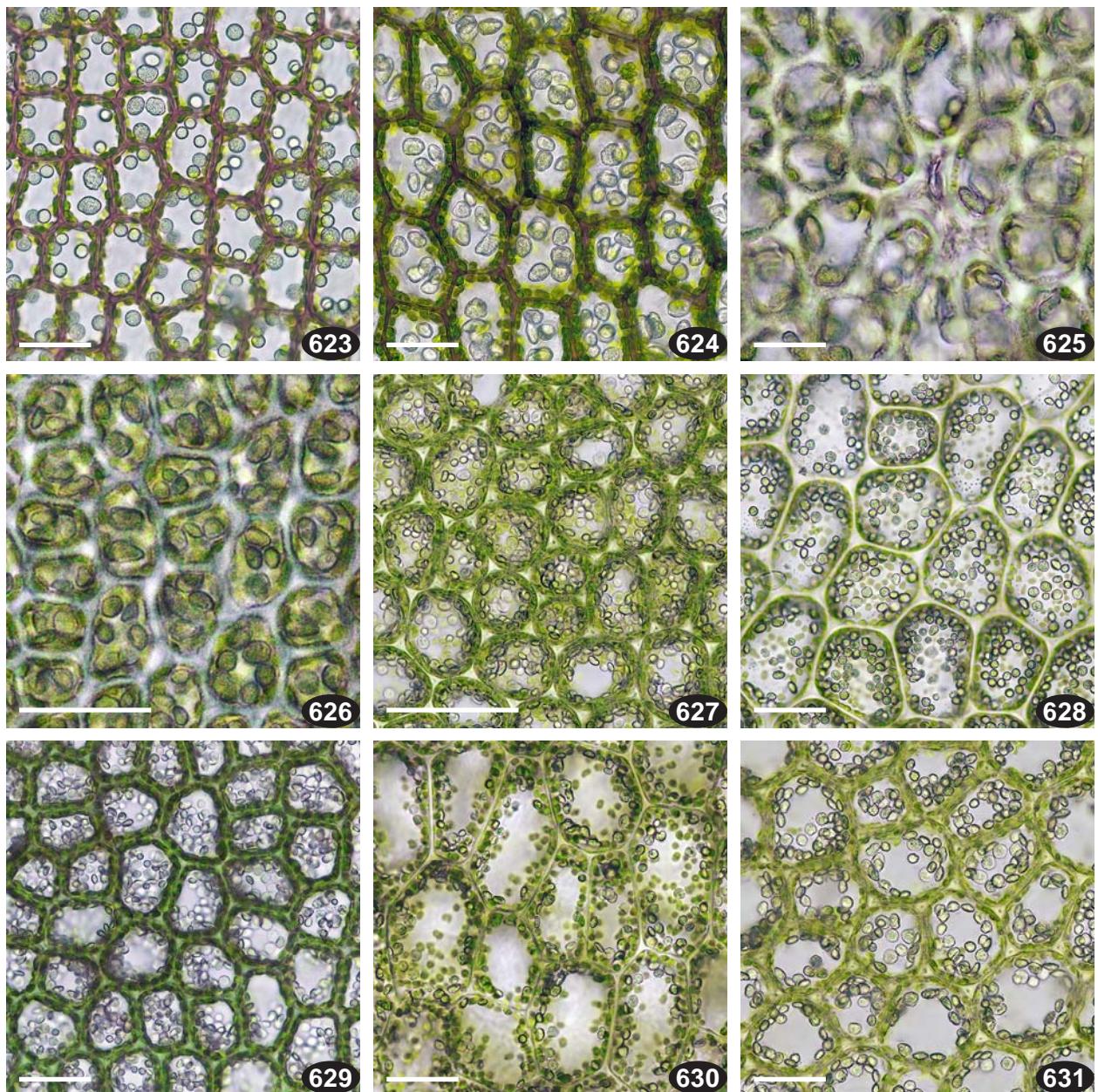
Scapania tundrae (Arnell) H.Buch

Fig. 620: Oil bodies 2–5 per cell, spherical, 5–6 µm in diameter, oblong 6–8×5–6 µm, granulate, brownish – RUSSIA, KRAZNOYARSK TERRITORY, Fedosov, n20.

Scapania uliginosa (Lindenb.) Dumort.

Fig. 621: Oil bodies (2)–3(–7) per cell, oblong 6–9(–10)×3–5 µm, granulate – RUSSIA, SAKHALIN PROVINCE, Bakalin, k-70-15-15.

Fig. 622: Oil bodies (2)–3–4(–5) per cell, spherical, 5–7 µm in diameter, oblong (5)–6–10(–12)×4–6(–8) µm, granulate – RUSSIA, MURMANSK PROVINCE, Bakalin, mur-34-8-15.



Scapania undulata (L.) Dumort.

Fig. 623: Oil bodies 3–7 per cell, spherical, 4–7(–10) μm in diameter, rarely oblong 8–10 \times 7–9 μm , granulate – RUSSIA, SAKHALIN PROVINCE, Bakalin, k-70-30-15.

Fig. 624: Oil bodies (3–)5–9 per cell, spherical, (4–)5–7 μm in diameter, oblong 7–10(–12) \times 4–7 μm , granulate – REPUBLIC OF KOREA, JEOLLABUK-DO, Bakalin, kor-73-6-19.

Scapania verrucosa Heeg

Fig. 625: Oil bodies (2–)3–4 per cell, spherical, 3–5 μm in diameter, oblong 4–7(–8) \times 3–5 μm , finely granulate – CHINA, SICHUAN PROVINCE, Bakalin & Klimova, c-35-7-17.

Fig. 626: Oil bodies (2–)3–5 per cell, spherical, 3–5 μm in diameter, oblong 4–8(–11) \times 3–5 μm , finely granulate – RUSSIA, PRIMORSKY TERRITORY, Bakalin, p-36-8-14.

Schistochilopsis boliviensis (Steph.) Bakalin & Fedosov

Fig. 627: Oil bodies 13–28(–30) per cell, spherical, (2–)3–4(–5) μm in diameter, oblong 4–6(–7) \times 3–4 μm , nearly smooth, sometimes biconcave – CHINA, YUNNAN PROVINCE, Bakalin, c-82-8-18.

Schistochilopsis cornuta (Steph.) Konstant.

Fig. 628: Oil bodies 15–40 per cell, spherical, (2–)3–4 μm in diameter, oblong 3–5(–6) \times (2–)3–4 μm , granulate to finely so, sometimes biconcave – RUSSIA, PRIMORSKY TERRITORY, Klimova, prim-99-12a-17.

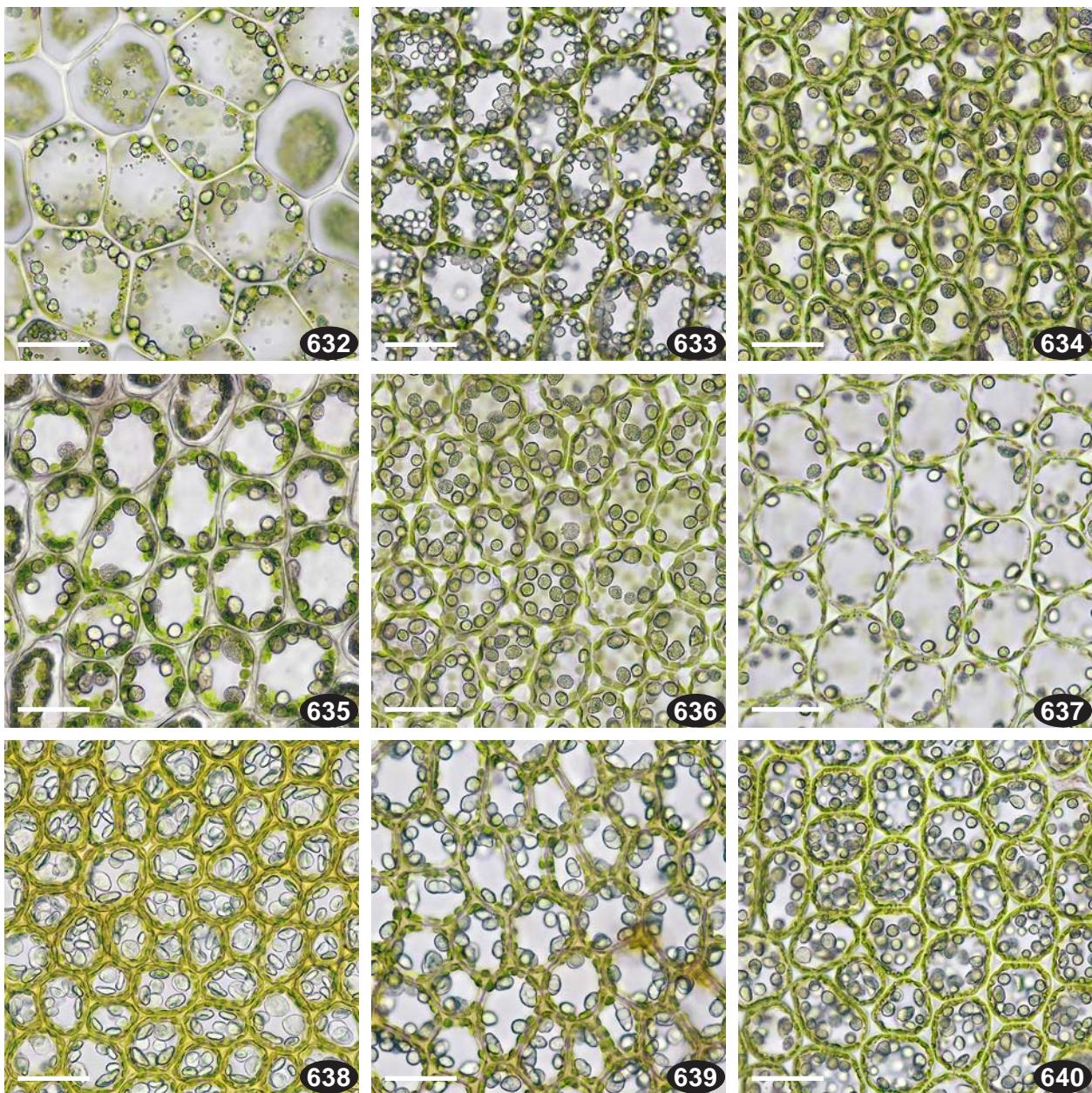
Schistochilopsis incisa (Schrad.) Konstant.

Fig. 629: Oil bodies 14–25(–35) per cell, spherical, (2–)2–3 μm in diameter, oblong 3–5 \times 2–3(–4) μm , nearly smooth – RUSSIA, MAGADAN PROVINCE, Bakalin, mag-32-9-14.

Schistochilopsis setosa (Mitt.) Konstant.

Fig. 630: Oil bodies 15–25 per cell, spherical, 3–5 μm in diameter, oblong 4–5(–6) \times 2–4 μm , smooth to granulate, sometimes biconcave – CHINA, YUNNAN PROVINCE, Bakalin, c-83-24-18.

Fig. 631: Oil bodies 15–26 per cell, spherical, 3–5(–6) μm in diameter, oblong 4–6(–8) \times 3–4(–5) μm , finely granulate, sometimes biconcave – VIETNAM, LAI CHAU PROVINCE, Bakalin & Klimova, v-6-3-19.



Lophoziaeae

Heterogemma laxa (Lindb.) Konstant. et Vilnet

Fig. 632: Oil bodies 9–12 per cell, spherical, 4–6 µm in diameter, oblong 5–7×4–6 µm, botryoidal to segmented – RUSSIA, SAKHALIN PROVINCE, Bakalin & Klimova, kh-57-8-18.

Lophozia ascendens (Warnst.) R.M.Schust.

Fig. 633: Oil bodies 10–20 per cell, spherical, 3–6 µm in diameter, oblong 6–8(–12×4–5(6) µm, granulate – RUSSIA, KHABAROVSK TERRITORY, Bakalin, kh-12-18-16.

Fig. 634: Oil bodies 5–9(10) per cell, spherical, 4–6 µm in diameter, oblong 6–12(14)×4–8 µm, granulate, brownish – RUSSIA, SAKHALIN PROVINCE, Bakalin, s-29-10-17.

Lophozia faurieana Steph.

Fig. 635: Oil bodies 7–9 per cell, spherical, 6–7 µm in diameter, oblong 6–12×4–6 µm, granulate – RUSSIA, SAKHALIN PROVINCE, Bakalin & Klimova, k-34-41-18.

Lophozia guttulata (Lindb. et Arnell) A.Evans

Fig. 636: Oil bodies 6–10 per cell, spherical, 4–6 µm in

diameter, oblong 7–12×4–6 µm, granulate – RUSSIA, KHBABROVSK TERRITORY, Bakalin & Klimova, kh-46-6-19.

Lophozia heteromorpha R.M. Schust. & Damsh.

Fig. 637: Oil bodies 3–6 per cell, spherical, 4–6 µm in diameter, oblong 5–10×3–5 µm, granulate – RUSSIA, KAMCHATKA TERRITORY, Klimova, kam-68-36-16.

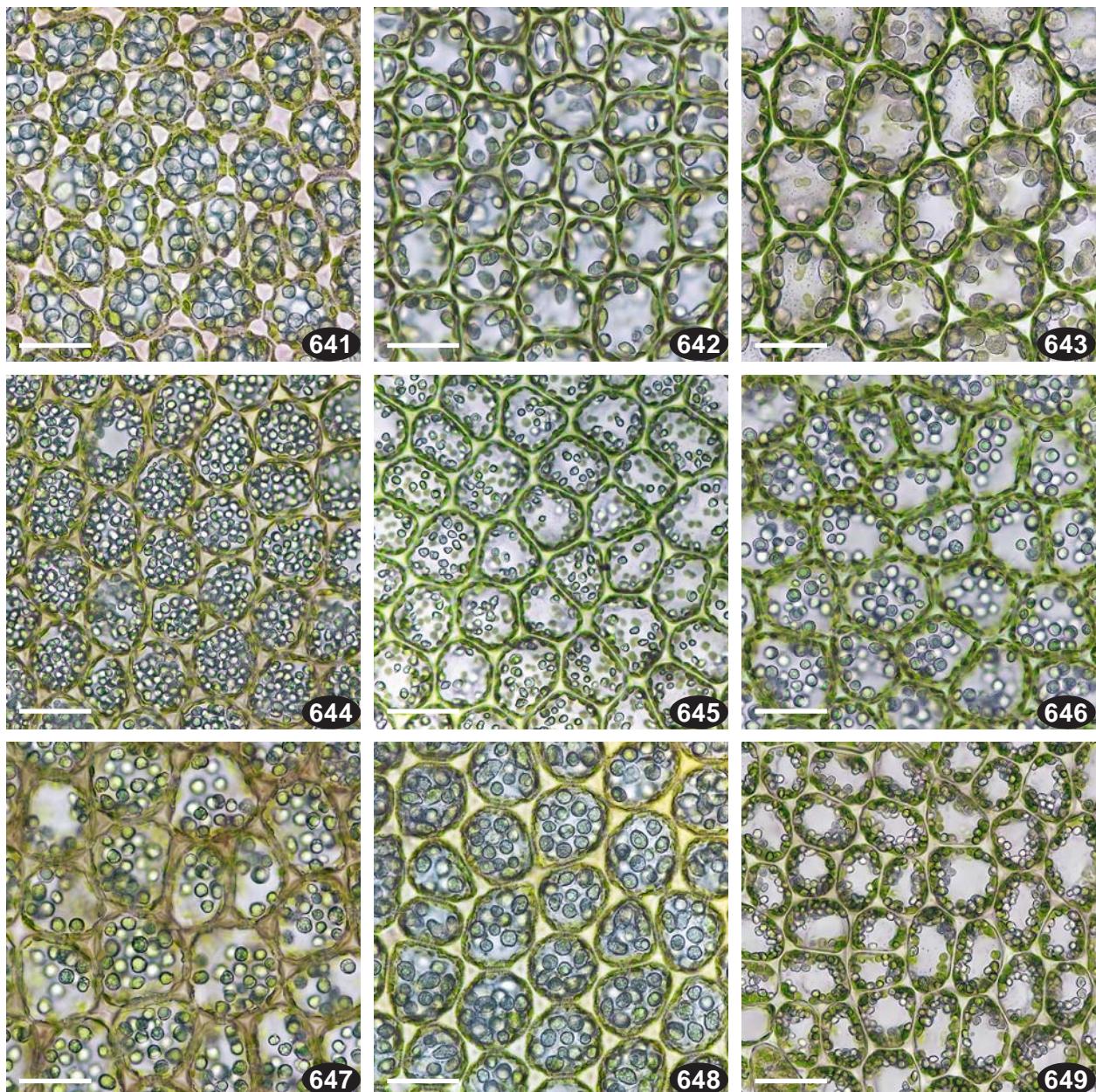
Lophozia lantratoviae Bakalin

Fig. 638: Oil bodies 7–10 per cell, spherical, 5–9 µm in diameter, oblong 7–10×(3)5–8 µm, finely granulate, biconcave – CHINA, YUNNAN PROVINCE, Bakalin, c-83-37-18.

Fig. 639: Oil bodies 5–8(10) per cell, spherical, 5–6 µm in diameter, oblong 5–10×3–5 µm, finely granulate, mostly biconcentric – RUSSIA, KHBABROVSK TERRITORY, Bakalin, kh-18-12-16.

Lophozia longiflora (Nees) Schiffn.

Fig. 640: Oil bodies 8–18 per cell, spherical, 3–5 µm in diameter, oblong 5–12×3–5 µm, granulate – RUSSIA, KAMCHATKA TERRITORY, Klimova, kam-75-81-16.



Lophozia longiflora (Nees) Schiffn.

Fig. 641: Oil bodies 7–15 per cell, spherical, 4–8 µm in diameter, oblong 6–12×4–6(7) µm, granulate – RUSSIA, KHABAROVSK TERRITORY, Bakalin, kh-17-28-16.

Lophozia murmanica Kaal.

Fig. 642: Oil bodies 5–9 per cell, spherical, 4–6 µm in diameter, oblong 5–12×4–6 µm, finely granulate – RUSSIA, MURMANSK PROVINCE, Bakalin, mur-32-43-15.

Lophozia pallida (Steph.) Grolle

Fig. 643: Oil bodies 9–15(20) per cell, spherical, 4–9 µm in diameter, oblong 7–12×5–8 µm, granulate, brownish – CHINA, YUNNAN PROVINCE, Bakalin, c-83-7-18.

Lophozia savicziae Schljakov

Fig. 644: Oil bodies 18–40 per cell, spherical, 2–4(–5) µm in diameter, oblong 4–6×2–4 µm, granulate to smooth, biconcentric – RUSSIA, KAMCHATKA TERRITORY, Bakalin, k-50-7-15.

Fig. 645: Oil bodies 8–15 (18) per cell, spherical, 2–3 µm in diameter, oblong 3–5×2–3 µm, coarsely granulate, biconcentric

– RUSSIA, MAGADAN PROVINCE, Bakalin, mag-26-6-14.

Fig. 646: Oil bodies 11–22 per cell, spherical, 3–7 µm in diameter, oblong 4–7×3–6 µm, granulate, biconcentric – RUSSIA, MURMANSK PROVINCE, Bakalin, mur-34-2-15.

Fig. 647: Oil bodies 10–20 per cell, spherical, 4–6 µm in diameter, oblong 4–8×3–6 µm, granulate, biconcentric – RUSSIA, SAKHALIN PROVINCE, Bakalin, s-27-20-17.

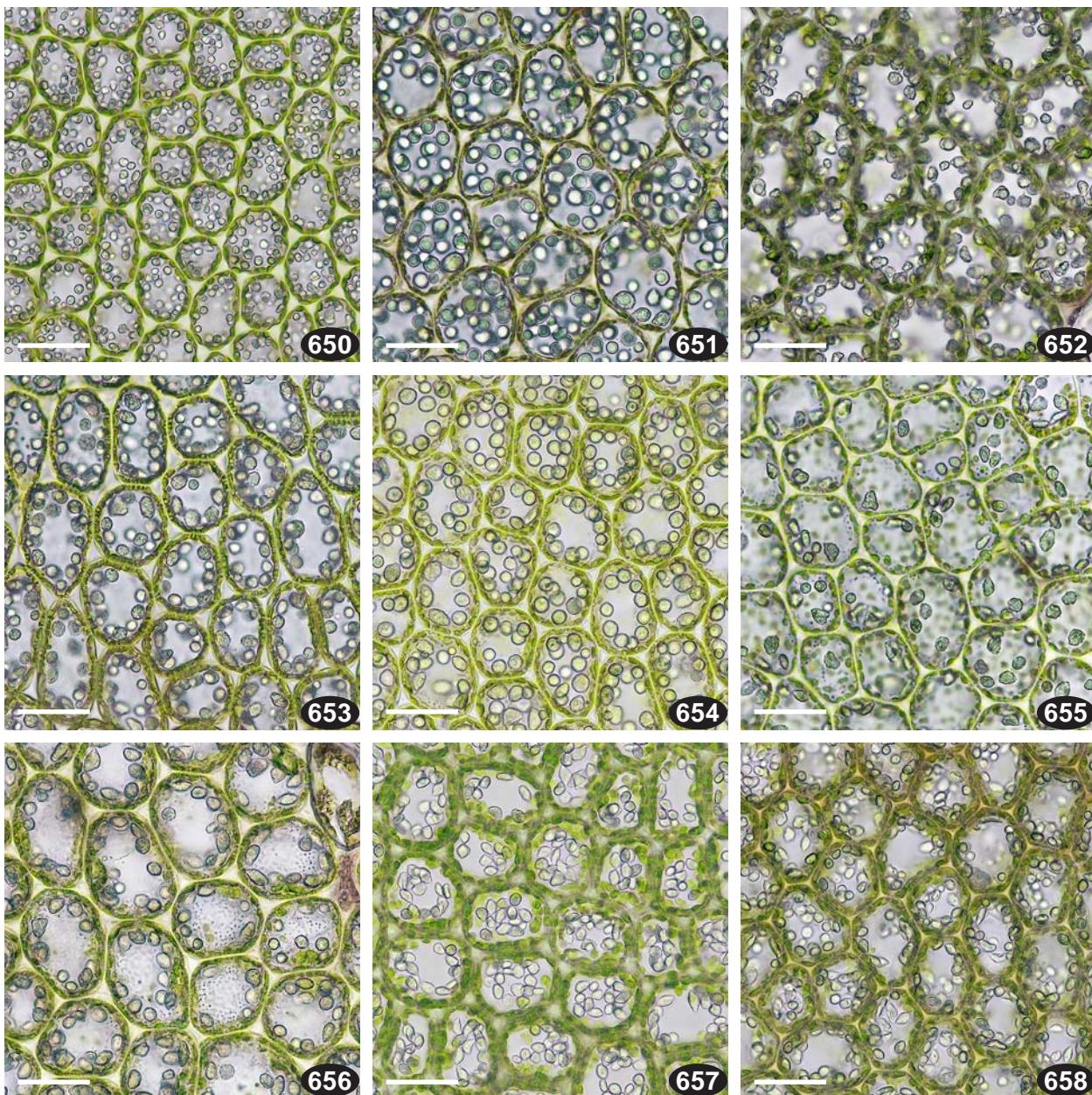
Comment: *L. savicziae* from Sakhalin (S-27-20-17) shows larger oil bodies than common and the identification may be questioned.

Lophozia schusteriana Schljakov

Fig. 648: Oil bodies 8–12 per cell, spherical, 4–7 µm in diameter, oblong (5)7–10×4–6 µm, granulate, some biconcentric – RUSSIA, MAGADAN PROVINCE, Bakalin, mag-31-12-14.

Lophozia silvicola H.Buch

Fig. 649: Oil bodies 15–30 per cell, spherical, 3–4 µm in diameter, oblong 4–5×3–4 µm, granulate, mostly biconcentric – RUSSIA, SAKHALIN PROVINCE, Bakalin & Klimova, k-34-41-18.



Lophozia silvicola H.Buch

Fig. 650: Oil bodies 10–20 per cell, spherical, (2–)3–4 µm in diameter, oblong 3–5×2–3 µm, granulate, mostly biconcentric – RUSSIA, KHABAROVSK TERRITORY, Bakalin & Klimova, kh-47-4-19.

Lophozia silvicoloides N.Kitag.

Fig. 651: Oil bodies 14–20(28) per cell, spherical, (3)4–7 µm in diameter, oblong 5–10×4–6 µm, granulate, biconcentric – JAPAN, YAMANASHI PREFECTURE, Bakalin, j-85-2a-15.

Fig. 652: Oil bodies 10–18(24) per cell, spherical, 3–5 µm in diameter, oblong 4–7×3–5 µm, granulate, biconcentric – RUSSIA, KHABAROVSK TERRITORY, Bakalin, kh-25-21-16.

Lophozia ventricosa (Dicks.) Dumort.

Fig. 653: Oil bodies 11–14(16) per cell, spherical, 4–7 µm in diameter, oblong 6–10×3–5 µm, granulate – RUSSIA, KAMCHATKA TERRITORY, Bakalin, k-50-5-15.

Fig. 654: Oil bodies 7–15 per cell, spherical, 4–8 µm in

diameter, oblong (6)7–10×4–6 µm, granulate – RUSSIA, KHABAROVSK TERRITORY, Bakalin & Klimova, kh-46-15-19.

Fig. 655: Oil bodies 4–7 per cell, spherical, 4–6 µm in diameter, oblong 5–10×4–6 µm, granulate – RUSSIA, MURMANSK PROVINCE, Bakalin, mur-32-51-15.

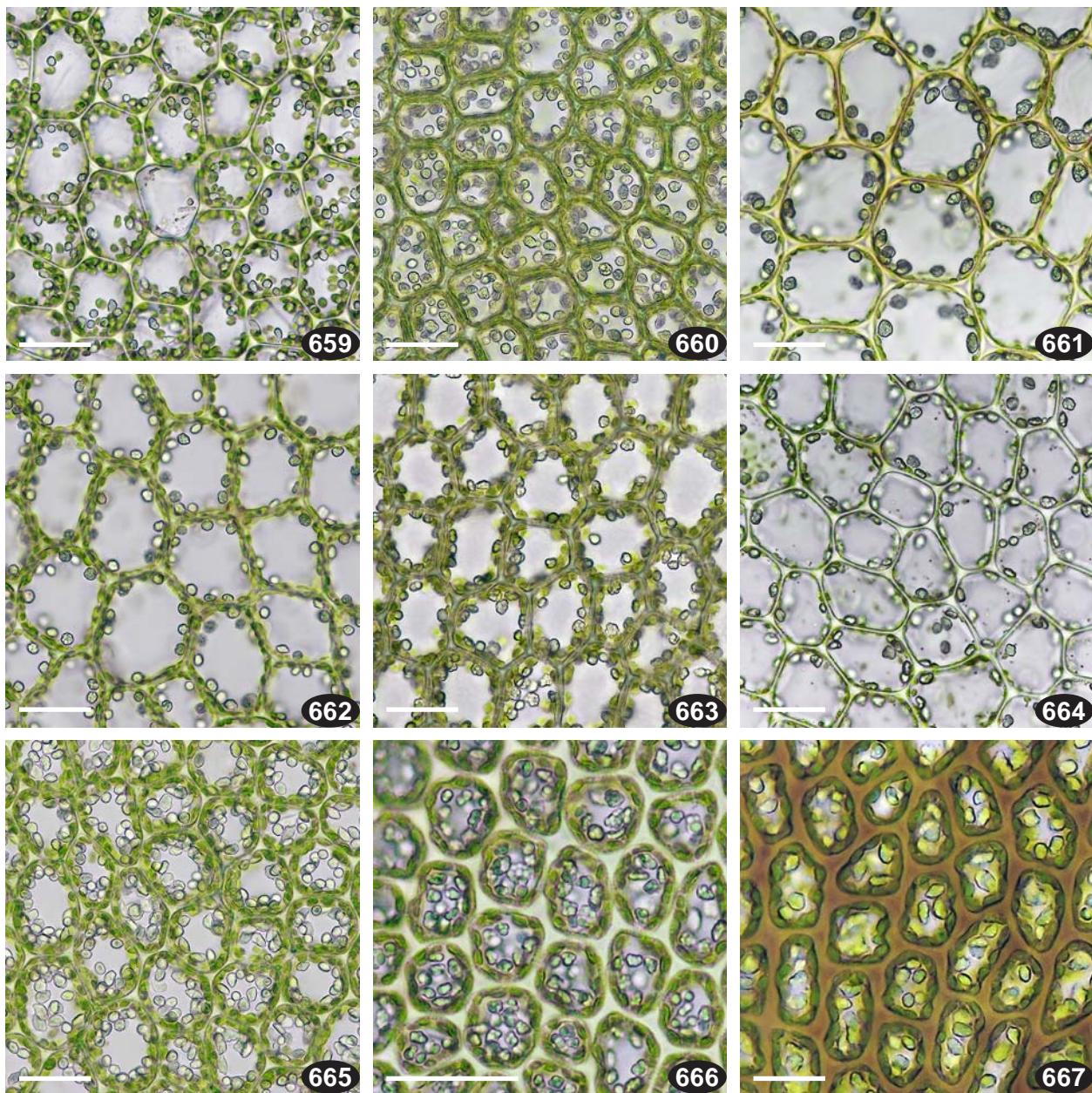
Lophozia ventricosa var. *rigida* R.M. Schust.

Fig. 656: Oil bodies 10–17(23) per cell, spherical, 4–6 µm in diameter, oblong (5)7–12×4–6 µm, granulate – RUSSIA, KRASNOYARSK TERRITORY, Fedosov, vf51b.

Lophoziopsis excisa (Dicks.) Konstant. et Vilnet

Fig. 657: Oil bodies 12–20 per cell, spherical, 4–6 µm in diameter, oblong 5–10×4–6 µm, granulate – CHINA, YUNNAN PROVINCE, Bakalin & Klimova, c-37-2-17.

Fig. 658: Oil bodies 12–20 per cell, spherical, 3–5 µm in diameter, oblong 4–7×3–4 µm, granulate – CHINA, YUNNAN PROVINCE, Bakalin, c-83-34-18.



Lophoziopsis excisa (Dicks.) Konstant. et Vilnet

Fig. 659: Oil bodies 5–12(14) per cell, spherical, 3–4 µm in diameter, oblong 3–5×2–4 µm, granulate – RUSSIA, KHABAROVSK TERRITORY, Bakalin, kh-16-6-16.

Lophoziopsis longidens (Lindb.) Konstant. et Vilnet

Fig. 660: Oil bodies 6–13(15) per cell, spherical, 3–5 µm in diameter, oblong 5–8×3–6 µm, granulate – RUSSIA, KHABAROVSK TERRITORY, Bakalin & Klimova, kh-36-4-19.

Lophoziopsis pellucida (R.M.Schust.) Konstant. et Vilnet

Fig. 661: Oil bodies 7–14 per cell, spherical, 3–5 µm in diameter, oblong 5–8(11)×3–6 µm, granulate – RUSSIA, MAGADAN PROVINCE, Bakalin, mag-31-28-14.

Fig. 662: Oil bodies 7–15 per cell, spherical, 3–5 µm in diameter, granulate to coarsely so – RUSSIA, SAKHALIN PROVINCE, Bakalin, s-26-4-17.

Lophoziopsis polaris var. *sphagnorum* (R.M.Schust.) Konstant. et Vilnet

Fig. 663: Oil bodies 6–15 per cell, spherical, 3–5 µm in diameter, oblong 5–8×3–5 µm, botryoidal – RUSSIA, SAKHALIN

PROVINCE, Bakalin, mag-25-3-14.

Fig. 664: Oil bodies (7)10–14(16) per cell, spherical, 4–5 µm in diameter, oblong 5–7×3–5 µm, botryoidal – RUSSIA, KHABAROVSK TERRITORY, Bakalin, kh-25-19-16.

Lophoziopsis propagulifera (Gottsche) Konstant. et Vilnet

Fig. 665: Oil bodies 12–20 per cell, spherical, 4–5 µm in diameter, oblong 5–8×3–5 µm, granulate – CHINA, SICHUAN PROVINCE, Bakalin & Klimova, c-35-17-17.

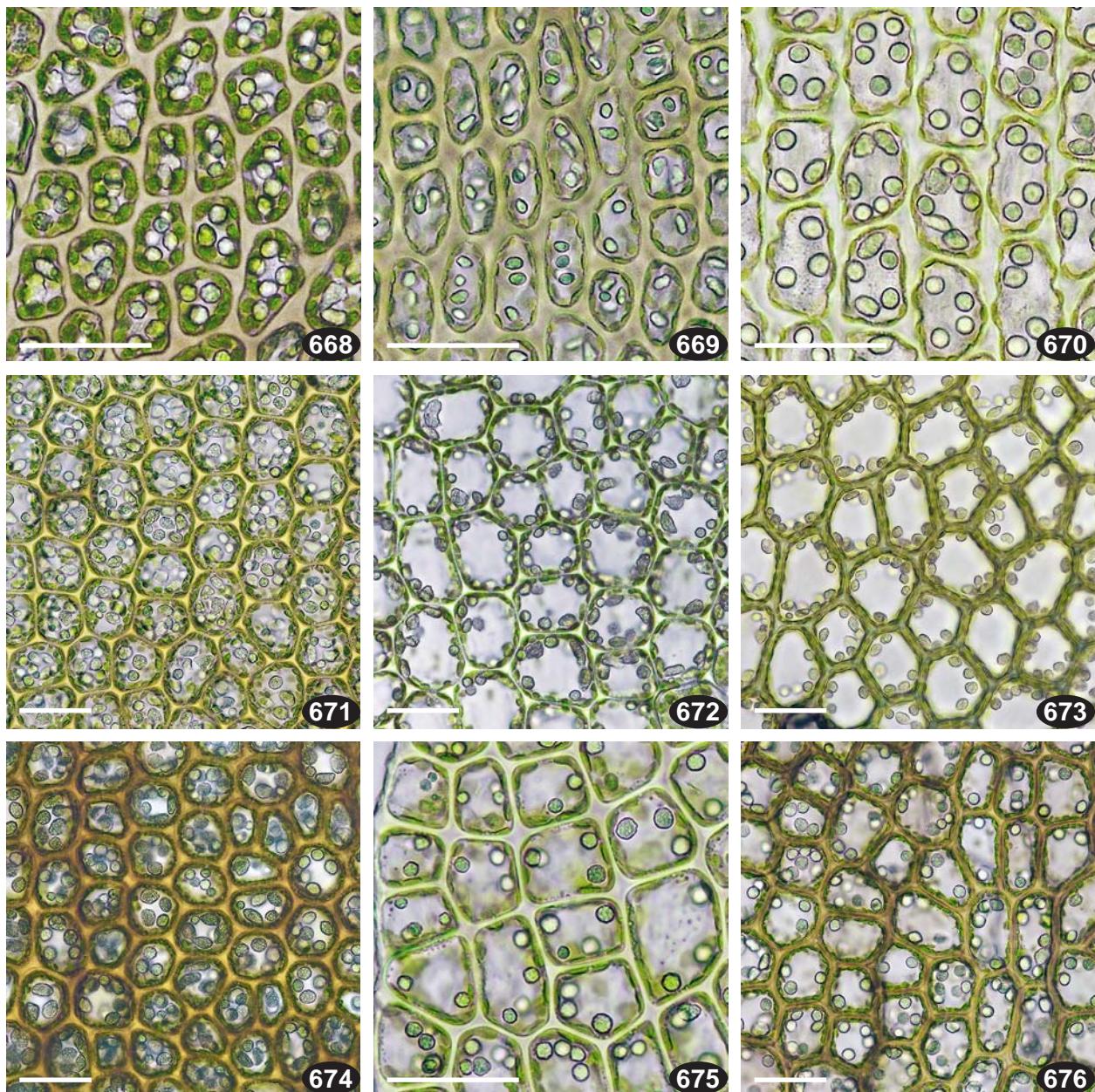
Anastrophyllaceae

Anastrepta orcadensis (Hook.) Schiffn

Fig. 666: Oil bodies 6–12 per cell, spherical, 3–4 µm in diameter, oblong, 3–5×4–6 µm, coarsely granulate – CHINA, SICHUAN PROVINCE, Bakalin & Klimova, c-38-15-17.

Anastrophyllum assimile (Mitt.) Steph.

Fig. 667: Oil bodies 3–6 per cell, spherical, 3–4 µm in diameter, oblong 3–5×2–4 µm, finely granulate to nearly smooth – REPUBLIC OF KOREA, GYEONGSANGNAM-DO, Bakalin, kor-25-18-15.



Anastrophyllum assimile (Mitt.) Steph.

Fig. 668: Oil bodies 3–6 per cell, spherical, 3–5 µm in diameter, oblong 3–5×5–8 µm, granulate – RUSSIA, PRIMORSKY TERRITORY, Klimova, prim-109-10-17.

Anastrophyllum lignicola D.B.Schill et D.G.Long

Fig. 669: Oil bodies 2–5 per cell, spherical, 3–4 µm in diameter, oblong 2.5–4×3–5 µm, granulate – CHINA, YUNNAN PROVINCE, Bakalin, c-83-24b-18.

Anastrophyllum michauxii (F.Weber) H.Buch

Fig. 670: Oil bodies 3–10 per cell, spherical, 4–5 µm in diameter, oblong 3–5×4–9 µm, granulate – RUSSIA, KHABAROVSK TERRITORY, Bakalin & Klimova, kh-55-16-19.

Barbilophozia barbata (Schmidel ex Schreb.) Loeske

Fig. 671: Oil bodies 4–9 per cell, spherical, 3–5 µm in diameter, oblong 3–5×4–7 µm, granulate – RUSSIA, KHABAROVSK TERRITORY, Bakalin & Klimova, kh-35-11-19.

Barbilophozia hatcheri (A.Evans) Loeske

Fig. 672: Oil bodies 5–10 per cell, spherical, 3–6 µm in

diameter, oblong, 3–6×5–12 µm, granulate – RUSSIA, MAGADAN PROVINCE, Bakalin, mag-23-6-14.

Barbilophozia lycopodioides (Wallr.) Loeske

Fig. 673: Oil bodies 4–12 per cell, spherical, 3–7 µm in diameter, oblong, 3–5×4–7 µm, granulate – RUSSIA, SAKHALIN PROVINCE, Bakalin, s-19-7-17.

Biantheridion undulifolium (Nees) Konstant. et Vilnet

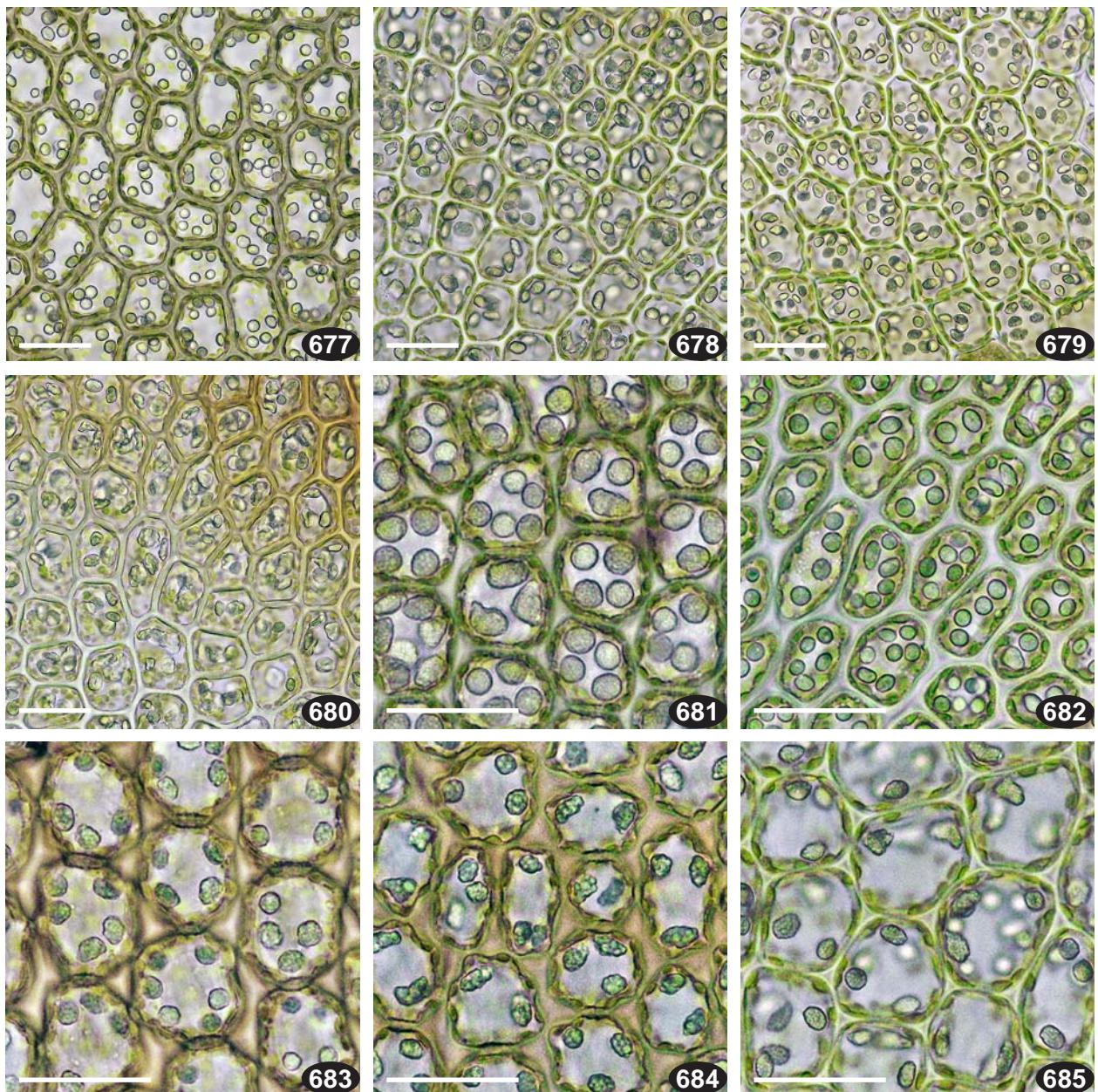
Fig. 674: Oil bodies 3–8 per cell, spherical, 3–6 µm in diameter, oblong, 4–6×5–10 µm, granulate, grayish – RUSSIA, KHABAROVSK TERRITORY, Bakalin, kh-42-7-13.

Crossocalyx hellerianus (Nees ex Lindemb.) Meyl.

Fig. 675: Oil bodies 3–8 per cell, spherical, 3–5 µm in diameter, oblong 2–5×4–7 µm, granulate – RUSSIA, SAKHALIN PROVINCE, Bakalin & Klimova, k-38-16-18.

Gymnocolea inflata (Huds.) Dumort.

Fig. 676: Oil bodies 4–8 per cell, spherical, 4–6 µm in diameter, oblong 6–9×4–5 µm, finely granulate – RUSSIA, SAKHALIN PROVINCE, Bakalin & Klimova, k-57-3-18.



Gymnocolea marginata (Steph.) S. Hatt.

Fig. 677. – Oil bodies 4–9 per cell, spherical, 4–6 µm in diameter, oblong 6–7×4–6 µm, finely granulate – RUSSIA, SAKHALIN PROVINCE, Bakalin & Klimova, k-25-5-18.

Comment: the relationships of this taxon with *G. inflata* are poorly known, now we prefer to maintain the species status for *G. marginata*, until molecular studies will not clarify this issue.

Isopaches bicrenatus (Schmidel ex Hoffm.) H.Buch

Fig. 678: Oil bodies 4–7 per cell, spherical, 4–7 µm in diameter, oblong 6–10×4–6 µm, granulate – RUSSIA, KHABAROVSK TERRITORY, Bakalin & Klimova, kh-42-1-19.

Fig. 679: Oil bodies 7–8(9) per cell, spherical, 4–6 µm in diameter, oblong 4–7×4–5 µm, finely granulate – RUSSIA, KHABAROVSK TERRITORY, Klimova, khab-152-2-19.

Isopaches decolorans (Limpr.) H.Buch

Fig. 680: Oil bodies 5–6 per cell, spherical, 4–7 µm in diameter, oblong 6–9×4–7 µm, finely granulate, biconcave – CHINA, YUNNAN PROVINCE, Bakalin, c-85-2-18.

Neoorthocaulis attenuatus (Mart.) L.Söderstr., De Roo et Hedd.

Fig. 681: Oil bodies 3–4(–7) per cell, spherical, (4)–5–8 µm in diameter, oblong 8–13×6–8 µm, granulate – RUSSIA, KHABAROVSK TERRITORY, Bakalin, kh-22-18-16.

Fig. 682: Oil bodies 6–8(–10) per cell, spherical, (2)–3–5 µm in diameter, oblong 3–5(–6)×(2)–3–4 µm, finely granulate to more or less smooth – RUSSIA, PRIMORSKY TERRITORY, Bakalin, p-31-22-15.

Neoorthocaulis binsteadii (Kaal.) L.Söderstr., De Roo et Hedd.

Fig. 683: Oil bodies 4–6 per cell, spherical, 4–6 µm in diameter, oblong 5–7×4–5 µm, coarsely granulate – RUSSIA, KHABAROVSK TERRITORY, Bakalin & Klimova, kh-38-5-19.

Fig. 684: Oil bodies 3–4 per cell, spherical, 4–5(–6) µm in diameter, oblong 5–8×4–5 µm, coarsely granulate to botryoidal – RUSSIA, MURMANSK PROVINCE, Bakalin, mur-32-56-15.

Neoorthocaulis floerkei (F.Weber et D.Mohr) L.Söderstr., De Roo et Hedd.

Fig. 685: Oil bodies 4–6 per cell, spherical, 4–5(–6) µm in diameter, oblong 5–10×4–5 µm, granulate – RUSSIA, MURMANSK PROVINCE, Bakalin, mur-32-24-15.

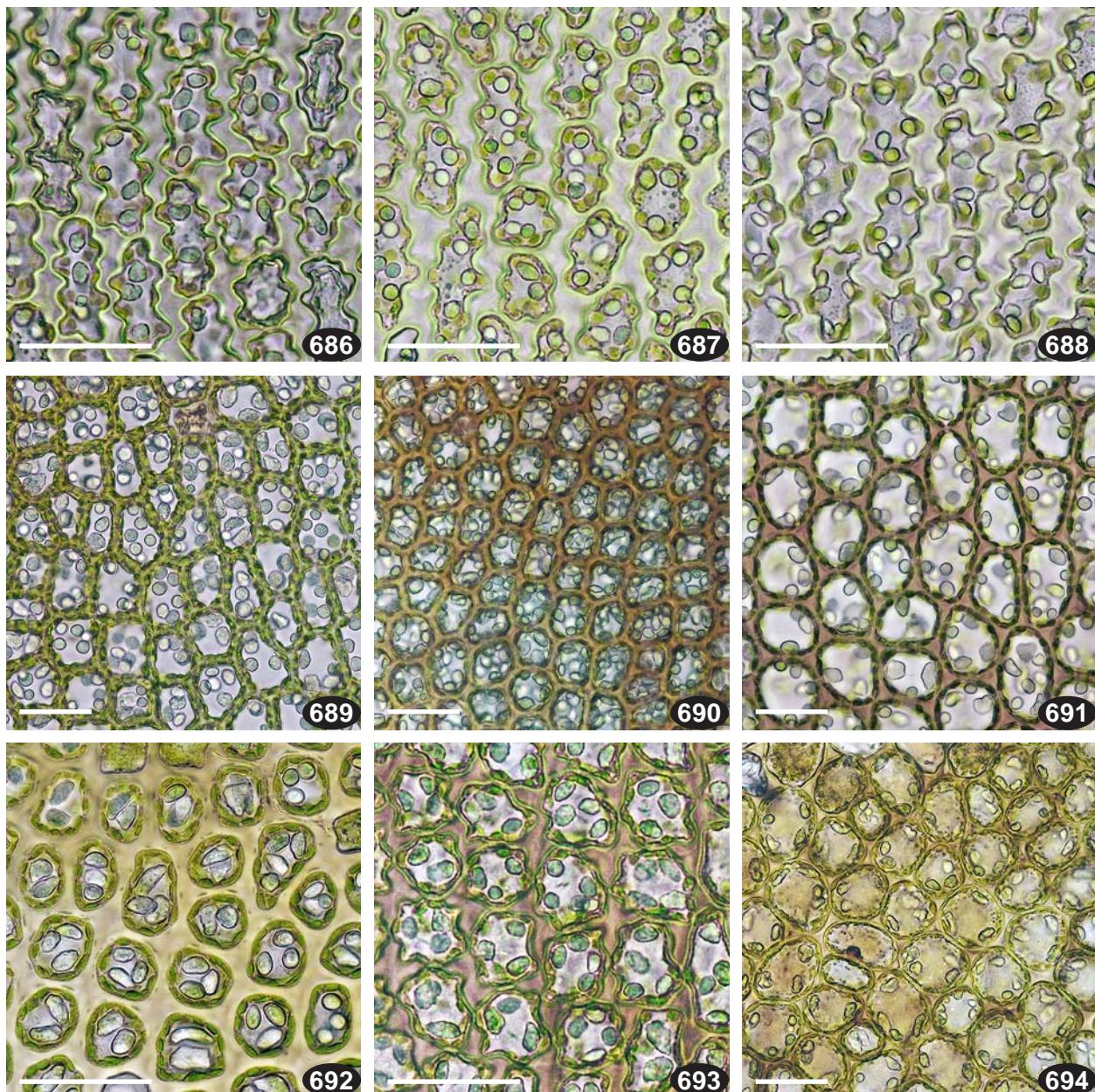
*Plicanthes birmensis* (Steph.) R.M.Schust.

Fig. 686: Oil bodies 3–5 per cell, spherical, (2–)3–5 μm in diameter, oblong 3–5×(2–)3–4 μm , loosely granulate – VIETNAM, LAO CAI PROVINCE, Bakalin, v-3-56-16.

Fig. 687: Oil bodies 2–4 per cell, spherical, 3–4 μm in diameter, oblong 4–6×3–4 μm , loosely granulate – VIETNAM, LAO CAI PROVINCE, Bakalin & Klimova, v-5-1-17.

Plicanthes hirtellus (F.Weber) R.M.Schust.

Fig. 688: Oil bodies 4–6 per cell, spherical, 3–4 μm in diameter, oblong 3–6×(2–)3–4 μm , merely smooth – CHINA, YUNNAN PROVINCE, Bakalin, c-81-11-18.

Pseudolophozia debiliformis (R.M. Schust. & Damsh.) Konstant. & Vilnet

Fig. 689: Oil bodies 4–7 per cell, spherical, 4–6(–8) μm in diameter, oblong 5–10×4–6 μm , granulate – RUSSIA, KAMCHATKA TERRITORY, Bakalin, k-49-5-15.

Fig. 690: Oil bodies 7–12 per cell, spherical, 3–4 μm in diameter, oblong 3–6(–7)×2–4 μm , finely granulate – RUSSIA, MAGADAN PROVINCE, Bakalin, mag-26-16-14.

Pseudolophozia sudetica (Nees ex Huebener) Konstant. & Vilnet

Fig. 691: Oil bodies 4–7(–9) per cell, spherical, (3–)4–6(–8) μm in diameter, oblong 5–10×4–6 μm , finely granulate – RUSSIA, KHABAROVSK TERRITORY, Bakalin, kh-23-6-16.

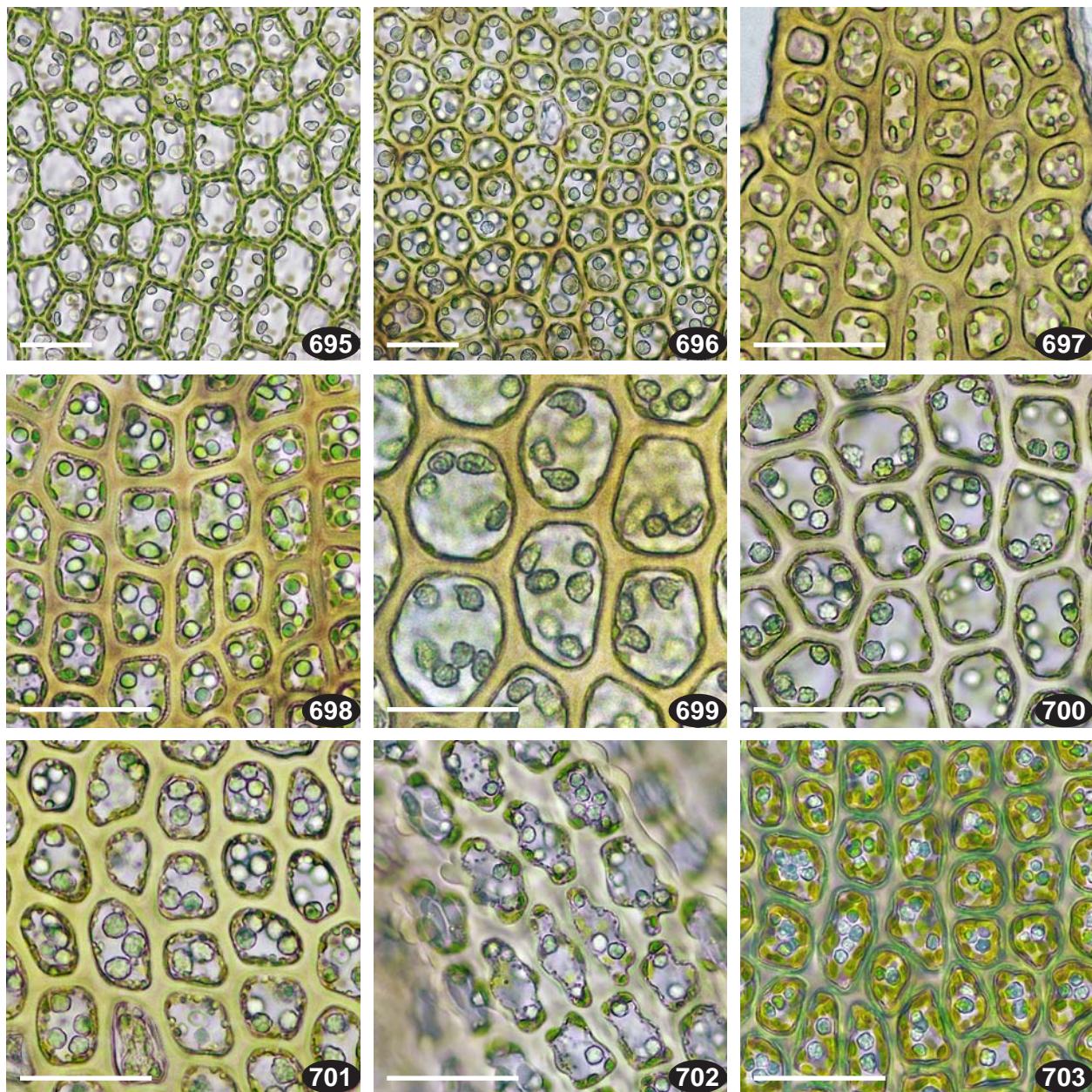
Schizophyllopsis bidens (Reinw., Blume et Nees) Váňa et L.Söderstr.

Fig. 692: Oil bodies 2–4 per cell, spherical, 3–4(–5) μm in diameter, oblong 4–10×3–4 μm , finely granulate to smooth – VIETNAM, LANG SON PROVINCE, Bakalin & Klimova, v-31-39-20.

Fig. 693: Oil bodies 3–6 per cell, spherical, 3–5 μm in diameter, oblong, 3–5×4–8 μm , granulate – VIETNAM, LAO CAI PROVINCE, Bakalin, v-3-94a-16.

Schljakovia kunzeana (Huebener) Konstant. et Vilnet

Fig. 694: Oil bodies (3–)4–6 per cell, spherical, (3–)4–5(–8) μm in diameter, oblong 4–8(–14)×3–5 μm , finely granulate, sometimes biconcave – RUSSIA, KHABAROVSK TERRITORY, Bakalin & Klimova, kh-44-12-19.



Schljakovianthus quadrilobus (Lindb.) Konstant. et Vilnet

Fig. 695: Oil bodies 2–5(–6) per cell, spherical, 4–6 μm in diameter, oblong (4–)5–7(–10) \times 3–5(–7) μm , finely granulate – RUSSIA, KAMCHATKA TERRITORY, Klimova, kam-80-50-16.

Fig. 696: Oil bodies 3–7(–10) per cell, spherical, (3–)4–7(–9) μm in diameter, oblong 5–8(–10) \times 4–6(–8) μm , granulate to finely so – RUSSIA, SAKHALIN PROVINCE, Bakalin, s-18-15-17.

Sphenolobopsis pearsonii (Spruce) R.M.Schust.

Fig. 697: Oil bodies 4–8 per cell, spherical, 2–2.5 μm in diameter, oblong 2–3 \times 1.5–2 μm , smooth – RUSSIA, KHABAROVSK TERRITORY, Bakalin, kh-23-4-16.

Fig. 698: Oil bodies 3–4(–5) per cell, spherical, (2–)3–4 μm in diameter, oblong 4–5 \times 3–4 μm , smooth – VIETNAM, LAO CAI PROVINCE, Bakalin & Klimova, v-11-19-17.

Sphenolobus cavifolius (H. Buch & S.W. Arnell) Müll. Frib.

Fig. 699: Oil bodies (3–)4–7 per cell, spherical, 4–5 μm in diameter, oblong 5–8(–10) \times 4–6 μm , coarsely granulate – RUS-

SIA, MAGADAN PROVINCE, Bakalin, mag-29-13-14.

Sphenolobus minutus (Schreb. ex D.Crantz) Berggr.

Fig. 700: Oil bodies 4–6 per cell, spherical, 3–5 μm in diameter, oblong 4–7(–10) \times 3–4(–5) μm , coarsely granulate – RUSSIA, KRASNOYARSK TERRITORY, Fedosov, vf42.

Fig. 701: Oil bodies 3–4(–5) per cell additionally with 1–several smooth small putative oil bodies 1–2 μm in diameter, spherical, 3–5(–6) μm in diameter, coarsely granulate to botryoidal – RUSSIA, KRASNOYARSK TERRITORY, Fedosov, vf70b.

Tetralophozia filiformis (Steph.) Urmi

Fig. 702: Oil bodies 2–5(–8) per cell, spherical, (2–)3–4 μm in diameter, rarely oblong 4–5 \times 3–4 μm , botryoidal to nearly smooth – CHINA, SICHUAN PROVINCE, Bakalin & Klimova, c-39-1-17.

Fig. 703: Oil bodies (1–)2–5 per cell, spherical, 1.5–3.0 μm in diameter, oblong 3–4 \times 2–3 μm , coarsely granulate – REPUBLIC OF KOREA, JEOLLABUK-DO, Bakalin, kor-75-4-19.

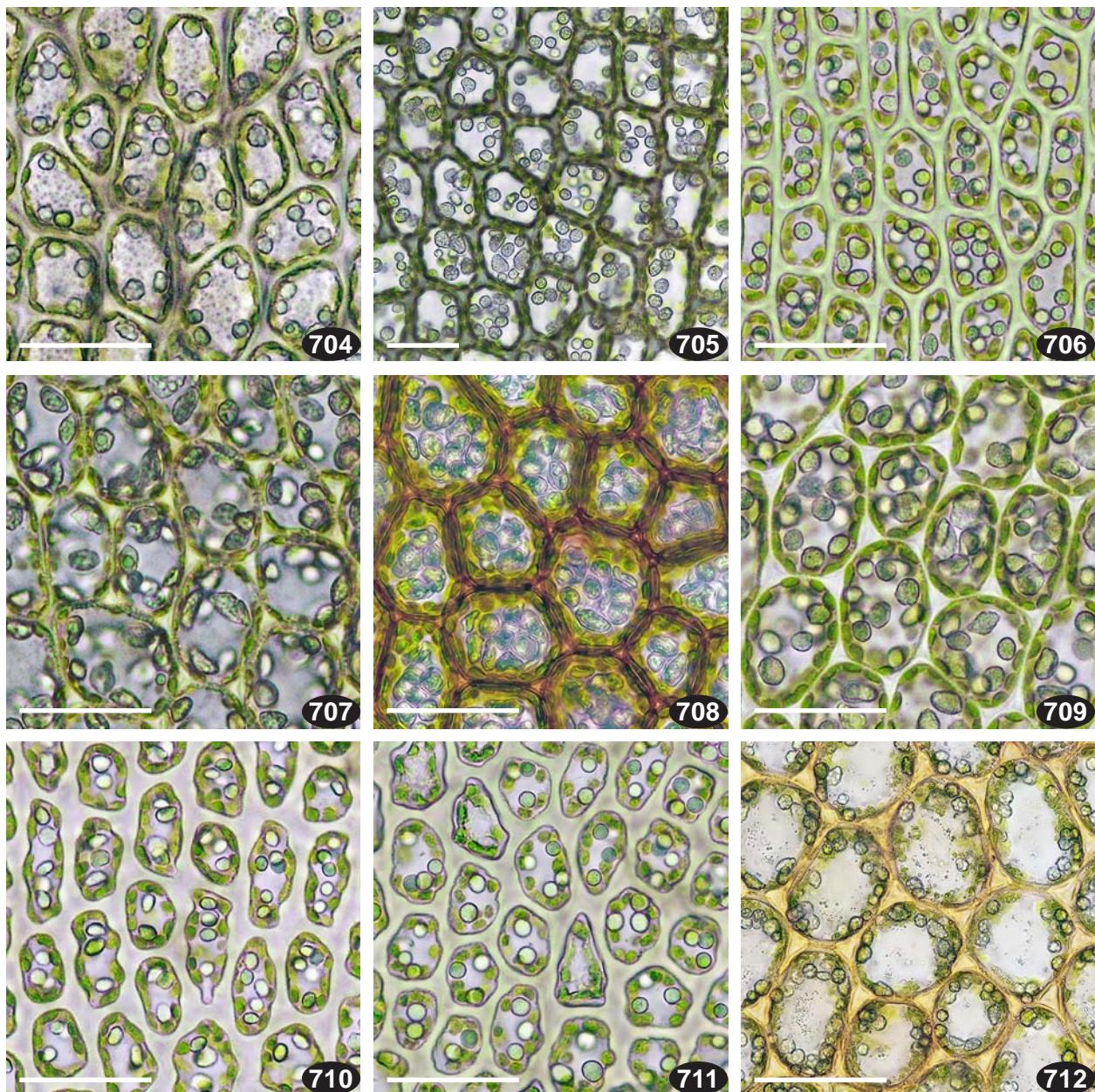
*Tetraphlozia setiformis* (Ehrh.) Schljakov

Fig. 704: Oil bodies (2–)3–6 per cell, spherical, (2–)3–4(–5) µm in diameter, coarsely granulate to botryoidal – RUSSIA, KHABAROVSK TERRITORY, Bakalin, kh-21-1-16.

Trilophozia quinquedentata (Huds.) Bakalin

Fig. 705: Oil bodies 5–11 per cell, spherical, 4–7 µm in diameter, rarely oblong 6–10×5–7 µm, coarsely granulate – RUSSIA, MAGADAN PROVINCE, Bakalin, mag-28-13-14.

Tritomaria exsecta (Schmidel) Schiffn. ex Loeske

Fig. 706: Oil bodies (1–)3–8 per cell, spherical, 3–4 µm in diameter, rarely oblong 4–5(–6)×3–4 µm, granulate to finely so – CHINA, SICHUAN PROVINCE, Bakalin & Klimova, c-39-3-17.

Tritomaria koreana Bakalin, S.S.Choi et B.Y.Sun

Fig. 707: Oil bodies (3–)4–9 per cell, spherical, 4–5 µm in diameter, oblong 4–8(–10)×(2–)3–5(–6) µm, granulate, 30% with eye – JAPAN, YAMANASHI PREFECTURE, Bakalin, j-87-13-15.

Fig. 708: Oil bodies (4–)9–17 per cell, spherical, 3–5(–7) µm in diameter, oblong 5–9×3–4 µm, granulate – REPUBLIC

OF KOREA, JEOLLABUK-DO, Bakalin, kor-75-15-19.

Tritomaria scitula (Taylor) Jrg.

Fig. 709: Oil bodies 4–9 per cell, spherical, 3–7 µm in diameter, oblong 4–8(–10)×3–4(–5) µm, finely granulate – RUSSIA, KHABAROVSK TERRITORY, Bakalin & Klimova, kh-50-32-19.

Vietnamiella epiphytica Bakalin & Vilnet

Fig. 710: Oil bodies (2–)3–7 per cell, spherical, 2.5–4(–5) µm in diameter, oblong 3–4(–6)×2.5–3.5(–5) µm, nearly smooth – VIETNAM, LAI CHAU PROVINCE, Bakalin & Klimova, v-8-18-19.

Fig. 711: Oil bodies 2–5 per cell, spherical, (2.5–)3–4 µm in diameter, nearly smooth – VIETNAM, LAO CAI PROVINCE, Bakalin & Klimova, v-9-8-17.

Myliaceae*Mylia anomala* (Hook.) Gray

Fig. 712: Oil bodies 5–16 per cell, spherical, (5–)7–12 µm in diameter, oblong 7–18×6–10 µm, botryoidal – RUSSIA, SAKHALIN PROVINCE, Bakalin & Klimova, k-57-11-18.

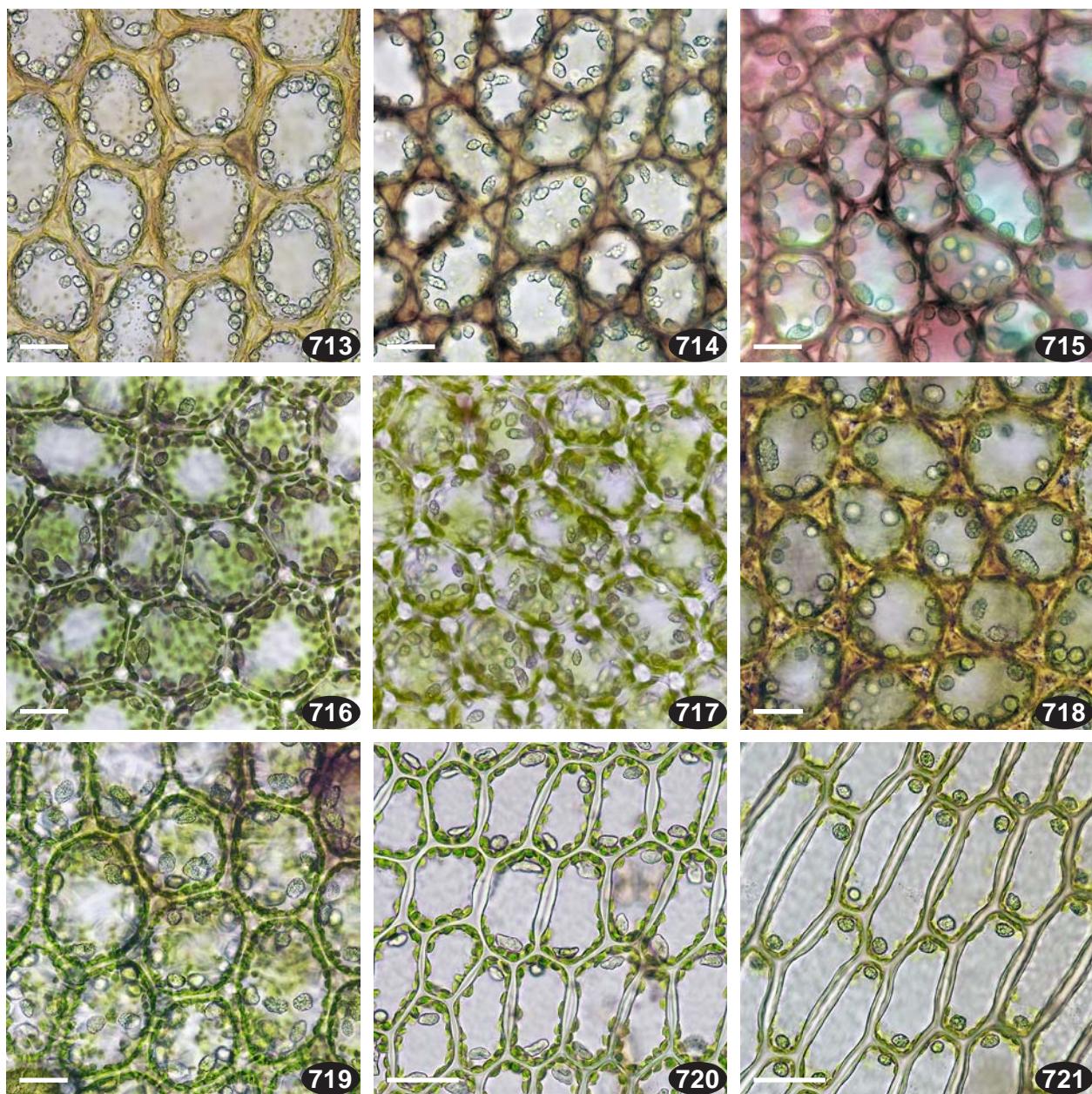


Fig. 713: Oil bodies 7–23 per cell, spherical, 5–10 µm in diameter, oblong 8–15×5–10 µm, botryoidal – RUSSIA, KHABAROVSK TERRITORY, Bakalin & Klimova, kh-44-3-19.

Fig. 714: Oil bodies 8–12(14) per cell, spherical, 6–10 µm in diameter, oblong 8–18×6–10 µm, botryoidal – RUSSIA, SAKHALIN PROVINCE, Bakalin, s-27-23-17.

Mylia taylorii (Hook.) Gray

Fig. 715: Oil bodies 6–10 per cell, spherical, 7–12 µm in diameter, oblong 12–17×8–10 µm, coarsely granulate – RUSSIA, MAGADAN PROVINCE, Bakalin, mag-24-1-14.

Fig. 716: Oil bodies 5–10 per cell, spherical, 7–10 µm in diameter, oblong 10–25×7–10 µm, coarsely granulate – RUSSIA, PRIMORSKY TERRITORY, Bakalin, p-35-20-14.

Mylia verrucosa Lindb.

Fig. 717: Oil bodies 11–25 per cell, spherical, 4–7 µm in diameter, oblong 7–14×4–6 µm, coarsely granulate – RUSSIA, PRIMORSKY TERRITORY, Bakalin, p-35-1-14.

Mylia vietnamica Bakalin & Vilnet

Fig. 718: Oil bodies 5–8(10) per cell, spherical, 7–13 µm in diameter, oblong 10–20×8–13 µm, botryoidal to coarsely granulate – CHINA, YUNNAN PROVINCE, Bakalin, c-83-30-18.

Fig. 719: Oil bodies 5–11 per cell, spherical, 8–14 µm in diameter, oblong 10–20×8–14 µm – VIETNAM, LAO CAI PROVINCE, Bakalin, v-3-19-16.

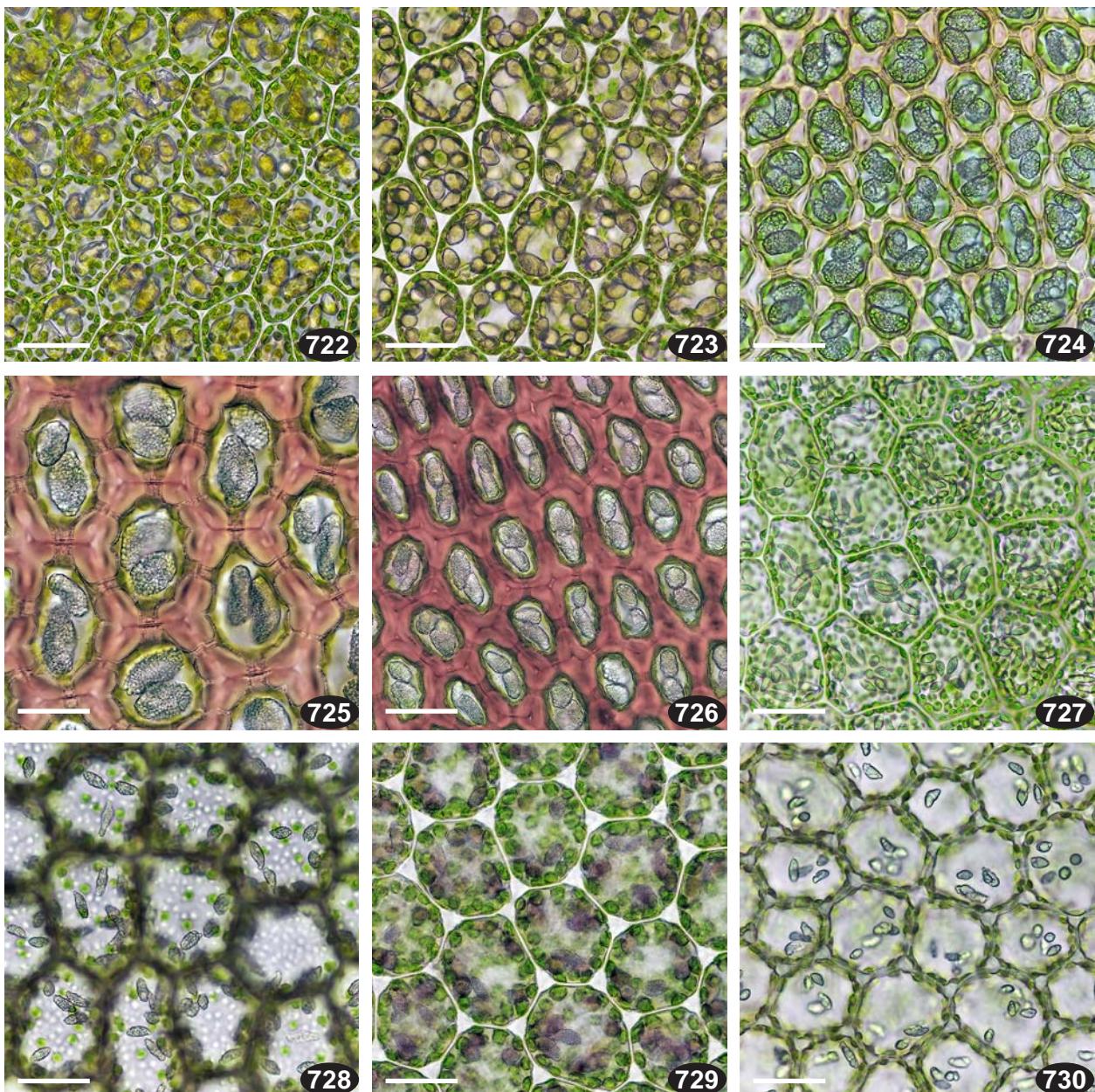
Comment: Oil bodies of *M. vietnamica* in specimen from China differs from those in specimens from type locality in Vietnam although genetically the plants of the Chinese and Vietnamese populations are quite similar (Ellis et al., 2019).

Balantiopsidaceae

Isotachis japonica Steph.

Fig. 720: Oil bodies 2(–3) per cell, oblong 6–12(14)×4–5(6) µm, loosely granulate – VIETNAM, LAO CAI PROVINCE, Bakalin, v-2-144-16.

Fig. 721: Oil bodies 2(–3) per cell, spherical, 4–7 µm in diameter, oblong 6–9×5–7 µm, coarsely granulate – VIETNAM, LAO CAI PROVINCE, Bakalin, v-2-93-16.



Acrobolbaceae

Acrobolbus ciliatus (Mitt.) Schiffn.

Fig. 722: Oil bodies (2–)5–8 per cell, spherical, 6–10 µm in diameter, oblong 10–20(–25)×6–10 µm, finely granulate, brown – REPUBLIC OF KOREA, GANGWON-DO, Bakalin, kor-73-8a-19.

Fig. 723: Oil bodies 7–14 per cell, spherical, 7–9 µm in diameter, oblong 7–9×9–15 µm, finely granulate, brown – VIETNAM, LAI CHAU PROVINCE, Bakalin & Klimova, v-4-16-19.

Conoscyphus trapezoides (Sande Lac.) Schiffn.

Fig. 724: Oil bodies 2(–3) per cell, oblong 12–18×5–10 µm, granulate, grayish brownish – INDONESIA, JAVA ISLAND, Bakalin, java-3-42-15.

Fig. 725: Oil bodies 2 per cell, oblong 18–30×10–18 µm, granulate to coarsely so, brownish – VIETNAM, LANG SON PROVINCE, Bakalin & Klimova, v-31-26-20_11.

Fig. 726: Oil bodies in underleaves 2 per cell, spherical, 8–10 µm in diameter, oblong 8–16×(5–)6–8 µm, granulate – VIETNAM, LANG SON PROVINCE, Bakalin & Klimova, v-31-26-20.

Comment: Leaf cell size in *C. trapezoides* is varying in available materials: the cell size in Vietnamese materials is strongly larger than in Javanese one.

Saccogynidium muricellum (De Not.) Grolle

Fig. 727: Oil bodies 6–14 per cell, oblong 5–20×3–4 µm, finely granulate – CHINA, GUIZHOU PROVINCE, Bakalin, china-56-91-13.

Fig. 728: Oil bodies 5–12 per cell, rarely spherical, 5–6 µm in diameter, oblong 7–20×4–5 µm, granulate – INDONESIA, JAVA ISLAND, Bakalin, java-3-7-15.

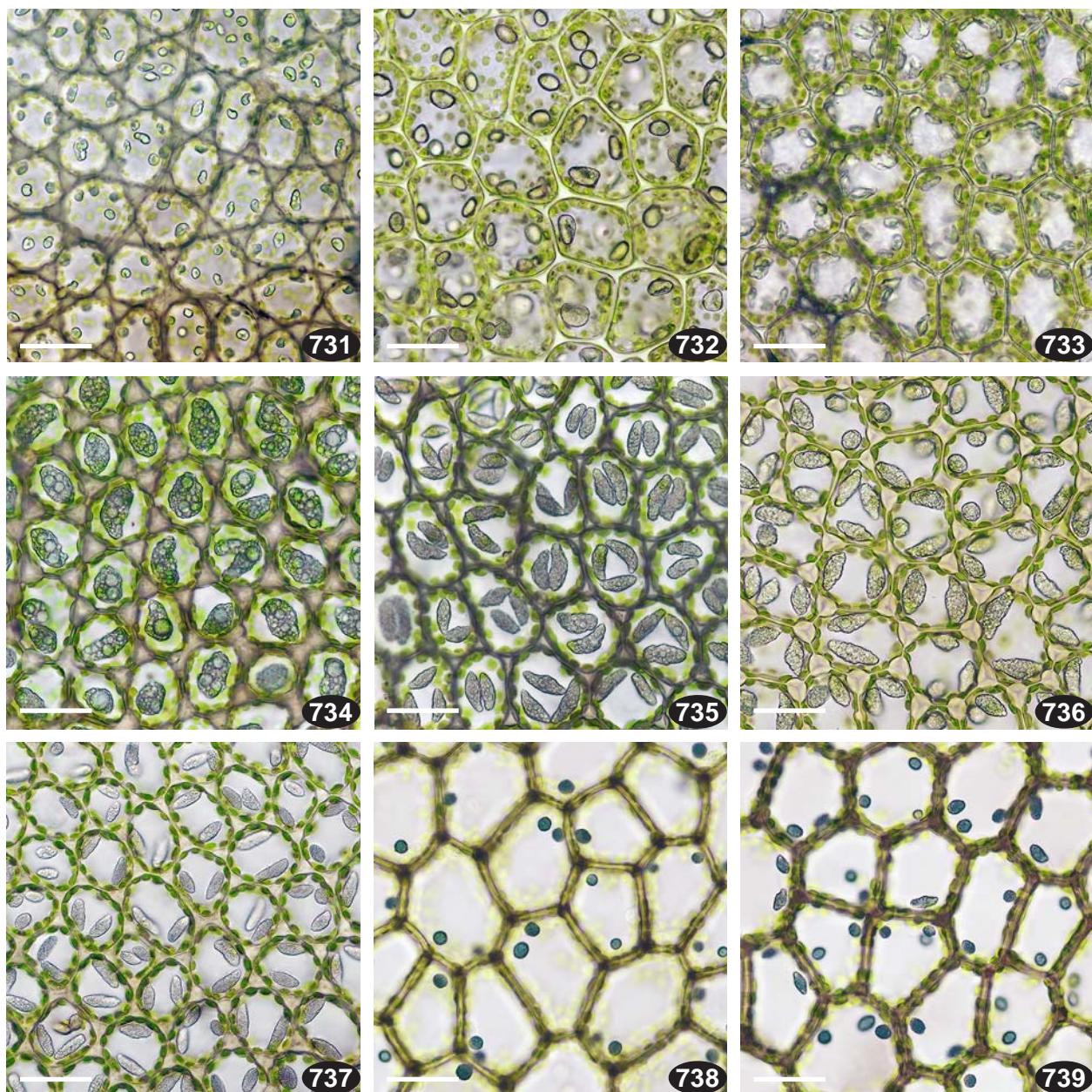
Saccogynidium rigidulum

Fig. 729: Oil bodies 5–8 per cell, rarely spherical, 6–7 µm in diameter, oblong 8–12×5–7 µm, granulate, brownish – VIETNAM, LANG SON PROVINCE, Bakalin & Klimova, v-30-12-20.

Arnelliaceae

Arnellia fennica (Gottsche) Lindb.

Fig. 730: Oil bodies 4–7 per cell, spherical, 4–6 µm in diameter, oblong, 3–6×5–12 µm, botryoidal to roughly segmented – RUSSIA, MAGADAN PROVINCE, Bakalin, mag-31-29-14.



Arnelliella fennica (Gottsch.) Lindb.

Fig. 731: Oil bodies 2–7 per cell, spherical, 3–5 µm in diameter, oblong, 3–5×6–9 µm, smooth to segmented – RUSSIA, SAKHALIN PROVINCE, Bakalin, s-22-20-17.

Southbyaceae

Gongylanthus himalayensis Grolle

Fig. 732: Oil bodies 2–5 per cell, spherical, 5–8 µm in diameter, oblong 5–13×(3–)4–6 µm, finely granulate – CHINA, YUNNAN PROVINCE, Bakalin, c-75-23-18.

Southbya grollei N. Kitag.

Fig. 733: Oil bodies 5–8 per cell, oblong 6–10(–14)×2–4(–10) µm, very finely granulate to nearly smooth, some biconcave – CHINA, YUNNAN PROVINCE, Bakalin, c-79-1-18.

Jackiellaceae

Jackiella javanica Schiffn.

Fig. 734: Oil bodies 1(–2) per cell, spherical, 7–10 µm in diameter, oblong 13–22×8–13 µm, coarsely granulate, with 1–several eyes (due to deterioration?) – CHINA, GUIZHOU PROVINCE, Bakalin, china-55-48-13.

Fig. 735: Oil bodies 2–3(4) per cell, oblong 10–20(22)×5–

10 µm, coarsely granulate – INDONESIA, JAVA ISLAND, Bakalin, java-3-73a-15.

Fig. 736: Oil bodies 2–3(–4) per cell, spherical, 7–10 µm in diameter, oblong 10–20×6–8 µm, granulate, brownish – VIETNAM, LAI CHAU PROVINCE, Bakalin & Klimova, v-1-3-19.

Fig. 737: Oil bodies 2(–3) per cell, oblong 6–16×5–6 µm, granulate to finely so – VIETNAM, CAO BANG PROVINCE, Bakalin & Klimova, v-23-6-20.

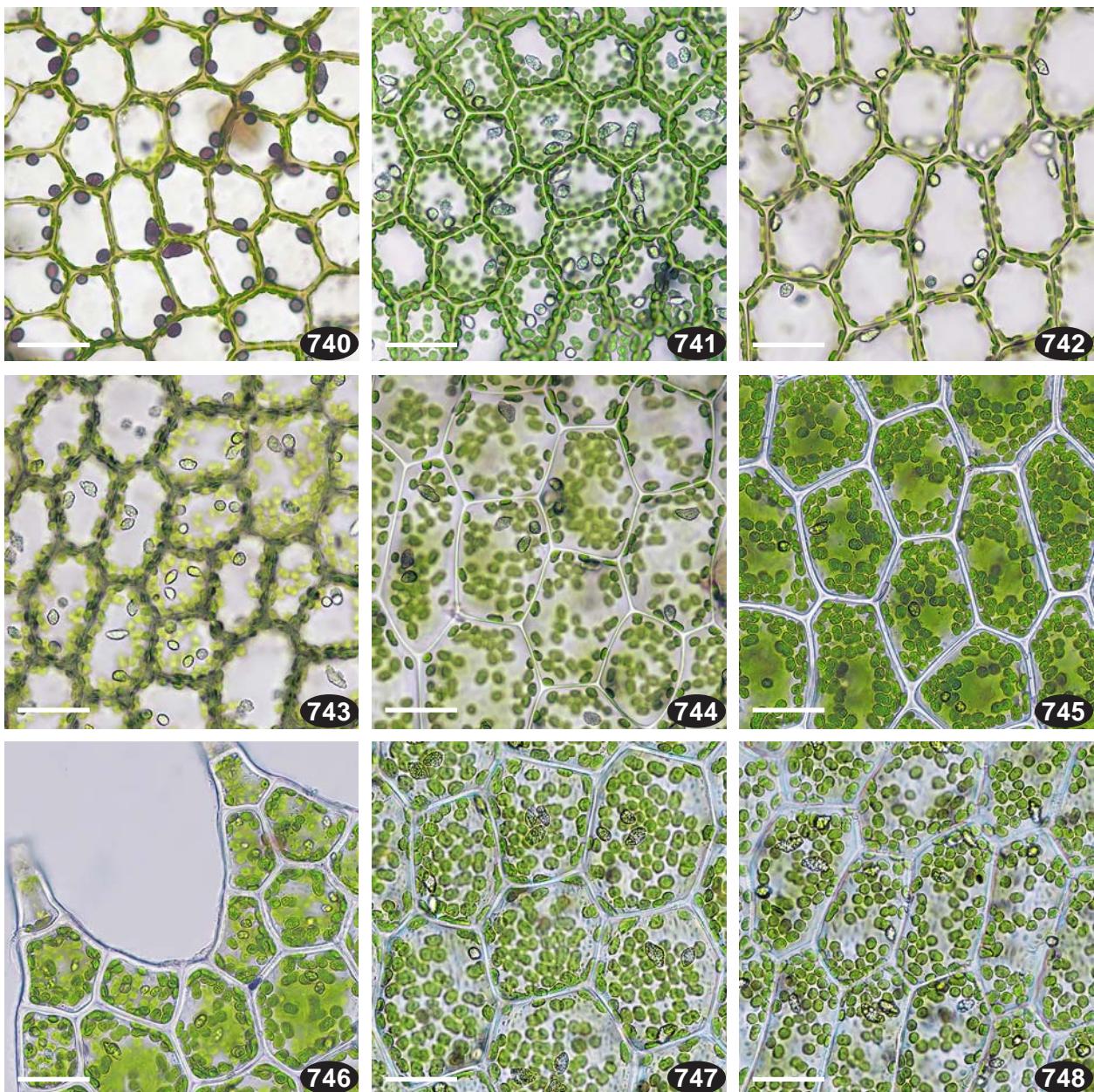
Comment: *J. javanica* includes four specimens collected from Guizhou Province of China in the North to Java Island in Indonesia in the South. The variability in oil bodies may imply the genetic differences too.

Calypogeiaaceae

Calypogeia aeruginosa Mitt.

Fig. 738: Oil bodies 1–2 per cell, spherical, 3–6 µm in diameter, oblong, 4–7×6–10 µm, granulate, grayish blue – VIETNAM, LAO CAI PROVINCE, Bakalin & Klimova, v-11-12-17.

Fig. 739: Oil bodies 2–3 per cell, spherical, 4–6 µm in diameter, oblong, 4–6×6–13 µm, coarsely granulate, blue-violet – VIETNAM, LAO CAI PROVINCE, Bakalin & Klimova, v-8-37-17.



Calypogeia aeruginosa Mitt.

Fig. 740: Oil bodies 1–2 per cell, spherical, 4–6 µm in diameter, oblong, 4–7×6–13 µm, granulate, brownish purple – VIETNAM, LAO CAI PROVINCE, Bakalin & Klimova, v-8-42-17.

Calypogeia angusta Steph.

Fig. 741: Oil bodies (2–)3–4 per cell, spherical, 4–5 µm in diameter, oblong, 4–5×5–10 µm, coarsely granulate – CHINA, GUIZHOU PROVINCE, Bakalin, china 55-19-13.

Calypogeia apiculata (Steph.) Steph.

Fig. 742: Oil bodies 3–7 per cell, spherical, 4–6 µm in diameter, oblong 4–6×6–10 µm, coarsely granulate – VIETNAM, LAI CHAU PROVINCE, Bakalin & Klimova, v-2-5-18.

Fig. 743: Oil bodies 2–5 per cell, spherical, 4–6 µm in diameter, oblong 4–6×6–11 µm, coarsely granulate – VIETNAM, LAI CHAU PROVINCE, Bakalin & Klimova, v-15-5-19.

Calypogeia arguta Nees et Mont.

Fig. 744: Oil bodies 2–3 per cell, oblong, 5–7×7–12 µm, granulate, grayish – VIETNAM, LAO CAI PROVINCE, Bakalin & Klimova, v-3-14-17.

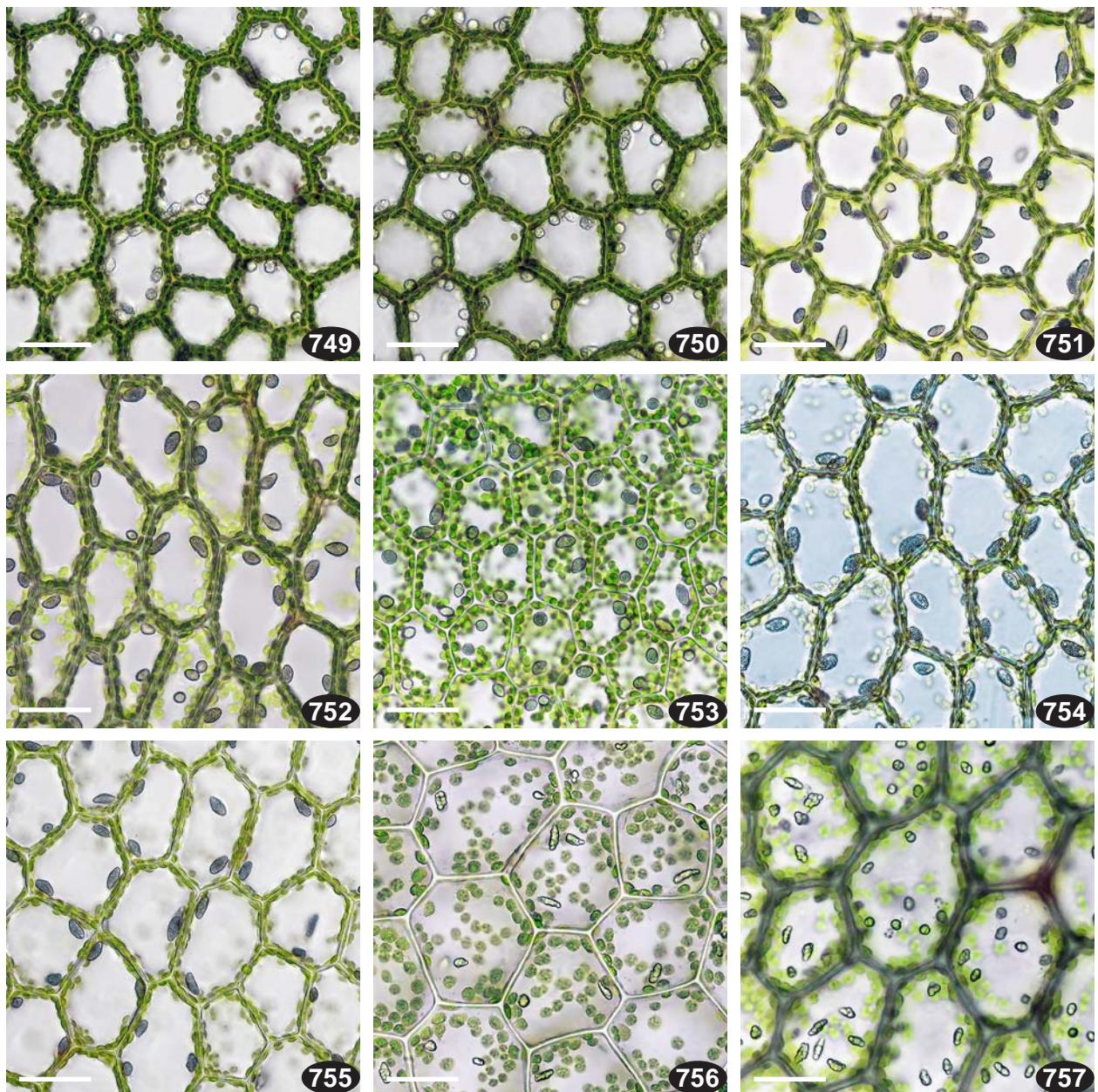
Fig. 745: Oil bodies 0–3 per cell, spherical, 4–5 µm in diameter, oblong 6–10×4–5 µm, coarsely granulate – REPUBLIC OF KOREA, JEOLLABUK-DO, Bakalin, kor-71-8-19_3.

Fig. 746: Oil bodies in the apex of the leaf 2–4 per cell, spherical, 4–5 µm in diameter, oblong 5–10×4–5 µm, coarsely granulate – REPUBLIC OF KOREA, JEOLLABUK-DO, Bakalin, kor-71-8-19_6.

Fig. 747: Oil bodies 0–3 per cell, rarely spherical, 4–5 µm in diameter, oblong 5–10×4–7 µm, granulate – VIETNAM, HA GIANG PROVINCE, Bakalin & Klimova, v-11-36-20.

Fig. 748: Oil bodies 0–2 per cell, rarely spherical, 4–5 µm in diameter, oblong 7–12×4–5(–6) µm, granulate – VIETNAM, HA GIANG PROVINCE, Bakalin & Klimova, v-2-2-20.

Comment: *C. arguta* is morphologically malleable species (varying in leaf cell wall thickness, leaf cell size, oilbodies' surface features). The morphological variability may be associated with genetic differences – the supposition we could not test in the course of the present study.



Calypogeia cuspidata (Steph.) Steph.

Fig. 749: Oil bodies (0–)4–7 per cell, spherical, 4–5(–6) μm in diameter, oblong 5–8 \times 4–5 μm , coarsely granulate – VIETNAM, CAO BANG PROVINCE, Bakalin & Klimova, v-23-13-20_3.

Fig. 750: Oil bodies 0–8 per cell, spherical, 4–5 μm in diameter, oblong 6–10(–13) \times 4–5 μm , coarsely granulate – VIETNAM, CAO BANG PROVINCE, Bakalin & Klimova, v-23-13-20_15.

Calypogeia granulata Inoue

Fig. 751: Oil bodies 2–4 per cell, spherical, 3–5 μm in diameter, oblong 4–6 \times 6–13 μm , granulate, brownish – VIETNAM, LAI CHAU PROVINCE, Bakalin & Klimova, v-3-4-19.

Fig. 752: Oil bodies 2–4 per cell, spherical, 3–5 μm in diameter, oblong 4–7 \times 6–14 μm , granulate, brownish – VIETNAM, LAI CHAU PROVINCE, Bakalin & Klimova, v-8-4-19.

Fig. 753: Oil bodies 2–3 per cell, spherical, 4–6 μm in di-

ameter, oblong, 4–6 \times 6–10 μm , granulate, brownish – CHINA, GUIZHOU PROVINCE, Bakalin, china-56-19-13.

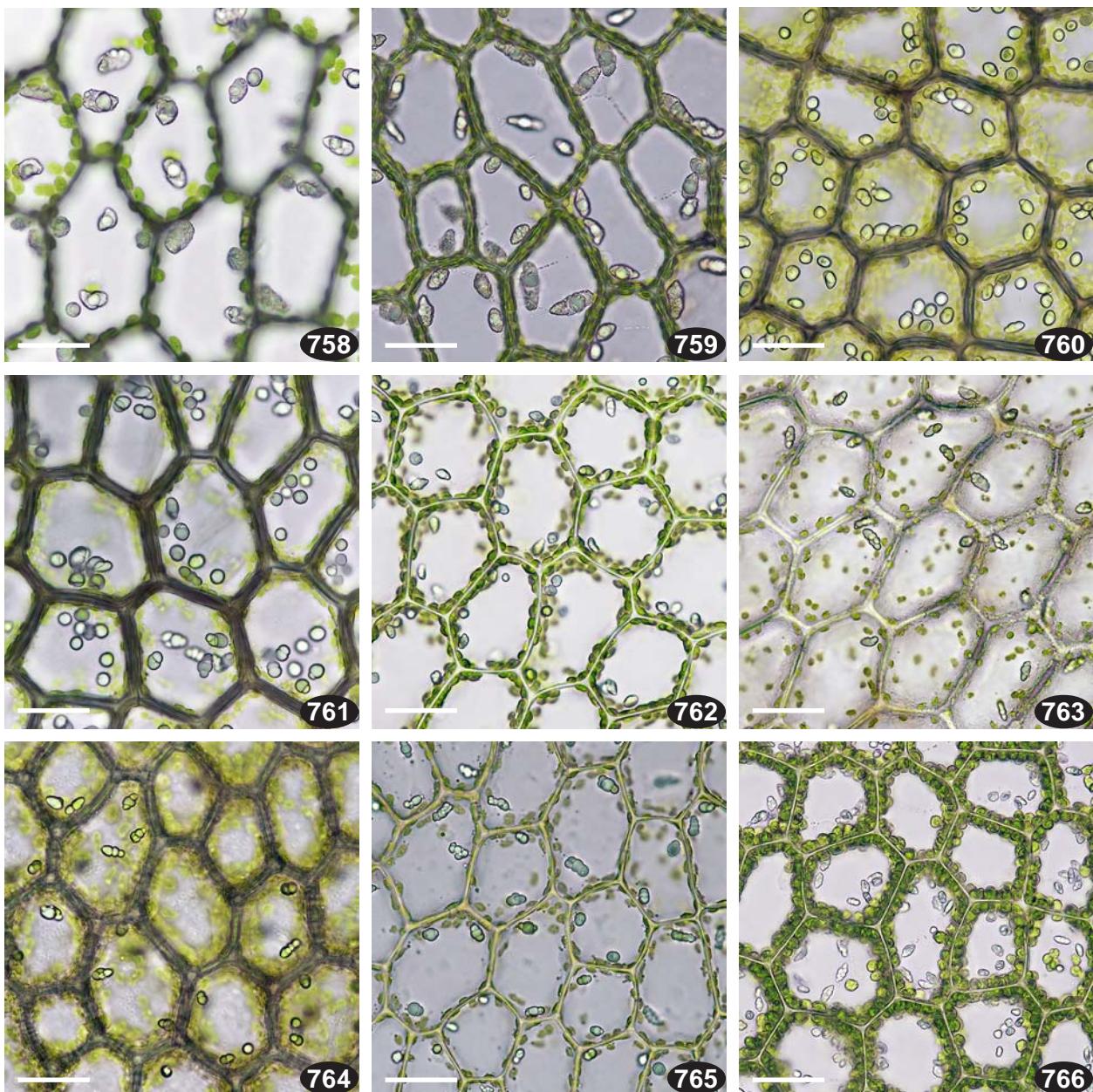
Fig. 754: Oil bodies 2(–3) per cell, oblong 6–12(–14) \times 5–6 μm , finely granulate, blue – VIETNAM, HA GIANG PROVINCE, Bakalin & Klimova, v-11-3-20.

Fig. 755: Oil bodies 2(–3) per cell, oblong 5–12(–14) \times 4–5 μm , finely granulate, blue grayish – VIETNAM, LANG SON PROVINCE, Bakalin & Klimova, v-31-2-20.

Calypogeia integrifolia Steph.

Fig. 756: Oil bodies 3–6 per cell, rarely spherical, 3–5 μm in diameter, commonly oblong 3–7 \times 6–12 μm , botryoidal – RUSSIA, KHABAROVSK TERRITORY, Bakalin & Klimova, kh-47-18-19.

Fig. 757: Oil bodies 5–10 per cell, spherical, 4–5 μm in diameter, oblong, 3–5 \times 5–10 μm , botryoidal – RUSSIA, MAGADAN PROVINCE, Bakalin, mag-33-5-14.



Calypogeia japonica Steph.

Fig. 758: Oil bodies 2–5 per cell, spherical, 5–8 µm in diameter, oblong, 6–10×8–15 µm, granulate, biconcentric, grayish – JAPAN, TOTTORI PREFECTURE, Bakalin, j-1-15-13.

Fig. 759: Oil bodies 3–5 per cell, spherical, 5–6 µm in diameter, oblong, 4–7×6–22 µm, granulate, biconcentric, grayish – VIETNAM, LAO CAI PROVINCE, Bakalin, v-4-22-16.

Calypogeia muelleriana (Schiffn.) Müll.Frib.

Fig. 760: Oil bodies 4–9 per cell, spherical, 4–6 µm in diameter, oblong 4–6×6–12 µm, segmented to botryoidal – RUSSIA, KHBAROVSK TERRITORY, Bakalin & Klimova, kh-43-11-19.

Fig. 761: Oil bodies 5–8 per cell, spherical, 4–6 µm in diameter, oblong, 4–6×5–14 µm, segmented to botryoidal – RUSSIA, MAGADAN PROVINCE, Bakalin, mag-28-26-14.

Fig. 762: Oil bodies 3–8 per cell, spherical, 3–5 µm in di-

ameter, oblong, 3–5×5–10 µm, botryoidal – RUSSIA, SAKHALIN PROVINCE, Bakalin, s-43-3-16.

Calypogeia neesiana (C.Massal. et Carestia) Müll.Frib.

Fig. 763: Oil bodies 2–4 per cell, rarely spherical, 4–5 µm in diameter, oblong, 3–6×6–12 µm, botryoidal – RUSSIA, SAKHALIN PROVINCE, Klimova, sak-10-4-16.

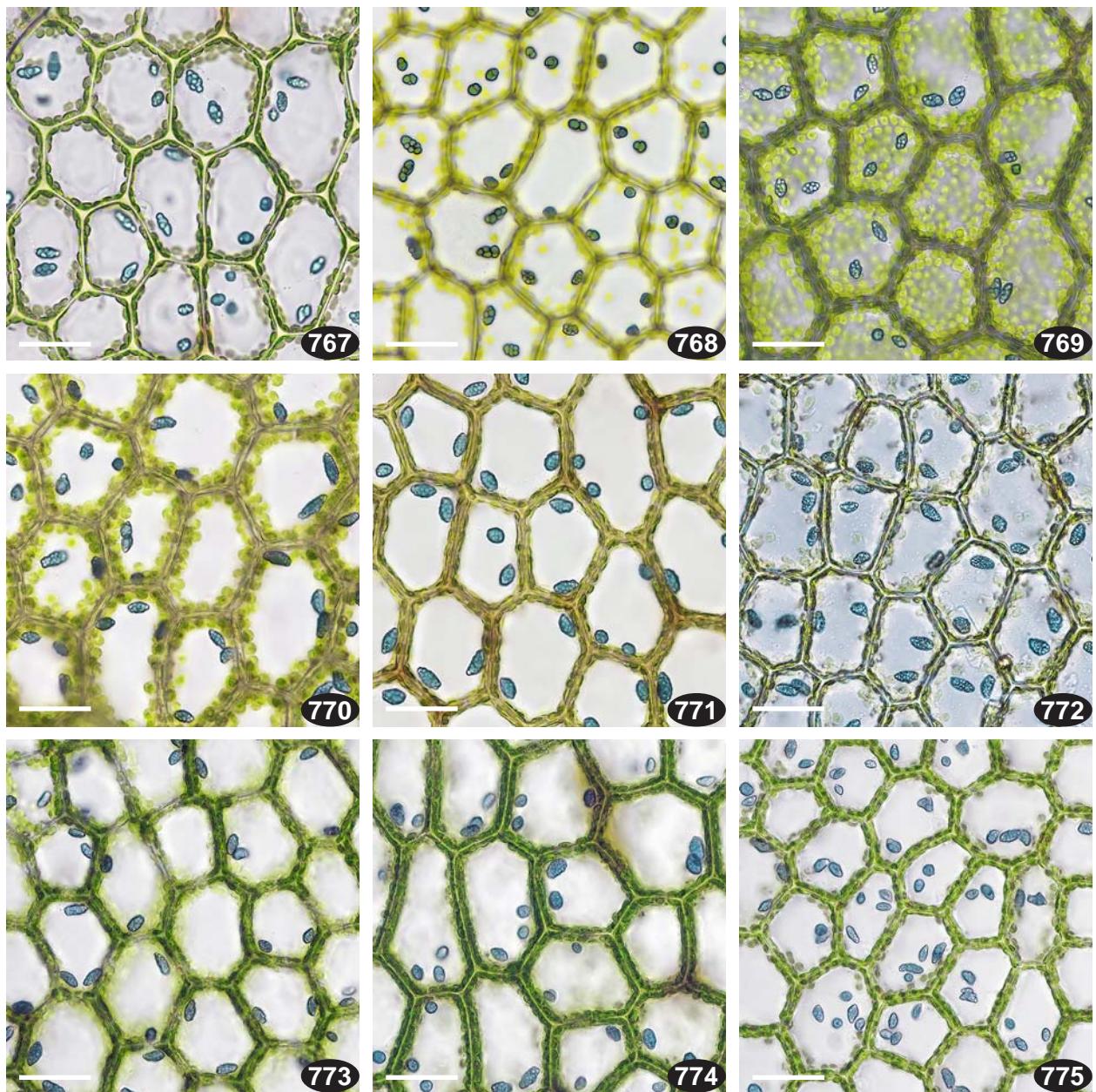
Calypogeia neesiana subsp. *subalpina* (Inoue) Inoue

Fig. 764: Oil bodies 2–3 per cell, rarely spherical, 4–6 µm in diameter, oblong, 4–6×5–12 µm, botryoidal – JAPAN, YAMANASHI PREFECTURE, Bakalin, j-87-1-15.

Calypogeia neogaea (R.M. Schust.) Bakalin

Fig. 765: Oil bodies 2–5 per cell, spherical, 4–6 µm in diameter, oblong, 4–6×6–10 µm, botryoidal – RUSSIA, KAMCHATKA TERRITORY, Bakalin, k-63-4-15.

Fig. 766: Oil bodies 6–13 per cell, spherical, 3–5 µm in diameter, oblong 3–5×5–10 µm, botryoidal – RUSSIA, KHBAROVSK TERRITORY, Bakalin & Klimova, kh-38-7-19.



Calypogeia orientalis Buczk. & Bakalin

Fig. 767: Oil bodies 2–3 per cell, spherical, 4–6 µm in diameter, oblong, 4–6×6–13 µm, botryoidal, blue – RUSSIA, SAKHALIN PROVINCE, *Bakalin*, k-77-20-15.

Fig. 768: Oil bodies 2(–4) per cell, spherical, 5–6 µm in diameter, oblong 5–11×4–6 µm, botryoidal, blue – REPUBLIC OF KOREA, GYEONGSANGNAM-DO, *Bakalin*, kor-28-1-15.

Fig. 769: Oil bodies 0–2 per cell, spherical, 5–6 µm in diameter, oblong 5–12×(3)–4–5 µm, botryoidal, blue – REPUBLIC OF KOREA, JEOLLABUK-DO, *Bakalin*, kor-75-8-19.

Calypogeia sinensis Bakalin & Buczk.

Fig. 770: Oil bodies 2–4 per cell, spherical, 4–6 µm in diameter, oblong 4–6×6–14 µm, coarsely granulate, deep blue – VIETNAM, SON LA PROVINCE, *Bakalin* & *Klimova*, v-21-26-19.

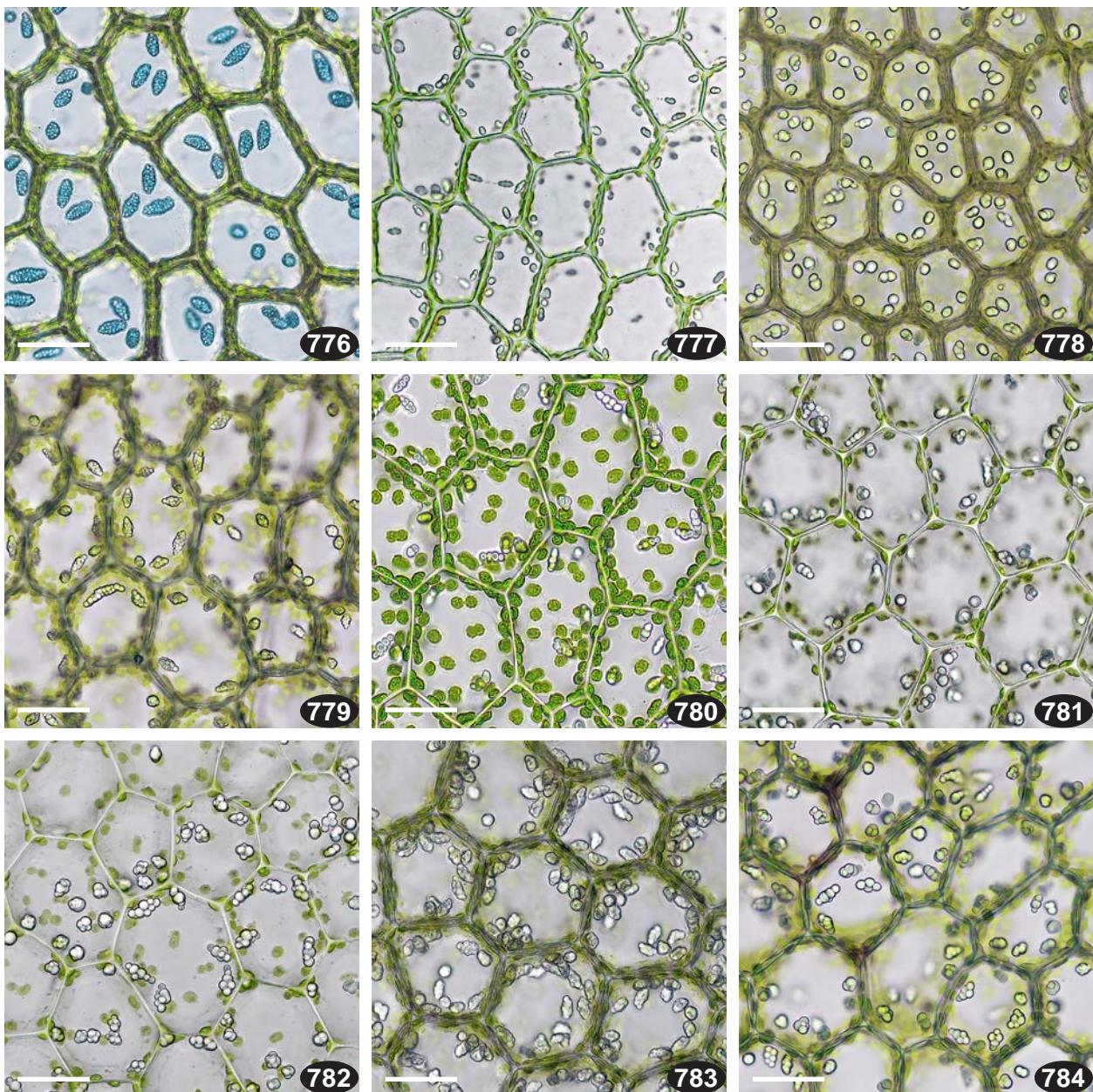
Fig. 771: Oil bodies 2–4 per cell, spherical, 5–7 µm in diameter, oblong 4–7×7–14 µm, coarsely granulate, deep blue – VIETNAM, SON LA PROVINCE, *Bakalin* & *Klimova*, v-24-12-19.

Fig. 772: Oil bodies 2–3(–4) per cell, oblong 5–17×4–6(–8) µm, coarsely granulate, blue – VIETNAM, HA GIANG PROVINCE, *Bakalin* & *Klimova*, v-11-23-20.

Fig. 773: Oil bodies 0–2(–3) per cell, oblong 6–10×(3)–4–5 µm, coarsely granulate, blue – VIETNAM, CAO BANG PROVINCE, *Bakalin* & *Klimova*, v-23-13-20_14.

Fig. 774: Oil bodies (0)–2–3 per cell, spherical, 5(–6) µm in diameter, oblong 5–10(–12)×4–5(–6) µm, coarsely granulate, blue – VIETNAM, CAO BANG PROVINCE, *Bakalin* & *Klimova*, v-23-13-20_21.

Fig. 775: Oil bodies 2–4 per cell, spherical, 4–5 µm in diameter, oblong 5–10×3–5 µm, coarsely granulate, blue – VIETNAM, CAO BANG PROVINCE, *Bakalin* & *Klimova*, v-24-10-20.



Calypogeia sinensis Bakalin & Buczk.

Fig. 776: Oil bodies 2–4 per cell, spherical, 5–6 µm in diameter, oblong 6–17×5–6 µm, coarsely granulate, blue – VIETNAM, HA GIANG PROVINCE, Bakalin & Klimova, v-5-2-20.

Calypogeia sphagnicola (Arnell et J.Perss.) Warnst. et Loeske

Fig. 777: Oil bodies 3–10 per cell, spherical, 2–5 µm in diameter, oblong, 2–4×4–8 µm, botryoidal – RUSSIA, MAGADAN PROVINCE, Bakalin, mag-28-28-14.

Calypogeia suecica (Arnell et J.Perss.) Müll.Frib.

Fig. 778: Oil bodies 3–8 per cell, spherical, 3–6 µm in diameter, oblong 3–6×6–8 µm, segmented to botryoidal – RUSSIA, KHABAROVSK TERRITORY, Bakalin & Klimova, kh-55-10b-19.

Calypogeia tosana (Steph.) Steph.

Fig. 779: Oil bodies 4–8 per cell, spherical, 4–6 µm in diameter, oblong 4–6×6–15(–20) µm, botryoidal – VIETNAM, LAI CHAU PROVINCE, Bakalin & Klimova, v-16-2-19.

Fig. 780: Oil bodies 2–5 per cell, spherical, 4–5 µm in di-

ameter, oblong 6–14×4–5 µm, botryoidal – REPUBLIC OF KOREA, JEOLLABUK-DO, Bakalin, kor-73-16-19.

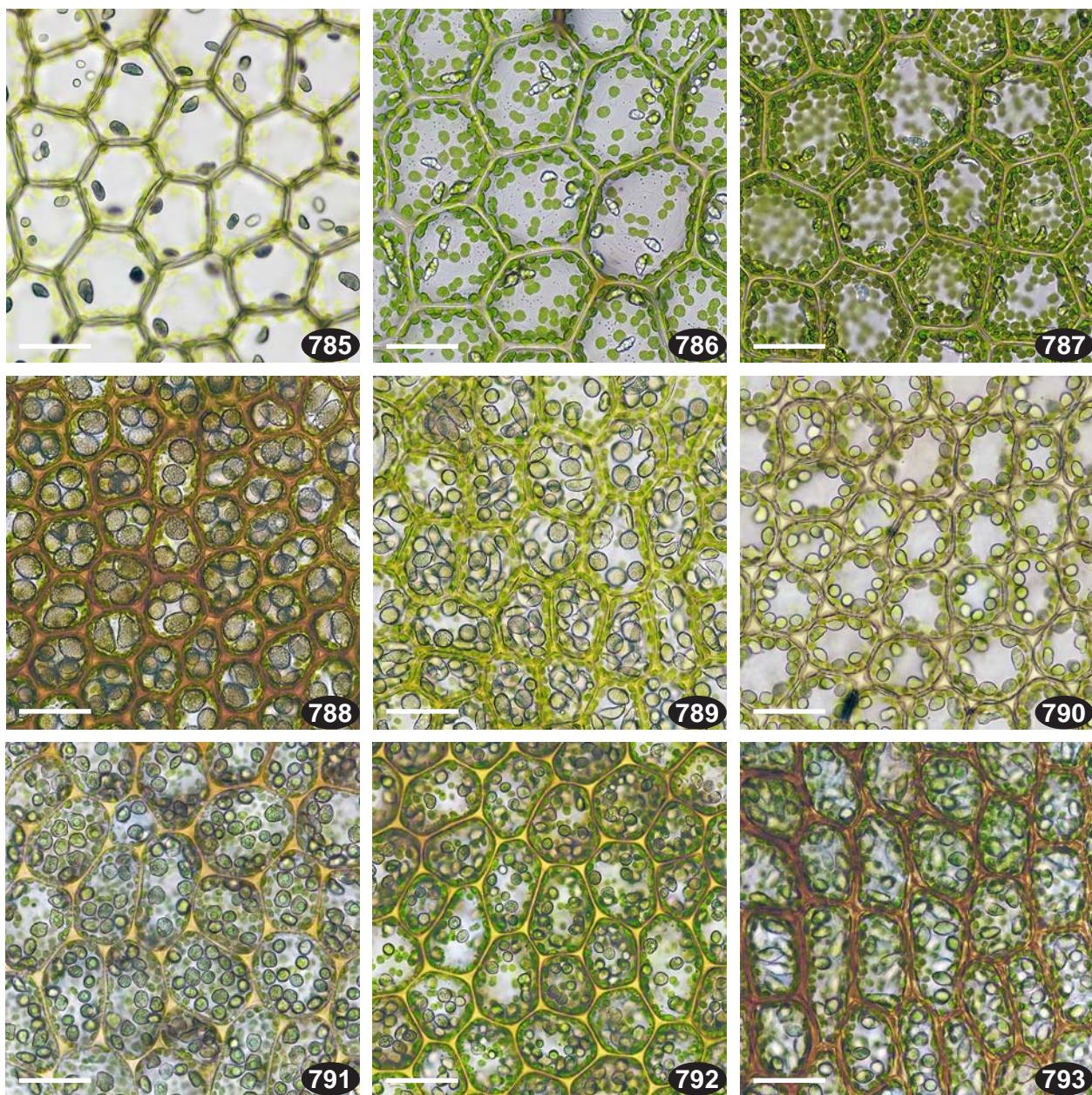
Fig. 781: Oil bodies 5–7 per cell, spherical, 5–6 µm in diameter, oblong 5–10(–12)×4–5 µm, botryoidal – VIETNAM, CAO BANG PROVINCE, Bakalin & Klimova, v-23-16-20_2.

Fig. 782: Oil bodies (0–)4–8 per cell, spherical, 5–7 µm in diameter, oblong 7–15×5–7 µm, botryoidal – VIETNAM, CAO BANG PROVINCE, Bakalin & Klimova, v-23-16-20_9.

Fig. 783: Oil bodies 15–22 per cell, spherical, 5–6 µm in diameter, oblong 6–12×5–6 µm, botryoidal to coarsely granulate – VIETNAM, CAO BANG PROVINCE, Bakalin & Klimova, v-23-2-20.

Fig. 784: Oil bodies 5–8 per cell, spherical, 4–6 µm in diameter, oblong, 4–8×6–12 µm, botryoidal – VIETNAM, LAO CAI PROVINCE, Bakalin & Klimova, v-3-73-17.

Comment: The strong variation was observed within ‘morphological species’ *C. tosana*, where oil bodies varying in number, size and surface features.



Calypogeia vietnamica Bakalin & Vilnet

Fig. 785: Oil bodies 2–5 per cell, spherical, 3–5 µm in diameter, oblong, 3–5×5–12 µm, finely granulate, grayish – VIETNAM, LAO CAI PROVINCE, Bakalin & Klimova, v-9-23-17.

Calypogeia yoshinagana Steph.

Fig. 786: Oil bodies 1–5 per cell, spherical, 3–5 µm in diameter, oblong 6–13×3–5 µm, botryoidal – REPUBLIC OF KOREA, JEOLLABUK-DO, Bakalin, kor-72-5-19.

Fig. 787: Oil bodies 2–6 per cell, oblong 6–14×3–5 µm, botryoidal – REPUBLIC OF KOREA, JEOLLABUK-DO, Bakalin, kor-79-1-19.

Eocalypogeia schusteriana (S.Hatt. et Mizut.) R.M.Schust.

Fig. 788: Oil bodies 3–6 per cell, spherical, 6–11 µm in diameter, oblong 8–18×6–10 µm, granulate, brownish – RUSSIA, KHABAROVSK TERRITORY, Bakalin & Klimova, kh-50-16-19.

Fig. 789: Oil bodies 6–11 per cell, spherical, 4–9 µm in diameter, oblong 6–18×4–8 µm, granulate, brownish – RUSSIA, SAKHALIN PROVINCE, Bakalin, s-22-13-17.

Comment: The populations of *E. schusteriana* from the

southern extremes of the species area (Sakhalin Island) are characterized by somewhat larger cells and more numerous oil bodies, it may imply that another taxon is in hand.

Metacalypogeia alternifolia (Nees) Grolle

Fig. 790: Oil bodies 5–9(12) per cell, spherical, 4–6 µm in diameter, oblong 5–8(10)×4–5 µm, finely granulate – VIETNAM, LAO CAI PROVINCE, Bakalin & Klimova, v-5-57-17.

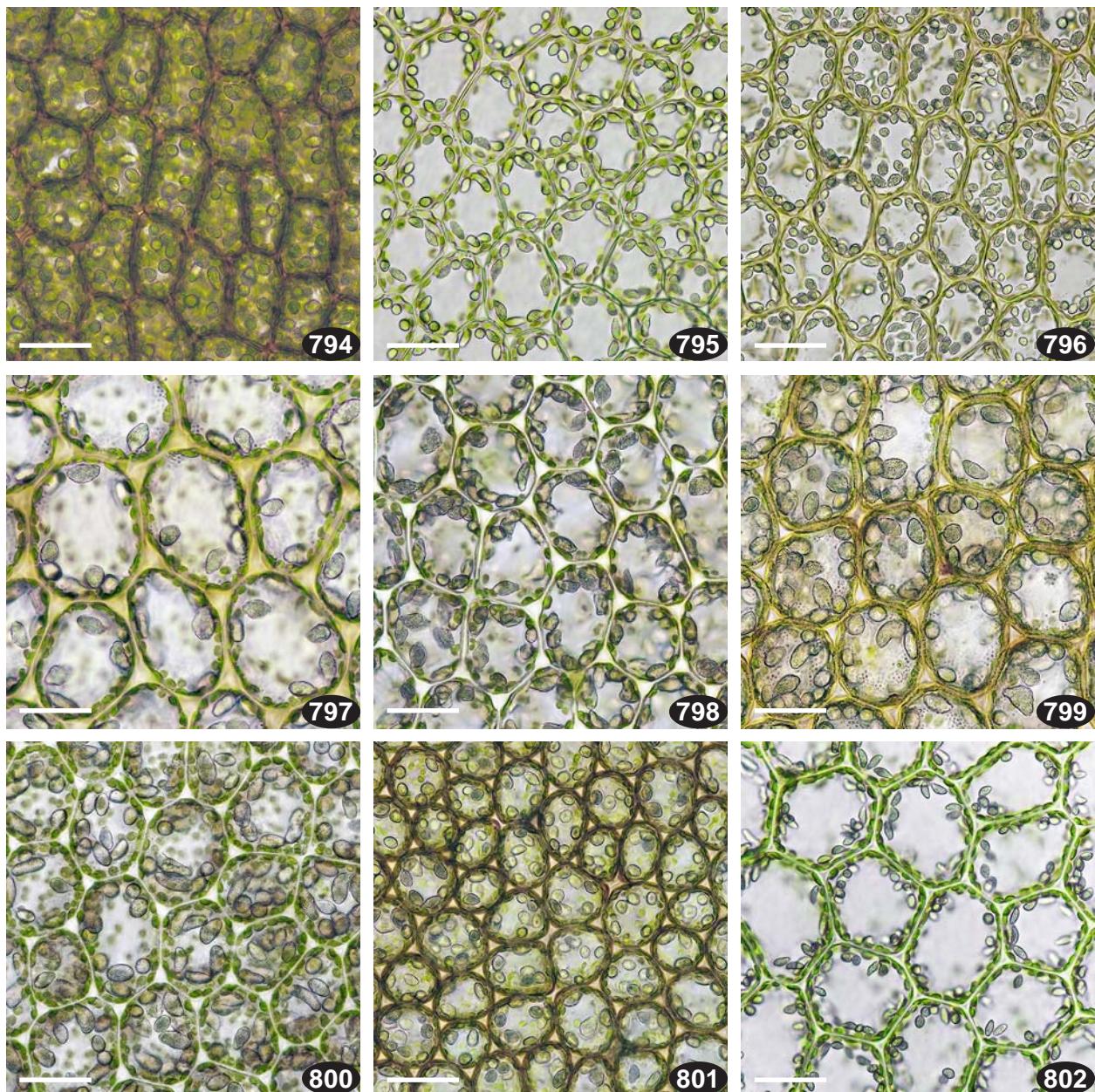
Metacalypogeia cordifolia (Steph.) Inoue

Fig. 791: Oil bodies 8–16 per cell, spherical, 5–8 µm in diameter, oblong 6–10×5–7 µm, granulate, brownish – JAPAN, KOCHI PREFECTURE, Bakalin, j-9-5-15.

Fig. 792: Oil bodies (4–)6–16 per cell, spherical, 3–7 µm in diameter, oblong 4–8×3–5 µm, finely granulate, sometimes biconcentric – RUSSIA, KHABAROVSK TERRITORY, Bakalin & Klimova, kh-54-1-19.

Mnioloma fuscum (Lehm.) R.M.Schust.

Fig. 793: Oil bodies 5–10(11) per cell, spherical, 5–7 µm in diameter, oblong 7–18×5–7 µm, finely granulate – CHINA, GUIZHOU PROVINCE, Bakalin, china-56-98-13.



Mnioloma fuscum (Lehm.) R.M.Schust.

Fig. 794: Oil bodies 6–10(11) per cell, spherical, 4–6 µm in diameter, oblong 6–10×4–6 µm, granulate, brownish – VIETNAM, LAO CAI PROVINCE, Bakalin, v-2-107-16.

Delavayellaceae

Delavayella serrata Steph.

Fig. 795: Oil bodies 6–11 per cell, spherical, 4–6 µm in diameter, oblong 5–13×4–6 µm, granulate – VIETNAM, LAO CAI PROVINCE, Bakalin & Klimova, v-5-30-17.

Fig. 796: Oil bodies 9–22 per cell, spherical, 4–6 µm in diameter, oblong 4–10×3–5 µm, granulate – VIETNAM, LAI CHAU PROVINCE, Bakalin & Klimova, v-8-16-19.

Liochlaena sichuanica Bakalin & Vilnet

Fig. 797: Oil bodies 5–10 per cell, oblong 6–16×6–8 µm, finely granulate – CHINA, SICHUAN PROVINCE, Bakalin & Klimova, c-40-10-17.

Fig. 798: Oil bodies 7–12 per cell, oblong 6–14×5–8 µm,

granulate, brownish – CHINA, YUNNAN PROVINCE, Bakalin, c-76-5-18.

Fig. 799: Oil bodies 7–13(16) per cell, spherical, 5–8 µm in diameter, oblong 7–14×5–7 µm, granulate – CHINA, SICHUAN PROVINCE, Bakalin & Klimova, c-39-5-17.

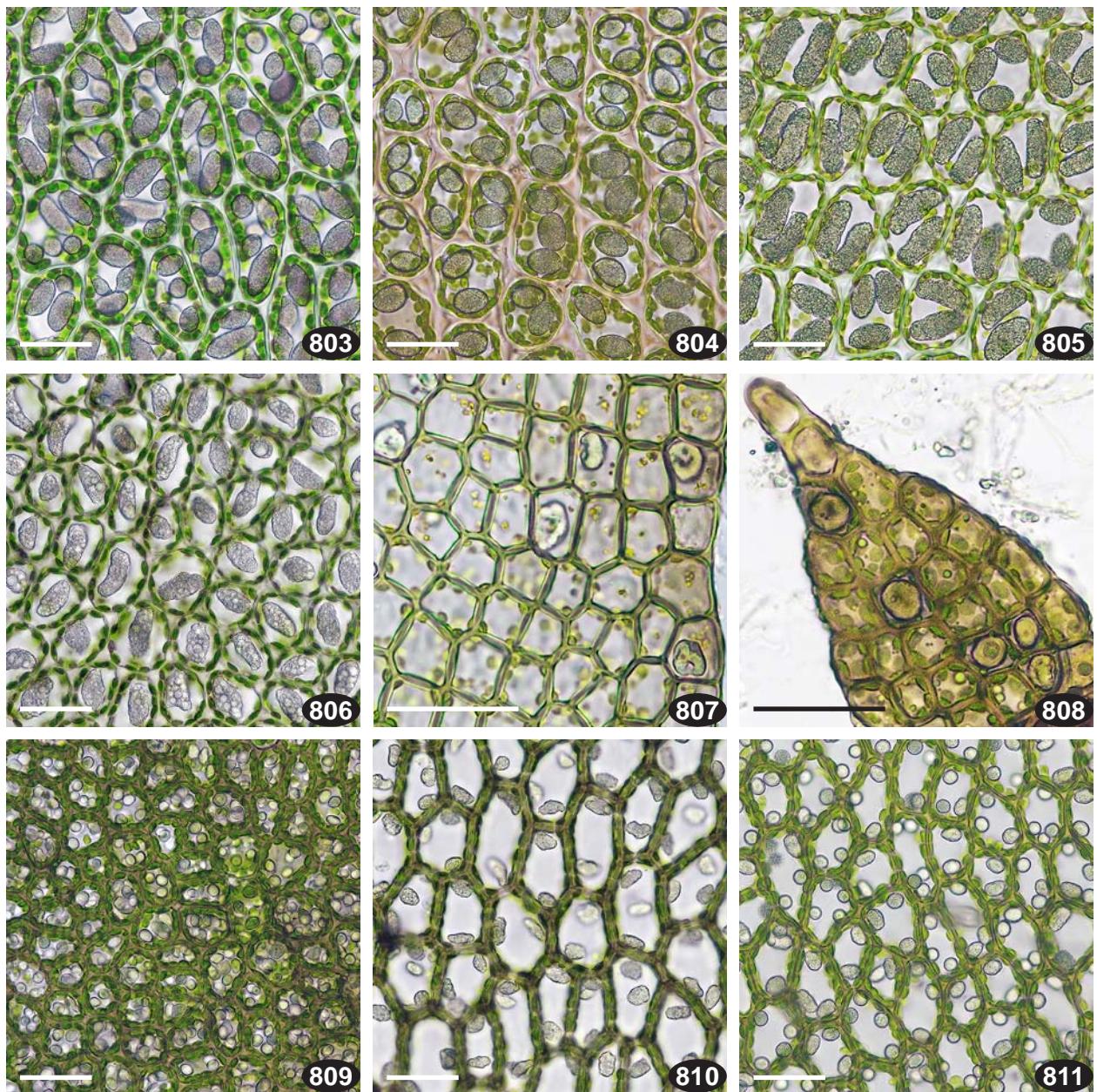
Fig. 800: Oil bodies 6–12 per cell, spherical, 5–7 µm in diameter, oblong 8–17×5–7 µm, finely granulate, brownish – VIETNAM, CAO BANG PROVINCE, Bakalin & Klimova, v-24-12-20.

Liochlaena subulata (A.Evans) Schljakov

Fig. 801: Oil bodies 6–12 per cell, spherical, 4–7 µm in diameter, oblong 7–10×5–6 µm, granulate – RUSSIA, AMUR PROVINCE, Bakalin, am-69-10-18.

Xenochila integrifolia (Mitt.) Inoue

Fig. 802: Oil bodies 12–20 per cell, spherical, 3–4 µm in diameter, oblong 4–7×3–4 µm, granulate – JAPAN, KOCHI PREFECTURE, Bakalin, j-10-28-15.



Notoscyphaceae

Notoscyphus lutescens (Lehm. et Lindenb.) Mitt.

Fig. 803: Oil bodies (3–)4–5 per cell, spherical, 8–10 µm in diameter, oblong 10–20(–24)×8–13 µm, granulate, brownish – INDONESIA, JAVA ISLAND, Bakalin, java-3-65-15.

Fig. 804: Oil bodies 2(–)3 per cell, oblong 10–18×8–13 µm, granulate, brownish – VIETNAM, LAO CAI PROVINCE, Bakalin, v-1-8-16.

Fig. 805: Oil bodies 2(–)3 per cell, oblong 14–28×9–12 µm, granulate, brownish – VIETNAM, LAO CAI PROVINCE, Bakalin & Klimova, v-4-11-16.

Fig. 806: Oil bodies 1 per cell, oblong 11–24×8–10 µm, granulate, with 1–several eyes – VIETNAM, LANG SON PROVINCE, Bakalin & Klimova, v-33-5-20.

Jungermanniaceae

Eremnotus myriocarpus (Carrington) Lindb. et Kaal. ex Pearson

Fig. 807: Oil bodies absent in unspecialized cells, ocelli up to 16 per leaf, spherical, 7 µm in diameter, oblong 8–11×5–7

µm, nearly smooth, biconcave – RUSSIA, KAMCHATKA TERRITORY, Bakalin, k-48-16-15.

Fig. 808: Oil bodies 5–7 per cell, spherical, 2–4 µm in diameter, smooth; ocelli 1–10 per leaf, spherical 8–10 µm in diameter, oblong 8–12×5–8 µm, smooth, sometimes biconcave – RUSSIA, KHABAROVSK TERRITORY, Bakalin & Klimova, kh-56-12-19.

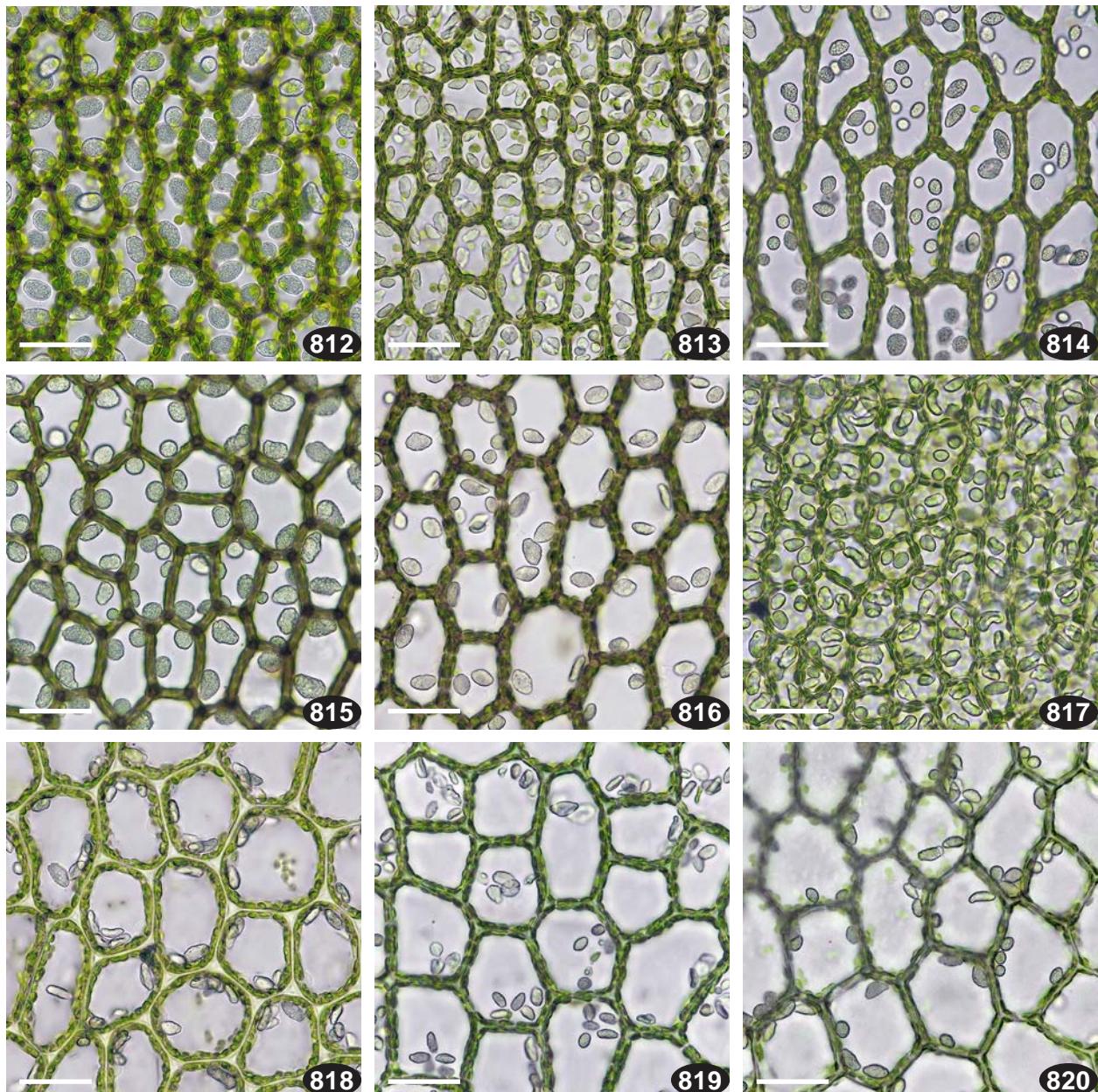
Jungermannia afoninae Mamontov, Konstant. & Vilnet

Fig. 809: Oil bodies 5–8 per cell, spherical, 4–6 µm in diameter, oblong 5–7×3–5 µm, finely granulate, sometimes biconcave – RUSSIA, KHABAROVSK TERRITORY, Bakalin & Klimova, kh-49-1-19.

Jungermannia atrovirens Dumort.

Fig. 810: Oil bodies 2–3(6) per cell, spherical, 5–7 µm in diameter, oblong 7–12(14)×5–7 µm, granulate – RUSSIA, SAKHALIN PROVINCE, Bakalin, s-29-13-17.

Fig. 811: Oil bodies 3–5 per cell, spherical, 4–8 µm in diameter, oblong 6–12×5–7 µm, granulate – CHINA, SICHUAN PROVINCE, Bakalin & Klimova, c-42-4-17.



Jungermannia atrovirens Dumort.

Fig. 812: Oil bodies 2(–4) per cell, spherical, 6–8 µm in diameter, oblong 7–14(–16)×(5)–6–8(–10) µm, granulate to finely so – REPUBLIC OF KOREA, JEOLLABUK-DO, Bakalin, kor-73-7-19.

Jungermannia borealis Damsh. et Váňa

Fig. 813: Oil bodies 4–7(9) per cell, spherical, 4–6 µm in diameter, oblong 5–13×4–8 µm, finely granulate – RUSSIA, SAKHALIN PROVINCE, Bakalin, s-46-1-16.

Jungermannia exsertifolia Steph.

Fig. 814: Oil bodies 2–6(10) per cell, spherical, 4–6 µm in diameter, oblong 7–10(13)×5–6(7) µm, granulate – RUSSIA, KAMCHATKA TERRITORY, Bakalin, k-55-6-15.

Fig. 815: Oil bodies 2–6 per cell, spherical, (6)7–9 µm in diameter, oblong 7–15×5–8 µm, granulate – JAPAN, KOCHI PREFECTURE, Bakalin, j-11-36-15.

Fig. 816: Oil bodies 2–5 per cell, spherical, 4–7 µm in diameter, oblong 6–14×5–8 µm, finely granulate – RUSSIA,

SAKHALIN PROVINCE, Bakalin, s-27-2-17.

Jungermannia konstantinovae Bakalin et Vilnet

Fig. 817: Oil bodies 2–4 per cell, spherical, 5–7 µm in diameter, oblong 7–13×5–6 µm, finely granulate to nearly smooth – RUSSIA, PRIMORSKY TERRITORY, Bakalin, p-9-2-16.

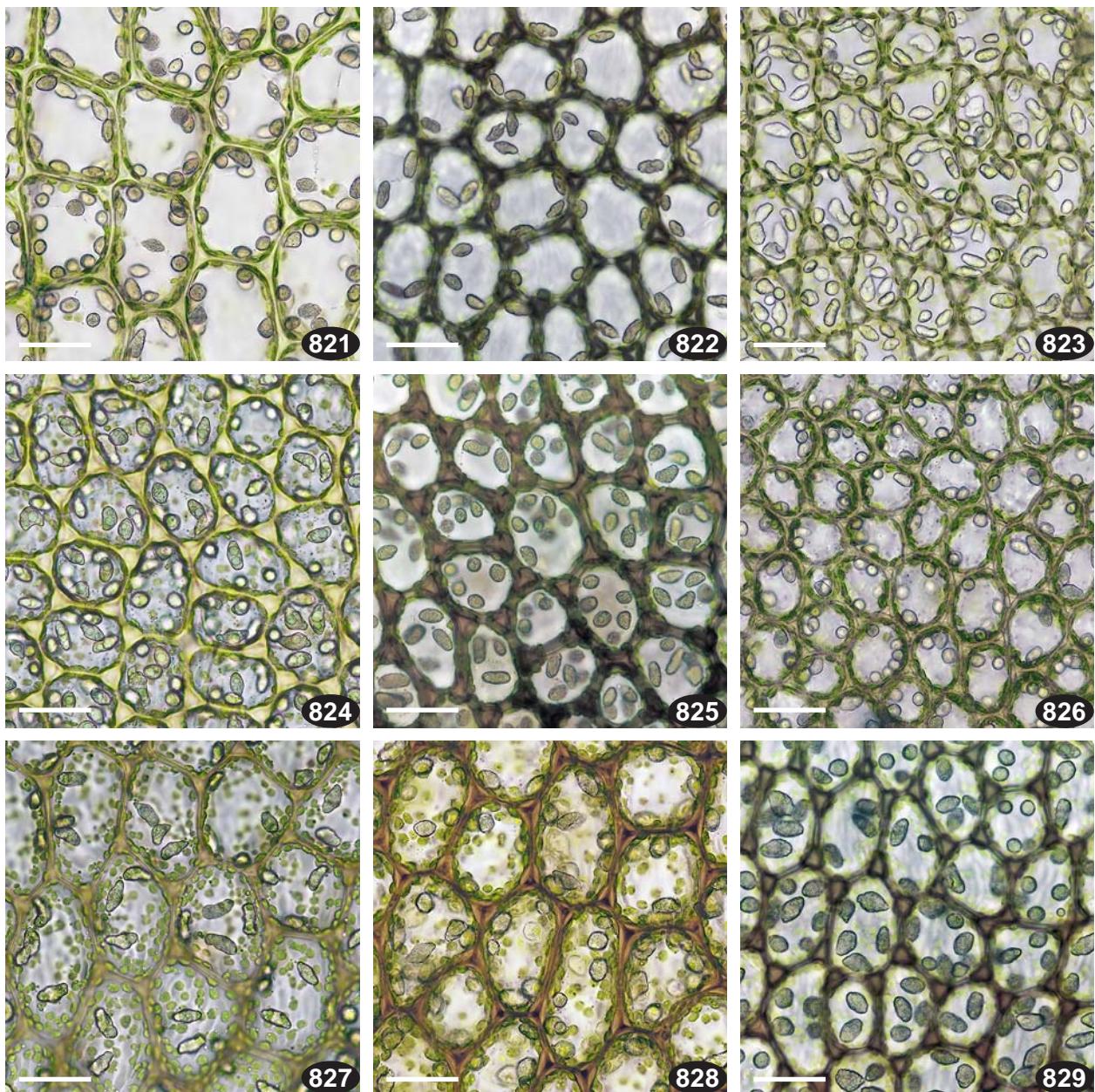
Mesoptychia badensis (Gottsche ex Rabenh.) L.Söderstr. et Váňa

Fig. 818: Oil bodies 3–5(–6) per cell, spherical, 5–6 µm in diameter, oblong 5–14×4–7 µm, finely granulate – RUSSIA, KHABAROVSK TERRITORY, Bakalin & Klimova, kh-57-6-19.

Fig. 819: Oil bodies 5–7 per cell, spherical, 4–7 µm in diameter, oblong 5–10×4–5 µm, finely granulate, brownish – RUSSIA, MAGADAN PROVINCE, Bakalin, mag-32-7-14.

Mesoptychia chinensis Bakalin, Vilnet et Y.X. Xiong

Fig. 820: Oil bodies 4–5(–6) per cell, spherical, 5–7 µm in diameter, oblong 4–12×4–6 µm, finely granulate, brownish – CHINA, GUIZHOU PROVINCE, Bakalin, china-51-57-13.



Mesoptychia gillmanii (Austin) L.Söderstr. et Váňa

Fig. 821: Oil bodies 5–10(11) per cell, spherical, 4–6 µm in diameter, oblong 7–14×4–6 µm, finely granulate, brownish – RUSSIA, KHABAROVSK TERRITORY, Bakalin & Klimova, kh-57-17-19.

Fig. 822: Oil bodies 2–4(6) per cell, spherical, 4–6 µm in diameter, oblong 7–12(16)×4–6 µm, finely granulate, brownish – RUSSIA, MAGADAN PROVINCE, Bakalin, mag-29-24-14.

Mesoptychia heterocolpos (Thed. ex Hartm.) L.Söderstr. et Váňa

Fig. 823: Oil bodies (2–)3–6(–7) per cell, spherical, 4–5(6) µm in diameter, oblong 6–16×4–7 µm, finely granulate, brownish – RUSSIA, KHABAROVSK TERRITORY, Bakalin & Klimova, kh-49-23-19.

Fig. 824: Oil bodies 4–10 per cell, spherical, 4–6(8) µm in diameter, oblong 7–16×4–7 µm, granulate, with 1–2 central eye – RUSSIA, SAKHALIN PROVINCE, Bakalin, k-80-48-15.

Comment: K-80-48-15 possesses oil bodies with 1–2 eyes and probably belongs to not yet described taxon.

Mesoptychia heterocolpos var. *arctica* (S.W.Arnell) L.Söderstr. et Váňa

Fig. 825: Oil bodies 5–7 per cell, spherical, 5–8 µm in diameter, oblong 6–16×5–7 µm, granulate, brownish – RUSSIA, MAGADAN PROVINCE, Bakalin, mag-31-4-14.

Mesoptychia igiana (S.Hatt.) L.Söderstr. et Váňa

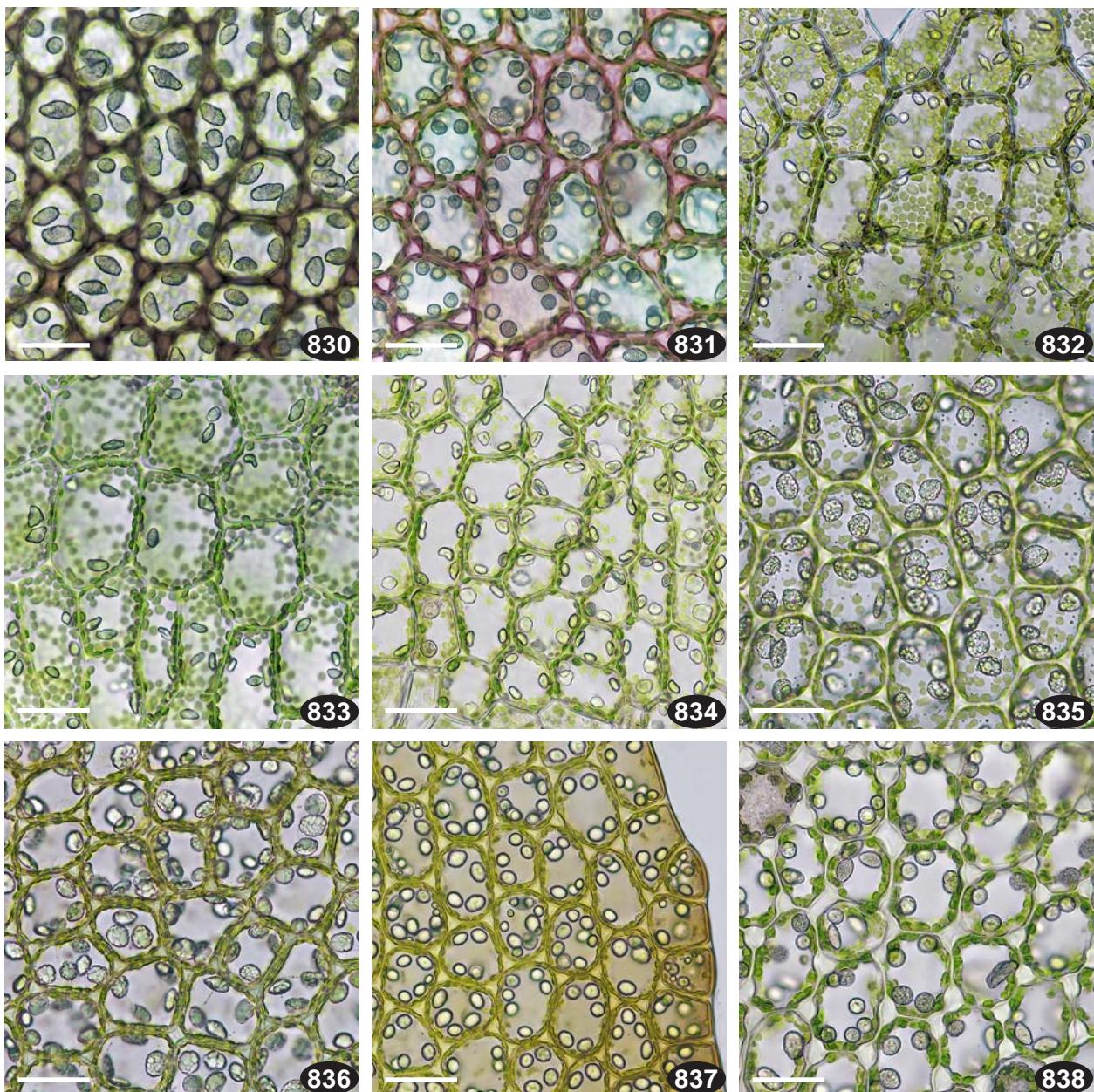
Fig. 826: Oil bodies 4–6 per cell, spherical, 4–6 µm in diameter, oblong 6–10(12)×4–6 µm, finely granulate – CHINA, YUNNAN PROVINCE, Bakalin, c-86-11-18.

Mesoptychia rutheana (Limpr.) L.Söderstr. et Váňa

Fig. 827: Oil bodies 3–4(–6) per cell, spherical, 6–8 µm in diameter, oblong 8–15×5–6 µm, finely granulate – RUSSIA, KAMCHATKA TERRITORY, Bakalin, k-58-11-15.

Fig. 828: Oil bodies 4–8(9) per cell, spherical, 5–9 µm in diameter, oblong 7–16×5–6 µm, granulate – RUSSIA, KHABAROVSK TERRITORY, Bakalin & Klimova, kh-59-5-19.

Fig. 829: Oil bodies 4–6 per cell, spherical, 5–8 µm in diameter, oblong 6–16×5–8 µm, finely granulate, brownish – RUSSIA, MAGADAN PROVINCE, Bakalin, mag-29-32-14_2.



Mesoptchia rutheana (Limpr.) L.Söderstr. et Váň

Fig. 830: Oil bodies 4–8 per cell, spherical, 5–8 µm in diameter, oblong 8–18×5–7 µm, finely granulate – RUSSIA, MAGADAN PROVINCE, Bakalin, mag-29-32-14.

Mesoptchia sahlbergii (Lindb. et Arnell) A.Evans

Fig. 831: Oil bodies 5–13 per cell, spherical, 5–7 µm in diameter, oblong 6–13×4–6 µm, finely granulate, brownish – RUSSIA, MAGADAN PROVINCE, Bakalin, mag-29-38-14.

Mesoptchia ussuriensis (Bakalin) L.Söderstr. et Váň

Fig. 832: Oil bodies (2–)3–6 per cell, spherical, 4–5 µm in diameter, oblong 4–11×3–5 µm, finely granulate – REPUBLIC OF KOREA, GANGWON-DO, Bakalin, kor-64-2-19.

Fig. 833: Oil bodies 2–3(5) per cell, oblong 6–10×3–5 µm, finely granulate, biconcave – RUSSIA, PRIMORSKY TERRITORY, Bakalin, p-11-1-14.

Fig. 834: Oil bodies 2–5(–7) per cell, spherical, 4–8 µm in diameter, oblong 5–9×4–5 µm, nearly smooth, biconcave – RUSSIA, PRIMORSKY TERRITORY, Klimova, prim-156-1-19.

Solenostomataceae

Cryptocolea imbricata R.M.Schust.

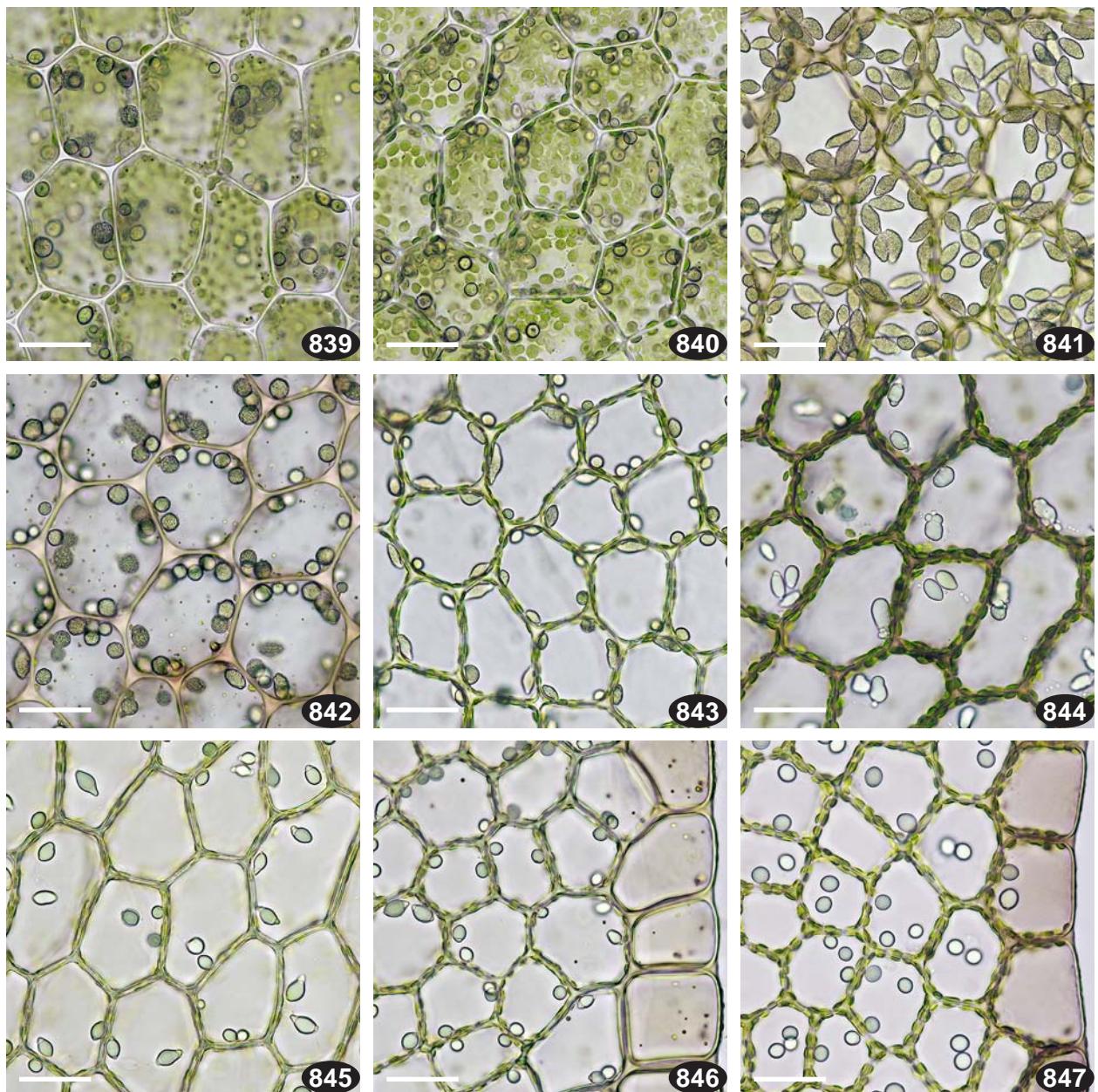
Fig. 835: Oil bodies 4–7 per cell, spherical, 6–12 µm in diameter, oblong 6–13×5–10 µm, coarsely granulate – RUSSIA, KAMCHATKA TERRITORY, Bakalin, k-48-6-15.

Fig. 836: Oil bodies 4–8 per cell, spherical, 5–12 µm in diameter, oblong 6–12×5–10 µm, coarsely granulate to botryoidal – RUSSIA, KAMCHATKA TERRITORY, Bakalin, k-66-17-15.

Fig. 837: Oil bodies 4–10 per cell, spherical, 4–7 µm in diameter, oblong 4–8×6–13 µm, botryoidal – RUSSIA, KHABAROVSK TERRITORY, Bakalin & Klimova, kh-42-3-19.

Diploclea sp.

Fig. 838: Oil bodies (2–)3–6 per cell, spherical, 5–8 µm in diameter, oblong 5–12×5–8 µm, granulate – RUSSIA, SAKHALIN PROVINCE, Bakalin & Klimova, k-47-11-18.



Metasolenostoma ochotense (Bakalin & Vilnet) Vilnet & Bakalin

Fig. 839. – Oil bodies 4–9(12) per cell, spherical, 4–10 µm in diameter, oblong 6–12×4–6(7) µm, finely granulate, brownish – RUSSIA, KAMCHATKA TERRITORY, Chernyagina, 29082017_5.

Fig. 840. – Oil bodies 5–9(10) per cell, spherical, 4–6 µm in diameter, oblong 6–12×4–5 µm, finely granulate, brownish – RUSSIA, KAMCHATKA TERRITORY, Chernyagina, 29082017_9.

Fig. 841. – Oil bodies 7–13 per cell, rarely spherical, 6–8 µm in diameter, oblong 8–20×5–7 µm, granulate, brownish – RUSSIA, SAKHALIN PROVINCE, Bakalin, s-15-15-17.

Fig. 842. – Oil bodies 8–15 per cell, spherical, 5–8 µm in diameter, oblong 8–15×5–7 µm, granulate, brownish – RUSSIA, SAKHALIN PROVINCE, Bakalin, s-15-15-17_2.

Fig. 843: Oil bodies 3–7 per cell, spherical, 4–5 µm in di-

ameter, oblong 6–15×4–6 µm, finely granulate, brownish – RUSSIA, SAKHALIN PROVINCE, Bakalin, s-84-2-15.

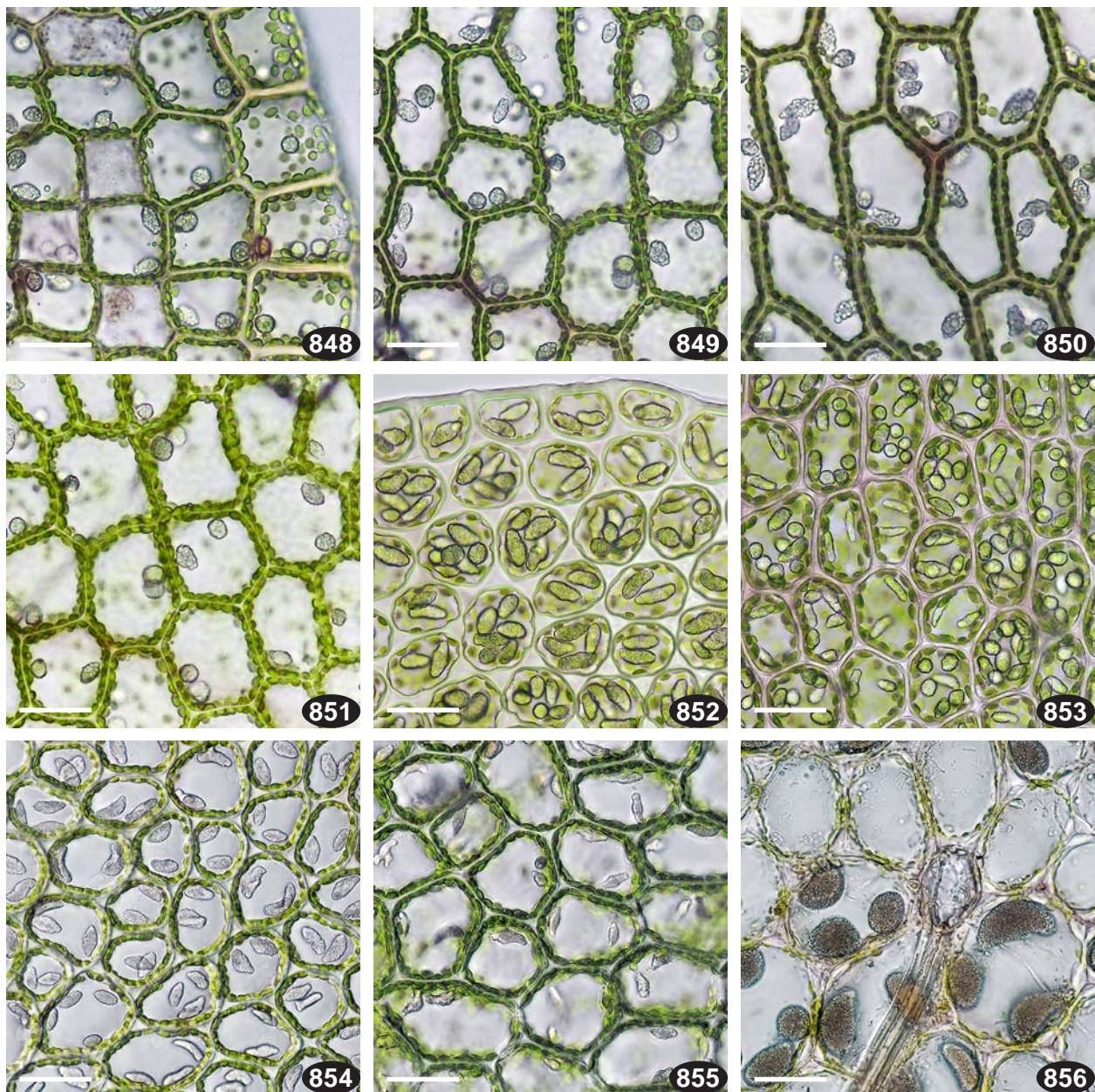
Metasolenostoma orientale Bakalin & Vilnet

Fig. 844: Oil bodies 2–5 per cell, oblong 8–20×5–8 µm, segmented – RUSSIA, SAKHALIN PROVINCE, Bakalin, k-79-11-15.

Fig. 845: Oil bodies 2(–3) per cell, spherical, 5–7 µm in diameter, oblong 7–14×5–7 µm, nearly smooth with very large central eye – RUSSIA, KAMCHATKA TERRITORY, Klimova, kam-66-12-16.

Fig. 846: Oil bodies 2–3 per cell, spherical, 5–8 µm in diameter, oblong 6–10(14)×4–6 µm, smooth, with very large eye – RUSSIA, KAMCHATKA TERRITORY, Klimova, kam-66-13-16.

Fig. 847: Oil bodies (1–)2–3 per cell, spherical, 5–8 µm in diameter, oblong 6–10×5–8 µm, smooth – RUSSIA, KAMCHATKA TERRITORY, Klimova, kam-66-8-16.



Metasolenostoma rubripunctatum (S. Hatt.) Vilnet & Bakalin

Fig. 848: Oil bodies 2–4 per cell, spherical, 7–9 µm in diameter, oblong 8–15×(6)–7–9(–10) µm, botryoidal to coarsely granulate – JAPAN, KOCHI PREFECTURE, Bakalin, j-8-25-15.

Fig. 849: Oil bodies 2–3 per cell, spherical, 6–10 µm in diameter, oblong 8–14×6–9 µm, coarsely granulate – JAPAN, KOCHI PREFECTURE, Bakalin, j-8-25-15_9.

Fig. 850: Oil bodies (1–)2 per cell, spherical, 6–8 µm in diameter, oblong 8–12×5–8 µm, coarsely granulate – JAPAN, KOCHI PREFECTURE, Bakalin, j-8-25-15_10.

Fig. 851: Oil bodies (1–)2 per cell, spherical, (6)–8–10 µm in diameter, oblong 8–14×7–9 µm, coarsely granulate – JAPAN, KOCHI PREFECTURE, Bakalin, j-8-25-15_2.

Fig. 852: Oil bodies 2–6(–8) per cell, spherical, 5–7 µm in diameter, oblong 7–20×5–8 µm, granulate, brownish – VIETNAM, LAI CHAU PROVINCE, Bakalin & Klimova, v-17-6-19_2.

Fig. 853: Oil bodies (2)–5–7 per cell, spherical, 5–7 µm in diameter, oblong 7–15(–20)×5–6 µm, granulate, rarely with

eye – VIETNAM, LAI CHAU PROVINCE, Bakalin & Klimova, v-17-6-19.

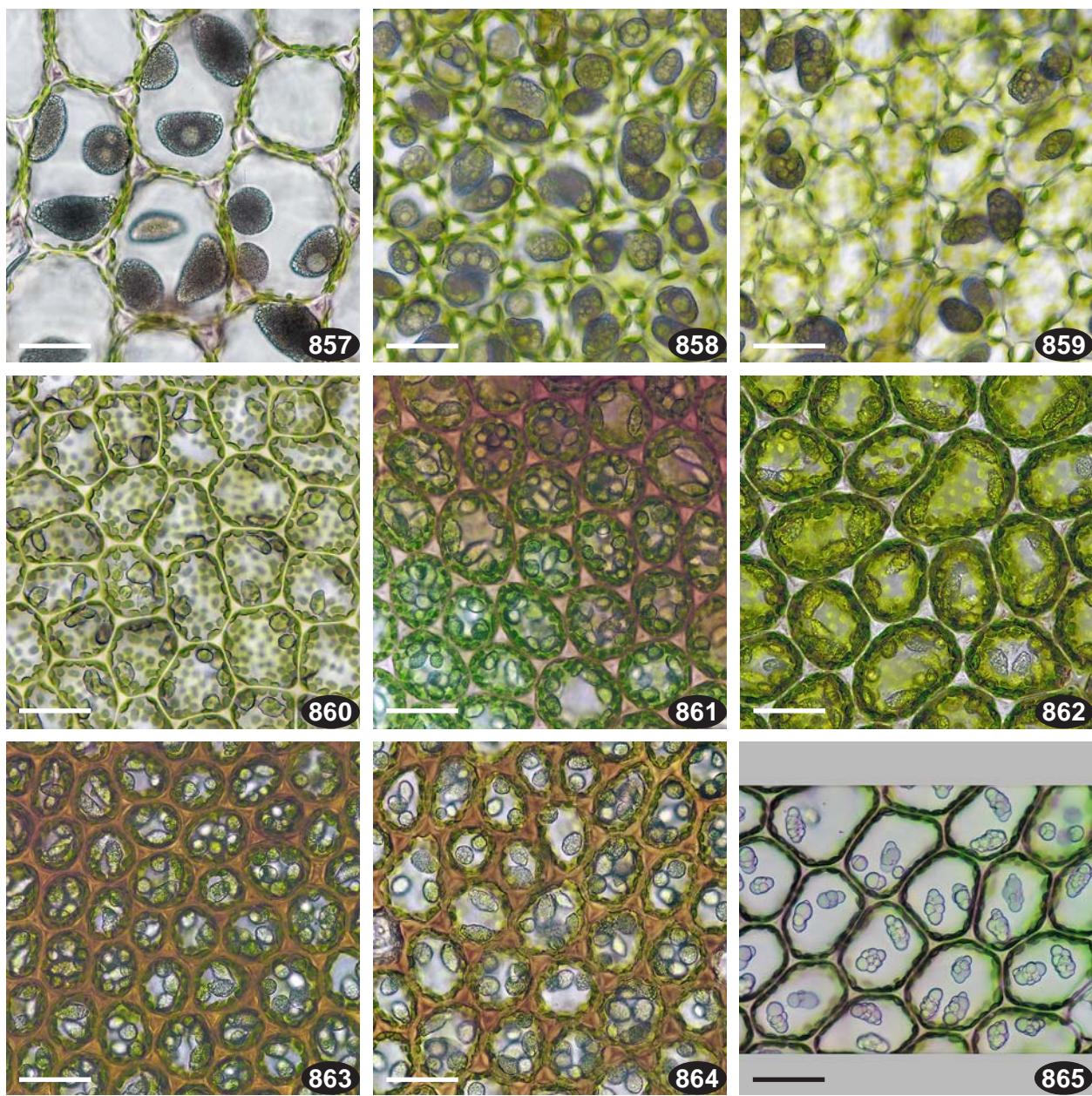
Fig. 854: Oil bodies 2–3(–4) per cell, oblong 7–18×4–8 µm, finely granulate – VIETNAM, CAO BANG PROVINCE, Bakalin & Klimova, v-25-10-20.

Fig. 855: Oil bodies (1)–2(–3) per cell, rarely spherical, 5 µm in diameter, oblong 6–17×4–6 µm, finely granulate – VIETNAM, CAO BANG PROVINCE, Bakalin & Klimova, v-25-5-20.

Comment: The strong differences in oil bodies and cell features between Japanese and Vietnamese populations suggest taxonomic differences between them too. Noticeable, the both groups of populations (haplotypes?) are characterized by similar purple gemmae that prevent the mistake with other recognized species of the family.

Plectocolea ariadne (Taylor) Mitt.

Fig. 856: Oil bodies 0–3 per cell, rarely spherical, 14 µm in diameter, oblong 18–35×10–18 µm, granulate, brownish – VIETNAM, HA GIANG PROVINCE, Bakalin & Klimova, v-19-2-20_3.



Plectocolea ariadne (Taylor) Mitt.

Fig. 857: Oil bodies (0–)2–3 per cell, rarely spherical, 19–20 µm in diameter, oblong 18–35×12–22 µm, granulate, some with 1(–2) unclear eyes, brownish – VIETNAM, HA GIANG PROVINCE, Bakalin & Klimova, v-19-2-20_6.

Plectocolea comata S. Hatt.

Fig. 858: Oil bodies (1–)2(–3) per cell, spherical, 10–18 µm in diameter, oblong 12–28×10–16 µm, coarsely granulate, with 1–several eyes, brownish – REPUBLIC OF KOREA, JEJU-DO, Bakalin, kor-30-57-15-4.

Fig. 859: Oil bodies 0–2 per cell, oblong 12–27×8–17 µm, coarsely granulate, with 1–several eyes, brownish – REPUBLIC OF KOREA, JEJU-DO, Bakalin, kor-30-57-15-6.

Plectocolea emarginata Amakawa

Fig. 860: Oil bodies 1–4 per cell, spherical, 7–10 µm in diameter, oblong 6–15×5–9 µm, finely granulate, sometimes biconcave – REPUBLIC OF KOREA, JEJU-DO, Bakalin, kor-29-39-15.

Plectocolea erecta Amakawa

Fig. 861: Oil bodies 5–10(–13) per cell, spherical, 4–7 µm in diameter, oblong 6–15(–17)×5–6 µm, granulate – REPUBLIC OF KOREA, Bakalin, kor-43-8-14.

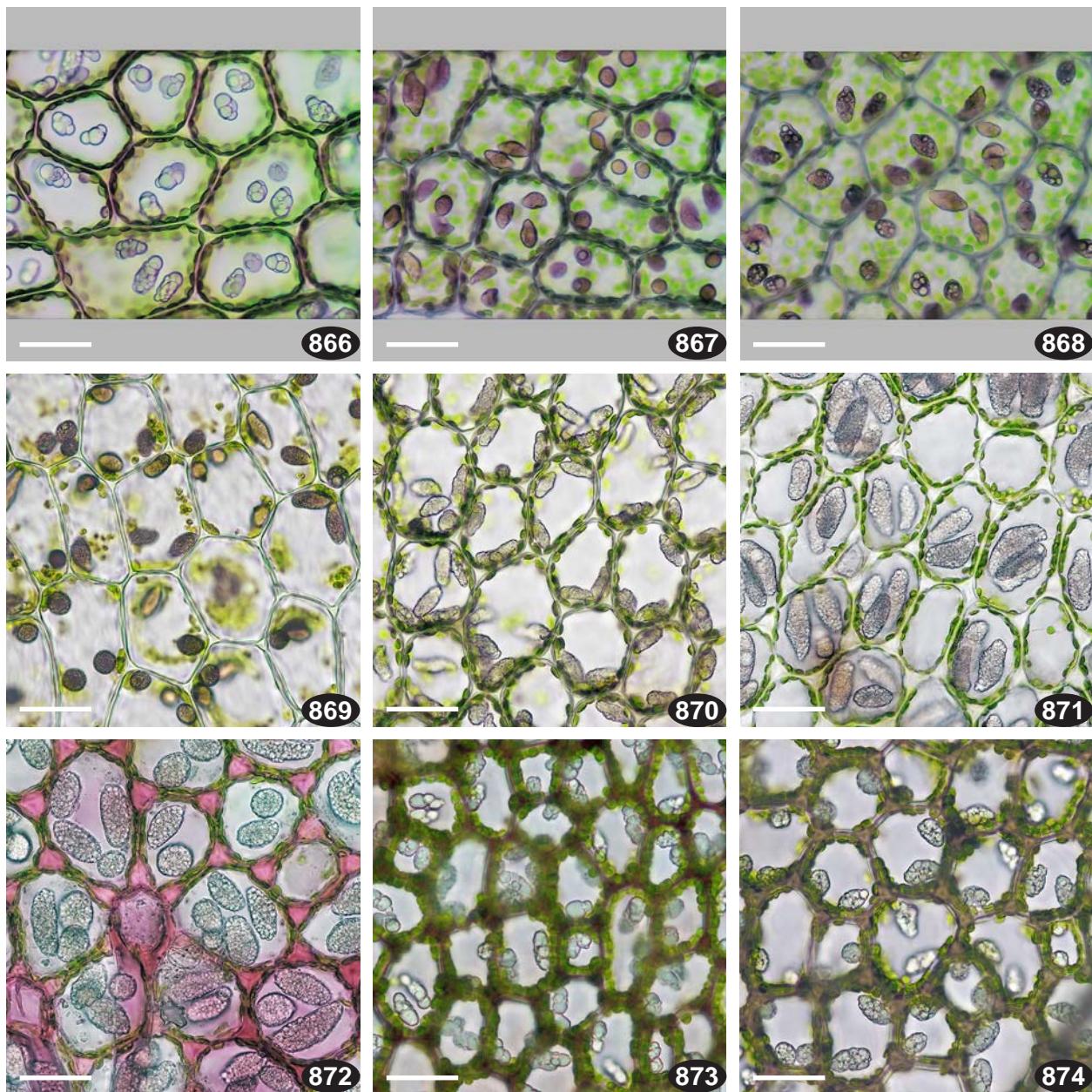
Fig. 862: Oil bodies 2–6(–8) per cell, spherical, (5)–6–8 µm in diameter, oblong 7–22×5–7 µm, granulate – REPUBLIC OF KOREA, JEOLLABUK-DO, Bakalin, kor-73-8-19.

Fig. 863: Oil bodies (2–)3–7(–9) per cell, spherical, 5–8 µm in diameter, oblong 8–18×5–8 µm, finely granulate to coarsely so – VIETNAM, LAO CAI PROVINCE, Bakalin, v-2-92-16.

Fig. 864: Oil bodies 3–5(–8) per cell, spherical, 5–7 µm in diameter, oblong 6–12(–16)×5–7(–10) µm, granulate – VIETNAM, LAO CAI PROVINCE, Bakalin, v-2-97-16.

Plectocolea flagellata S. Hatt.

Fig. 865: Oil bodies 2–3(–4) per cell, rarely spherical, 6–9 µm in diameter, oblong 8–18×7–10 µm, botryoidal – JAPAN, KAGOSHIMA PREFECTURE, Furuki, CBM.



Plectocolea flagellata S. Hatt.

Fig. 866. – Oil bodies 2–3 per cell, rarely spherical, 9–10 µm in diameter, oblong 11–20×8–11 µm, botryoidal – JAPAN, KAGOSHIMA PREFECTURE, Furuki, CBM_2.

Plectocolea granulata (Steph.) Bakalin

Fig. 867. – Oil bodies 2–4 per cell, rarely spherical, 7–8 µm in diameter, oblong 8–22×7–8 µm, finely granulate, brownish, rarely with eye – JAPAN, KAGOSHIMA PREFECTURE, Furuki, Furuki23500 CBM_3.

Fig. 868. – Oil bodies 2–3 per cell, rarely spherical, 10 µm in diameter, oblong 10–20×7–10 µm, finely granulate, brownish, some with 1–several eyes – JAPAN, KAGOSHIMA PREFECTURE, Furuki, Furuki23500 CBM_5.

Fig. 869. – Oil bodies 3–4 per cell, spherical, 8–10 µm in diameter, oblong 8–17(–20)×6–8(–10) µm, granulate, brownish – JAPAN, YAMANASHI PREFECTURE, Bakalin, j-91-13-15.

Fig. 870: Oil bodies (2–)4–8 per cell, spherical, 5–7 µm in diameter, oblong 8–20×5–6(–7) µm, granulate, brownish

– VIETNAM, LAO CAI PROVINCE, Bakalin & Klimova, v-2-10-17.

Plectocolea haskarliana (Nees) Mitt.

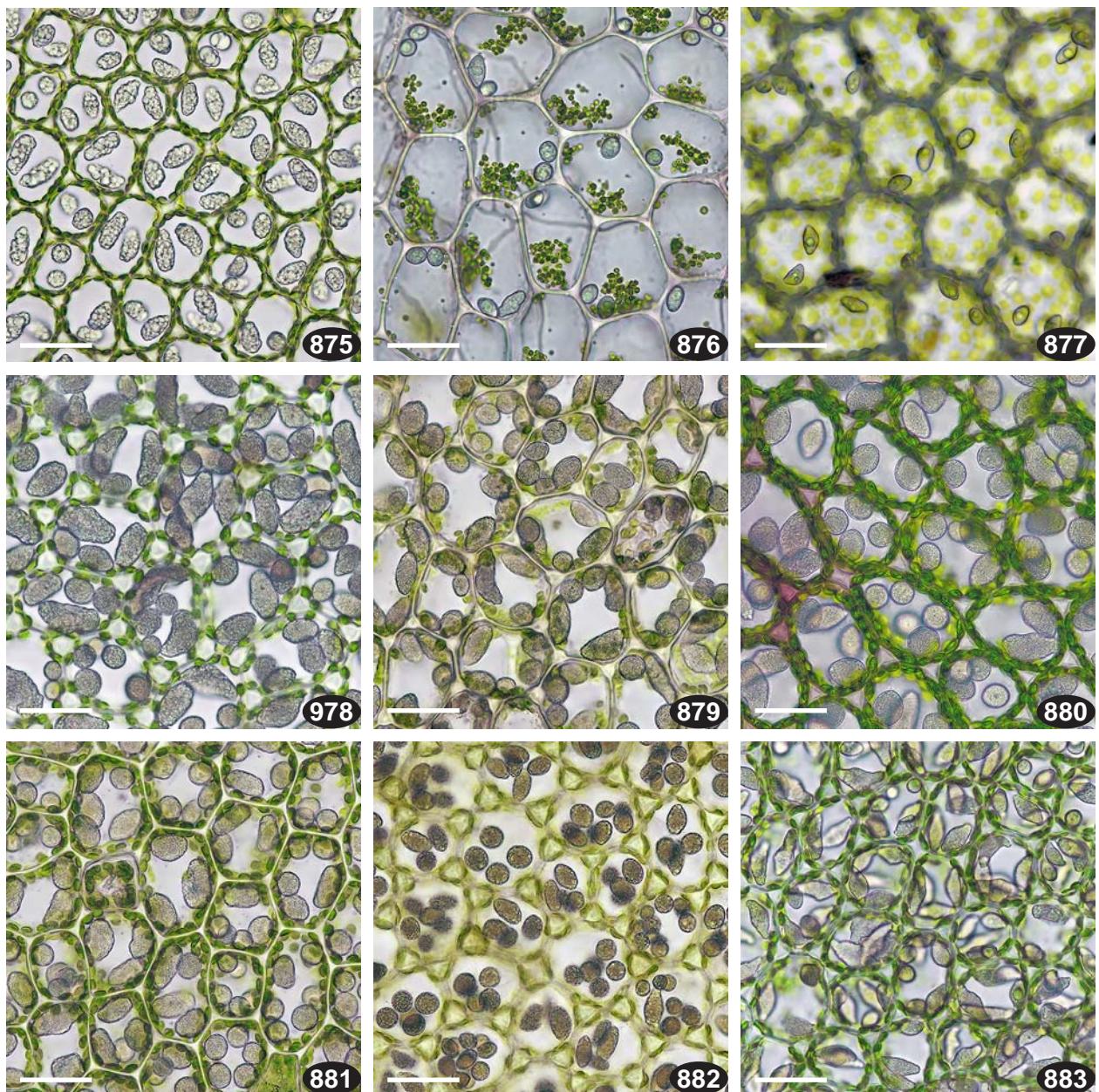
Fig. 871: Oil bodies 0–5 per cell, rarely spherical, 8–10 µm in diameter, oblong 13–30×7–11 µm, coarsely granulate – VIETNAM, HA GIANG PROVINCE, Bakalin & Klimova, v-1-1-20.

Fig. 872: Oil bodies (0–)2–5 per cell, spherical, 11–18 µm in diameter, oblong 14–30×10–15 µm, coarsely granulate, rarely with 1–2 unclear eyes – VIETNAM, CAO BANG PROVINCE, Bakalin & Klimova, v-22-6-20.

Plectocolea hattoriana Amakawa

Fig. 873: Oil bodies 2(–4) per cell, oblong 10–20 × 7–10 µm, botryoidal – RUSSIA, SAKHALIN PROVINCE, Bakalin, k-78-38-15.

Fig. 874: Oil bodies 2 per cell, spherical, 9–12 µm in diameter, oblong 10–16(–18)×9–12 µm, coarsely granulate to botryoidal – RUSSIA, SAKHALIN PROVINCE, Bakalin, k-78-13-15.



Plectocolea hattoriana Amakawa

Fig. 875: Oil bodies 2 per cell, spherical, 7–9 µm in diameter, oblong 10–20(–24)×6–8 µm, coarsely granulate to botryoidal – RUSSIA, SAKHALIN PROVINCE, Bakalin, s-48-19-16.

Plectocolea horikawana Amakawa

Fig. 876: Oil bodies 2–3 per cell, spherical, 5–9 µm in diameter, oblong 6–14(–17)×6–8 µm, granulate, with central eye – RUSSIA, SAKHALIN PROVINCE, Bakalin, k-80-30-15.

Fig. 877: Oil bodies 2–3 per cell, spherical, 5–6 µm in diameter, oblong 6–16×5–7 µm, finely granulate, with 1(–2) eyes – REPUBLIC OF KOREA, JEJU-DO, Bakalin, kor-30-68-15.

Plectocolea infusca Mitt.

Fig. 878: Oil bodies 3–6(–7) per cell, spherical, 9–14 µm in diameter, oblong 8–28×8–14 µm, granulate, brownish – JAPAN, KOCHI PREFECTURE, Bakalin, j-11-10-15.

Fig. 879: Oil bodies 3–6 per cell, spherical, 8–12 µm in diameter, oblong 10–23×8–12 µm, granulate, brownish – RUS-

SIA, SAKHALIN PROVINCE, Bakalin & Klimova, k-23-18-18.

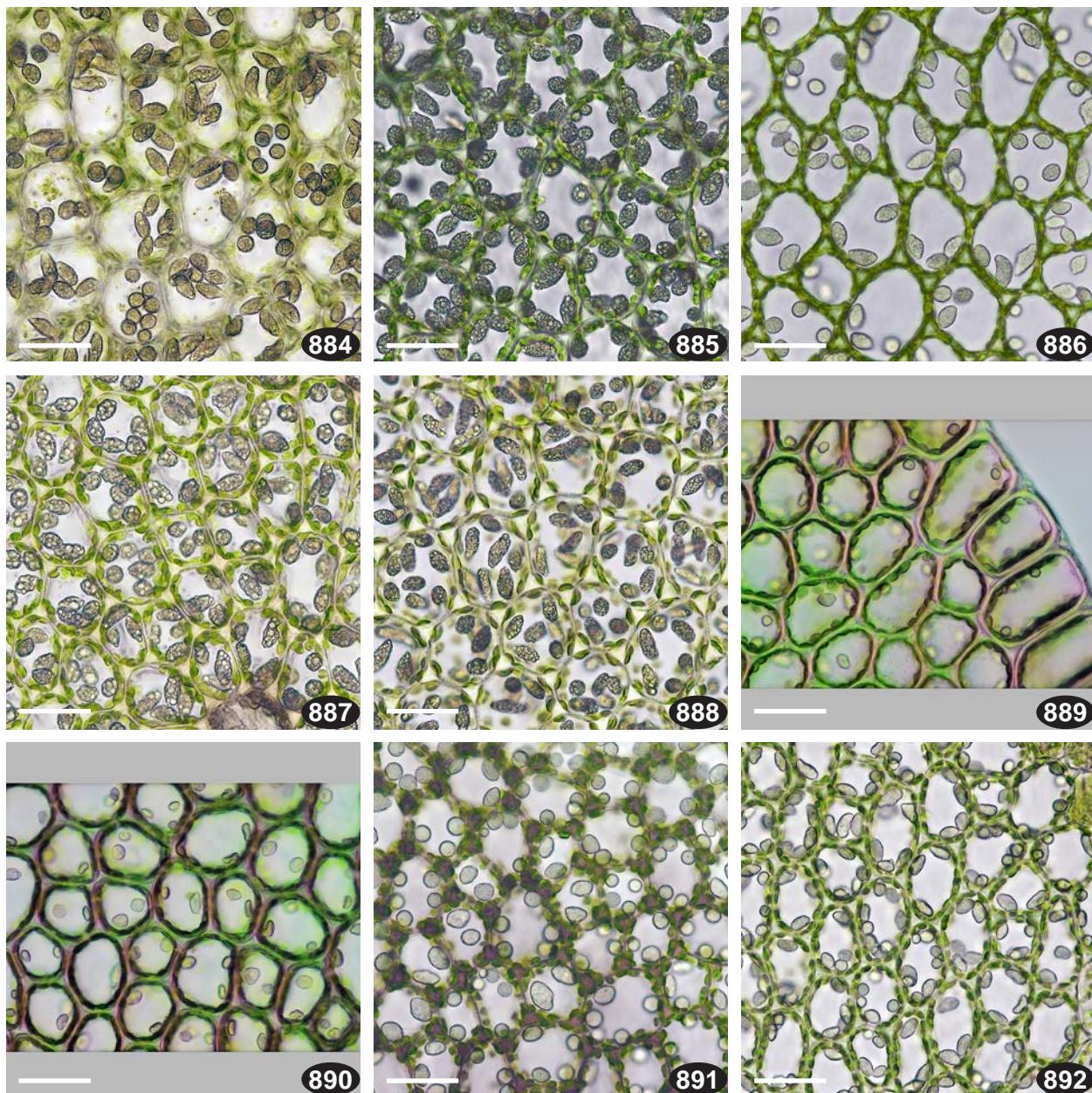
Fig. 880: Oil bodies 3–5 per cell, spherical, 10–13 µm in diameter, oblong 12–25×10–13 µm, finely granulate, brownish – REPUBLIC OF KOREA, GYEONGSANGNAM-DO, Bakalin, kor-70-22-19.

Plectocolea infusca var. *recondita* Bakalin

Fig. 881: Oil bodies 3–6 per cell, spherical, 8–10(–13) µm in diameter, oblong 10–18(–22)×8–11(–15) µm, granulate, brownish – RUSSIA, SAKHALIN PROVINCE, Bakalin & Klimova, k-23-15-18.

Fig. 882: Oil bodies 4–9(–11) per cell, spherical, 5–8 µm in diameter, oblong 7–16(–20)×(5–)6–8 µm, finely granulate, brownish – RUSSIA, SAKHALIN PROVINCE, Bakalin & Klimova, k-57-12-20.

Fig. 883: Oil bodies (3–)6–8 per cell, spherical, 5–7 µm in diameter, oblong 7–18(–22)×5–7 µm, granulate, brownish – RUSSIA, PRIMORSKY TERRITORY, Bakalin, p-37-8-15.



Plectocolea infusca var. *recondita* Bakalin

Fig. 884: Oil bodies 4–8 per cell, spherical, 5–8 µm in diameter, oblong 6–15×5–7 µm, finely granulate to granulate, brownish – RUSSIA, SAKHALIN PROVINCE, Klimova & Bakalin, shik-37-13-20.

Plectocolea kuriensis (Bakalin) Bakalin & Vilnet

Fig. 885: Oil bodies 4–10 per cell, spherical, 5–8 µm in diameter, oblong 10–15(–18)×5–8 µm, coarsely granulate to botryoidal – RUSSIA, SAKHALIN PROVINCE, Bakalin, k-69-16-15_2.

Fig. 886: Oil bodies 2–4 per cell, spherical, 6–7 µm in diameter, oblong 7–15×6–9 µm, granulate – RUSSIA, PRIMORSKY TERRITORY, Bakalin, p-31-2-15.

Fig. 887. – Oil bodies (3–)5–8 per cell, spherical, 6–8 µm in diameter, oblong 8–12(–14)×6–8 µm, botryoidal to coarsely granulate – RUSSIA, SAKHALIN PROVINCE, Bakalin & Klimova, k-34-9-18.

Fig. 888. – Oil bodies 5–8 per cell, spherical, 5–8 µm in diameter, oblong 7–15×5–7 µm, coarsely granulate – RUSSIA,

SAKHALIN PROVINCE, Bakalin, k-71-39-15.

Plectocolea marginata S. Hatt.

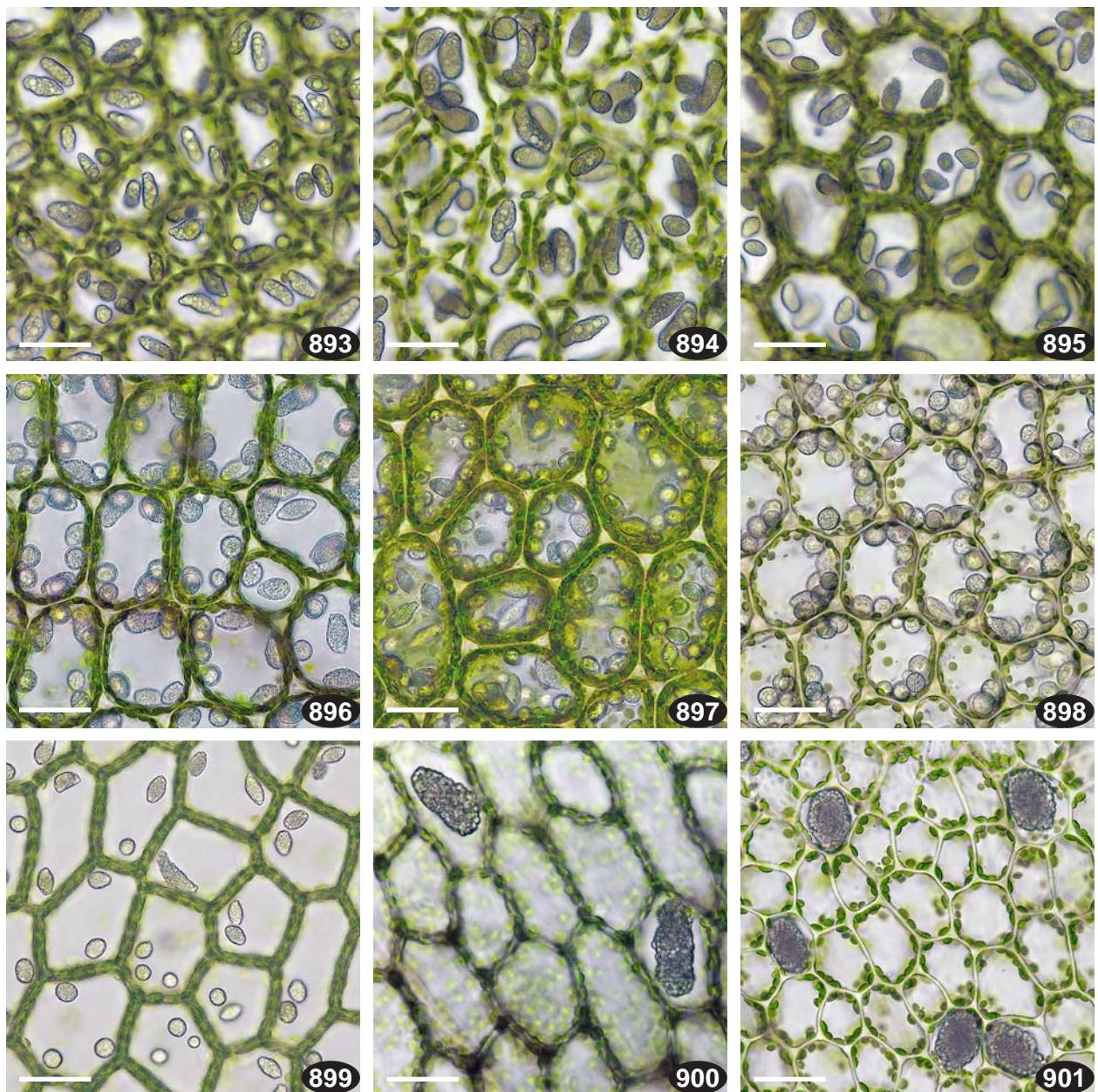
Fig. 889. – Oil bodies in the leaf margin cells 2–3 per cell, spherical, (4–)5–6 µm in diameter, oblong 5–9×4–6 µm, finely granulate to nearly smooth – JAPAN, KAGOSHIMA PREFECTURE, Furuki, CBM 2-3.

Fig. 890. – Oil bodies 2–3 per cell, spherical, (4–)5–7 µm in diameter, oblong 5–10×(3–)4–6 µm, finely granulate to nearly smooth – JAPAN, KAGOSHIMA PREFECTURE, Furuki, CBM 2-3_3.

Plectocolea ovalifolia (Amakawa) Bakalin & Vilnet

Fig. 891: Oil bodies 3–7 per cell, spherical, 5–6 µm in diameter, oblong 6–15(–18)×5–10 µm, granulate – RUSSIA, KHABAROVSK TERRITORY, Bakalin, kh-22-6-16.

Fig. 892: Oil bodies 5–9 per cell, spherical, (3–)4–5 µm in diameter, oblong 6–11(–13)×4–5 µm, finely granulate – RUSSIA, KHABAROVSK TERRITORY, Bakalin, kh-31-18-16.



Plectocolea radicellosa (Mitt.) Mitt.

Fig. 893: Oil bodies 2–4 per cell, spherical, (5–)6–8 µm in diameter, oblong (6–)8–16×6–8 µm, coarsely mgranulate, with 1–several eyes – REPUBLIC OF KOREA, JEJU-DO, Bakalin, kor-30-53-15.

Fig. 894: Oil bodies 2–6(–8) per cell, spherical, 8–12 µm in diameter, oblong 10–27×7–11 µm, granulate to coarsely so, with 1–several eyes – REPUBLIC OF KOREA, JEJU-DO, Bakalin, kor-30-64-15.

Plectocolea rosulans (Steph.) S. Hatt.

Fig. 895: Oil bodies 3–6 per cell, rarely spherical, 5–6 µm in diameter, oblong 7–18×5–10 µm, finely granulate – REPUBLIC OF KOREA, GYEONGSANGNAM-DO, Bakalin, kor-23-3-15.

Fig. 896: Oil bodies 7–10 per cell, spherical, 6–8 µm in diameter, oblong 7–18×6–9 µm, granulate – REPUBLIC OF KOREA, JEOLLABUK-DO, Bakalin, kor-73-2-19.

Fig. 897: Oil bodies 8–12 per cell, spherical, (5–)6–8 µm in diameter, oblong 7–19×(5–)6–8 µm, granulate – REPUBLIC OF KOREA, JEOLLABUK-DO, Bakalin, kor-80-4-19.

Fig. 898: Oil bodies 5–10 per cell, spherical, 8–10 µm in diameter, oblong 10–15(–18)×8–10 µm, granulate – VIET-NAM, LAO CAI PROVINCE, Bakalin & Klimova, v-1-46-17.

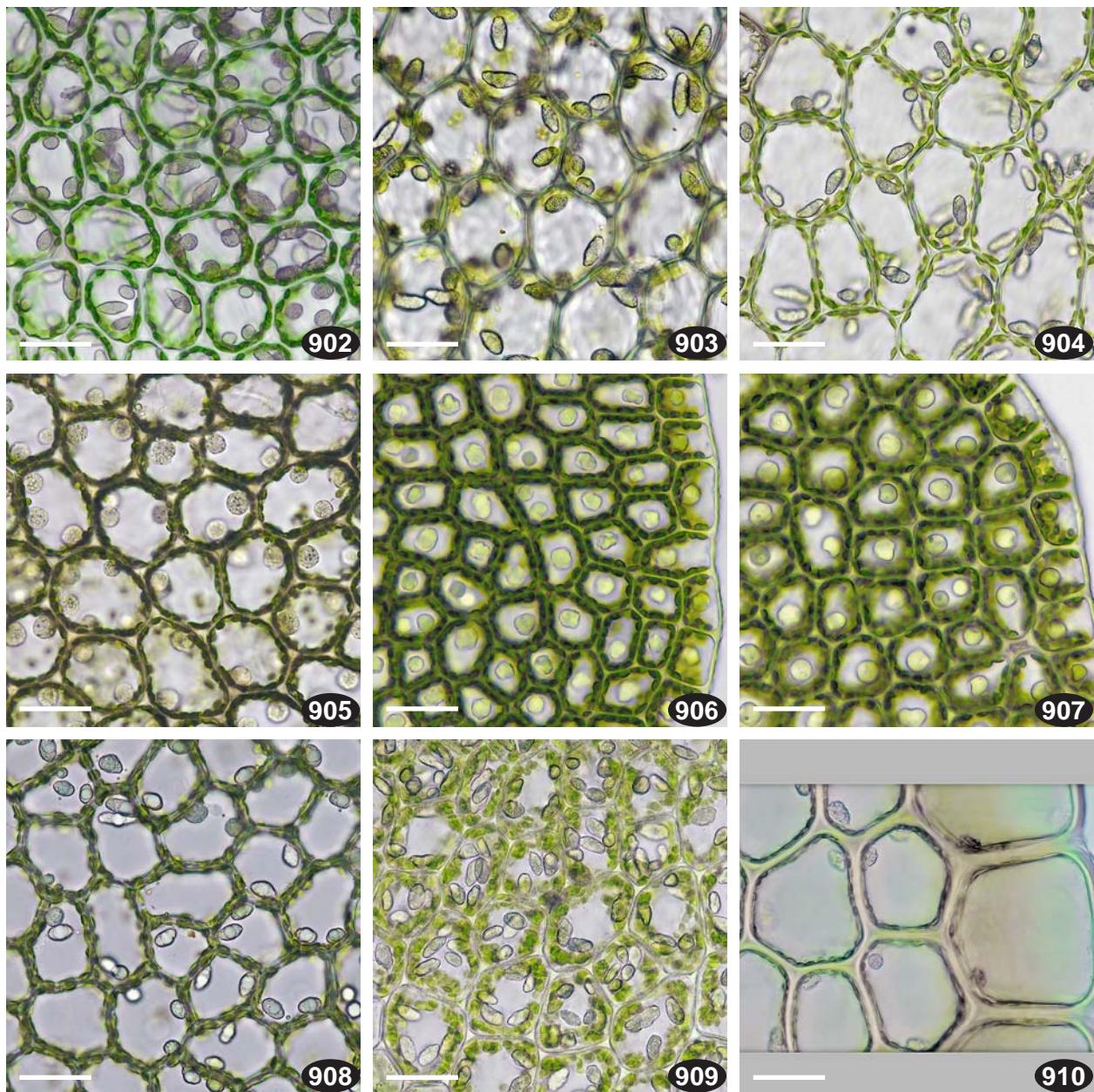
Plectocolea sordida S. Hatt.

Fig. 899: Oil bodies (1–)2(–3) per cell, spherical, 6–8 µm in diameter, oblong (8–)10–14(–18)×6–8 µm, granulate – VIET-NAM, HOA BINH PROVINCE, Bakalin & Klimova, v-29-13-19.

Plectocolea tetragona (Lindenb.) Amakawa

Fig. 900: Oil bodies 1 per oil cell, spherical, oblong 34–40×12–20 µm, coarsely granulate – INDONESIA, JAVA ISLAND, Bakalin, java-1-1-15.

Fig. 901: Oil bodies 1 per oil cell, spherical, oblong 22–34×12–18 µm, coarsely granulate – VIETNAM, LAO CAI PROVINCE, Bakalin & Klimova, v-3-2-17.



Plectocolea truncata (Nees) Herzog

Fig. 902: Oil bodies 3–5 per cell, spherical, 5–7(–7) µm in diameter, oblong 10–20(–25)×5–6 µm, finely granulate – CHINA, GUIZHOU PROVINCE, Bakalin, china-56-66-13.

Fig. 903: Oil bodies 2–4(–6) per cell, spherical, 6–8 µm in diameter, oblong (8–)10–17(–19)×5–8 µm, granulate – JAPAN, YAMANASHI PREFECTURE, Bakalin, j-91-42-15.

Fig. 904: Oil bodies 2–5 per cell, oblong (8–)10–18(–22)×(4–)5–6 µm, granulate – VIETNAM, LAO CAI PROVINCE, Bakalin & Klimova, v-2-4-17.

Plectocolea virgata Mitt.

Fig. 905: Oil bodies 2(–4) per cell, spherical, (7–)8–10(–12) µm in diameter, as crumbling paper ball – JAPAN, YAMANASHI PREFECTURE, Bakalin, j-91-64-15.

Fig. 906: Oil bodies 1–2 per cell, spherical, 6–10 µm in diameter, oblong 8–13×7–9(–11) µm, crumpled – REPUBLIC OF KOREA, JEJU-DO, Bakalin, kor-29-21-15.

Fig. 907: Oil bodies 1(–2) per cell, spherical, 7–10 µm in diameter, crumpled to nearly smooth, with small central eye – REPUBLIC OF KOREA, JEJU-DO, Bakalin, kor-30-47-15.

Plectocolea vulcanicola (Schiffn.) Bakalin

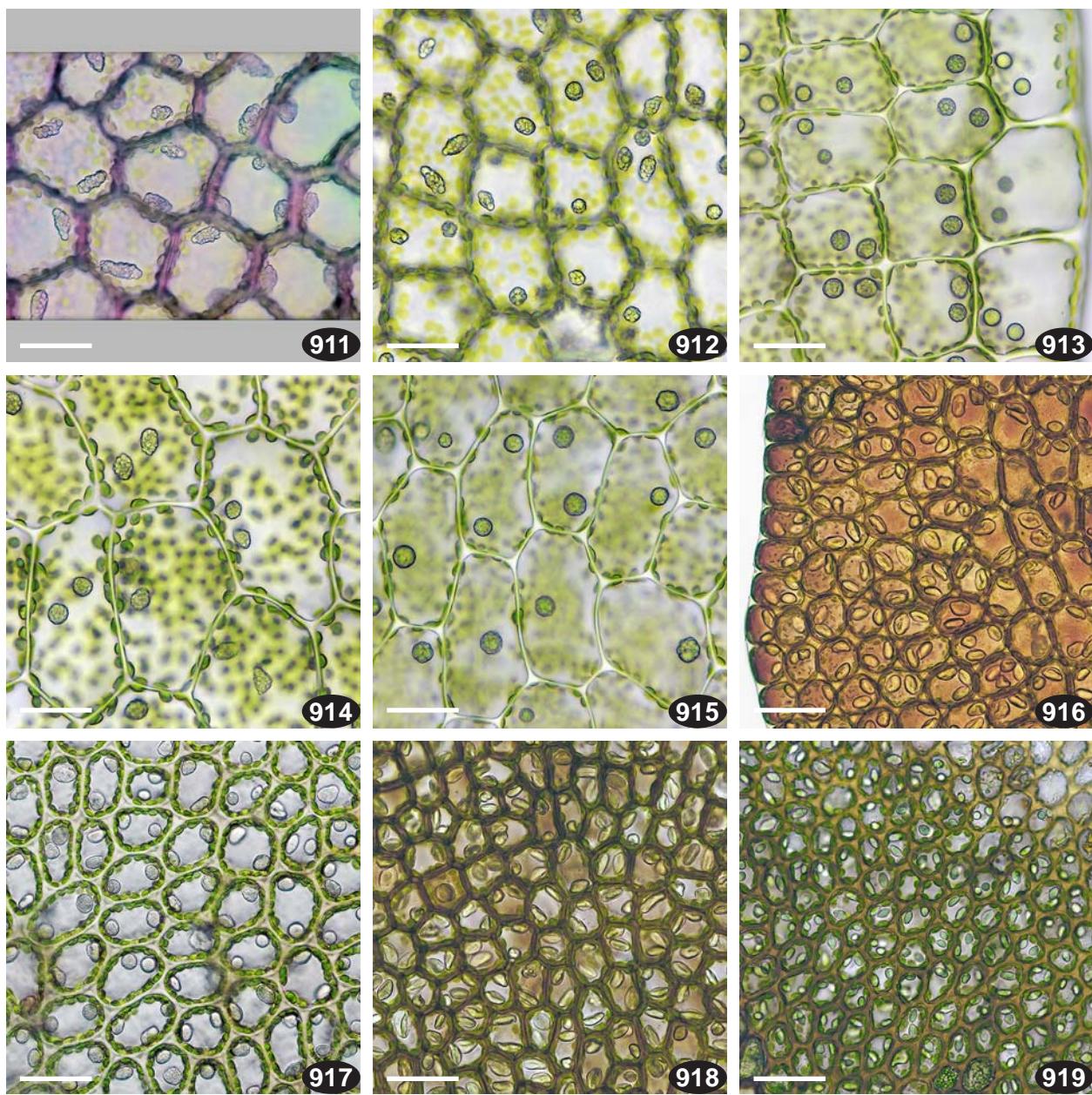
Fig. 908: Oil bodies 2–3 per cell, spherical, 5–7 µm in diameter, oblong 7–18×4–6 µm, granulate, with central eye – RUSSIA, SAKHALIN PROVINCE, Bakalin & Borovichev, exs1 goryachaya river.

Plectocolea yunnanensis Bakalin

Fig. 909: Oil bodies 6–10 per cell, oblong (6–)8–16(–20)×(4–)5–8 µm, granulate – CHINA, YUNNAN PROVINCE, Bakalin, c-78-3-18.

Protosolenostoma fusiforme (Steph.) Vilnet & Bakalin

Fig. 910: Oil bodies in the leaf margin 1–2 per cell, rarely spherical, 7–12 µm in diameter, oblong 8–14×5–9 µm, coarsely granulate – JAPAN, KAGOSHIMA PREFECTURE, Furuki, CBM_3.



Protosolenostoma fusiforme (Steph.) Vilnet & Bakalin

Fig. 911: Oil bodies 2–3 per cell, rarely spherical, 6–7 µm in diameter, oblong 10–16×6–7 µm, coarsely granulate – JAPAN, KAGOSHIMA PREFECTURE, Furuki, CBM_4.

Fig. 912: Oil bodies 1–2 per cell, spherical, 6–10 µm in diameter, coarsely granulate to botryoidal – REPUBLIC OF KOREA, JEJU-DO, Bakalin, kor-29-46-15_22.

Fig. 913: Oil bodies 1–2 per cell, spherical, 6–8 µm in diameter, rarely oblong 10–12×6–7 µm, coarsely granulate to botryoidal – REPUBLIC OF KOREA, JEJU-DO, Bakalin, kor-29-46-15_3.

Fig. 914: Oil bodies (1–)2 per cell, spherical, (5–)6–8 µm in diameter, oblong 7–15×6–8 µm, coarsely granulate to botryoidal – REPUBLIC OF KOREA, JEJU-DO, Bakalin, kor-29-46-15_6.

Fig. 915: Oil bodies (1–)2(–3) per cell, spherical, 6–8 µm in diameter, oblong 7–14×6–7 µm, coarsely granulate to botryoidal – REPUBLIC OF KOREA, JEJU-DO, Bakalin, kor-29-59-15_2.

Comment: The populations from Japan and Korea may belong to different species, but this concept was not tested in the course of the present study. The type of *Protosolenostoma* genus is *Solenostoma koreanum* Steph. treated as the heterotypic

synonym of *S. fusiforme*.

Solenostoma appressifolium (Mitt.) Váňa et D.G.Long

Fig. 916: Oil bodies (2–)3–4 per cell, rarely spherical, 5–6 µm in diameter, mostly oblong 6–12×4–7 µm, nearly smooth to finely granulate, mostly biconcave – CHINA, YUNNAN PROVINCE, Bakalin, c-77-22-18.

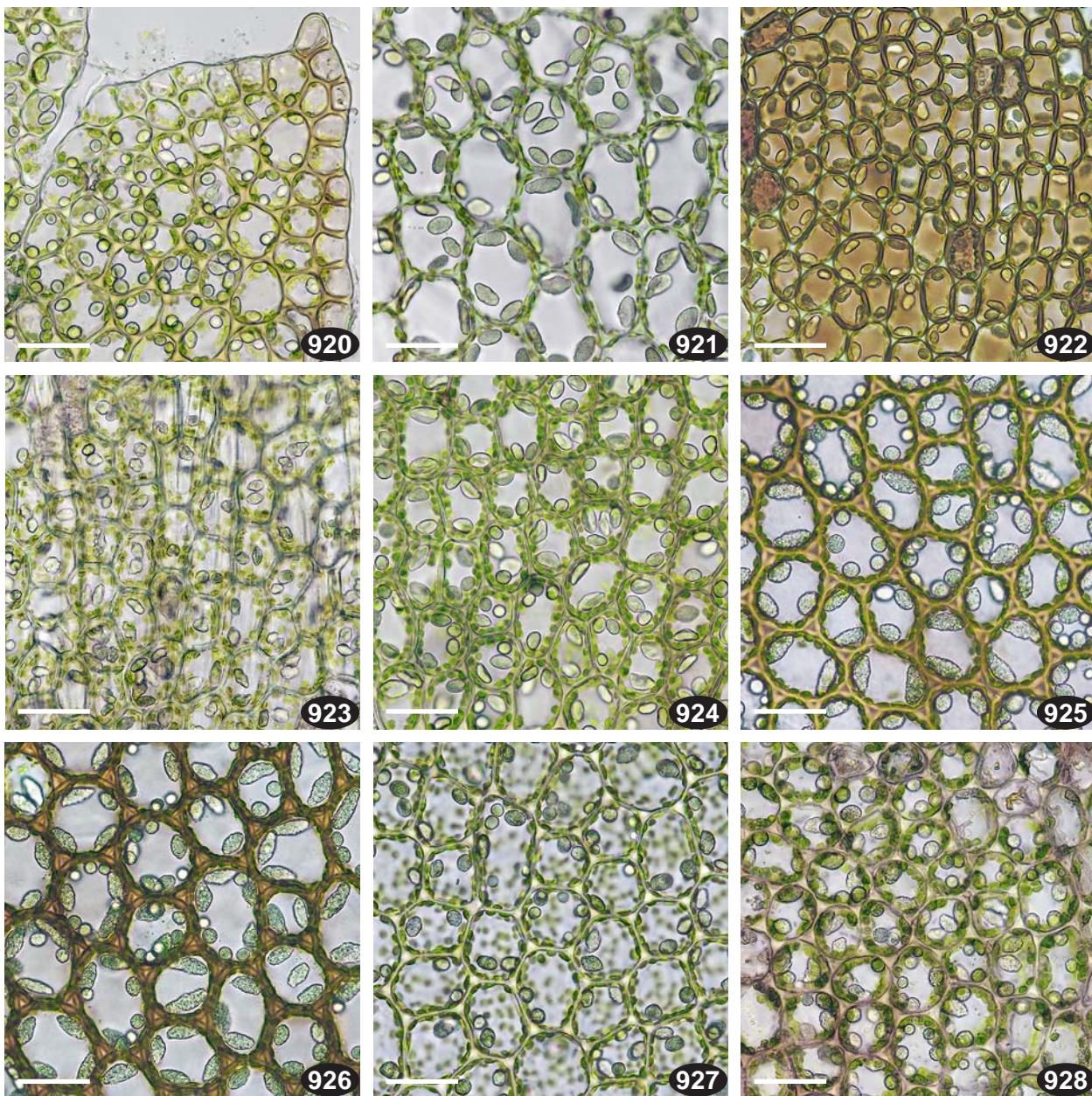
Fig. 917: Oil bodies (1–)2 per cell, spherical, 4–7 µm in diameter, oblong 5–9×4–6 µm, finely granulate – VIETNAM, CAO BANG PROVINCE, Bakalin & Klimova, v-25-5-20.

Solenostoma appressifolium var. *minor* (Amakawa) Váňa et D.G.Long

Fig. 918: Oil bodies (1–)2–3 per cell, rarely spherical, 4–6 µm in diameter, oblong 5–11(–13)×(3–)4–6 µm, nearly smooth to finely granulate, mostly biconcave – CHINA, YUNNAN PROVINCE, Bakalin, c-87-6-18.

Solenostoma atrorevolutum (Grolle ex Amakawa) Váňa et D.G.Long

Fig. 919: Oil bodies (1–)2 per cell, spherical, 3–4 µm in diameter, oblong (3–)4–6×(2–)3–4 µm, finely granulate, some biconcave – CHINA, YUNNAN PROVINCE, Bakalin, c-85-9-18.



Solenostoma bilobum (S.Hatt. ex Amakawa) Potemkin et Nyushko

Fig. 920: Oil bodies 3–5 per cell, spherical, 4–6 µm in diameter, oblong 5–8×4–6 µm, nearly smooth the finely granulate – RUSSIA, SAKHALIN PROVINCE, Bakalin, k-31-6-18.

Solenostoma confertissimum (Nees) Schljakov

Fig. 921: Oil bodies (3–)4–5(–7) per cell, spherical, (4–)5–8 µm in diameter, oblong 6–17×(4–)5–8 µm, finely granulate – RUSSIA, MURMANSK PROVINCE, Bakalin, mur-33-1-15.

Solenostoma flagellare (Amakawa) Váňa et D.G.Long

Fig. 922: Oil bodies 2–3 per cell, spherical, 3–4(–5) µm in diameter, oblong 4–10×(2–)3–4(–5) µm, finely granulate – CHINA, YUNNAN PROVINCE, Bakalin, c-85-7-18.

Solenostoma flavorevolutum (Váňa) Váňa et D.G.Long

Fig. 923: Oil bodies (1–)2–5(–8) per cell, spherical, 4–5 µm in diameter, oblong 4–10(–12)×3–5(–6) µm, finely granulate – CHINA, YUNNAN PROVINCE, Bakalin, c-87-5-18.

Solenostoma gollanii Steph.

Fig. 924. – Oil bodies 2–4 per cell, spherical, 5–8 µm in

diameter, oblong 5–12(–14)×3–8 µm, finely granulate, some bi-concave – CHINA, YUNNAN PROVINCE, Bakalin, c-73-42-18.

Comment: this is not the same taxon with *Plectocolea gollanii* (Steph.) Bakalin treated in the World checklist (Söderström et al., 2016) as *Jungermannia gollanii* Steph. despite the type of the latter belongs to *Plectocolea*, not *Jungermannia* (Bakalin, 2014).

Solenostoma heterolimbatum (Amakawa) Váňa et D.G.Long

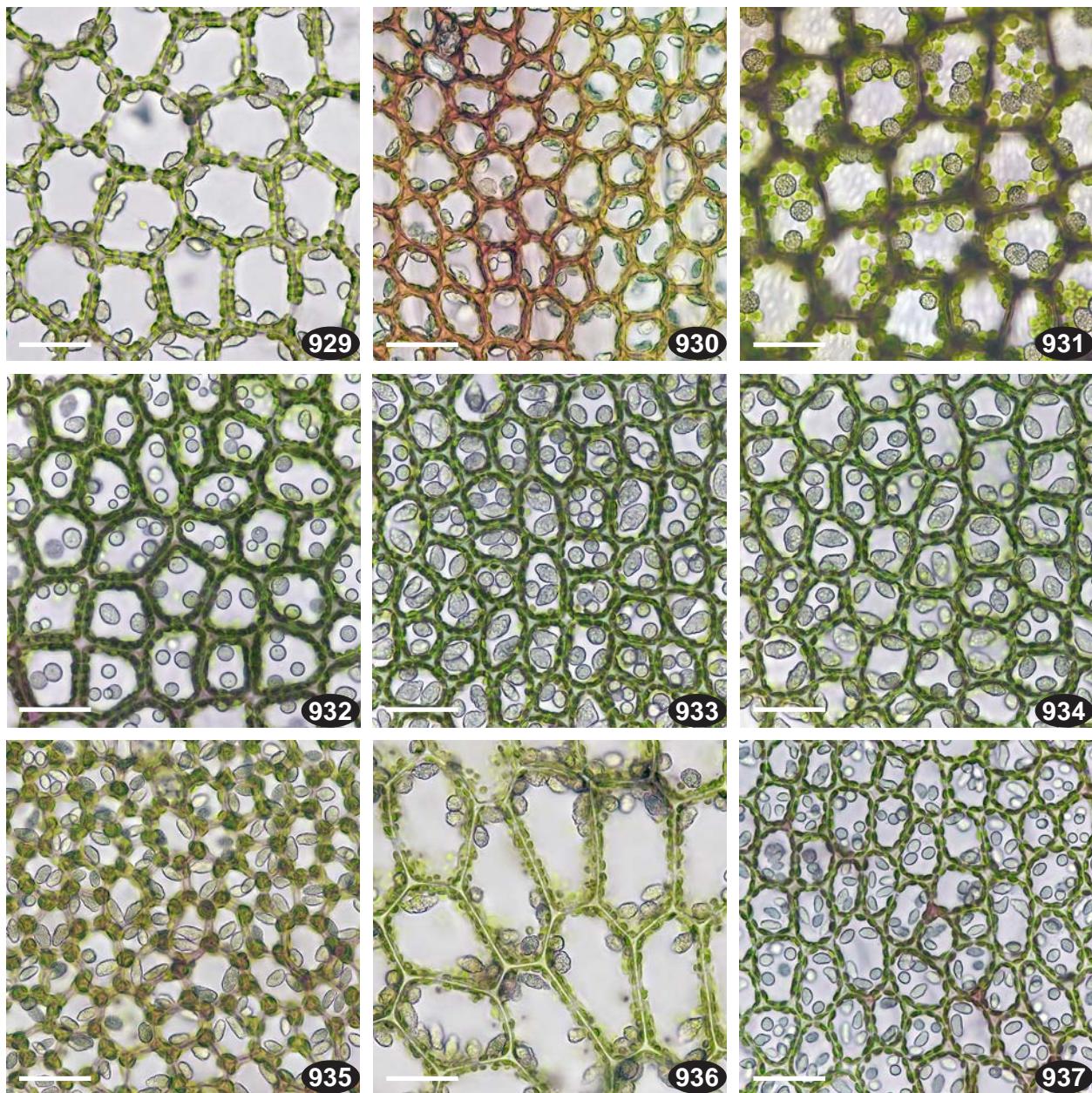
Fig. 925. – Oil bodies 2–10(–14) per cell, spherical, 4–8 µm in diameter, oblong 7–20×5–8 µm, granulate to coarsely so – VIETNAM, LAO CAI PROVINCE, Bakalin, v-2-108-16_5.

Fig. 926. – Oil bodies 3–10(–12) per cell, spherical, 5–8 µm in diameter, oblong 6–20×4–8 µm, granulate to coarsely so – VIETNAM, LAO CAI PROVINCE, Bakalin, v-2-108-16_6.

Solenostoma hokkaidense (Váňa) Váňa

Fig. 927: Oil bodies 2–6 per cell, spherical, 4–6(–7) µm in diameter, oblong 5–10(–12)×4–6 µm, granulate – RUSSIA, SAKHALIN PROVINCE, Bakalin, k-78-28-15.

Fig. 928: Oil bodies 3–6(–10) per cell, spherical, 4–7 µm in diameter, oblong 6–12(–14)×5–8 µm, granulate – RUSSIA, SAKHALIN PROVINCE, Bakalin & Klimova, k-42-10-18.



Solenostoma hyalinum (Lyell) Mitt.

Fig. 929: Oil bodies 3–4(–6) per cell, rarely spherical, 5–6 µm in diameter, oblong 5–16×4–6 µm, finely granulate – RUSSIA, KHABAROVSK TERRITORY, Bakalin, kh-22-12-16.

Solenostoma lanigerum (Mitt.) Váňa et D.G.Long

Fig. 930: Oil bodies 2–3 per cell, spherical, 5–6 µm in diameter, oblong 6–12×3–5 µm, finely granulate, some biconcave – CHINA, YUNNAN PROVINCE, Bakalin, c-87-1-18.

Solenostoma obovatum (Nees) C.Massal.

Fig. 931: Oil bodies (1–)3–4 per cell, spherical, 7–10 µm in diameter, coarsely granulate – RUSSIA, SAKHALIN PROVINCE, Bakalin, k-70-32-15.

Solenostoma obscurum (A.Evans) R.M.Schust.

Fig. 932: Oil bodies (2–)4–9 per cell, spherical, 4–8 µm in diameter, oblong 8–11×6–8 µm, granulate – RUSSIA, MAGADAN PROVINCE, Bakalin, mag-33-15-14.

Fig. 933: Oil bodies (2–)3–6 per cell, spherical, 5–6 µm in diameter, oblong 8–12(–14)×5–9 µm, coarsely granulate –

RUSSIA, PRIMORSKY TERRITORY, Bakalin, p-36-3-14.

Fig. 934: Oil bodies 2–3(–4) per cell, spherical, 5–8 µm in diameter, oblong 7–16×6–10 µm, coarsely granulate – RUSSIA, PRIMORSKY TERRITORY, Bakalin, p-36-3-14_2.

Solenostoma parvitextum (Amakawa) Váňa et D.G.Long

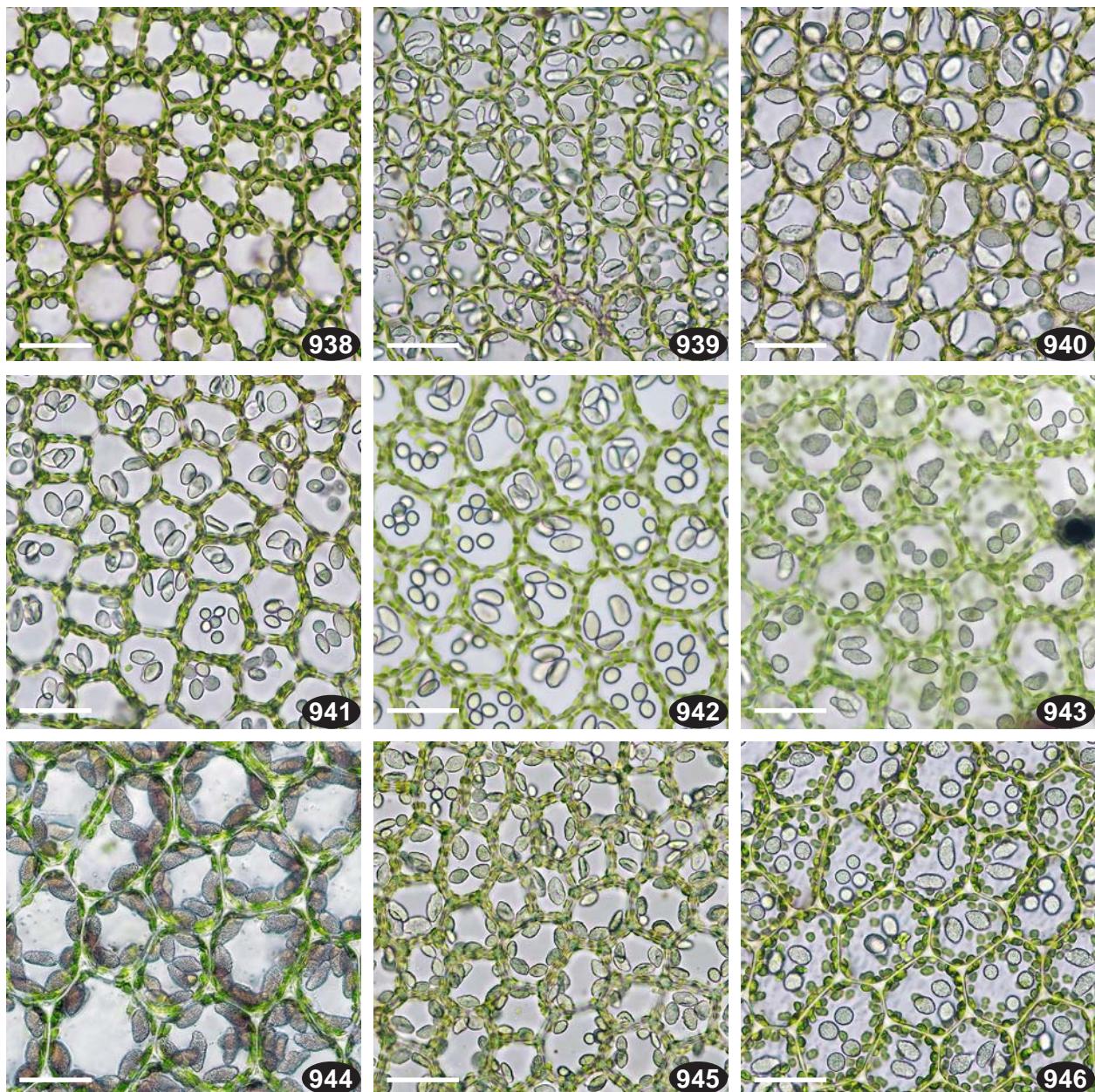
Fig. 935: Oil bodies 2(–)5 per cell, spherical, (4–)5–7 µm in diameter, oblong 5–12(–14)×4–6(–8) µm, granulate – VIETNAM, LAI CHAU PROVINCE, Bakalin & Klimova, v-11-20-19.

Solenostoma polyrhizoides (Grolle ex Amakawa) Váňa et D.G.Long

Fig. 936: Oil bodies 6–10 per cell, spherical, 6–8 µm in diameter, oblong 8–16(–20)×6–8 µm, granulate – CHINA, SICHUAN PROVINCE, Bakalin & Klimova, c-33-3-17.

Solenostoma pseudopyriflorum Bakalin & Vilnet

Fig. 937: Oil bodies 4–7 per cell, spherical, (3–)4–5 µm in diameter, oblong 5–10×4–5 µm, finely granulate – RUSSIA, PRIMORSKY TERRITORY, Bakalin, p-35-17-14.



Solenostoma pseudopyriflorum Bakalin & Vilnet

Fig. 938: Oil bodies (2–)3–4 per cell, spherical, 4–5(–6) μm in diameter, oblong 5–9(–10) \times 4–5 μm , finely granulate – RUSSIA, PRIMORSKY TERRITORY, Klimova & Bakalin, prim-16-35-16.

Solenostoma pusillum (C.E.O. Jensen) Steph.

Fig. 939: Oil bodies 3–5 per cell, spherical, 3–5 μm in diameter, oblong 4–12 \times 3–5(–6) μm , finely granulate – RUSSIA, KAMCHATKA TERRITORY, Bakalin, k-61-6-15.

Solenostoma pyriflorum Steph.

Fig. 940: Oil bodies 2–3(–4) per cell, rarely spherical, 6–8 μm in diameter, mostly oblong 8–18(–20) \times 6–9 μm , finely granulate – JAPAN, YAMANASHI PREFECTURE, Bakalin, j-86-12-15.

Solenostoma rossicum Bakalin & Vilnet

Fig. 941: Oil bodies 2–6 per cell, spherical, 4–9 μm in diameter, oblong 6–16 \times 5–9 μm , finely granulate – RUSSIA, KAMCHATKA TERRITORY, Bakalin, k-60-8-15.

Fig. 942: Oil bodies (2–)3–6 per cell, spherical, 5–6 μm in

diameter, oblong 6–15 \times 5–7 μm , finely granulate, some with small eye – RUSSIA, KHABAROVSK TERRITORY, Bakalin, kh-38-11-13.

Solenostoma rotundatum Amakawa

Fig. 943: Oil bodies 2–3(–4) per cell, spherical, 5–8 μm in diameter, oblong 6–14(–18) \times 5–7(–9) μm , granulate – JAPAN, KOCHI PREFECTURE, Bakalin, j-9-9-15.

Solenostoma schaulianum (Steph.) Váňa et D.G.Long

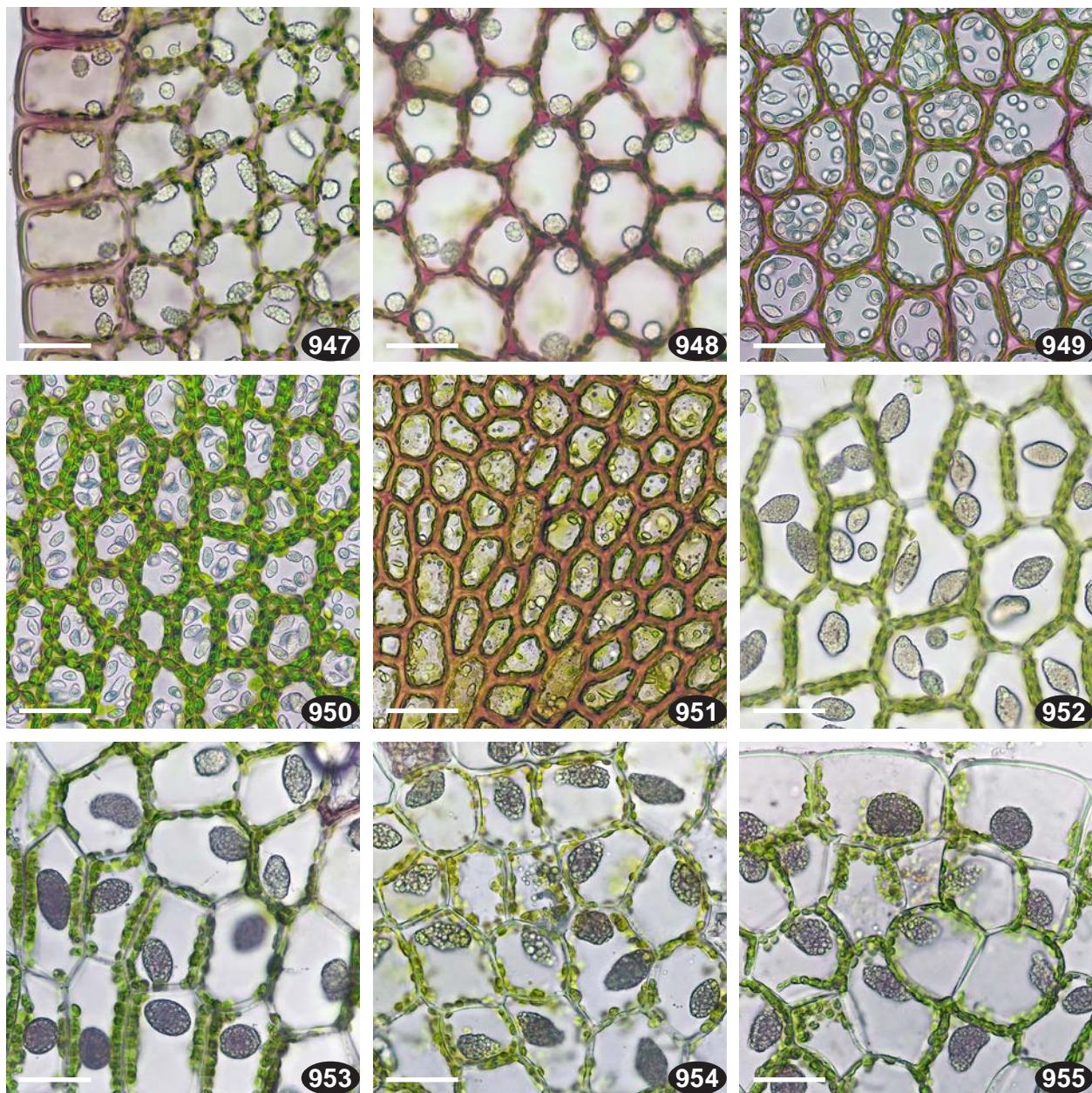
Fig. 944: Oil bodies 7–10 per cell, oblong 7–17 \times 4–7 μm , granulate, brownish – VIETNAM, HA GIANG PROVINCE, Bakalin & Klimova, v-15-16-20.

Solenostoma sphaerocarpum (Hook.) Steph.

Fig. 945: Oil bodies 3–5(–9) per cell, rarely spherical, 4–5 μm in diameter, oblong 5–10(–12) \times (3–)4–5(–7) μm , finely granulate – RUSSIA, KAMCHATKA TERRITORY, Bakalin, k-48-13-15.

Solenostoma subellipticum (Lindb. ex Heeg) R.M. Schust.

Fig. 946: Oil bodies 2–4 per cell, spherical, 4–7 μm in diameter, oblong 8–12(–15) \times 4–6(–7) μm , granulate – RUSSIA, KAMCHATKA TERRITORY, Bakalin, k-49-18-15.



Solenostoma suborbiculatum (Amakawa) Váňa et D.G.Long

Fig. 947: Oil bodies 2(–3) per cell, spherical, 5–8 µm in diameter, oblong 6–15×5–7 µm, botryoidal – VIETNAM, LAO CAI PROVINCE, Bakalin & Klimova, v-11-22-17.

Fig. 948: Oil bodies 2(–3) per cell, spherical, 6–10 µm in diameter, botryoidal – VIETNAM, LAO CAI PROVINCE, Bakalin & Klimova, v-11-26-17.

Solenostoma sunii Bakalin et Vilnet

Fig. 949: Oil bodies 6–14 per cell, spherical, 4–6 µm in diameter, oblong 6–11×4–5 µm, finely granulate – REPUBLIC OF KOREA, JEOLLABUK-DO, Bakalin, kor-73-1-19.

Fig. 950: Oil bodies 5–7 per cell, spherical, 4–5 µm in diameter, oblong 5–9×4–5 µm, finely granulate – REPUBLIC OF KOREA, JEOLLABUK-DO, Bakalin, kor-82-4-19.

Solenostoma ventroversum (Grolle) Váňa et D.G.Long

Fig. 951: Oil bodies (4–)6–8(–10) per cell, spherical, 2–4 µm in diameter, oblong 3–5×2–3 µm, very finely granulate to

nearly smooth – VIETNAM, LAI CHAU PROVINCE, Bakalin & Klimova, v-10-11-19.

Endogemmataceae

Endogemma caespiticia (Lindenb.) Konstant., Vilnet et A.V.Troitsky

Fig. 952: Oil bodies 1(–3) per cell, spherical, 8–15 µm in diameter, oblong 11–27×(4–)9–14 µm, granulate to coarsely so – RUSSIA, KHABAROVSK TERRITORY, Bakalin, kh-47-1-13.

Fig. 953: Oil bodies 1 per cell, spherical, 12–16 µm in diameter, oblong 14–27×11–15 µm, coarsely granulate – RUSSIA, MAGADAN PROVINCE, Bakalin, mag-23-1-14.

Fig. 954: Oil bodies 1 per cell, spherical, 11–12 µm in diameter, oblong 17–24×10–14 µm, coarsely granulate – RUSSIA, MURMANSK PROVINCE, Bakalin, mur-33-3-15.

Fig. 955: Oil bodies 1 per cell, spherical, 12–18 µm in diameter, oblong 13–22×10–15 µm, coarsely granulate – RUSSIA, MAGADAN PROVINCE, Bakalin, mag-28-2-14.

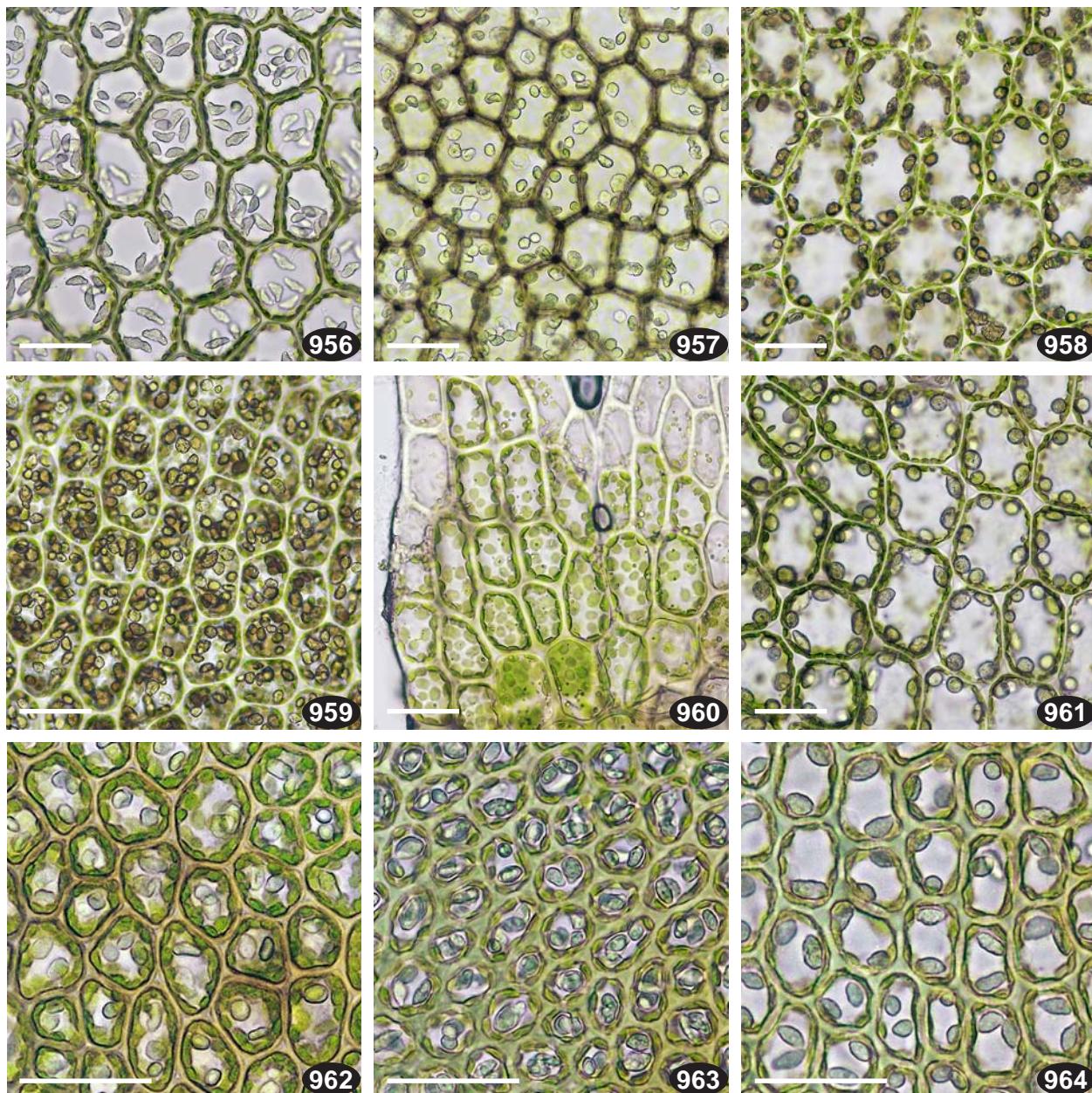
**Harpanthaceae***Harpanthus flotovianus* (Nees) Nees

Fig. 956: Oil bodies 3–6 per cell, rarely spherical, 3–5 µm in diameter, commonly oblong 7–14×4–5 µm, granulate, brownish – RUSSIA, SAKHALIN PROVINCE, Bakalin, s-15-4-17.

Harpanthus scutatus (F.Weber et D.Mohr) Spruce

Fig. 957: Oil bodies 3–5(–10) per cell, spherical, 4–7 µm in diameter, oblong 5–8×3–6 µm, loosely granulate, biconcave – RUSSIA, AMUR PROVINCE, Bakalin, am-69-3-18.

Geocalycaceae*Geocalyx graveolens* (Schrad.) Nees

Fig. 958: Oil bodies 5–12 per cell, spherical, 4–6 µm in diameter, oblong 6–10×(3–)4–6 µm, granulate, brownish – CHINA, SICHUAN PROVINCE, Bakalin & Klimova, c-37-3-17.

Fig. 959: Oil bodies 8–12(13) per cell, spherical, 4–6 µm in diameter, oblong 5–10×4–5 µm, granulate, brownish – RUSSIA, PRIMORSKY TERRITORY, Klimova & Bakalin, prim-16-12-16.

Comment: *G. graveolens* from Sichuan has cells smaller than in Primorsky Territory and may belong to little known *G. lancistipulus*.

Antheliaceae*Anthelia juratzkana* (Limpr.) Trevis

Fig. 960: Small putative oil bodies 10–20 per cell, 1–1.5 µm in diameter or smaller – RUSSIA, KHABAROVSK TERRITORY, Bakalin & Klimova, kh-47-26-19.

Gymnomitriaceae*Cryptocoleopsis imbricata* Amakawa

Fig. 961: Oil bodies 6–12 per cell, spherical, 5–8 µm in diameter, oblong 5–13×5–8 µm, granulate – RUSSIA, KAMCHATKA TERRITORY, Klimova, kam-64-35-16.

Gymnomitrion adustum Nees

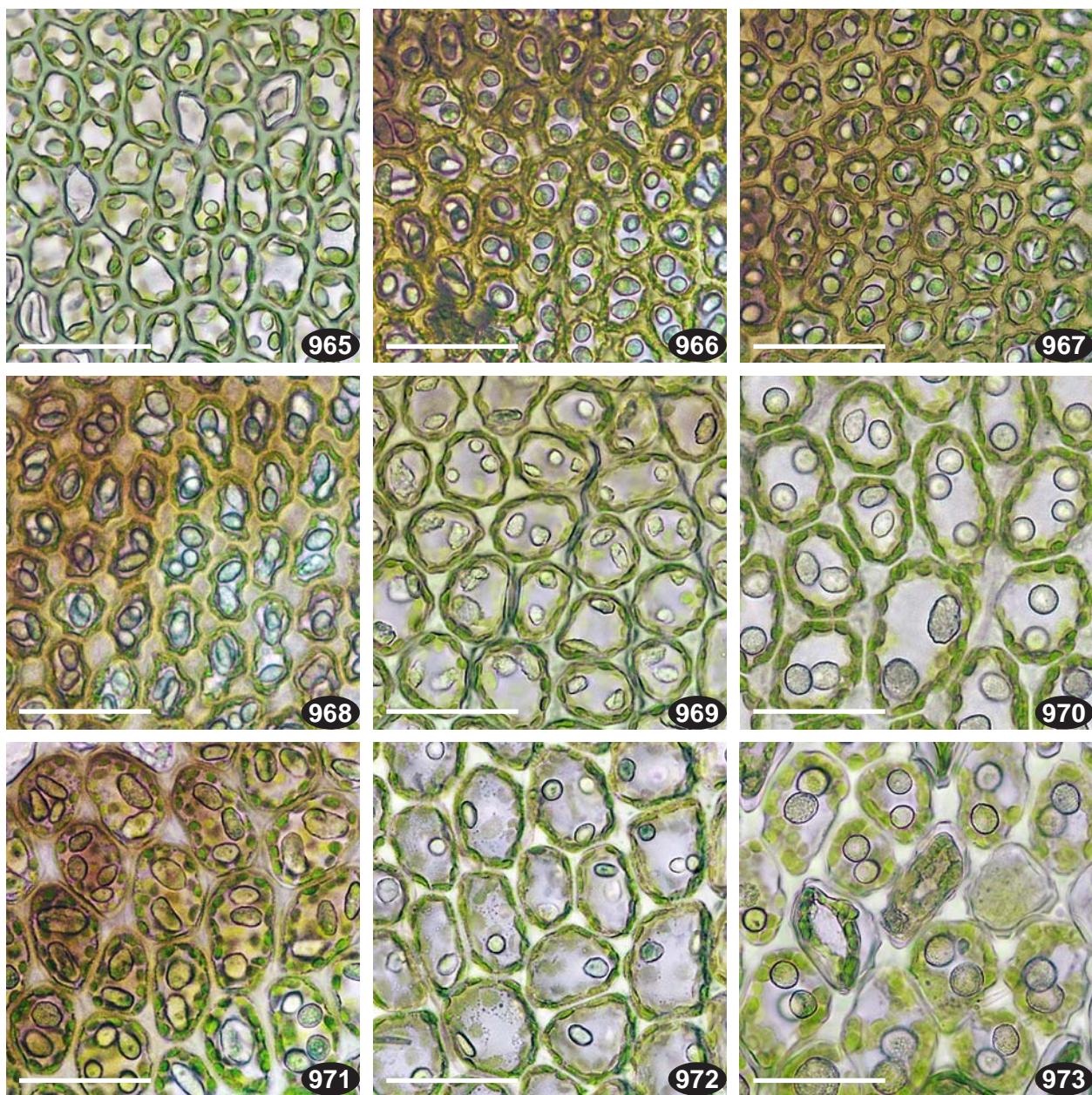
Fig. 962: Oil bodies 2(–3) per cell, spherical, 3–5 µm in diameter, oblong 4–7×3–4 µm, nearly smooth – RUSSIA, SAKHALIN PROVINCE, Bakalin & Klimova, k-48-1-18.

Gymnomitrion alpinum (Gottsche ex Husn.) Schiffn.

Fig. 963: Oil bodies 2(–3) per cell, spherical, 2–3 µm in diameter, oblong 3–6×2–4 µm, smooth to segmented – JAPAN, YAMANASHI PREFECTURE, Bakalin, j-86-4-15.

Gymnomitrion brevissimum (Dumort.) Warnst.

Fig. 964: Oil bodies 2(–3) per cell, spherical, 4–6 µm in diameter, oblong 4–8×3–5 µm, loosely granulate, sometimes biconcentric – RUSSIA, KAMCHATKA TERRITORY, Bakalin, k-45-6-15.



Gymnomitrium brevissimum (Dumort.) Warnst.

Fig. 965: Oil bodies 2(–3) per cell, spherical, 2–4 μm in diameter, oblong 3–8 \times 2–3(4) μm , loosely granulate, with small central eye – RUSSIA, KAMCHATKA TERRITORY, Klimova, kam-48-7a-16.

Gymnomitrium commutatum (Limpr.) Schiffn.

Fig. 966: Oil bodies 2(–3) per cell, spherical, 2–4 μm in diameter, oblong 4–8 \times (2)3–4 μm , finely granulate – RUSSIA, KAMCHATKA TERRITORY, Bakalin, k-43-3-15.

Fig. 967: Oil bodies (1–)2 per cell, spherical, 3–4 μm in diameter, oblong 4–7 \times 3–4 μm , nearly smooth – RUSSIA, KHABAROVSK TERRITORY, Bakalin & Klimova, kh-38-4-19.

Fig. 968: Oil bodies 2(–3) per cell, spherical, 3–4 μm in diameter, oblong 5–8 \times 3–4(5) μm , finely granulate – RUSSIA, MAGADAN PROVINCE, Bakalin, mag-26-11-14.

Gymnomitrium concinnatum (Lightf.) Corda

Fig. 969: Oil bodies 2–4 per cell, spherical, 3–7 μm in diameter, oblong 5–10 \times 3–5 μm , granulate – RUSSIA,

KHABAROVSK TERRITORY, Bakalin & Klimova, kh-40-2-19.

Fig. 970: Oil bodies 2–3(–4) per cell, spherical, 5–7 μm in diameter, oblong 6–14 \times 4–6 μm , finely granulate – RUSSIA, KHABAROVSK TERRITORY, Klimova, khab-73-2-18.

Fig. 971: Oil bodies (1–)2–4 per cell, spherical, 4–5 μm in diameter, oblong 6–8(–10) \times 4–5(–8) μm , finely granulate to smooth, with small central eye – RUSSIA, KRASNOYARSK TERRITORY, Fedosov, vf84c.

Gymnomitrium coralliodes Nees

Fig. 972: Oil bodies 1–3 per cell, spherical, 3–5 μm in diameter, oblong 5–8 \times 4–5 μm , nearly smooth to finely granulate, sometimes biconcave with central eye – RUSSIA, KHABAROVSK TERRITORY, Bakalin & Klimova, kh-38-3-19.

Fig. 973: Oil bodies 2–4 per cell, spherical, 4–7(–10) μm in diameter, oblong 6–11 \times 5–7 μm , finely granulate, some with small central eye – RUSSIA, KRASNOYARSK TERRITORY, Fedosov, vf19.

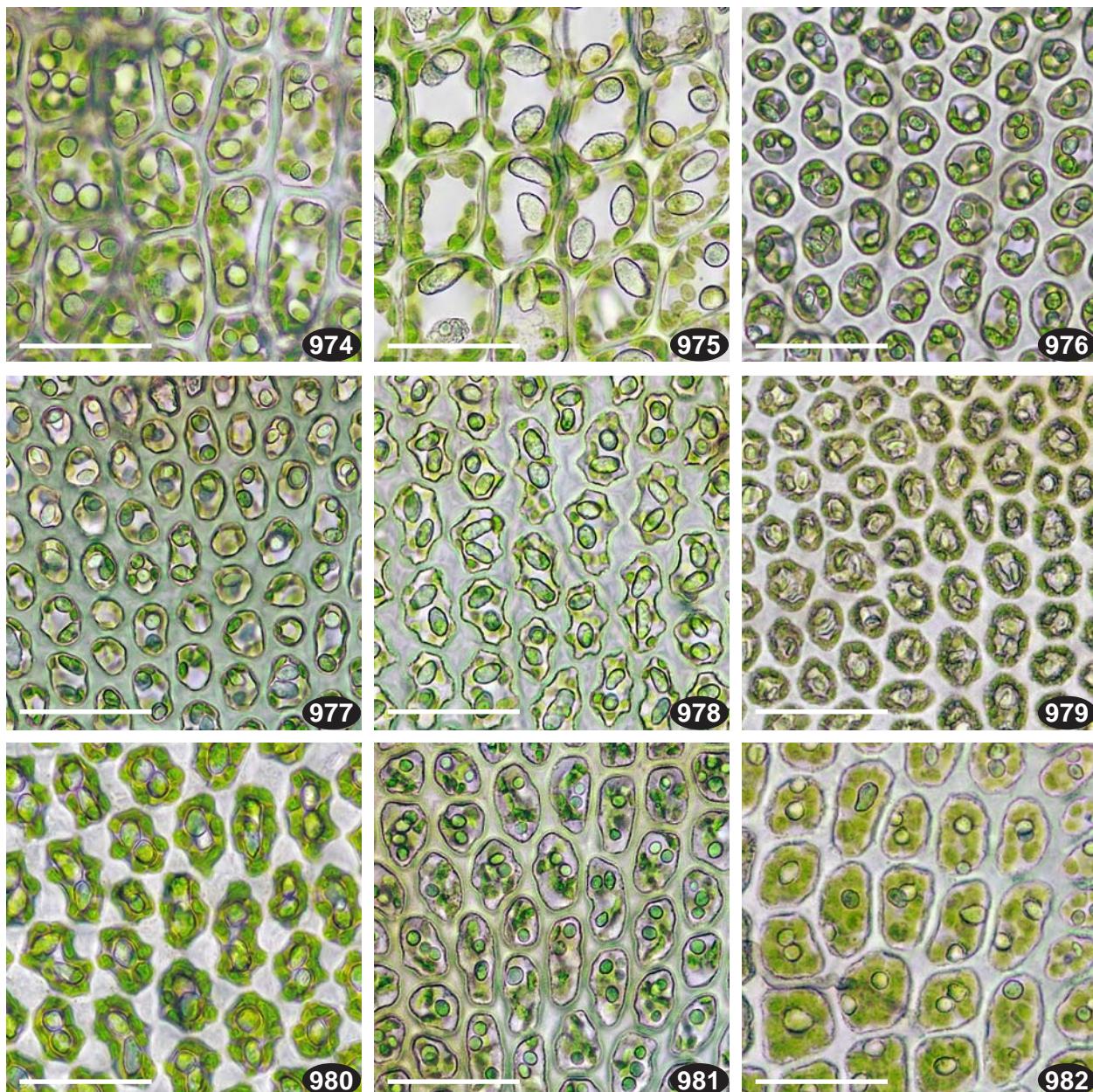
*Gymnomitrion crenatilobum* Grolle

Fig. 974: Oil bodies 3–5 per cell, spherical, 4–6 µm in diameter, oblong 6–10×4–6 µm, finely granulate to nearly smooth – CHINA, SICHUAN PROVINCE, Bakalin & Klimova, c-46-4-17.

Gymnomitrion faurieanum (Steph.) Horik.

Fig. 975: Oil bodies 2–3 per cell, spherical, 5–7 µm in diameter, oblong 6–13×5–7 µm, finely granulate – RUSSIA, SAKHALIN PROVINCE, Bakalin & Klimova, k-34-46-18.

Gymnomitrion mucronulatum (N.Kitag.) N.Kitag.

Fig. 976: Oil bodies 1–2(–3) per cell, spherical, 1.5–3 µm in diameter, oblong 3–5×1.5–3 µm, finely granulate to nearly smooth – JAPAN, YAMANASHI PREFECTURE, Bakalin, j-86-5-15.

Fig. 977: Oil bodies 2–3 per cell, spherical, 2–4 µm in diameter, oblong 3–4(–8)×2–3(–5) µm, finely granulate to nearly smooth – JAPAN, YAMANASHI PREFECTURE, Bakalin, j-90-9-15.

Gymnomitrion parvitextum (Steph.) Mamontov, Konstant. & Potemkin

Fig. 978: Oil bodies 2(–3) per cell, spherical, 3–4 µm in diameter, oblong 4–8×2–4 µm, loosely granulate – JAPAN, YAMANASHI PREFECTURE, Bakalin, j-86-7-15.

Fig. 979: Oil bodies 2(–3) per cell, oblong 3–5×1, 5–3 µm, smooth to loosely segmented, biconcave – RUSSIA, KHABAROVSK TERRITORY, Klimova, khab-54a-1-18.

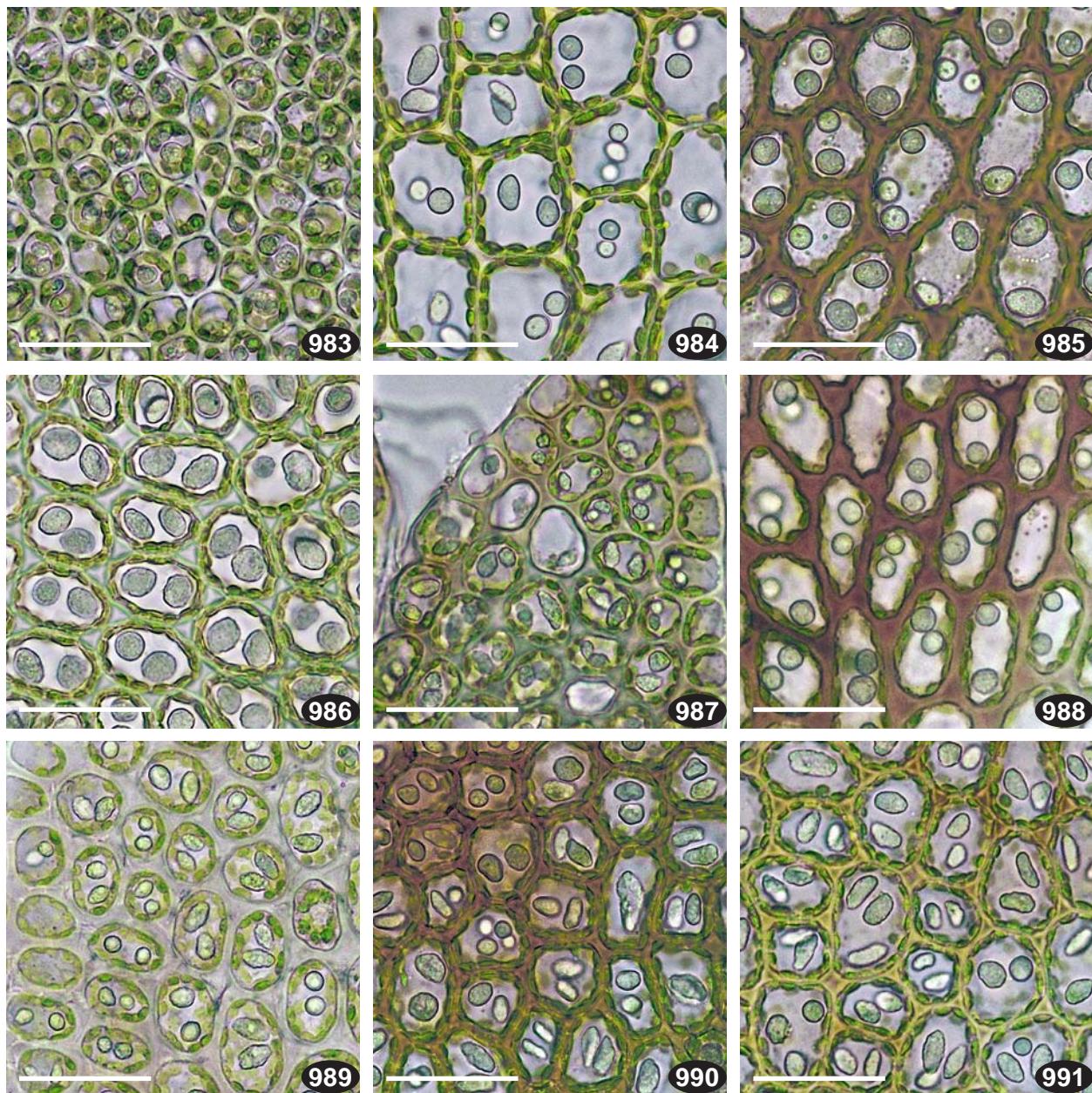
Fig. 980: Oil bodies 1–2 per cell, spherical, 4–5 µm in diameter, oblong 5–8×4–5 µm, nearly smooth – REPUBLIC OF KOREA, JEOLLABUK-DO, Bakalin, kor-76-3-19.

Gymnomitrion rubidum (Mitt.) Váňa

Fig. 981: Oil bodies 2–3(4) per cell, spherical, 3–4 µm in diameter, oblong 3–5×2–3 µm, nearly smooth – CHINA, YUNNAN PROVINCE, Bakalin, c-72-17-18.

Gymnomitrion sinense Müll.Frib.

Fig. 982: Oil bodies (1–)2(–3) per cell, spherical, 3–4 µm in diameter, oblong 4–6×3–4 µm, nearly smooth – CHINA, SICHUAN PROVINCE, Bakalin & Klimova, c-46-1-17.



Marsupella alata S.Hatt. et N.Kitag

Fig. 983: Oil bodies 2 per cell, spherical, (2)3–4 µm in diameter, oblong 3–6×3–4 µm, nearly smooth to granulate, sometimes biconcentric – RUSSIA, SAKHALIN PROVINCE, Bakalin & Klimova, k-35-11-18.

Marsupella apertifolia Steph.

Fig. 984: Oil bodies 2–3(–4) per cell, spherical, 4–5 µm in diameter, oblong 5–12×4–5 µm, finely granulate, with small central eye – RUSSIA, KAMCHATKA TERRITORY, Bakalin, k-60-7-15.

Fig. 985: Oil bodies 2(–3) per cell, spherical, 6–9 µm in diameter, oblong 6–10(12)×5–7 µm, finely granulate, with small central eye – RUSSIA, SAKHALIN PROVINCE, Bakalin, k-77-6-15.

Marsupella apiculata Schiffn.

Fig. 986: Oil bodies 2(–3) per cell, spherical, 4–7 µm in diameter, oblong 6–9×4–6 µm, finely granulate – RUSSIA, SAKHALIN PROVINCE, Bakalin, k-76-3-15.

Marsupella boeckii (Austin) Lindb. ex Kaal

Fig. 987: Oil bodies 2(–3) per cell, spherical, 2–4 µm in diameter, oblong 3–6(–10)×2–4 µm, finely granulate – RUSSIA, KAMCHATKA TERRITORY, Bakalin, k-48-11-15.

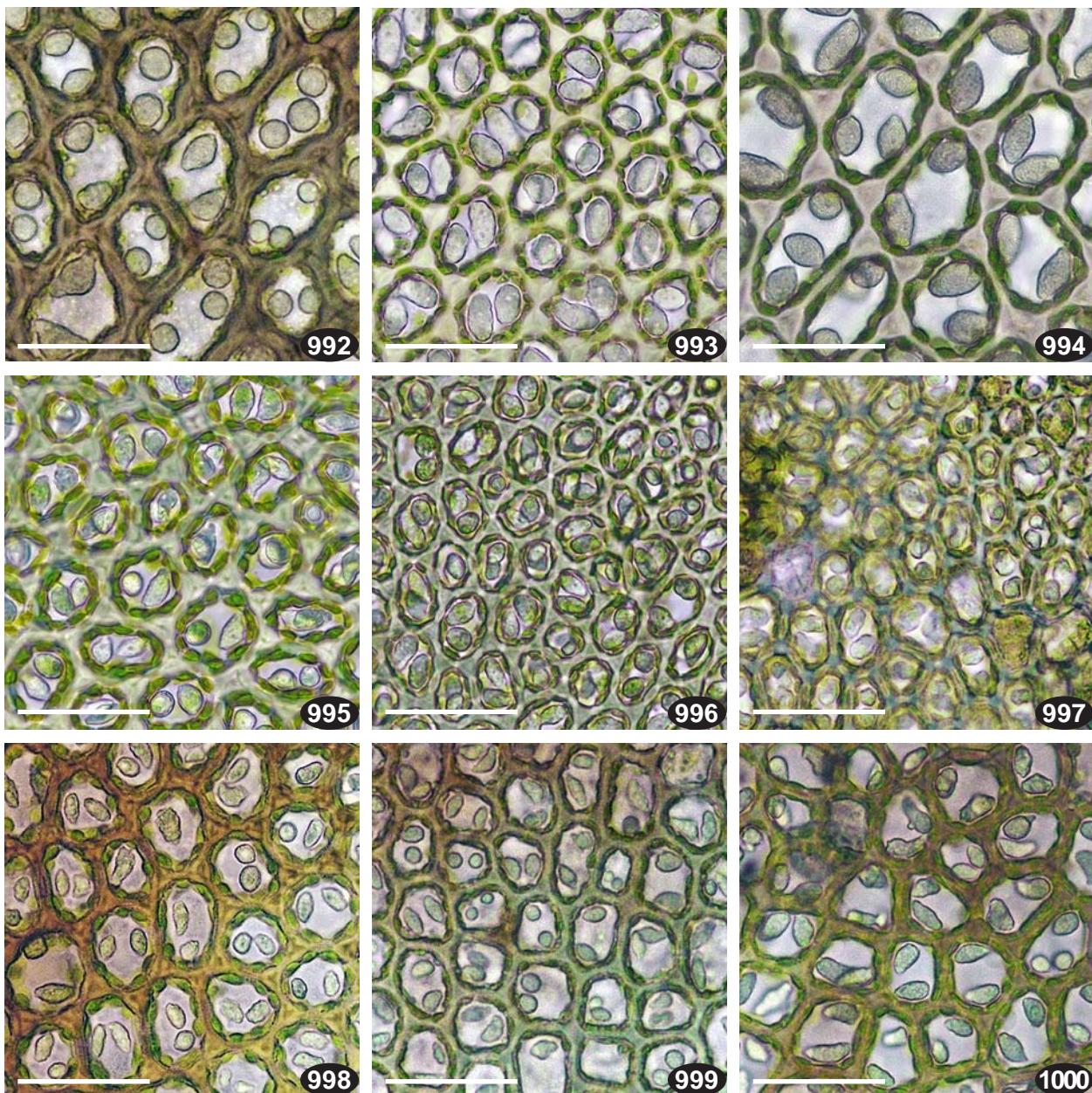
Fig. 988: Oil bodies 2(–4) per cell, spherical, 4–7 µm in diameter, loosely granulate – RUSSIA, KHABAROVSK TERRITORY, Bakalin, kh-21-10-16.

Fig. 989: Oil bodies 2(–3) per cell, spherical, 2–5 µm in diameter, oblong 4–8×2–3(4) µm, smooth to loosely granulate – RUSSIA, KHABAROVSK TERRITORY, Bakalin & Klimova, kh-47-19-19.

Marsupella condensata (Lngstr. ex C.Hartm.) Lindb. ex Kaal

Fig. 990: Oil bodies 2–4 per cell, spherical, 2–7 µm in diameter, oblong 5–10×4–6 µm, finely granulate – RUSSIA, KAMCHATKA TERRITORY, Bakalin, k-51-2-15.

Fig. 991: Oil bodies (1)2(–3) per cell, spherical, 4–6 µm in diameter, oblong 5–12×4–6 µm, finely granulate – RUSSIA, KAMCHATKA TERRITORY, Bakalin, k-60-30-15.



Marsupella emarginata (Ehrh.) Dumort.

Fig. 992: Oil bodies 2–3(–4) per cell, spherical, 5–8 µm in diameter, oblong 7–14×5–7 µm, finely granulate – RUSSIA, KHABAROVSK TERRITORY, Bakalin, kh-17-31-16.

Fig. 993: Oil bodies 2–3 per cell, spherical, 5–7 µm in diameter, oblong 8–12(–20)×4–6 µm, loosely granulate, with small central eye – RUSSIA, KHABAROVSK TERRITORY, Bakalin & Klimova, kh-40-7-19.

Fig. 994: Oil bodies 2–3 per cell, spherical, 6–8 µm in diameter, oblong 8–18(20)×5–8 µm, finely granulate, brownish – RUSSIA, MAGADAN PROVINCE, Bakalin, mag-26-9-14.

Marsupella koreana Bakalin & Fedosov

Fig. 995: Oil bodies 2 per cell, spherical, 4–5 µm in diameter, oblong 5–10×4–5(–6) µm, finely granulate – REPUBLIC OF KOREA, GYEONGSANGNAM-DO, Bakalin, kor-70-4-19.

Marsupella pseudofunckii S.Hatt.

Fig. 996: Oil bodies 2 per cell, spherical, 2–4(5) µm in di-

ameter, oblong 4–7(8)×3–4 µm, loosely granulate – JAPAN, YAMANASHI PREFECTURE, Bakalin, j-88-23-15.

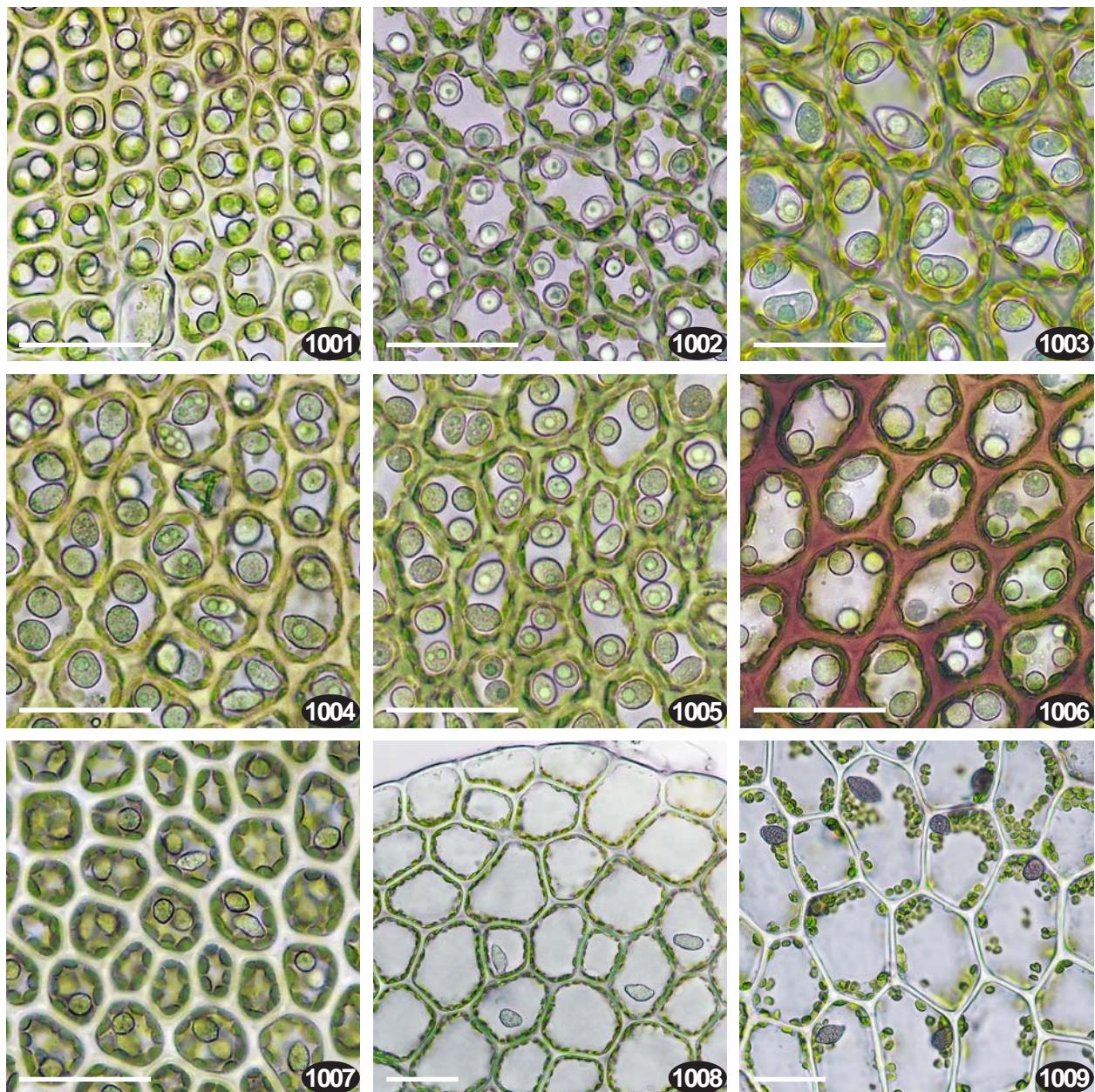
Fig. 997: Oil bodies 2 per cell, spherical, 2–5 µm in diameter, oblong 4–6×2–4 µm, nearly smooth, biconcave – RUSSIA, PRIMORSKY TERRITORY, Klimova & Bakalin, prim-16-34-16.

Marsupella sprucei (Limpr.) Bernet

Fig. 998: Oil bodies 2(–3) per cell, spherical, 3–5 µm in diameter, oblong 5–8(10)×3–4 µm, loosely granulate – RUSSIA, KHABAROVSK TERRITORY, Bakalin & Klimova, kh-40-1-19.

Fig. 999: Oil bodies 2–4(–6) per cell, spherical, 3–4(5) µm in diameter, oblong 4–7×3–4 µm, with common addition of small – Oil bodies 1.5–2 µm in diameter, finely granulate – RUSSIA, MAGADAN PROVINCE, Bakalin, mag-25-2-14.

Fig. 1000: Oil bodies 2–4 per cell, spherical, 3–5 µm in diameter, oblong 6–8(12)×3–5 µm, finely granulate – RUSSIA, MURMANSK PROVINCE, Bakalin, mur-32-5-15.



Marsupella stoloniformis N.Kitag.

Fig. 1001: Oil bodies 2(–3) per cell, spherical, 4–6 µm in diameter, smooth – VIETNAM, LAO CAI PROVINCE, Bakalin & Klimova, v-II-28-17.

Marsupella tubulosa Steph.

Fig. 1002: Oil bodies 2(–3) per cell, spherical, 4–6 µm in diameter, oblong 4–8×4–6 µm, nearly smooth, biconcentric with large central eye – RUSSIA, SAKHALIN PROVINCE, Bakalin & Klimova, k-35-24-18.

Fig. 1003: Oil bodies 2(–3) per cell, spherical, 6–7(–8) µm in diameter, oblong 7–13×6–8 µm, finely granulate, with 1(–3) eyes – REPUBLIC OF KOREA, GYEONGSANGNAM-DO, Bakalin, kor-70-8-19.

Fig. 1004: Oil bodies (1–)2–3(–4) per cell, spherical, 4–6 µm in diameter, oblong 5–10×4–6(–7) µm, finely granulate, with central eye – RUSSIA, PRIMORSKY TERRITORY, Klimova, prim-111-19-17.

Fig. 1005: Oil bodies 2–3 per cell, spherical, 3–8 µm in diameter, oblong 6–10×4–6 µm, finely granulate, with 1–several eyes – RUSSIA, PRIMORSKY TERRITORY, Klimova, prim-111-19-17_2.

Comment: The oil bodies in the specimen ‘prim-111-19-17’ (from Sikhote-Alin Mountains, Primorsky Territory) bear 0 to several central eyes of various diameter, contrary to the typical morphotypes of *M. tubulosa*.

Marsupella vietnamica Bakalin & Fedosov

Fig. 1006: Oil bodies 2–3 per cell, spherical, 4–7 µm in diameter, oblong 6–10×4–6 µm, finely granulate – VIETNAM, LAO CAI PROVINCE, Bakalin & Klimova, v-II-17-17.

Marsupella yakushimensis (Horik.) S.Hatt.

Fig. 1007: Oil bodies 1–2 per cell, spherical, 4–5 µm in diameter, oblong 5–8×4–5 µm, finely granulate – REPUBLIC OF KOREA, JEJU-DO, Bakalin, kor-29-13-15.

Nardia assamica (Mitt.) Amakawa

Fig. 1008: Oil bodies in some cells, 1 per cell, oblong 10–13×6–7 µm, granulate – JAPAN, TOTTORI PREFECTURE, Bakalin, j-3-1-13.

Fig. 1009: Oil bodies in some cells, 1 per cell, oblong 10–16×7–10 µm, granulate – RUSSIA, SAKHALIN PROVINCE, Bakalin, k-70-26-15.

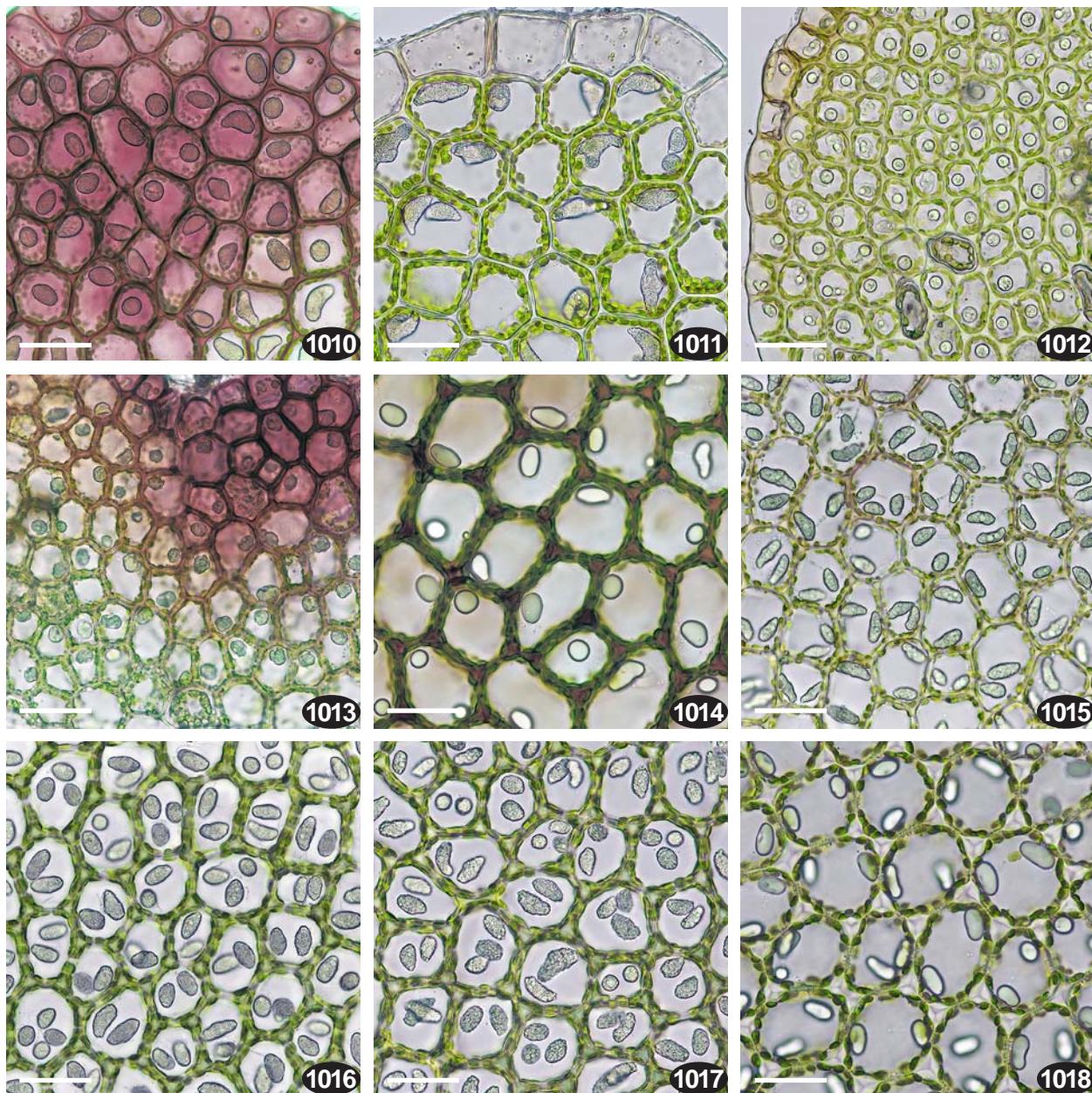
*Nardia assamica* (Mitt.) Amakawa

Fig. 1010: Oil bodies 1 per cell, spherical, 7–9 µm in diameter, oblong 10–18×7–10 µm, finely granulate – RUSSIA, KHABAROVSK TERRITORY, Bakalin, kh-47-2-13.

Fig. 1011: Oil bodies 1(–2) per cell, spherical, 7–10 µm in diameter, oblong (8–)10–25×7–12 µm, granulate – REPUBLIC OF KOREA, JEOLLABUK-DO, Bakalin, kor-78-3-19.

Comment: *N. assamica* from Khabarovsk Territory (Kh-47-2-13) was identified with some doubts since oil bodies are distributed in all (or nearly so) leaf cells. However, subhorizontally inserted and distant leaves suggest this species rather than *N. subclavata*.

Nardia breidleri (Limpr.) Lindb.

Fig. 1012: Oil bodies 1 per cell, spherical, 4–6 µm in diameter, loosely segmented to as crumpled paper ball – RUSSIA, SAKHALIN PROVINCE, Bakalin & Klimova, k-47-23-18.

Fig. 1013: Oil bodies 1 per cell, spherical, (4–)5–8 µm in diameter, coarsely granulate to as crumpled paper ball – RUSSIA, MURMANSK PROVINCE, Bakalin, mur-33-4-15.

Nardia compressa (Hook.) Gray

Fig. 1014: Oil bodies 1–2 per cell, spherical, 7–8(–10) µm in diameter, oblong 10–15(–18)×6–11 µm, smooth – RUSSIA, SAKHALIN PROVINCE, Bakalin, k-76-1-15.

Nardia geoscyphus (De Not.) Lindb.

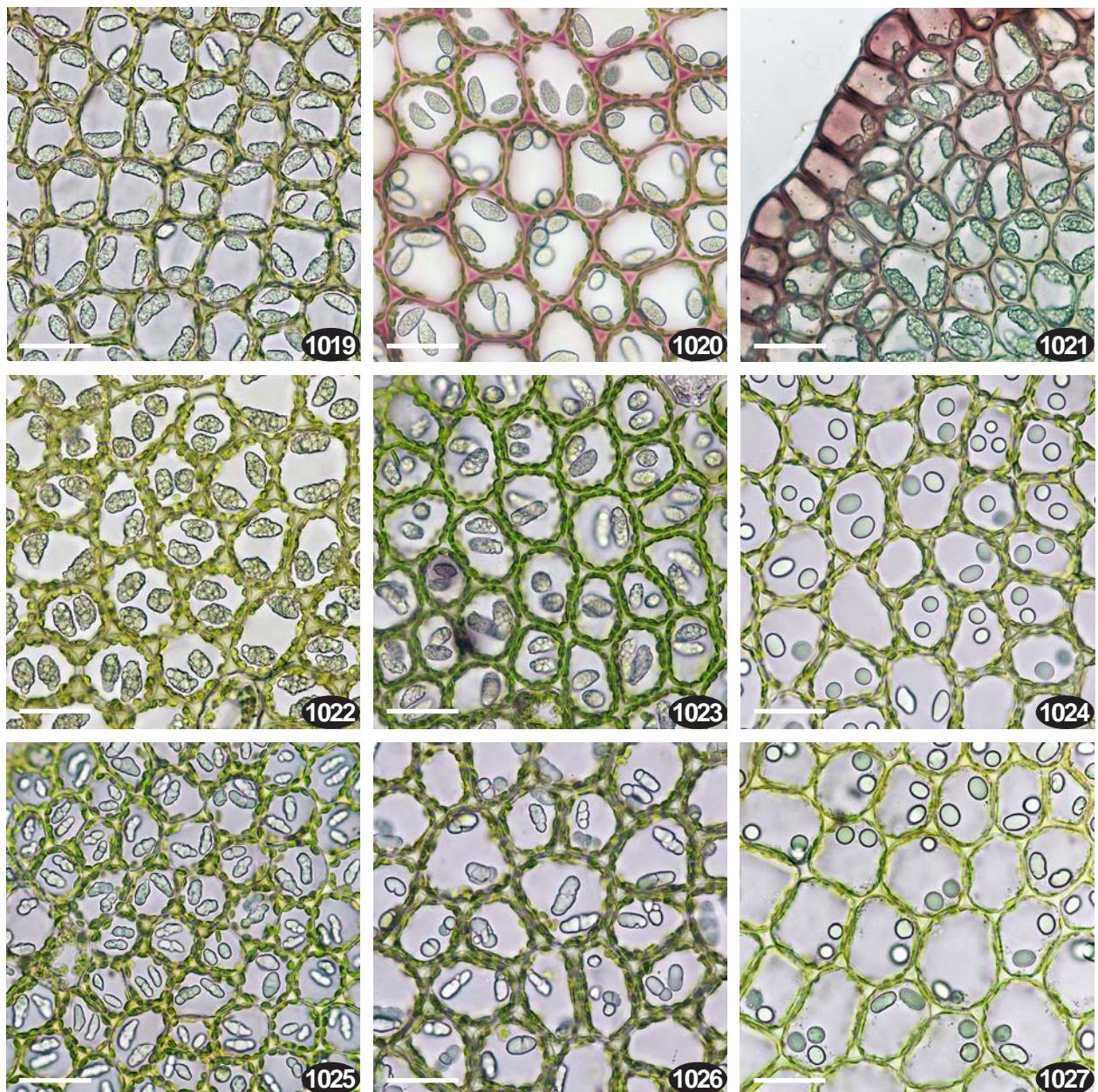
Fig. 1015: Oil bodies 2–3 per cell, oblong 8–18×(4–)5–6 µm, granulate – RUSSIA, MAGADAN PROVINCE, Bakalin, mag-25-20-14.

Fig. 1016: Oil bodies 2(–3) per cell, spherical, 6–8 µm in diameter, oblong 8–17×6–8 µm, granulate – RUSSIA, MAGADAN PROVINCE, Bakalin, mag-30-6-14.

Fig. 1017: Oil bodies 2(–3) per cell, spherical, 5–7 µm in diameter, oblong 8–16(–20)×6–8 µm, granulate – RUSSIA, KAMCHATKA TERRITORY, Bakalin, k-49-6-15.

Nardia harae Amakawa

Fig. 1018: Oil bodies 2 per cell, spherical, 6–8 µm in diameter, oblong 8–16×6–8 µm, smooth – JAPAN, YAMANASHI PREFECTURE, Bakalin, j-88-14-15.



Nardia hiroshii Amakawa

Fig. 1019: Oil bodies 2(–4) per cell, spherical, 6–7 µm in diameter, oblong 7–18×5–7 µm, coarsely granulate – JAPAN, YAMANASHI PREFECTURE, Bakalin, j-86-3-15.

Nardia insecta Lindb.

Fig. 1020: Oil bodies 2(–4) per cell, spherical, 6–8 µm in diameter, oblong 6–18×5–7 µm, granulate, brownish – RUSSIA, KHABAROVSK TERRITORY, Bakalin, kh-38-3-13.

Nardia japonica Steph.

Fig. 1021: Oil bodies 2 per cell, oblong 10–16×(5)–6–8 µm, coarsely granulate to botryoidal – RUSSIA, MAGADAN PROVINCE, Bakalin, mag-21-27-14.

Fig. 1022: Oil bodies 2(–3) per cell, oblong 10–15(–18)×7–10(–12) µm, coarsely granulate to botryoidal – RUSSIA, SAKHALIN PROVINCE, Bakalin, s-27-28-17.

Fig. 1023: Oil bodies 2 per cell, spherical, 6–10 µm in diameter, oblong 8–15×5–9 µm, coarsely granulate to

botryoidal – RUSSIA, SAKHALIN PROVINCE, Bakalin, s-47-7-16.

Nardia pacifica Bakalin

Fig. 1024: Oil bodies 2(–3) per cell, spherical, (4)–5–8 µm in diameter, oblong 8–16(–20)×6–8 µm, smooth – RUSSIA, KAMCHATKA TERRITORY, Bakalin, k-67-7-15.

Fig. 1025: Oil bodies 2 per cell, spherical, 4–6 µm in diameter, oblong 6–14×(3)–4–5 µm, botryoidal to segmented – RUSSIA, SAKHALIN PROVINCE, Bakalin, k-76-8-15.

Nardia scalaris Gray

Fig. 1026: Oil bodies 2(–3) per cell, spherical, 5–6 µm in diameter, oblong 10–20(–24)×3–8 µm, botryoidal – RUSSIA, SAKHALIN PROVINCE, Bakalin, k-78-11-15.

Fig. 1027: Oil bodies 2(–5) per cell, spherical, 5–10 µm in diameter, oblong 8–13(–16)×5–8 µm, smooth – RUSSIA, MURMANSK PROVINCE, Bakalin, mur-32-41-15.

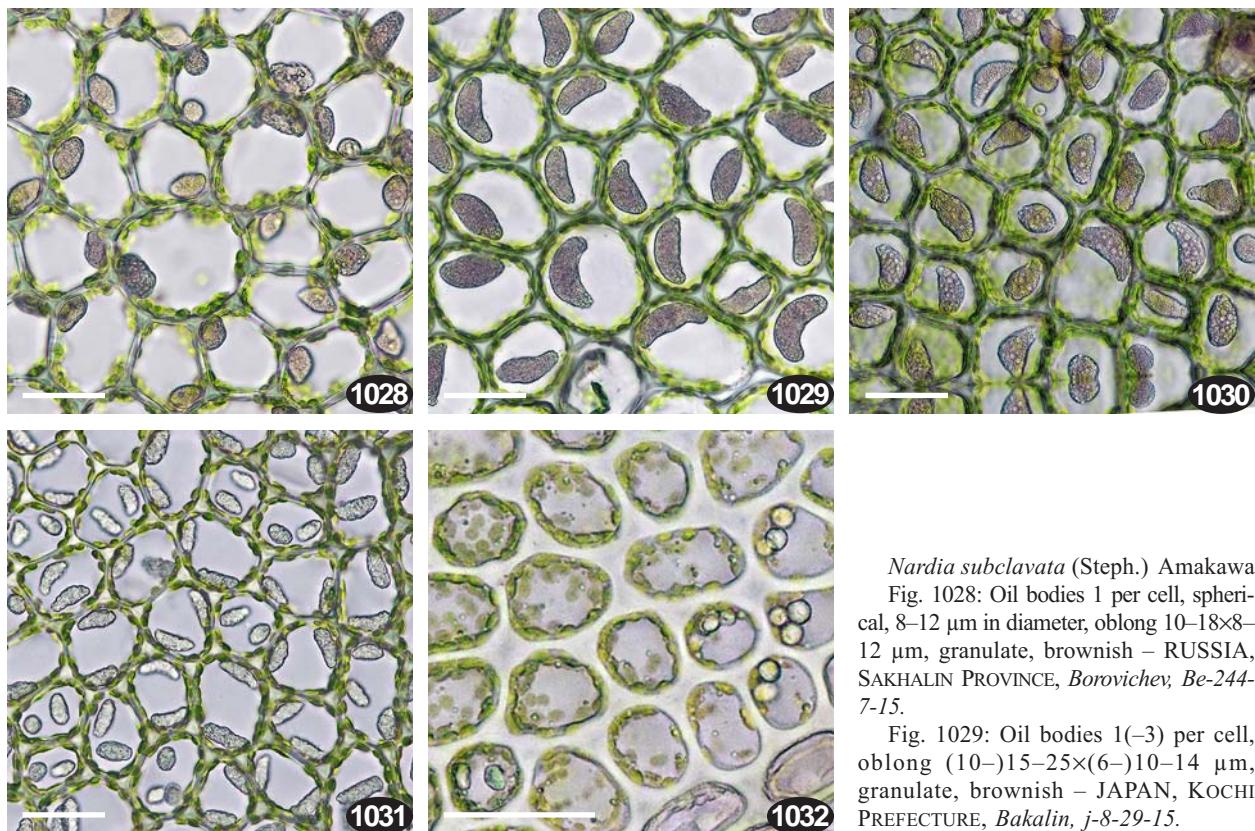


Fig. 1030: Oil bodies 1(–2) per cell, rarely spherical, 8–10 µm in diameter, oblong 14–27×9–11 µm, finely granulate, with 1–several unclear eyes – VIETNAM, CAO BANG PROVINCE, Bakalin & Klimova, v-21-20-20.

Nardia unispiralis Amakawa

Fig. 1031: Oil bodies 2(–3) per cell, spherical, 7–9 µm in diameter, oblong 10–20×5–7 µm, coarsely granulate – RUS-

Nardia subclavata (Steph.) Amakawa
Fig. 1028: Oil bodies 1 per cell, spherical, 8–12 µm in diameter, oblong 10–18×8–12 µm, granulate, brownish – RUSSIA, SAKHALIN PROVINCE, Borovichev, Be-244-7-15.

Fig. 1029: Oil bodies 1(–3) per cell, oblong (10)–15–25×(6)–10–14 µm, granulate, brownish – JAPAN, KOCHI PREFECTURE, Bakalin, j-8-29-15.

SIA, SAKHALIN PROVINCE, Bakalin, k-78-33-15.

Prasanthus suecicus (Gottsche) Lindb.

Fig. 1032: Oil bodies in some cells only 2(–3) per cell, spherical, 4–6 µm in diameter, oblong 4–6×3–5 µm, loosely granulate – RUSSIA, Khabarovsk TERRITORY, Bakalin & Klimova, kh-41-6-19.

ACKNOWLEDGEMENTS

Authors thank Vladimir Fedosov (MW), Eugeniy Borovichev (KPABG), Tatsuwo Furuki (CBM) and Olga Chernyagina (KAM) for provided specimens for our studies; Bakalin and Klimova also thank their colleagues for the help in the field researches, especially Olga Pisarenko (NSK) for the participation in the expeditions where many specimens were collected. Authors thank Ms. Olga Deryugina for the assistance in the technical preparation of the layerwise photographs. The laboratory work of V.A. Bakalin and K.G. Klimova was partially supported by

the grant from the Russian Foundation for the Basic Research (no. 20-04-00278 & 20-54-54002) and is within the frame of institutional research project “Cryptogamic Biota of Pacific Asia: taxonomy, floristics and distribution patterns of taxa” (no. AAAA-A20-120031990012-4). Collection and analysis of the specimens from Vietnam was partially supported by the Vietnam Academy of Science and Technology (Project no. KHCBDT.02/21-23). The work of S.S. Choi was partially supported by the National Ecosystem Survey of National Institute of Ecology (NIE-A-2021-1).

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<i>C. sphagnicola</i>	777	<i>F. japonica</i>	19, 20	<i>Jubula japonica</i>	155
<i>C. suecica</i>	778	<i>Frullania apiculata</i>	119, 120	<i>J. javanica</i>	156, 157
<i>C. tosana</i>	779–784	<i>F. appendiculata</i>	121	<i>Jungermannia afoninae</i>	809
<i>C. vietnamica</i>	785	<i>F. austini</i>	122	<i>J. atrovirens</i>	810–812
<i>C. yoshinagana</i>	786, 787	<i>F. brotheri</i>	123	<i>J. borealis</i>	813

<i>J. exsertifolia</i>	814–816	<i>L. silvicolaoides</i>	651, 652	<i>N. binsteadii</i>	683, 684
<i>J. konstantinovae</i>	817	<i>L. ventricosa</i>	653–655	<i>N. floerkei</i>	685
<i>Lejeunea alaskana</i>	207, 208	<i>L. ventricosa</i> var. <i>rigida</i>	656	<i>Neotrichocolea bissetii</i>	277
<i>L. alata</i>	209	<i>Lophozioopsis excisa</i>	657–659	<i>Nipponolejeunea pilifera</i>	159–161
<i>L. anisophylla</i>	210	<i>L. longidens</i>	660	<i>N. subalpina</i>	162, 163
<i>L. aquatica</i>	211	<i>L. pellucida</i>	661, 662	<i>Notoscyphus lutescens</i>	803–806
<i>L. coeces</i>	212	<i>L. polaris</i> var. <i>sphagnorum</i>	663, 664	<i>Nowellia curvifolia</i>	490
<i>L. aff. discreta</i>	213	<i>L. propagulifera</i>	665	<i>Obtusifolium obtusum</i>	520, 521
<i>L. lefrigii</i>	214	<i>Makinoa crispa</i>	15, 16	<i>Odontoschisma denudatum</i>	491–494
<i>L. flava</i>	215, 216, 217	<i>Marsupella alata</i>	983	<i>O. elongatum</i>	495, 496
<i>L. hui</i>	218	<i>M. apertifolia</i>	984, 985	<i>O. grosseverrucosum</i>	497–499
<i>L. japonica</i>	219–221	<i>M. apiculata</i>	986	<i>O. macounii</i>	500–502
<i>L. kodamae</i>	222	<i>M. boeckii</i>	987–989	<i>O. pseudogrosseverrucosum</i>	503, 504
<i>L. magohukui</i>	223, 224	<i>M. condensata</i>	990, 991	<i>Pallavicinia ambigua</i>	25
<i>L. neelgherriana</i>	225, 226	<i>M. emarginata</i>	992–994	<i>P. levieri</i>	26–28
<i>L. obscura</i>	227, 228, 229	<i>M. koreana</i>	995	<i>P. lyelli</i>	29
<i>L. pallidevirens</i>	230–232	<i>M. pseudofunckii</i>	996, 997	<i>Pedinophyllum interruptum</i>	394
<i>L. papilionacea</i>	233	<i>M. sprucei</i>	998–1000	<i>P. truncatum</i>	395, 396
<i>L. parva</i>	234–236	<i>M. stoloniformis</i>	1001	<i>Pellia endiviifolia</i>	8, 9
<i>L. sordida</i>	237	<i>M. tubulosa</i>	1002–1005	<i>P. neesiana</i>	10, 11
<i>L. subacuta</i>	238, 239	<i>M. vietnamica</i>	1006	<i>Plagiochila arctica</i>	397, 398
<i>L. tuberculosa</i>	240	<i>M. yakushimensis</i>	1007	<i>P. assamica</i>	399, 400
<i>Lepidozia fauriana</i>	353, 354	<i>Mastigolejeunea humilis</i>	260, 261	<i>P. bantamensis</i>	401
<i>L. omeiensis</i>	355	<i>Mastigophora diclados</i>	292	<i>P. beddomei</i>	402–404
<i>L. reptans</i>	356	<i>M. woodsii</i>	293	<i>P. bicornuta</i>	405
<i>L. subintegra</i>	357	<i>Mesoptychia badensis</i>	818, 819	<i>P. chinensis</i>	406, 407
<i>L. subtransversa</i>	358	<i>M. chinensis</i>	820	<i>P. devexa</i>	408
<i>L. suyungii</i>	359	<i>M. gillmanii</i>	821, 822	<i>P. durelii</i>	409–412
<i>L. trichodes</i>	360	<i>M. heterocolpos</i>	823, 824	<i>P. elegans</i>	413
<i>L. vitrea</i>	361	<i>M. heterocolpos</i> var. <i>arctica</i>	825	<i>P. flexuosa</i>	414, 415
<i>Leptolejeunea balansae</i>	241	<i>M. igiana</i>	826	<i>P. fruticosa</i>	416–419
<i>L. elliptica</i>	242, 243	<i>M. rutheana</i>	827–830	<i>P. fusca</i>	420
<i>L. latifolia</i>	244	<i>M. sahlbergii</i>	831	<i>P. gracilis</i>	421–424
<i>L. maculata</i>	245	<i>M. ussuriensis</i>	832–834	<i>P. gymnoclada</i>	425
<i>Leucolejeunea paroica</i>	246	<i>Metacalypogeia alternifolia</i>	790	<i>P. hakkodensis</i>	426, 427
<i>L. turgida</i>	247–249	<i>M. cordifolia</i>	791, 792	<i>P. hyalodermica</i>	428, 429
<i>L. xanthocarpa</i>	250–252	<i>Metalejeunea cucullata</i>	262	<i>P. khasiana</i>	430
<i>Liochlaena sichuanica</i>	797–800	<i>Metasolenostoma ochotense</i>	839–843	<i>P. nepalensis</i>	431, 432
<i>L. subulata</i>	801	<i>M. orientale</i>	844–847	<i>P. orbicularis</i>	433
<i>Lobatiriccardia coronopus</i>	43	<i>M. rubripunctatum</i>	848–855	<i>P. ovalifolia</i>	434–437
<i>L. yunnanensis</i>	44	<i>Metzgeria lindbergii</i>	37, 38	<i>P. parvifolia</i>	438
<i>Lophocolea bidentata</i>	382, 383	<i>M. temperata</i>	39	<i>P. peculiaris</i>	439–441
<i>L. cuspidata</i>	384	<i>Microlejeunea punctiformis</i>	263–265	<i>P. poeltii</i>	442
<i>L. heterophylla</i>	385	<i>Mnioloma fuscum</i>	793, 794	<i>P. poreolloides</i>	443–445
<i>L. horikawana</i>	386	<i>Moerckia blyttii</i>	22	<i>P. pseudofirma</i>	446, 447
<i>L. kurzii</i>	387	<i>Moerckia flotoviana</i>	23, 24	<i>P. pseudopoeltii</i>	448, 449
<i>L. minor</i>	388–390	<i>Monosolenium tenerum</i>	6, 7	<i>P. recurvata</i>	450
<i>L. muricata</i>	391, 392	<i>Mylia anomala</i>	712–714	<i>P. retusa</i>	451
<i>L. sikkimensis</i>	393	<i>M. taylorii</i>	715, 716	<i>P. salacensis</i>	452
<i>Lopholejeunea appplanata</i>	253, 254	<i>M. verrucosa</i>	717	<i>P. satoi</i>	453–455
<i>L. euplopha</i>	255	<i>M. vietnamica</i>	718, 719	<i>P. sciophila</i>	456–460
<i>L. nigricans</i>	256, 257	<i>Nardia assamica</i>	1008–1011	<i>P. semidecurrans</i>	461–464
<i>L. subfusca</i>	258	<i>Nardia breidleri</i>	1012, 1013	<i>P. sichotensis</i>	465
<i>L. zollingeri</i>	259	<i>N. compressa</i>	1014	<i>P. subtropica</i>	466, 467
<i>Lophozia ascendens</i>	633, 634	<i>N. geoscyphus</i>	1015–1017	<i>P. trabeculata</i>	468, 469
<i>L. faurieana</i>	635	<i>N. harae</i>	1018	<i>P. vexans</i>	470, 471
<i>L. guttulata</i>	636	<i>N. hiroshii</i>	1019	<i>P. zonata</i>	472
<i>L. heteromorpha</i>	637	<i>N. insecta</i>	1020	<i>Plagiochilion fimbriatum</i>	473–475
<i>L. lantratoviae</i>	638, 639	<i>N. japonica</i>	1021–1023	<i>P. mayebarae</i>	476
<i>L. longiflora</i>	640, 641	<i>N. pacifica</i>	1024, 1025	<i>P. oppositum</i>	477, 478
<i>L. murmanica</i>	642	<i>N. scalaris</i>	1026, 1027	<i>P. theriotanum</i>	479
<i>L. pallida</i>	643	<i>N. subclavata</i>	1028–1030	<i>Plectocolea ariadne</i>	856, 857
<i>L. savicziae</i>	644–647	<i>N. unispiralis</i>	1031	<i>P. comata</i>	858, 859
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<i>L. silvicola</i>	649, 650	<i>Neoorthocaulis attenuatus</i>	681, 682	<i>P. erecta</i>	861–864

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<i>P. hattoriana</i>	873–875	<i>Riccardia chamedryfolia</i>	45–49	<i>S. verrucosa</i>	625, 626
<i>P. horikawana</i>	876, 877	<i>R. flavovirens</i>	50, 51	<i>Schiffneria hyalina</i>	505
<i>P. infusca</i>	878–880	<i>R. glauca</i>	52, 53	<i>Schistochila aligera</i>	279, 280
<i>P. infusca</i> var. <i>recondita</i>	881–884	<i>R. graeffei</i>	54, 55	<i>S. blumei</i>	281–283
<i>P. kurilensis</i>	885–888	<i>R. latifronsoides</i>	56, 57	<i>S. sciurea</i>	284
<i>P. marginata</i>	889, 890	<i>R. multifida</i> subsp. <i>decrescens</i>	58, 59	<i>Schistochilopsis boliviensis</i>	627
<i>P. ovalifolia</i>	891, 892	<i>R. nagasakiensis</i>	60	<i>S. cornuta</i>	628
<i>P. radicellosa</i>	893, 894	<i>R. palmata</i>	61, 62	<i>S. incisa</i>	629
<i>P. rosulans</i>	895–898	<i>R. parvula</i>	63, 64	<i>S. setosa</i>	630, 631
<i>P. sordida</i>	899	<i>R. pusilla</i>	65	<i>Schizophyllum bidens</i>	692, 693
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<i>P. truncata</i>	902–904	<i>Saccobasis polita</i>	536	<i>Schljakovianthus quadrilobus</i>	695, 969
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<i>P. yunnanensis</i>	909	<i>Scapania ampliata</i>	537	<i>S. atrorevolutum</i>	919
<i>Pleurozia acinosa</i>	30	<i>S. apiculata</i>	538	<i>S. bilobum</i>	920
<i>P. gigantea</i>	31, 32	<i>S. bhutanensis</i>	539	<i>S. confertissimum</i>	921
<i>P. subinflata</i>	33–36	<i>S. bolanderi</i>	540	<i>S. flagellare</i>	922
<i>Plicanthus birmensis</i>	686, 687	<i>S. carinthiaca</i>	541, 542	<i>S. flavorevolutum</i>	923
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<i>P. campylophylla</i>	72, 73	<i>S. curta</i>	552, 553	<i>S. lanigerum</i>	930
<i>P. densifolia</i>	74, 75	<i>S. cuspiduligera</i>	554, 555	<i>S. obovatum</i>	931
<i>P. faurieri</i>	76	<i>S. davidi</i>	556	<i>S. obscurum</i>	932–934
<i>P. gracillima</i>	77	<i>S. degenii</i>	557–559	<i>S. parviflexum</i>	935
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<i>P. platiphylla</i>	87	<i>S. hians</i>	570	<i>S. schaulianum</i>	944
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