occasional papers of the Farlow Herbarium of cryptogamic botany

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Continued on back cover

EDWARD ANGUS BURT (1859–1939)

CARROLL W. DODGE[1]

Note: There appears to be no account of the life of E. A. Burt in the mycological literature. Because of this I prevailed upon Dr. Dodge to allow publication of this note. Dr. Dodge is perhaps one of the few people who can now give us a personal view of Burt and his work. In several cases I have appended, in footnotes, comments and quotations from Burt's correspondence in the Farlow Library.

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Edward Angus Burt was born on April 9, 1859 at Athens, Pennsylvania. When he was a small boy, the family moved to a dairy farm near Middle Grove, Saratoga County, New York. His father died when he was five years old; much of the land was rented and just enough cultivated by the family to keep a few cows for his mother to secure a small income from the sale of butter. Consequently, there was less work about the farm for a growing boy than usual for a farmer's son and he spent his time fishing in the summer and, as soon as he was big enough to handle a gun, hunting in the winter. While leading this active and outdoor life, he found many curious plants, which he brought in and tried to find out more about without much help.

When he finished the country school, he hired out to a neighboring farmer to learn improved methods of agriculture. The farmer was fairly well-educated and a trustee of the local school district. Here Burt came in contact with a weekly paper containing an agricultural department which offered to answer queries about weeds etc. and gave instructions for the preparation and forwarding of plant material. This appealed to the boy and he took advantage of the opportunity. Later a county superintendent of schools visited the farm and left a copy of a report of the state board of education. The boy read it and learned that there was such an institution as a normal school where one could learn, among other things, to identify plants. He decided to try it and arranged to attend the State Normal School in Albany during the winters.

He worked his way through the school until his senior year, when he was offered an opportunity to fill a vacancy teaching penmanship, bookkeeping and English at the Albany Academy, a preparatory school for boys. He continued to teach there from 1880 to 1885, finishing his course at the Normal School as best he could and taking first year Latin at the Academy. A conflict prevented his taking more Latin at the Academy but he read Caesar and Virgil by himself. He gradually shifted to subjects more to his liking until finally a department of natural sciences, including biology, chemistry and physics, was created

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for him at the Academy and a laboratory fitted up. He studied French and German by attending summer school.

He gradually saved some money and was determined to enter Yale Sheffield Scientific School since that was one of the very few schools where Greek was not required because he had neither the time nor the inclination to devote himself to learning Greek. His plans changed when a vacancy occurred in the State Normal School at Albany and he accepted the position teaching natural history at a comfortable salary. He gave up the idea of attending college, married Clara Mary Briggs and purchased a home. Their eldest son, Angus Edward was born on June 20, 1885. In 1883 he was appointed to the Board of Regents' Examiners in New York State but in 1885 a change was made which required full time for the Board of Regents' work. Since the salary was considerably lower than that in the Normal School, he resigned. He spent his summers at the family farm in East Galway where his second son, Albert Forsyth, was born in July, 1890.

In 1891 he was offered an opportunity to enter the junior class at Harvard University without examination (as he quaintly stated: "one of those exceptions which college faculties sometimes make"). Here he came under the influence of Professors Roland Thaxter and William G. Farlow and decided to devote his life to the study of mycology. He graduated fifth in his class in 1893 and began graduate work, receiving his A.M. in 1894 and his doctorate in 1895.[2]

He accepted an appointment as Burr Professor of Natural History at Middlebury College under the presidency of Ezra Brainerd in 1895. He held this position until 1913. He bought a house with a lot big enough to keep a horse and two cows on Webridge Street and remodeled it as his family grew. To save on the size of radiators, he designed the heating system to use hot water during spring and autumn, changing to steam for the coldest months. Since he was fond of apples, the existing orchard was partly grafted and new trees planted so that he had a succession of apples from mid-summer until early spring. He told an amusing anecdote about his pruning. In sawing off a low limb, he rested enough of his weight on the limb so that when the limb was nearly cut through it broke and he fell about three feet, without being hurt. He remarked that he was fortunate that a student was not passing to see him!

In the early years the work at Middlebury was burdensome since

[2] Burt's thesis was on the Phalloideae. Several papers were published covering his results. They follow: The development of *Mutinus caninus* (Huds.) Fr. Ann. Bot. *10:* 343–372. 1896.; The Phalloideae of the United States. I. Development of the receptaculum of *Clathrus columnatus* Bosc. II. Systematic account. III. On the physiology of elongation of the receptaculum. Bot. Gaz. *22:* 273–292, 379–391. 1896.; *24:* 73–92. 1897.

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Burt gave courses in comparative anatomy as well as in botany. He found considerable difficulty in supplying class material which consisted in part of two frogs and two cats per student. He told many interesting stories of his quest for cats, for sixty or seventy must all be on hand, killed, injected and ready for dissection in a short time since the college had no adequate refrigeration facilities. One trick was to walk to a remote part of town, then rub his shoe with oil of valerian, an attractant. The cats followed him to his barn where he took care of them in privacy. Frogs presented other difficulties, for while they were abundant in nearby ponds, Dr. Burt was very near-sighted. So, he trained his sons to catch frogs, for part of their pocket money.

In 1900 a new Science Building was built and very well-equipped with the latest in laboratory furniture. The great task of moving the geological museum, with its large collections of fossils and minerals, fell to him. Labels were dissociated in many collections due to the carelessness of workmen and he undertook a complete check of the specimens against original descriptions and reidentification of many minerals.

As the college grew he was relieved of teaching geology and zoology and, although his botany classes were large, was able to devote more time to his research.[3] He was also active in the affairs of the Congregational Church and the community, serving as chairman of the construction committee of the local waterworks, 1900–1902. Meanwhile his oldest son, Angus Edward, after two years at the college transferred to the Massachusetts Institute of Technology, graduating in 1909. He married the next year and settled in Porcupine, Ontario. Here he and his wife were killed in a forest fire on July 11, 1911. The shock led Dr. and Mrs. Burt to withdraw from the social life of the community except for the usual entertaining of advanced students.

Dr. Burt was a very popular teacher, with consequent extra sessions in the laboratory and many examinations to grade. Although his primary interest was in fungi, his course in general bacteriology was one of the largest advanced classes in the college. He collected extensively in the vicinity of Middlebury, and became increasingly interested in the resupinate Basidiomycetes. Vacations were utilized in trips to the Cryptogamic Herbarium of Harvard University and to the Schweinitz herbarium at the Academy of Natural Sciences in Philadel-

[3]Letter, Burt to Farlow, Jan. 25, 1897. "I should like very much to work up the Thelephoraceae. . . . They are a very difficult family, but still the specimens retain their characters well. With plenty of material for study, there is undoubtedly opportunity for a good piece of work on this family. . . . The lack of carefully determined specimens of some of the species has been a great disadvantage."

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phia. He spent one summer in Europe,[4] sectioning the types in the larger herbaria and collecting Friesian species in the vicinity of Uppsala, Femsjö and Stockholm. He also began to receive large series of specimens from correspondents, which came to occupy much of his research time.

Meanwhile, his second son, Albert Forsyth Burt, attended Middlebury College. He graduated in 1911 and entered Harvard Law School, receiving his Ll.B. in 1914.

I first met Dr. Burt when I entered Middlebury College in the fall of 1912. My adviser, an English professor, noted that my transcript listed a term of secondary school botany and enrolled me in second year botany to satisfy my science requirement. The course was plant anatomy and Record's *Economic Woods of the United States* had just been published. I knew nothing of the preparation of microscopic sections and had never seen a compound microscope, much less used one. We first studied cell division in the root tip of *Equisetum*.

After the study of *Equisetum* and corn root tips, we were ready for stem anatomy. In the morning, Dr. Burt would meet the class, toss a chip or small piece of wood on our laboratory table, tell us to study the sample until we would be willing to testify in court what species of wood the sample was. Then he would retire to his private laboratory next door. If we had any questions on interpretation of the structures we saw, or a difficulty in Record's keys, he was always prompt to lay aside his research to explain things to us. In order to provide the information needed in the keys, we had to prepare radial, transverse, and tangential sections after moistening the wood. At that time E. C. Jeffrey at Harvard was just developing his more sophisticated techniques. Dr. Burt's lectures were strictly descriptive without the synthesis that Jeffrey was teaching his students but did not publish until 1916. During the second semester Dr. Burt lectured on plant physiology with simple experiments such as those developed by Ganong in his *Teaching Botanist* (ed. 2, 1910).

During the spring vacation, I helped my father tap the sugar woods where recent rains made the foliose lichens on the trunks more conspicuous. I collected specimens of several species such as *Lobaria quercizans* and *L. pulmonaria* on maple trunks, *Cladonia cristatella* on mossy rotten logs, and *Peltigera canina* growing over mosses at the bases of trees where the snow had melted. When I returned to college, I spent several afternoons studying my lichens. In a small book case in the laboratory, I found a copy of W. Lauder Lindsay's

[4] Burt discusses this trip, from which he had just returned, and his itinerary in a letter to Farlow dated November 16, 1899.

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Popular History of British Lichens with some colored plates. With this I identified both *Lobarias* and the *Peltigera* and the *Cladonia* to genus. One afternoon when Dr. Burt returned from lunch, he noticed me at work and came over to the table to see what I was doing. He confirmed my identifications and brought me, from his office, his copy of Bruce Fink's *Lichens of Minnesota,* suggesting it would be more useful to a beginner. Somewhat later he introduced me to Tuckerman's *Synopsis of North American Lichens* and B. D. Jackson's *Glossary of Botanic Terms.* Sometimes Dr. Burt would invite me to go with him on trips to collect class material and I would collect lichens. About the middle of May, Dr. Burt invited me to go home with him to compare my lichens with those in his personal herbarium in his study. I was invited to stay for supper where I met Mrs. Burt and the younger sons, Farlow,[5] a high school junior and Howard, a sophomore.

Dr. Burt and Dr. Farlow had been competing to complete their copies of Quélet's *Champignons du Jura et des Vosges.* The supplements were short papers published in obscure journals. In May, 1913, Dr. Burt completed his set and wrote to Dr. Farlow. Farlow took the train to Middlebury the next day and stayed as Dr. Burt's houseguest. I was working in the advanced laboratory when a small elderly man entered and inquired for Dr. Burt. I replied that Dr. Burt had gone home after his one o'clock lecture as he had a houseguest. Professor Farlow sat down at the table where I was working at lichens and visited with me until Dr. Burt returned. It turned out that Dr. Farlow had retired for a nap after lunch and had come to the laboratory by the sidewalk, while Dr. Burt had hurried home across lots.[6]

In the early twentieth century an intense interest in forestry developed and several colleges and universities began to offer courses in forestry. Dr. Burt offered a course in forestry at Middlebury with field trips to the Battell forests of the Green Mountains. He became interested enough to plant white pines on the less productive portions of his farm at Middle Grove, N.Y. during spring vacations. After Dr. Burt left, the forestry courses were discontinued at Middlebury.

When Dr. George T. Moore (1871–1956) succeeded Dr. William Trelease as Director of the Missouri Botanical Garden and Dean of

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[5]Letter, Burt to Farlow, Jan. 3, 1896. "Our third son was born on Nov. 24th last. Out of regard for the associations and rememberances of my later years at Harvard, he has been named Farlow Burt. He is a bright and vigorous youngster and if he develops as promisingly as his brothers, we hope that he will not discredit his name."

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[6]Letter, Farlow to Burt. June 1, 1913. Farlow wrote about Burt's copy of Quélet's book upon his return—"Your copy of Quélet is complete and you are fortunate. The part generally missing is part 4 . . ."

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the Henry Shaw School of Botany of Washington University in 1912, he began expansion of the scientific staff. He continued with Dr. Trelease's large elementary class and the course in bacteriology, the second oldest in America, and added an advanced course in algology. Dr. Moore turned to men he had known at the Harvard Graduate School in 1894–6 to fill his vacancies. Dr. Jesse M. Greenman (1867–1951) became curator of the herbarium and offered courses in taxonomy and plant geography; Dr. Benjamin M. Duggar (1872–1956) was appointed plant physiologist; and Dr. E. A. Burt was appointed librarian and mycologist. The salary offered to Burt was much larger than he had been receiving at Middlebury.

In late May, 1913, Dr. Burt sold his home in Middlebury and bought a smaller house in St. Louis, a couple of blocks from the Botanical Garden. A young man replaced him at Middlebury who proved to be a very poor teacher and left at the end of the first semester. As I had started work for honors in botany under Dr. Burt, he offered to guide me by correspondence, although I was formally enrolled under the Professor of Zoology. I expanded my project to include fungi and sent my identified specimens to Dr. Burt for confirmation. In March of my senior year, through Dr. Burt, I received an appointment as a Lackland Fellow for graduate work in Washington University at the Garden. When I arrived in St. Louis, Dr. Burt invited me to stay at his home until I found a room and boarding house.

Dr. Burt's work as librarian was almost a sinecure. There was a very efficient assistant librarian and a cataloguer. He spent about an hour a week suggesting subject-headings to the cataloguer for puzzling pamphlets. He gave a semester course in mycology every other year, thus most of his time was devoted to his monograph of the Thelephoraceae. Dr. Moore had established the Annals of the Missouri Botanical Garden for works by staff and students, so Dr. Burt had an easy means of publication. I was assigned to help him one afternoon a week making microscopic preparations.

Since their home was nearly an hour by street car from the University, the Burts made few acquaintances with the faculty and had very little social life. Their neighbors were mostly German speaking. Since he had a larger salary without increasing his living expenses, Dr. Burt began to study the stock market intensely and invested part of his savings shrewdly. By the beginning of the depression, he was one of the largest payers of income taxes in St. Louis. Although he lost heavily in the depression, he still had a large income in his retirement.[7]

[7]Some of Burt's financial dealings are outlined in his letters to Thaxter in the late 1920's. Though he was deeply in debt he states that he repaid them all before the stock market crash. During

I soon finished work for the doctorate, I joined the Army, and upon discharge taught two years at Brown University, ten and a half years at Harvard University and returned to St. Louis as Mycologist at the Missouri Botanical Garden and Professor of Botany in the Shaw School of Botany, teaching mycology and Dr. Trelease's course in bacteriology which had been given continuously since 1884. I had kept in contact by correspondence with Dr. Burt while I was in the East and was glad to renew acquaintance with him when I returned to St. Louis. Burt retired in 1933, after his monograph was finished and gave up microscopic work because of failing eyesight. He sold his personal herbarium to Harvard University[8] and finally moved back to the family home in Middle Grove, N.Y. Mrs. Burt died in 1938 and Dr. Burt in 1939.

this period he also contemplated moving back to Cambridge in retirement. Out of respect to Farlow he wrote the text for the *Icones Farlowianae* which was published in 1929. As compensation he insisted only that his name appear on the title page. The publication history of the *Icones Farlowianae* has been documented elsewhere (Pfister, Bull. Boston Mycol. Club *1975* (4): 6–8).

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[8] Burt's herbarium is rich in material procured through his exchanges with many important North American and European mycologists. The Hymenomycetes portion of the collection is kept as a separate unit. The other groups have been inserted into the Farlow Herbarium general collection.

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JACOB W. BAILEY AND THE DIATOMS OF THE WILKES EXPLORING EXPEDITION (1838–1842)

Robert K. Edgar[1]

ABSTRACT

The Wilkes Exploring Expedition's collection of diatoms included samples primarily associated with seaweeds collected in the southern Atlantic and Pacific regions and of Miocene diatomite and recent materials collected in Oregon (USA) between 1838 and 1842. J. W. Bailey was instrumental in the generation of the samples, their subsequent analyses and the resulting publications. The past, present and projected extents of these samples and the contributions of Bailey to the published literature on the Expedition's diatoms are discussed. Lectotypes are designated for nine diatom species in the genera ***Amphitetras, Arachnoidiscus, Aulacodiscus, Campylodiscus, Cocconeis*** and ***Triceratium*** that were derived from the Expedition and authored by Bailey and W. H. Harvey and Bailey.

INTRODUCTION

The United States Exploring Expedition (1838–1842), under the command of Charles Wilkes, was America's first national attempt at large-scale science beyond her own continental margins. Various combinations of interest in commercial expansion in the Pacific, jingoistic competition with the expeditions of other nations, personal and political profit, and unadulterated scientific curiosity motivated its organizers and participants. Equally varied were the scientific results of the Expedition, which ranged from achievements of enduring momentum, such as James D. Dana's treatises on geology and zoophytes and Wilkes' discovery of Antarctica, to works that never reached the printer (Haskell, 1942; Stanton, 1975). The fact that observations on diatoms could have been included among the Expedition's results probably crossed no American mind before Wilkes embarked; the fact that they were included was solely the circumstantial product of the post-Expedition involvement of Jacob W. Bailey with the macroalgal and geological collections.

In 1838 America had no botanist who focused on the algae much less the more narrowly defined diatoms. Early in the decade John Torrey had written to Lewis D. de Schweinitz, a leading American cryptogamic botanist, "It is astonishing that scarcely any of our botanists have collected them [the algae] hitherto—no department of our Cryptogamia has been so neglected" (Rogers, 1942). Despite his interest in remedying the neglect of the algae, an interest he pursued for a short while in the early 1830's, Torrey never removed his focus from phanerogams; but he did encourage his close personal and professional friend, J. W. Bailey, to investigate the group, especially in view of Bailey's strength as a microscopist. Bailey had begun to

[1]Hellerman Diatom Herbarium, Southeastern Massachusetts University, North Dartmouth, Massachusetts 02747

examine American algae, both seaweeds and diatoms, by the late 1830's but wrote honestly to Asa Gray about his progress: "I am troubled with the vast number of forms [and] . . . feel the want of books on Algae very much" (Bailey, MS., 1840). Not until nearly five years *after* the Expedition had returned would American botanists first publish on their own seaweed flora (Bailey, 1847, 1848; Olney, 1847) and only then with the critical assistance of the Irish algologist, William H. Harvey. Stephen Olney was not an algologist, and his report was largely the work of Harvey supplemented by that of Bailey. Also, the first American paper on diatoms was published by Bailey two months *after* the Expedition had sailed (Bailey, 1838), and only while the Expedition was gone were general sketches of the diatoms made available to American botanists (Bailey, 1841–1842). By the late 1840's even though he considered himself professionally more a micropaleontologist, in response to coaxing by Torrey and Gray J. W. Bailey had accepted dutifully the role of America's algologist; his acceptance was reluctant and primarily because the role was vacant.

The administration of the scientific collections and the publication of the results of the Expedition rested largely with Wilkes, who insisted that the reports be a wholly American production uncontaminated by Europeans. Wilkes envisioned the reports as a declaration of scientific independence from Europe, a declaration that had both popular and political support but not the wholesale support of scientists whose interests were in attaining the best science regardless of its national origin. In directing with Gray the Expedition's plant collections to various specialists for separate monographs, Torrey informed Wilkes (who had originally insisted a single botanist do all the plants!) that no American was qualified to do the algae. As late as 1847 no American botanist would undertake them. The compromise in the Torrey-Wilkes dispute was Bailey; he agreed in 1848 to describe the small collection of algae from the Expedition but with the assistance of Harvey. However, even Wilkes' sarcastic view of this compromise proved an overestimate: "A population of 20 millions and only half an algologist . . . in the lot!" (Stanton, 1975). A few months after receiving the collection Bailey accepted what was inevitable given his scientific honesty and his meager algological experience, literature and herbarium resources—only Harvey could do the collection. "How absurd it is for anyone in this country to undertake it. . . . I confess I do not sympathize with the national feeling that prevents him [Harvey] from having full credit" (Bailey, MS., 1848). Before Bailey repackaged the collection and sent it to Harvey, he removed from it samples of a flora he could handle. Clearly diatoms are incidentally collected with any underwater substrate (*e.g.*, plants, shells, mud); Bailey took advantage of the fact. These excerpted diatom samples were the basis for his reports, some coauthored but not actually co-worked with Harvey, on the geographical distribution of some common and new diatoms along the Wilkes Expedition route and the description of 14 new diatom species from the Pacific region (Bailey, 1853a; Bailey *in* Ehrenberg, 1849; Bailey & Harvey *in* Gray, 1862; Harvey & Bailey, 1853).

Bailey's other report on diatoms derived from the Expedition did not result from his familiarity with botany and the macroalgae but rather his expertise in microscopic geology. In 1841 in the Oregon Territory, James D. Dana, the Expedition's geologist, collected fossil and recent geological samples containing infusoria, and in either 1843 or 1844 sent portions of them to Bailey for microscopic examination. The fossil sample included a diatomite as part of a larger collection of fossils that Dana had extracted from argillaceous Tertiary shale deposits near Astoria [Fort George] on the Columbia River (Dana, 1849). Bailey received the samples labeled as the "Tertiary of Oregon" and accompanied by some marine shells. Timothy A. Conrad concluded later, based on the shells in this deposit, that it was Miocene (Conrad *in* Dana, 1849). The recent sample contained primarily epiphytes "entangled in a mass of Confervae attached to a *Unio* [Bivalvia] from Ft. George, Columbia River" (Bailey, 1845). Although Bailey did not indicate explicitly in his article or notes that the *Unio* sample came specifically from Dana and thus the Expedition (even though Ehrenberg later would), the sample was collected from the same nominal locality as the fossil material and was grouped by Bailey with the fossil materials from Dana. At about the same time Bailey received, via James Hall, other samples of Oregon diatoms from John C. Frémont's survey of inland Oregon (1843–1844), but the *Unio* sample is not likely Frémont's because his expedition did not reach Astoria (Goetzmann, 1959). Portions of Dana's recent and fossil samples were sent by Bailey to Christian G. Ehrenberg, and each of them independently published microscopic analyses of the samples (Bailey, 1845; Ehrenberg, 1845, 1854). The Dana samples, especially the fossil one, are nomenclaturally important because they are replicates of the samples from which 24 new diatom species were described by Ehrenberg (1845) and are paleontologically significant because they were among the initial bases for establishing that the Tertiary of the American Pacific Northwest resembled more the Tertiary of Europe with its alternating freshwater and marine deposits than all previously known North American Tertiary deposits (Atlantic and Gulf Coasts; *e.g.*, the Richmond infusorial deposit), which were entirely marine (Dana, 1875).

Addressing these two sets of Wilkes Expedition diatoms—the seaweed-associated samples and Dana's samples—this paper continues a project of establishing a stable and reliable basis for evaluating the taxonomic and systematic contributions on diatoms of J. W. Bailey (see Edgar, 1977, 1978). Herein I have attempted to circumscribe the diatom collections that were generated from the Expedition's materials, to clarify the contributions of Bailey to published reports on diatoms derived from the Expedition, and to typify or clarify the application of the diatom species names authored by either Bailey or Harvey and Bailey in connection with these collections.

METHODS

The search for diatom materials from the Wilkes Expedition has been limited to the direct examination of the diatom holdings of the Farlow Herbarium (FH) and the Academy of Natural Sciences of Philadelphia (PH) and my examination by correspondence with the curators of the herbaria at Ohio State University (OS) and the U.S. National Museum (US). The characterization of appropriate materials and the selection of types have been the product of the analysis of the published papers on diatoms resulting from the Expedition, the *Catalogue of the Bailey Microscopical Collection* and its associated manuscripts (Edgar, 1978), J. W. Bailey's "Memoranda of Things Sent to Correspondents" (Bailey, MS., [?1848–1856]), Bailey's scientific notebooks and the correspondence from William H. Harvey and Charles Wilkes to Bailey, housed in the archives of the Museum of Science (Boston Society of Natural History), the correspondence from Bailey to Asa Gray in the Gray Herbarium Library, and the examination of diatom slides and exsiccati.

The microscopic examination of specimens was conducted with brightfield (direct and oblique illumination) and phase-contrast optics using semiapochromatic objectives. In most cases slide coverglasses and mounting media thicknesses above the specimen were so large as to prohibit the use of oil-immersion objectives and to produce considerable spherical aberration in high dry objectives. Consequently, most samples were examined using numerical apertures less than 0.75. Among the lectotypes presented in this paper only that of *Arachnoidiscus ehrenbergii* could be examined under oil; figure 21 was also produced using oil-immersion optics (N.A. $\cong$ 1.25). All depth measurements were calculated assuming a balsam mounting medium with a refractive index of 1.5.

In each case where I have specified a lectotype I have designated and described a single specimen and referenced its location on the slide by a simple Cartesian coordinate system. The system is centered around two short crossed vertical and horizontal rules scratched on the slide (not the coverglass) near the slide number, which is also scratched into the glass. The rules are parallel to the edges of the slide. The coordinates are presented in millimeters as (x, y). For example: (+7.3, −2.0) would indicate that the specimen is 7.3 mm to the right (+) of the vertical rule parallel to the horizontal (x) axis and 2.0 mm below (−) the horizontal rule parallel to the vertical (y) axis. The coordinate references are given in parentheses following the specification of the herbarium, collection and slide number of the type.

RESULTS AND DISCUSSION

The Seaweed Samples. Remnants of the diatom materials from the Expedition's seaweeds were found almost exclusively in the Bailey Collection at the Farlow Herbarium. Two slides of Expedition diatoms derived from Bailey's original materials were located at the Academy of Natural Sciences of Philadelphia, but none were uncovered at Ohio State University or the U.S. National Museum. Based on an examination of the records and catalogs relating to the Bailey Collection (Edgar, 1978), the Collection originally (ca. 1857) contained 108 diatom slides from the Expedition: Bailey Coll. 812–837, 1539, 1737, 1738, 2102–2110 and 2129–2185. Only 53 of these slides are currently in the Collection: Bailey Coll. 812–837 (Puget Sound); 1539, 2142–2146, 2148, 2150, 2152 (Philippine Islands); 2139 (East Indies); 2153–2156 (Australia); 2158, 2159 (New Zealand); 2160 (Patagonia) and 2162 (Tierra del Fuego). The original slides from the Hawaiian, Fiji and Society Islands, the Sulu Sea, Rio de Janeiro, Madeira, Tahiti, Tongatabu, St. Helena and Wilson's Island are missing. A single vial of unmounted material (Bailey Coll. U138) labeled "Specimen of bottom of York Roads, Straits of Magellan, Chile" was probably collected by the Expedition. At the Academy (PH) Febiger Collection slide 2190 contains diatoms from Tahiti, some of which were reported by the Expedition, and as importantly the slide bears the paper cover and handwriting of Emanuel A. Samuels of Milton, Massachusetts who worked extensively with the Bailey Collection in the late 1800's while it was possessed by the Boston Society of Natural History. Also, Febiger Collection slide 1025 contains specimens of *Arachnoidiscus ehrenbergii* from Puget Sound and a notation in the handwriting of Loring W. Bailey, J. W. Bailey's son and himself a reputable diatomist, that the sample is the Expedition's. Both Febiger slides were probably made from Bailey's original materials.

Consequently, contrary to Koster (1969), Stafleu (1972) and Stafleu and Cowan (1976), the Expedition diatoms of J. W. Bailey and thus potential lectotype material for his names are not located at the Boston Society of Natural History or the U.S. National Museum but at the

Farlow Herbarium primarily. In addition, Collins (1912) indicated that "evidently the individuals [seaweeds] from which the plates [of the Wilkes Expedition] were drawn, are in the herbarium of Brown University, Providence, Rhode Island." I have not seen these specimens, but if they still exist and are as Collins supposed, they are probably type material for Bailey's seaweed names authored with Harvey and should contain diatoms representative of his original collections.

Replicates of the Expedition's diatom samples derived from Bailey probably exist also at numerous herbaria that I have not searched. He distributed Expedition diatoms to the following individuals, whose collections, if they persist, should contain subsamples of his original materials (Bailey, MS., [?1848–1856]):

Australia (Port Oxford): Alexander S. Johnson ([?Buffalo], NY) **California:** John Ralfs (Cornwall), Rev. William Smith (Cork) **Hawaii:** Louis A. de Brébisson (Falaise) **Philippines (Mindinao):** Charles A. Spencer (Canastota, NY) **Puget Sound:** Louis A. de Brébisson (Falaise), Charles F. Beck (Fredericksburg, VA), M. F. Beck (Philadelphia), Christopher E. Broome (Bristol, England), Thomas F. Bergen (Dublin), Thomas Brightwell (Norwich, England), James H. Couper (Darien, GA), George Dickie (Aberdeen), Christian G. Ehrenberg (Berlin), C. R. Gilman, Robert Harrison (Hull, England), Alexander S. Johnson ([?Buffalo], NY), Matthew Marshall (London), John Quekett (London), J. Milton Sanders (Memphis, TN), Benjamin Silliman, Jr. (New Haven, CT), Charles A. Spencer (Canastota, NY), George J. Strong (New York), H. VanArsdale (Morristown, NJ), William C. Williamson (Manchester, England) **Rio de Janeiro:** William C. Williamson (Manchester, England) **Society Islands:** John Ralfs (Cornwall) **Tahiti:** William Gregory (Edinburgh), Robert K. Greville (Edinburgh), René Lenormand (Calvados), Rev. William Smith (Cork).

Given that substantial slide and vial portions of the Bailey Collection are missing and that much of Bailey's original materials were disseminated by the Boston Society of Natural History among diatom collectors in the late 1800's, this list is conservative and clearly does not exhaust the possible replicates.

Bailey received the seaweeds bearing the diatoms from William Brackenridge, the curator of the Expedition's botanical collections, in March or April of 1848 (Haskell, 1942; Wilkes, MS., 1848), and by May of 1848 he was sending diatom specimens from the Puget Sound material to correspondents (Bailey, MS., [?1848–1856]). By early 1851 he had finished descriptions of 15 new diatom species and sent them to Harvey, who had agreed to rewrite them in Latin for publication. Harvey responded with Latin descriptions which are identical to those for the 13 new species contained in their 1853 joint publication (Harvey, MS., 1851; Harvey & Bailey, 1853). In addition, Harvey's letter contained the Latin descriptions of two diatom species that Bailey decided not to publish (and which are therefore invalid): *Cocconeis occidentalis* B. & H. (*nom. nud.*) and *Navicula inornata* B. & H. (*nom. nud.*). Harvey concluded his letter with an emphatic request: "But will you please let them be called such & such of '*Bail. & Harv.*' (not *H & B* as *you* place us), for it is quite enough for me to be tacked to your tail in connexion with these atoms of which I know so very little, & would be outrageous were I to be [? put] forward so unwarrantably." Accordingly, all the new names in the letter are followed by "B. & H." However, in response to the delays in printing a very limited number of official government Expedition reports, for which his work had been intended, Bailey validly published the 13 new diatom names by publishing just the Latin descriptions in the Proc. Acad. nat. Sci. Phila. 6(11):430–431. And apparently unswayed by Harvey's request, he ordered the authors' names on both the article and all the new binomials as "Harvey and Bailey." The date of this publication in the literature has been given as both 1853 and 1854, but based on Nolan's (1913) indication of the receipt of this number by the Smithsonian Institution, the date of effective publication was 31 December 1853. This article was reprinted without alteration in 1854 in the Q. J. microsc. Sci. 3(9):93–94. The protologues of the 13 new names were later also incorporated into the governmental issue of the Expedition report (and subsequent reprints of it; see Haskell, 1942), which was not issued until 1862, nearly eleven years after the descriptions had been written (Bailey & Harvey *in* Gray, 1862). In this report the names of the coauthors were reversed to "Bailey and Harvey" on the title page of the section on algae and in referring to the authors of the new species names in the subsection on diatoms; with new names presented in the other subsection on seaweeds the order remained "Harvey and Bailey." Collins (1912) speculated that the reason for this author inversion was that the mood of the period [and probably the attitude of Wilkes] demanded the American author come first. The figures of the new diatoms that Bailey had drawn a decade before were printed in this report for the first time, nine years after the protologues and five years after Bailey had died. And the plate containing them was without a scale, something Bailey had never omitted from published figures or even most sketches in his letters to correspondents. The protologues were faithfully reprinted here except for some minor declension and word substitutions, and they were supplemented with descriptions and notes in English in keeping with the practice of Harvey and then recent British authors (Harvey, MS., 1851).

Bailey published alone a list indicating the geographical distribution of diatoms along the Wilkes Expedition's route in an article accompanying the protologues of the new names (Bailey, 1853a). This list was also reprinted (Bailey, 1853b) and incorporated into the official Expedition report.

Bailey's earliest examinations of the seaweed's diatoms led to his description of a new species, *Arachnoidiscus ehrenbergii*, from the Puget Sound and California materials. Specimens of this new species were sent by July of 1848 to John Ralfs and Matthew Marshall and presumably at least by this time to Ehrenberg, who published the description acknowledging Bailey's authorship (Ehrenberg, 1849). The publication of this name several years before all other diatom names generated by the Expedition is curious. But just prior to getting the Expedition's seaweeds, Bailey received from Henry Deane via Matthew Marshall specimens of *Arachnoidiscus japonicus*, which Deane had described from an edible Japanese fucoid in 1847 at a meeting of the Royal Microscopical Society (see Brown, 1933). Bailey Collection vial U144 labeled "*Fucus jacobonnus;* Japan; *Arachnoidicus japonensis;* attached . . ." is extant and presumably contains Deane's specimens. Given the large, spectacular, abundant and new *Arachnoidiscus* Bailey discovered in the Puget Sound material coupled to his recent experiences with Deane's material, his singling out the new species for immediate description would be understandable. As a consequence of its description in Ehrenberg's report, this new species was omitted from the descriptions of new species published in 1853 by Harvey and Bailey, but it was incorporated into the official Expedition report (Bailey & Harvey *in* Gray, 1862). Bailey's first-hand familiarity with Deane's material would explain also his consistent rejection of attempts to credit himself with the name of the genus (Brown, 1933).

The fates of these 14 new names authored by Bailey, wholly or in part, have been summarized by VanLandingham (1967a, 1968, 1971) and Mills (1935): continued use is recommended for six; it is not recommended for eight—six because they are considered synonyms of "recommended names" and two because they are "invalid, poorly described or doubtful." Because the application of names is based on types (Stafleu *et al.*, 1972) and types for none of these names have been designated, these recommendations should be taken cautiously. Despite these recommendations often reflecting a consensus of the literature or a few major workers, correct names are not determined by consensus but by the Code. The problems inherent in substituting illustrations and descriptions of them for specimens, especially as types, is that drawings have as often as not been restorations and archetypal syntheses. The dangers descendant from "paper" nomenclature are well illustrated in the history of the name *Rhabdonema punctatum* (Harvey & Bailey) Stodder, which I have discussed below under *Hyalosira punctata*.

I have chosen from materials in the Bailey Collection and described below lectotypes for nine of the 14 new species names. For the other five names I considered the designation of neotypes because original materials have not been found but deferred on those selections because in some cases there persist a few leads to appropriate lectotype material in European herbaria and because criteria I have applied to their selection have not been met completely. Specifically, these criteria are that neotypes should (1) agree with the description of the protologue of the name, (2) be from the *locus classicus*, and (3) be subject, without extraordinary invention or device, to a critical examination in the light microscope. The choice of lectotypes is confined to the selection of specimens that were studied by the author in the preparation of the protologue; often the material that *must* be used is quantitatively and qualitatively poor. In contrast, when neotypes are to be selected, the opportunity arises to choose from a larger pool of material. Nomenclatural stability will be increased if the information content of the description of the type *and* the future opportunity to critically reexamine the type are maximized. In cases where slides are found in collections that satisfy the first two criteria but not the third, they should be rejected as types in favor of other, possibly newly collected material that can be subjected to the best procedures of microscopical preparation. In the choice of lectotypes one often makes the best out of poor alternatives; in the selection of neotypes there need not be poor alternatives.

The intent of the following section is primarily nomenclatural—to present the lectotypes I have designated and to discuss the reasons why I have not typified certain names.

Amphitetras favosa Harvey & Bailey FIGS. 1-3

Proc. Acad. nat. Sci. Phila. **6**(11):430. 1853. Also: Q. J. microsc. Sci. **3**(9):93. 1854; Gray, p. 178, pl. 9, fig. 18. 1862.

LECTOTYPE: FH—Bailey Coll. 2145 (+27.2, −8.7)

TYPE LOCALITY: [Philippine Islands], "Mindinao"

DESCRIPTION OF THE TYPE: Valve square with straight margins (or slightly convex margins depending on the level of focus); face flat to scarcely convex; mantle normal to face, depth 7 μm; diameter 95 μm. Valve bearing areolae in more or less straight rows and more or less parallel to margins. Areolae regularly to irregularly hexagonal; cribrate; [? pseudolocular]; relatively uniform in size; 2.5 μm deep; 2 areolae/10 μm. Exterior spinules at each hexagonal angle; height 1.5 μm. Valve corners with radially protruding, hollow and narrowing processes, not extending appreciably beyond valve margins; diameter at tip 5 μm; length 5–6 μm.

The type consists of a single valve with its exterior face oriented away from the coverglass. Although no specifically identifiable slide was indicated by Bailey in his collection as containing *Amphitetras favosa*, on Bailey Coll. slide 2145 two specimens are ringed which conform to *A. favosa*. The one I have chosen as the type agrees better with the protologue, although the other presents clearer microscopic structure. In the protologue the valve corners are described only as "scarcely produced" and no mention is made of processes at them. This description is understandable, however, given a view resulting from little valve tilt, debris around the specimen (which Bailey commented on in his notes) and the valve exterior facing away from the observer. Under these conditions the processes are not evident even to a careful examination; the most critical optical sectioning is required to reconstruct them in the type. Bailey's description of the valve margins as "scarcely concave" emphasizes the effects of the produced corners. The illustration of *A. favosa* in figure 18 of the Expedition report shows the hexagonal areolae more regular than they appear in the type. Figure 3 presents a photograph of a paratype on slide 2145 in which the structure of the process is discernible. Notwithstanding my previous comments on the importance of being able to critically examine the type in the microscope, I have chosen here from those specimens studied by Bailey the one which best conforms to the protologue.

Amphitetras wilkesii Harvey & Bailey FIGS. 4–5

Proc. Acad. nat. Sci. Phila. **6**(11):430. 1853. Also: Q. J. microsc. Sci. **3**(9):93. 1854; Gray, p. 174, pl. 9, figs. 1, 2. 1862.

LECTOTYPE: FH—Bailey Coll. 816 (+18.5, +1.1)

TYPE LOCALITY: [U.S.A., Washington], "Puget's Sound"

DESCRIPTION OF THE TYPE: Valve quadrangular, nearly square, with markedly concave margins and rounded corners; face flat but with very slightly elevated corners; mantle normal to face via abrupt transition; mantle depth 7 μm; diameter (longest diagonal) 165 μm, (narrowest) 99 μm. Valve bearing areolae arranged in radial rows, only about 1 in 10 rows continuous from mantle to central cluster, others shorter and confined distally; 3 rows/10 μm. Areolae hexagonal to pentagonal, increasingly irregular and smaller near center (less to) and towards corners (distinctly so), becoming at the corners conspicuous fields of punctae [? pseudocelli]; areolae 3/10 μm; cribrate. Punctae fields 20 μm long on valve face along radius, with convex proximal border. Punctae in radial and oblique striae, moderately fasciculate radially, striae 10/10 μm; punctae 10–12/10 μm.

The type is a single valve which was ringed by Bailey and indicated in his notes by a coordinate system as *A. wilkesii* (see Edgar, 1978).

Arachnoidiscus ehrenbergii Bailey ex Ehrenberg FIGS. 6–7

Ber. Akad. Wiss. Berl. [1849]:64. 1849. Also: Gray, p. 174, 175, pl. 9, figs. 9, 10. 1862.

LECTOTYPE: FH—Bailey Coll. 828 (+14.3, −1.2)

TYPE LOCALITY: [U.S.A., Washington], "Puget Sound"

DESCRIPTION OF THE TYPE: Valve circular; face slightly concave, reaching a depth of 12 μm below face-and-mantle junction at center; mantle normal to face, depth 28 μm; diameter 296 μm. Valve face partitioned equally into 31 primary sectors by primary, radial, internal costae, running from mantle to 23 μm from valve center; primary sectors successively and increasingly incompletely subpartitioned distally by secondary, tertiary and quaternary radial and internal costae, each arising from mantle midway between adjacent costae of higher orders; lower-order costae increasingly shortened: ca. 25–65 μm (secondary costae), 10 15 μm (tertiary costae), 5–7 μm (quaternary costae). Primary costae united proximally by internal, broad, distally scalloped band (ca. 12 μm wide) reaching 35 μm from center; primary and secondary costae united distally adjacent to mantle by internal, broad, proximally scalloped band (ca. 20 μm wide).

Valve surface areolate; areolae volate. Areolae in primary sectors arranged in concentric rows (2–3 rows/10 μm), separated by concentric, slightly thickened internally, interspaces (1–2 μm wide), with least row density and greatest interspace at distance of about one-half radius. Areolae or groups of areolae in radial rows; single areolae more or less circular (1–4 μm diameter); group of 2–3 areolae elliptical (long axis circumferential) up to 3 by 6 μm; ca. 4 areolae/10 μm. Valve face band bordering mantle exteriorly unornamented, width 12 μm. Valve center (diameter 46 μm) internally thickened except for two concentric rings of ornamentation, elements of which are aligned with central radii of primary sectors; outer circlet (diameter 36 μm) of single circular areolae, one at base of each primary sector; inner circlet (centered 12 μm from center) of radially oriented slit-like pores, one per primary sector, 6–7 μm long by 1 μm wide.

The type consists of a single valve from a slide on which Bailey specifically indicated *A. ehrenbergii* was present. Although both Puget Sound and California were cited in the protologue as the original collection sites of this species, no Wilkes Expedition materials from California remain in the Bailey Collection. Samples containing *A. ehrenbergii* from the Monterey region of California, which Bailey received about 1853 from another expedition, should not be confounded with them. Bailey sent specimens specifically labeled as *A. ehrenbergii* from Puget Sound material or before 1853 (and thus most probably from Puget Sound material) to T. Bergen, Thomas Cole (Salem, MA), Ehrenberg, R. Harrison, A. S. Johnson, M. Marshall, J. Ralfs, B. Silliman, Jr., C. A. Spencer and W. C. Williamson (see p. 14). Numerous other specimens recorded by Bailey as only *Arachnoidiscus* were also sent to correspondents, many after 1853 (Bailey, MS, [?1848–1856]).

Aulacodiscus oregonus Harvey & Bailey FIGS. 8–9

Proc. Acad. nat. Sci. Phila. **6**(11):430. 1853. Also: Q. J. microsc. Sci. **3**(9):93. 1854; Gray, p. 176, pl. 9, fig. 6. 1862 [as *A. oregonensis* Bailey et Harvey; orthographic variant, *non*-homonym]

LECTOTYPE: **FH**—Bailey Coll., 815 (+29.6, −0.6)

TYPE LOCALITY: [U.S.A., Washington], "Puget's Sound"

DESCRIPTION OF THE TYPE: Valve circular with smooth margin; diameter 129 μm. Valve surface bearing a gentle concentric ridge about 50 μm from valve center and immediately proximal to the face-and-mantle junction; within the ridge concave along both primary rays and inter-ray sectors, reaching maximal depression at the hyaline central space, depth 4–5 μm; mantle sloping steeply from the ridge to valve margin, depth 11 μm; between adjacent processes moderately concave across the face-to-mantle transition. Primary rays hyaline; 13; most conspicuous at low magnifications (*e.g.*, 100X); radiating from central space to small hyaline spaces at base of processes; partitioning valve face into 13 sectors. Rays bordered on each side by 1-2(-3) aerolae striae running parallel to the ray, but only the most proximal stria running the entire length of the ray, others shorter and confined distally but terminating at the process hyaline space; areolae 5–6/10 μm. Each valve sector containing a group of parallel areolate striae extending to the valve margin, the centralmost being longest and radial; striae 7–8/10 μm; areolae 5–6/10 μm. Central space hyaline, slightly irregular but circular in outline; bearing a single excentric punctum; diameter 10 μm. Processes highly refractive and dark; 13; conspicuously projecting centrifugally at face-and-mantle junction; more or less normal to valve surface but ca. 45° oblique to apical plane; hollow and slightly inflated apically; diameter 7 μm; height 6–7 μm. Valve mantle below processes striate as other parts of mantle [? except radiate]. Valve iridescent at low magnifications.

The type consists of a single partially broken valve; however, the description has assumed it to be intact. On the type slide Bailey ringed the specimen I have chosen as the type, but he identified it only as "*Eupodiscus*" by his scratched notation. Harvey's (MS., 1851) Latin diagnosis for "*Eupodiscus oregonus*, B. & H." is identical to that in the protologue of *Aulacodiscus oregonus* and the explicit result of the translation of what Bailey had forwarded him. On this letter from Harvey, Bailey crossed out the name "*Eupodiscus*" and wrote over it "*Aulacodiscus*." He further indicated in his notebooks (v. 3, p. 136) that "*Aulacodiscus oregonus* B & H = *Eupodiscus oregonus*." Also, in the Bailey Collection Catalog he indicated coordinates for a specimen he called *Aulacodiscus oregonus* on slide 815 that coincide with the location of the type. Bailey had proposed originally in a letter to Harvey [*non vide*] the specific epithet for this species to be "*oregonicus*" but Harvey substituted "*oregonus* . . ., as it is the word used by Nuttal & Gray several times in *Fl* [*ora*] *Bor* [*ealis*] *Amer* [*icana*] and sounds better to my ear than *oregonicus*" (Harvey, MS., 1851). Bailey indicated that he sent a specimen of this species to A. S. Johnson ([?Buffalo], NY).

Campylodiscus kützingii Harvey & Bailey FIGS. 10–13

Proc. Acad. nat. Sci. Phila. **6**(11):430. 1853. Also: Q. J. microsc. Sci. **3**(9):93. 1854; Gray, p. 178, pl. 9, fig. 20. 1862.

LECTOTYPE: FH—Bailey Coll. 2145 (+27.1, −9.0)

TYPE LOCALITY: [Philippine Islands], "Mindinao"

DESCRIPTION OF THE TYPE: Valve isodiametric, approximately circular and saddle-shaped; diameter 57 μm. Valve surface with radiate costae, widest near margin and tapering toward central axial space; costae 5/10 μm (margin) to 10–13/10 μm (center; most dense toward distal ends of central axial space); occasional short costae adjacent to margin not penetrating across valve face. Central axial space narrowly elongate and linear; 30 μm long by ca. 3 μm wide. Valve showing distinct submarginal line 12 μm from margin surrounding entire valve.

The type consists of a single valve circled by Bailey, although there are no extant slides in the Bailey Collection for which he indicated *C. kützingii* was specifically present. Figure 13 shows an oblique view of a paratype of this species, photographed from slide 2145.

Cocconeis parmula Harvey & Bailey

Proc. Acad. nat. Sci. Phila. **6**(11):430. 1853. Also: Q. J. microsc. Sci. **3**(9): 93–94. 1854; Gray, p. 181, pl. 9, fig. 28. 1862.

LOCUS CLASSICUS: "Tahiti"

I have found no specimens which conform to the protologue description of this species.

Cocconeis rhombifera Harvey & Bailey FIGS. 14–16

Proc. Acad. nat. Sci. Phila. **6**(11):430. 1853. Also: Q. J. microsc. Sci. **3**(9): 94. 1854; Gray, p. 175, pl. 9, figs. 3, 4. 1862 [as *C. rhombifer* Harvey & Bailey; orthographic error].

LECTOTYPE: **FH**—Bailey Coll. 830 (+13.0, −5.9)

TYPE LOCALITY: [U.S.A., Washington], "Puget's Sound"

DESCRIPTION OF THE TYPE: Valves broadly elliptical; pseudoraphe valve very slightly convex across the apical axis; length 70 μm; width 55 μm; frustule pervalvar depth 10μm. *Pseudoraphe valve* with moderately wide (ca. 8 μm) slightly sigmoid pseudoraphe oriented very slightly obliquely to apical axis and slightly narrowing distally. Central area transversely widened, narrowly rectangular and ending irregularly about one-half distance to margin; 25 μm long by 4–5 μm wide. Striae curved, radiate, punctate; striae 11/10 μm; punctae 8/10 μm near pseudoraphe to 5/10 μm near mantle. Longitudinal striae zigzag, especially towards margin; 5–8/10 μm. *Raphe valve* with narrow sigmoid axial area, very slightly oblique to apical axis. Central area large, transversely widened resembling a very narrow rhombus and ending about one-half way to margin. Raphe sigmoid with close slightly enlarged proximal pores; distal raphe ends distinct, terminating near the mantle. Striae curved, radiate, finely punctate, 11/10 μm.

The type is a complete frustule with the pseudoraphe valve toward the coverglass. Figure 16 shows a photograph from slide 830 of just the pseudoraphe valve from a paratype of *C. rhombifera.*

Cocconeis sulcata Harvey & Bailey FIGS. 17–19

Proc. Acad. nat. Sci. Phila. **6**(11):430. 1853. Also: Q. J. microsc. Sci. **3**(9): 94. 1854; Gray, p. 175, pl. 9, fig. 5. 1862.

LECTOTYPE: **FH**—Bailey Coll. 825 (+11.5, +2.7)

TYPE LOCALITY: [U.S.A., Washington], "Puget's Sound"

DESCRIPTION OF THE TYPE: Valves suborbicular and flat; length 56 μm; width 47 μm. *Pseudoraphe valve* with narrow linear-lanceolate pseudoraphe about 2.5 μm wide at center; faint central area; distinct curved radiate costae; multiseriate radiate punctate striae between costae, widest near margin (4/10 μm) and tapering towards pseudoraphe (7/10 μm); valve showing a distinct submarginal line surrounding the entire valve, about 8 μm from margin in transapical axis and slightly closer near the apical axis. *Raphe valve* with narrow linear axial area; central area narrowly rhomboidal extending to prominent hyaline submarginal ring and tapering centrifugally; striae discernible only near mantle and immediately adjacent to hyaline ring (7–8/10 μm). Raphe straight with proximal pores slightly enlarged, close (ca. 3 μm) and slightly displaced in opposite directions from apical axis [oblique illumination]; distal pores distinct and in submarginal hyaline ring.

The type is a complete frustule with the raphe valve nearer the coverglass. Bailey used "sulcus" to refer to the transverse striae (or costae): "transversim sulcata, sulcis 30–40 arcuatis" (Harvey & Bailey, 1853). Figures 18 and 19 show photographs of the two different valves of this species taken from specimens other than the lectotype on slide 825.

Hyalosira punctata Harvey & Bailey

Proc. Acad. nat. Sci. Phila. **6**(11):430. 1853. Also: Q. J. microsc. Sci. **3**(9): 94. 1854; Gray, p. 181, pl. 9, figs. 29, 30. 1862.

LOCUS CLASSICUS: "Tahiti"

No specimens from Tahiti conforming to the protologue of this species were located. Febiger Collection (PH) slide 2190 from Tahiti contains a few frustules of *Rhabdonema arcuatum* (Lyngb.) Kütz. but nothing congruent with the description of *H. punctata*. As instructive in illustrating the importance of types in determining the relationships among the names of diatoms, I have observed the following: VanLandingham (1971) has listed *H. punctata* as a synonym of the "recommended name" *Rhabdonema punctatum* (Harvey & J. W. Bailey) Stodder, apparently as a result of Boyer's (1927) treatment of the names. *Rhabdonema punctatum* is not a validly published name, at least by Stodder, who made no such combination even by "incidental mention." The protologue for *R. punctatum* given in Boyer is in Stodder, 1880, but this note by Stodder is a discussion illustrating the difficulties arising from the use of descriptions and illustrations in comparing diatom names. He concluded that a comparison of the figures of *H. punctata* [in Gray, 1862] and *Rhabdonema mirificum* [in Smith, 1856] "showed at once they were the same thing." Stodder said nothing more about the names and proposed neither new ones nor new combinations. Also, after examining the slides from Tahiti in the Bailey Collection and noting in the *Catalogue* his observations, Stodder used only the name *R. mirificum*. The name *R. punctatum* originated with Boyer, not Stodder. Also, it is interesting to note that in VanLandingham (1971) all species names in the genus *Hyalosira* have been referred to *Striatella*, except *R. punctatum*. Boyer (1927) was sufficiently impressed that *H. punctata* might belong to *Striatella* that he created another name, "*Striatella* ? *punctatum* Harv. & Bail., U.S. Expl. Exp. 17: 181. 1862." Harvey and Bailey did not originate this name. Clearly, the relationships among these names will remain confused until the names are typified.

Isthmia minima Harvey & Bailey FIGS. 20–21

Proc. Acad. nat. Sci. Phila. **6**(11):430. 1853. Also: Q. J. microsc. Sci. **3**(9): 94. 1854; Gray, p. 177, pl. 9, fig. 11. 1862.

LOCI CLASSICI: "Rio de Janeiro" and "Sooloo Sea"

No specimens of this species were found usable as lectotypes or acceptable as neotypes. Slides no. 205 in H. L. Smith's *Diatomacearum Species Typicae* (1874–1879) conform extremely well to the protologue of this species (Figures 20 and 21: FH—Cheever Collection D-3/205) except the locality indicated on the slides is given only as "In mare." Despite Mann's (1925) remark that Smith's Type Slide no. 205 is "uniformly accepted as correctly named *Isthmia minima*," I have not yet been able to establish that the specimens on it came from either Bailey's collections or either of the *loci classici*, and so I have not selected one of them as a type. Boyer Collection (PH) slide X-1-7 contains a single specimen of *I. minima* from "Rio Janeiro" which agrees with the protologue, but the substructure of its areolae cannot be seen at all due either to the specimen being highly eroded or just not suitably prepared for microscopic observation with high numerical aperture. Because the microstructure of the Smith no. 205 specimen in the Farlow Herbarium is clear and indicates what *might* be seen here (Figure 21) and because I cannot satisfy myself as to what *is* present in the Boyer specimen, I have not specified it as a type either.

Triceratium concavum Harvey & Bailey

Proc. Acad. nat. Sci. Phila. **6**(11):430. 1853. Also: Q. J. microsc. Sci. **3**(9):94. 1854; Gray, p. 181, 182. pl. 9, figs. 24–26. 1862.
LOCUS CLASSICUS: "Tahiti"

I have found no specimens from Tahiti which conform to the protologue of this species.

Triceratium gibbosum Harvey & Bailey

Proc. Acad. nat. Sci. Phila. **6**(11):430. 1853. Also: Q. J. microsc. Sci. **3**(9):94. 1854; Gray, p. 182, pl. 9, fig. 32. 1862.
LOCUS CLASSICUS: "Tahiti"

No specimens from Tahiti conforming to the protologue have been located. Febiger Collection (PH) slide 991 bears 14 picked mounts of diatoms from the Sandwich Islands labeled *"Triceratium/arcticum/gibbosum;"* the second through the fifth diatoms from the left in the bottom row conform to the protologue of *T. gibbosum* except their valve margins are crenulate.

Triceratium orientale Harvey & Bailey FIGS. 22–23

Proc. Acad. nat. Sci. Phila. **6**(11):430–431. 1853. Also: Q. J. microsc. Sci. **3**(9):94. 1854; Gray, p. 179, pl. 9, fig. 19 [not 9!], 1862.
LECTOTYPE: **FH**—Bailey Coll. 2145 (+16.6, −13.3)
TYPE LOCALITY: [Philippine Islands], "Mindinao"
DESCRIPTION OF THE TYPE: Valves triangular with gently convex sides and angular corners; face slightly convex; mantle normal to face; triangular heights of valve 117–127 μm; pervalvar depth of frustule 52 μm. Valves with linear to slightly convex rows of areolae [? pseudoloculi] parallel to valve margins. Areolae regularly hexagonal; areolae 2/10 μm; microstructure not visible. Valve corners with stout hollow processes, one at each corner; processes slightly enlarged basally and with conspicuous lip around the distal opening; extending centrifugally beyond the valve margin about one-third their length and about 45° to apical plane; length ca. 12 μm; diameter ca. 6 μm. Several spinules [?] on basal part of each process.

The type is a complete frustule selected from specimens circled by Bailey, although he did not anywhere in his notes indicate a name for this specimen. There is no slide in the Bailey Collection specifically indicated as containing *T. orientale*.

Triceratium wilkesii Harvey & Bailey FIGS. 24–25

Proc. Acad. nat. Sci. Phila. **6**(11):431. 1853. Also: Q. J. microsc. Sci. **3**(9):94. 1854; Gray, p. 176, pl. 9, figs. 7, 8. 1862.

LECTOTYPE: FH—Bailey Coll. 827 (+22.1,−0.80)

TYPE LOCALITY: [U.S.A., Washington], "Puget's Sound"

DESCRIPTION OF THE TYPE: Valves triangular with very gently convex margins and rounded corners; face flat; mantle normal to face via gradual transition; triangular heights of valve 142–149 μm; mantle depth 25 μm; pervalvar depth of frustule 62 μm (measured ca. 20 μm along radius from one corner). Valve with areolae in radiating straight-to-curved rows, only about 1 in 10 rows continuous from mantle to central cluster, others shorter and confined distally; continuous onto mantle to valve margin; 3 rows/10 μm (face), 4 rows/10 μm (mantle). Areolae irregularly hexagonal to pentagonal (to rectangular, near valve margin); increasingly irregular near center (less so) and towards corners (more so); becoming distinctly smaller and intergrading into fields of punctae at the corners [? pseudocelli]; cribrate [?]; areolae 3/10 μm. Corner punctate fields very slightly produced; 18 μm long on face along radius, with convex proximal margins; extending across mantle to margin. Punctae in radial and oblique striae, moderately parallel-fasciculate; striae 10/10 μm; punctae 11/10 μm.

The type is a frustule with one complete and one fragmented valve but with the greater portion of the fragments remaining adjacent to the specimen. The largest valve fragment (about one-third of an intact valve) is oriented with its mantle towards the coverglass. Bailey circled the specimen I have selected as the type and indicated it was *T. wilkesii* in his notes. The comment following the reprinted protologue in Gray (1862) describes the valve margin as "slightly concave" in contrast to the protologue and Harvey's Latin description (Harvey, MS., 1851) which indicates that it is convex—an apparent slip-of-the-pen.

The Dana Samples. Portions of Dana's samples are extant in the Bailey Collection (FH): 854 ("Fossil infusoria/Oregon/Dana's specimens"); 855 ("Recent Infusoria on a *Unio* from/Ft. George, Columbia R./Oregon"); 856 ("Oregon"); 857 ("Oregon"); 858 ("Oregon"); U208 ("Fossil Inf./Oregon/T. [sic] D. Dana/From Bail. Coll. Box./#208"). All notations are scratched on the slides in Bailey's handwriting except those on U208. Except for slides 854 and U208, the samples are mounted presumably in balsam under mica. Sample 854 has apparently been remounted with a commercial coverglass on the original slide. Slide U208 was derived from a bottled collection of Bailey materials that bore a label identical to that noted on the slide plus the pencilled notation "too little C[harles]. S[todder]."; it was made while the Collection was in the possession of the Boston Society of Natural History in the nineteenth century. I have reexamined vial 208 in the Bailey Collection and it currently contains mostly clay and virtually no diatoms, as suggested by Stodder. Specimens of Dana's fossil material were sent to Thomas F. Bergen (Dublin), Thomas Brightwell (Norwich, England), Christopher E. Broome (Bristol, England), Christian G. Ehrenberg (Berlin), Robert Harrison (Hull, England), Joseph

L. Riddell (New Orleans, LA) and Benjamin Silliman, Jr. (New Haven, CT) (Bailey, MS., [?1848–1856]).

Primarily emphasizing the taxa reported by Bailey (1845) and Ehrenberg (1845), I have reexamined Dana's recent sample (Bailey Coll. 855). This *Unio* sample contains predominantly *Rhoicosphenia curvata* (Kütz.) Grun. [Bail. & Ehr.: *Gomphonema minutissima*] and to a lesser extent *Melosira varians* C. A. Ag. [Bail.: *Gallionella aurichalcea*], *Eunotia turgida* var. *westermanii* (Ehr.) Grun. [Bail.: *E. westermanii*]; *Cymbella lanceolata* (Ag.) Ag. [Bail.: *Cocconema cymbiforme*], *Cocconeis placentula* var. *lineata* (Ehr.) V. H. [Bail.: a minute *Cocconeis*], *Synedra* cf. *rumpens* Kütz. [Bail.: *Fragilaria* sp.] and *Gomphoneis herculeana* (Ehr.) Cl. [Ehr.: *Gomphonema herculeanum*]. I found no specimens in this sample which I could reasonably interpret to represent Bailey's reported *Synedra ulna* or Ehrenberg's reported *Staurosira construens*. The protologue of *Gomphonema herculeanum* (Ehrenberg, 1845) indicates "in Oregonia" as a site of original collection; it refers to this sample.

The description of the fossil sample by Bailey was confined to very brief notes and illustrations of selected specimens (Bailey, 1845, pl. 4), the names of which he left largely to Ehrenberg. Based on observations on Bailey Collection slides 854, 856–858 and U208, I have reinterpreted Bailey's figures to represent the following taxa:

Bailey Figure & Notation	Interpreted as . . .
1. allied to *Terpsinoë*	*Tetracyclus ellipticus* var. *lancea* (Ehr.) Hust.
2. allied to *Terpsinoë*	*Tetracyclus lacustris* Ralfs
3. allied to *Terpsinoë*	*Tetracyclus ellipticus* var. *compressus* (Ehr.) Hust.
4. allied to *Terpsinoë*	*Tetracyclus ellipticus* var. *clypeus* (Ehr.) Hust.
5. allied to *Terpsinoë*	*Tetracyclus* sp. [girdle view]
6. *Surirella* ———, n. sp.	Fragment only
7. *Gallionella* "alpha," n. sp.	*Melosira undulata* (Ehr.) Kütz.
8. *Gallionella* "beta," n. sp.	*Melosira granulata* (Ehr.) Ralfs
9. *Gallionella* "gamma," n. sp.	*Melosira granulata* (Ehr.) Ralfs
10. *Navicula* sp.	*Navicula leptostigma* (Ehr.) Ralfs

In addition, Bailey's report of *Navicula viridis* [= *Pinnularia viridis* (Nitz.) Ehr.] and *Cocconema cymbiforme* [= *Cymbella lanceolata* (Ag.) Ag.] is verified although each species is rare. The taxonomic composition of this deposit agrees well with those reported for Oregon Miocene diatomites by VanLandingham (1967b). Ehrenberg's analysis of this deposit resulted in a plate of the common diatoms in the sample in his *Mikrogeologie* (Ehrenberg, 1854, pl. XXXIII(XII)) and his description of 24 new diatom species, although several of the names had been used but not described two years earlier in reporting the composition of diatomite from Siberia (Ehrenberg, 1843, 1845): *Biblarium compressum, B. ellipticum, B. glans, B. lancea, B. lineare, B. rhombus, B. speciosum, B. stella, Eunotia amphidicranon, E. luna, E. sima, Gallionella sculpta, G. spiralis, Pinnularia amphistylus, P. leptostigma, P. oregonica, Stylobiblium clypeus, S. divisum, S. eccentricus, Surirella leptoptera, S. oregonica* and *S. reflexa.*

ACKNOWLEDGEMENTS

The completion of this work has been facilitated by the generous assistance of Charles Reimer and Heinz Koerner of the Academy of Natural Sciences of Philadelphia, Paul Conger of the U.S. National Museum, Jere Brunken of Ohio State University, Barbara Wiseman of the Museum of Science (Boston), Jane Fessenden of the Marine Biological Laboratory Library (Woods Hole) and the Gray Herbarium Library of Harvard University, and especially the staff of the Farlow Herbarium and library.

FIGURES 1–7

FIGS. 1–3. *Amphitetras favosa.* 1, lectotype, ×437, BF; 2, lectotype, ×427, BF; 3, paratype, ×1440, BF.

FIGS. 4–5. *Amphitetras wilkesii.* 4, lectotype, ×389, PC; 5, lectotype, ×1129, PC.

FIGS. 6–7. *Arachnoidiscus ehrenbergii.* 6, lectotype, ×230, BF; 7, lectotype, ×469, BF.

FIGURES 8–13

FIGS. 8–9. *Aulacodiscus oregonus.* 8 and 9, lectotype, ×380, BF.

FIGS. 10–13. *Campylodiscus kützingii.* 10 and 11, lectotype, ×738, PC; 12, lectotype, ×602, OB; 13, paratype, ×528, PC.

FIGURES 14–19

FIGS. 14–16. *Cocconeis rhombifera.* 14, lectotype, pseudoraphe valve focus, ×672, PC; 15, lectotype, raphe valve focus, ×656, PC; 16, paratype, pseudoraphe valve, ×547, PC.

FIGS. 17–19. *Cocconeis sulcata.* 17, lectotype, pseudoraphe valve focus, ×736, PC; 18, paratype, pseudoraphe valve, ×584, PC; 19, paratype, raphe valve, ×580, PC.

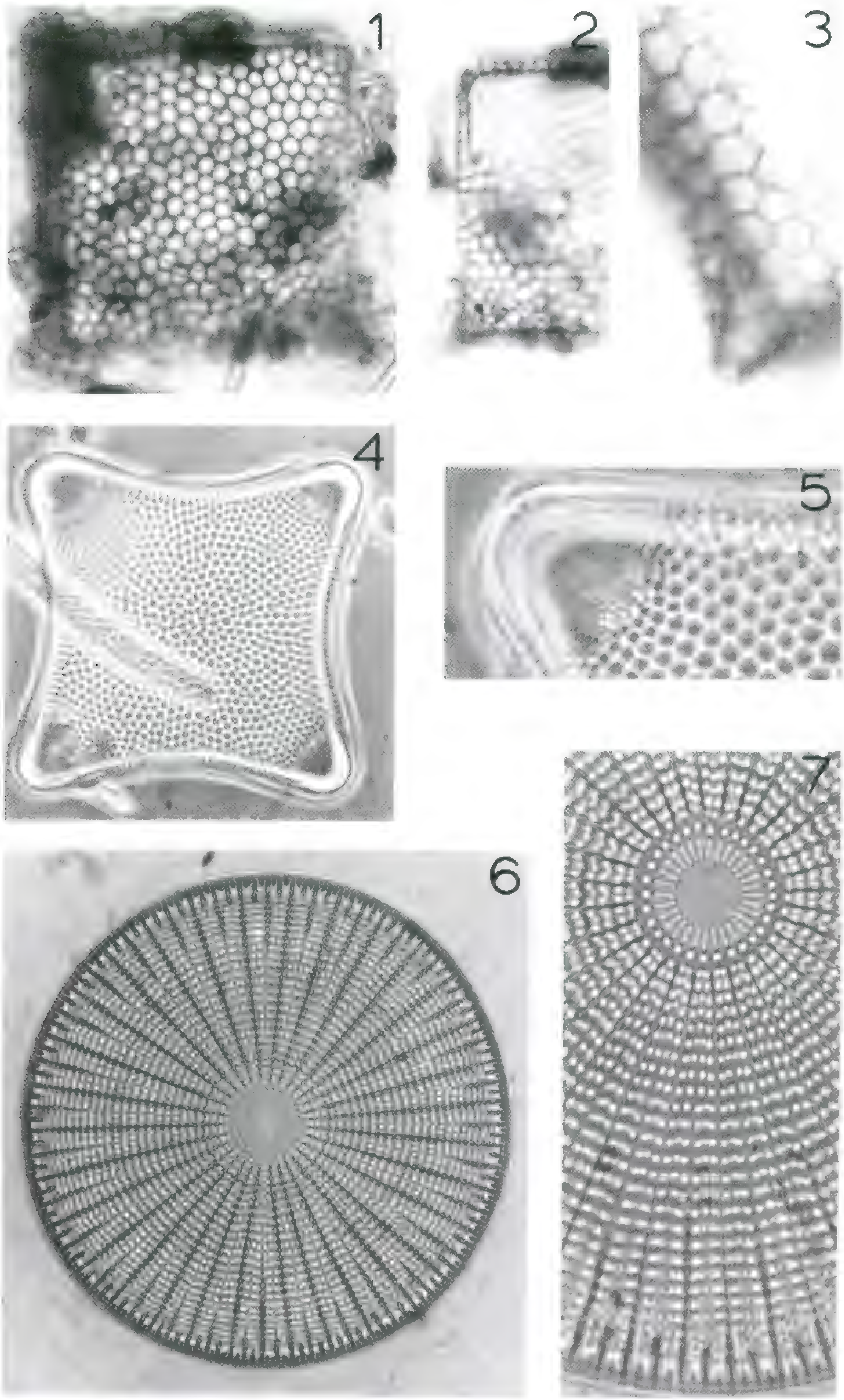
FIGURES 20–25

FIGS. 20–21. *Isthmia minima.* 20, ×374, BF; 21, ×1518, PC.

FIGS. 22–23. *Triceratium orientale.* 22, lectotype, ×276, BF; 23, lectotype, ×534, BF.

FIGS. 24–25. *Triceratium wilkesii.* 24, lectotype, ×294, PC; 25, lectotype ×947, PC.

BF—brightfield optics, direct illumination. OB—brightfield optics, oblique illumination. PC—phase contrast optics.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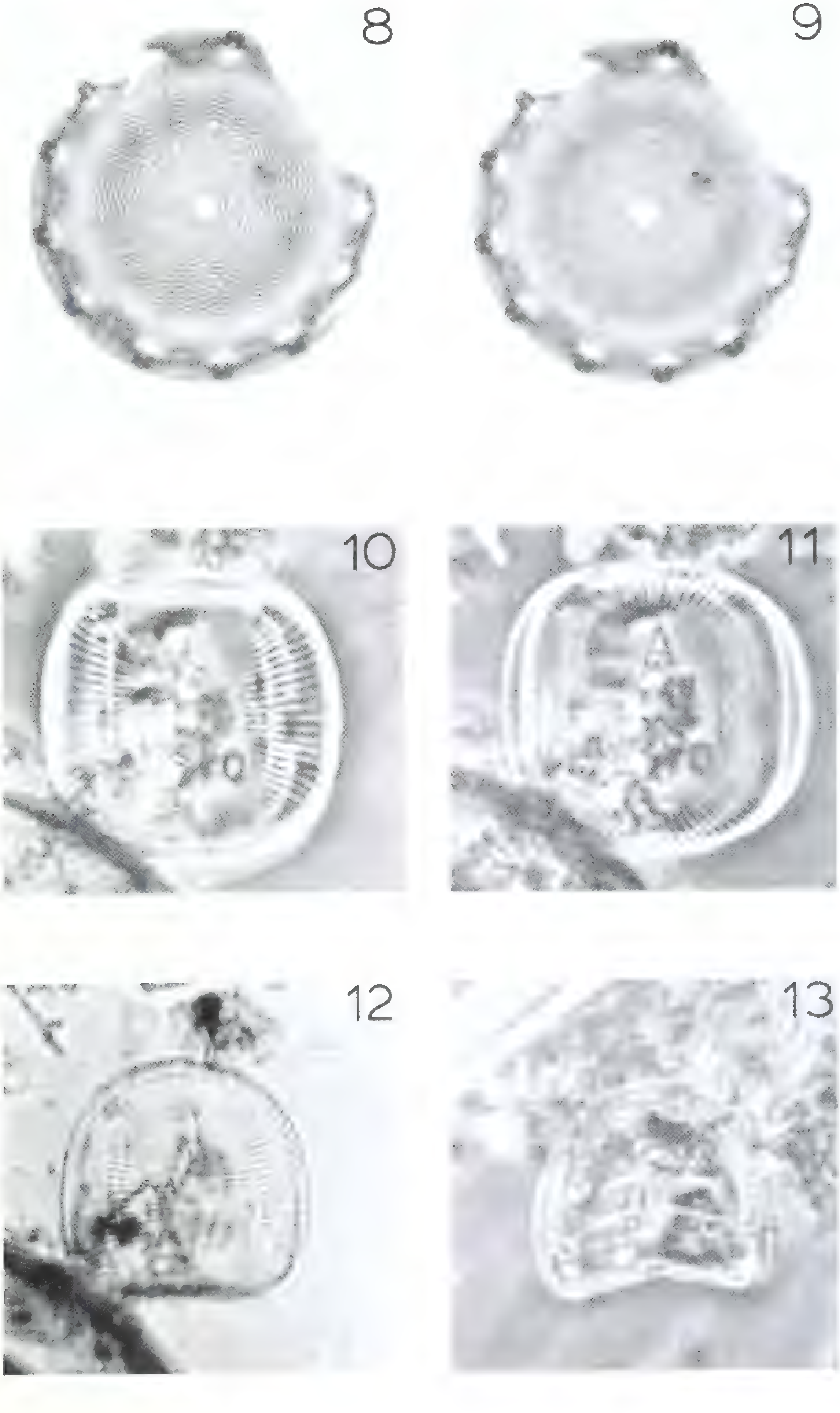
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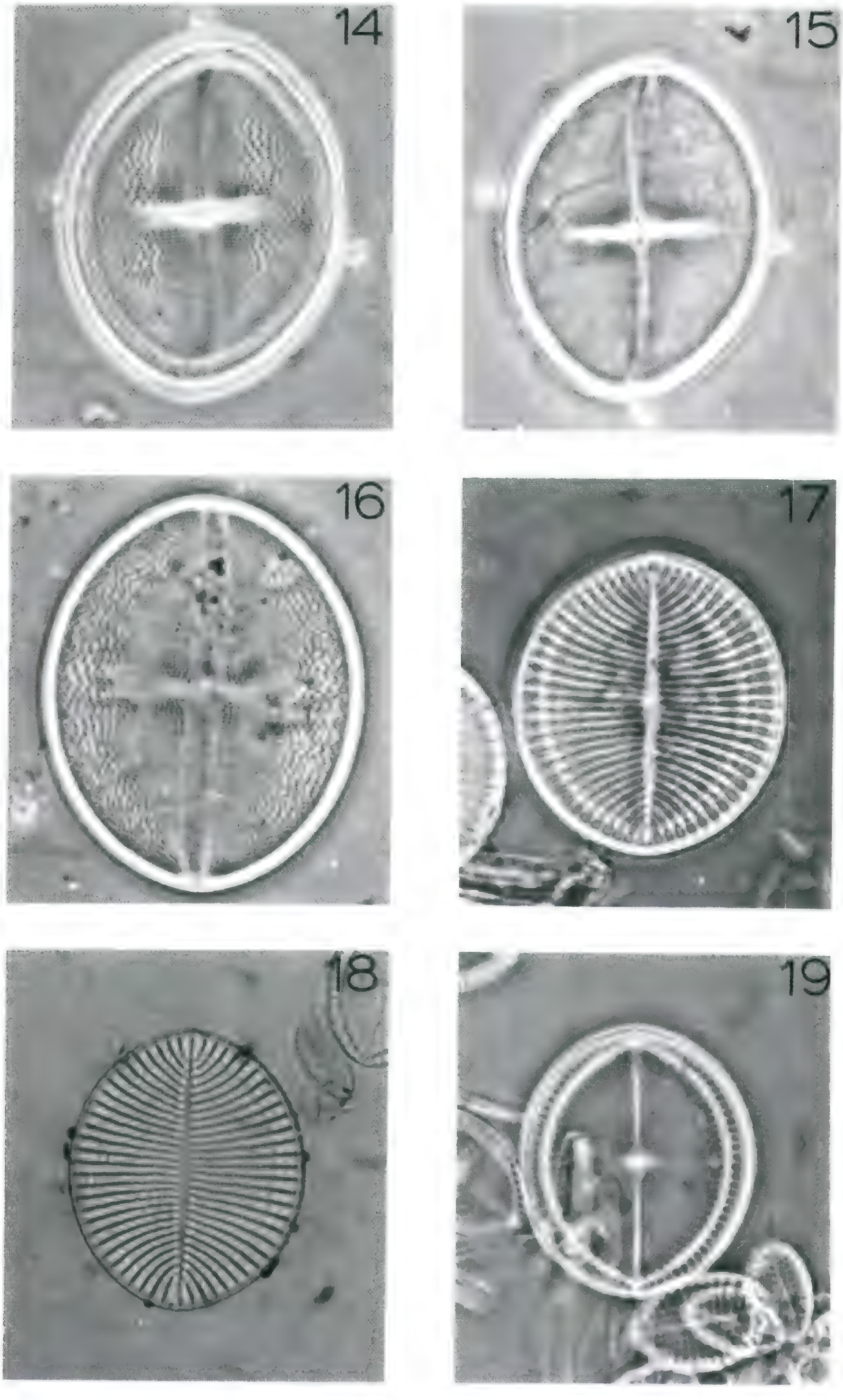
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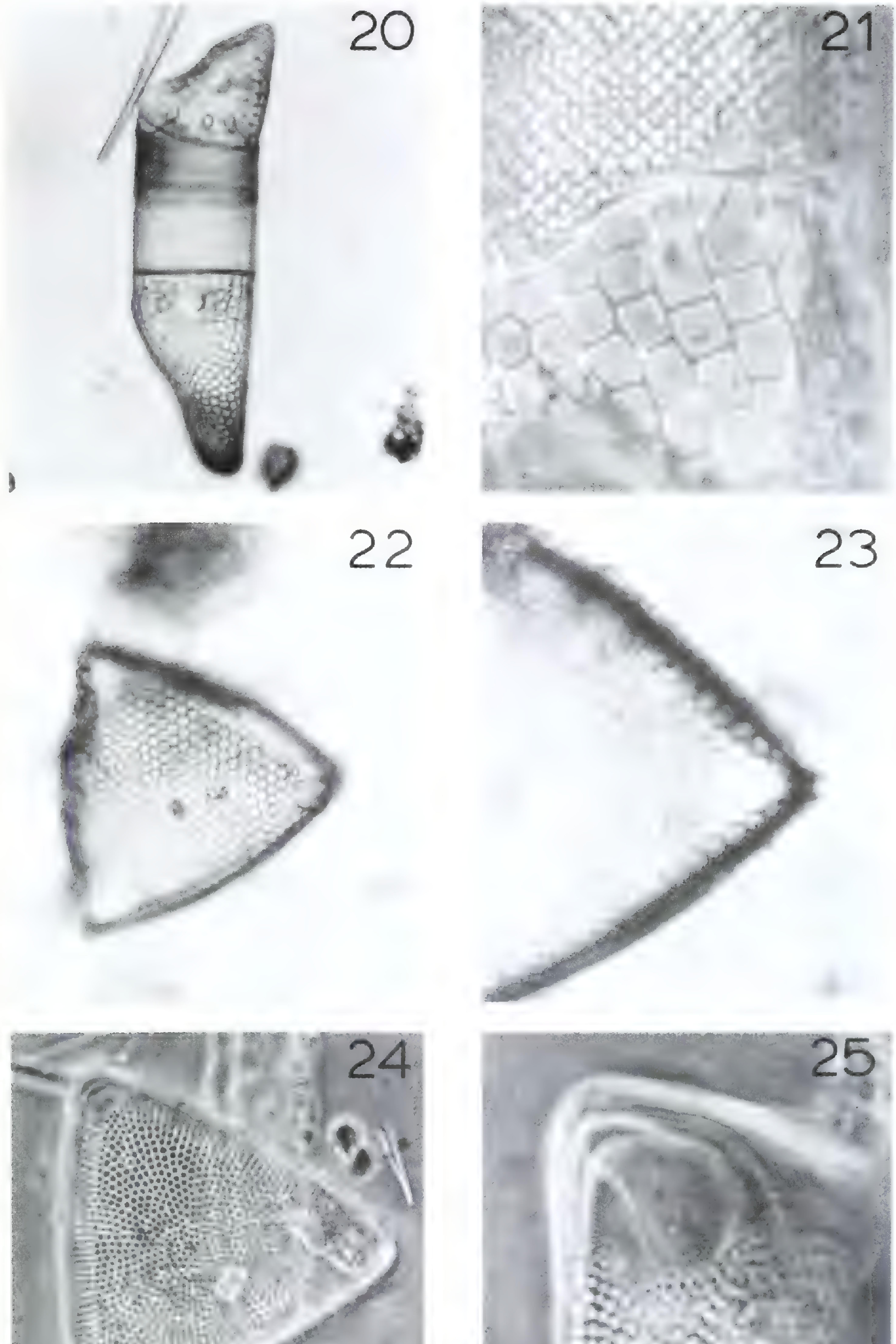
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NEW PHACIDIALES AND OSTROPALES FROM THE COLLECTIONS OF THE FARLOW HERBARIUM

MARTHA A. SHERWOOD

SUMMARY

The following new species and varieties of Phacidiales and Ostropales are described: *Colpoma deusta*, from Oregon, *Schizoxylon juniperinum* var. *cylindrospermum*, from Turkmenian S.S.R., *Schizoxylon punctatum*, from India, *Stictus radiata* var. *aggregata*, from Chile, and *Stictis reticulata*, from Kirghiz S.S.R. Two western North American species of *Stictis* are reported for the first time from the eastern hemisphere.

Among unidentified collections deposited in the Farlow Herbarium, material sent for identification, and collections made by the staff, the following new species of Phacidiales and Ostropales were encountered. Among specimens sent by A. Raitviir (TAA) for identification were representatives of two distinctive species of *Stictis* previously reported only from North America; these are discussed below.

Methods and terminology employed in studying the Ostropales were outlined by Sherwood (1977a, b). This should be consulted for more information on the genera concerned. For a diagrammatic cross section and an explanation of the terminology and ontogeny of tissues in hysterothecial Rhytismataceae (Phacidiales), see Nannfeldt (1932), Powell (1974), or Sherwood (1977a).

COLPOMA Wallr., Fl. Cryptog. Germaniae 2:422. 1833.

Colpoma deusta Sherwood, spc. nov. FIGURE 1.

Hysterothecia atra, in ligno nigro immersa, dein erumpentia, carbonacea, linearia vel oblongo-linearia, rugosa, usque ad 4 mm longa, 0.7–1.0 mm lata, rima longitudinali periphysibus praedita aperta. Asci clavati, pedicellati, 140–175 × 8–9 μm, in iodo non caerulescentes, 8-spori. Paraphyses filiformes, ramosae, circinatae. Sporae hyalinae, aciculares, simplices, 30–45 × 1.5–2 μm, tunica gelatinosa inconpicua involutae.

Hab: In ligno decorticato coniferarum, Amer. Bor. Occident.

Holotypus: FH, reference stand 14, Wildcat Mountain, Cascade Mts., Linn Co., Oregon, USA, elev. 5200 ft. leg. M. A. Sherwood, L. H. Pike, G. C. Chrones.

Isotypi: OSC; BPI.

Etymology: deusta (L.), burnt, referring to the appearance of the wood on which the colonies occur.

Apothecia immersed in swarms beneath a common black stromatic crust on decorticated wood, becoming erumpent, 1.5–4 × 0.7–1.0 mm, elliptic to linear, black, shining, the thick margin rugose, with numerous longitudinal striae, generally elongate in the grain of the direction of the wood, rarely branched, 1 mm high, opening by a longitudinal slit, when wet with prominent pale grey lips and an immersed pale yellowish-grey disc. Stroma in cross section massive, the covering layer irregular in outline, with a black carbonized crust 20 μm thick, and an internal matrix of brown hyphae ca. 2.0 μm diam., the slit flanked by a dense fringe of colorless gelatinous branched hyphae 50 × 1–1.5 μm diam.; basal stroma 0.5–0.7 mm thick, of disintegrating, carbonized hyphae and partially decomposed wood fragments. Subhymenium 30–40 μm thick, colorless. Asci 140–175 × 8–9 μm, clavate, long-stalked, J-, 8-spored. Paraphyses filiform, branched, circinate, barely enlarged to 1.5–2 μm at the apex. Ascospores 30–45 × 1.5–2 μm, nonseptate, acicular, narrowly sheathed.

On decorticated conifer wood, Oregon, U.S.A.

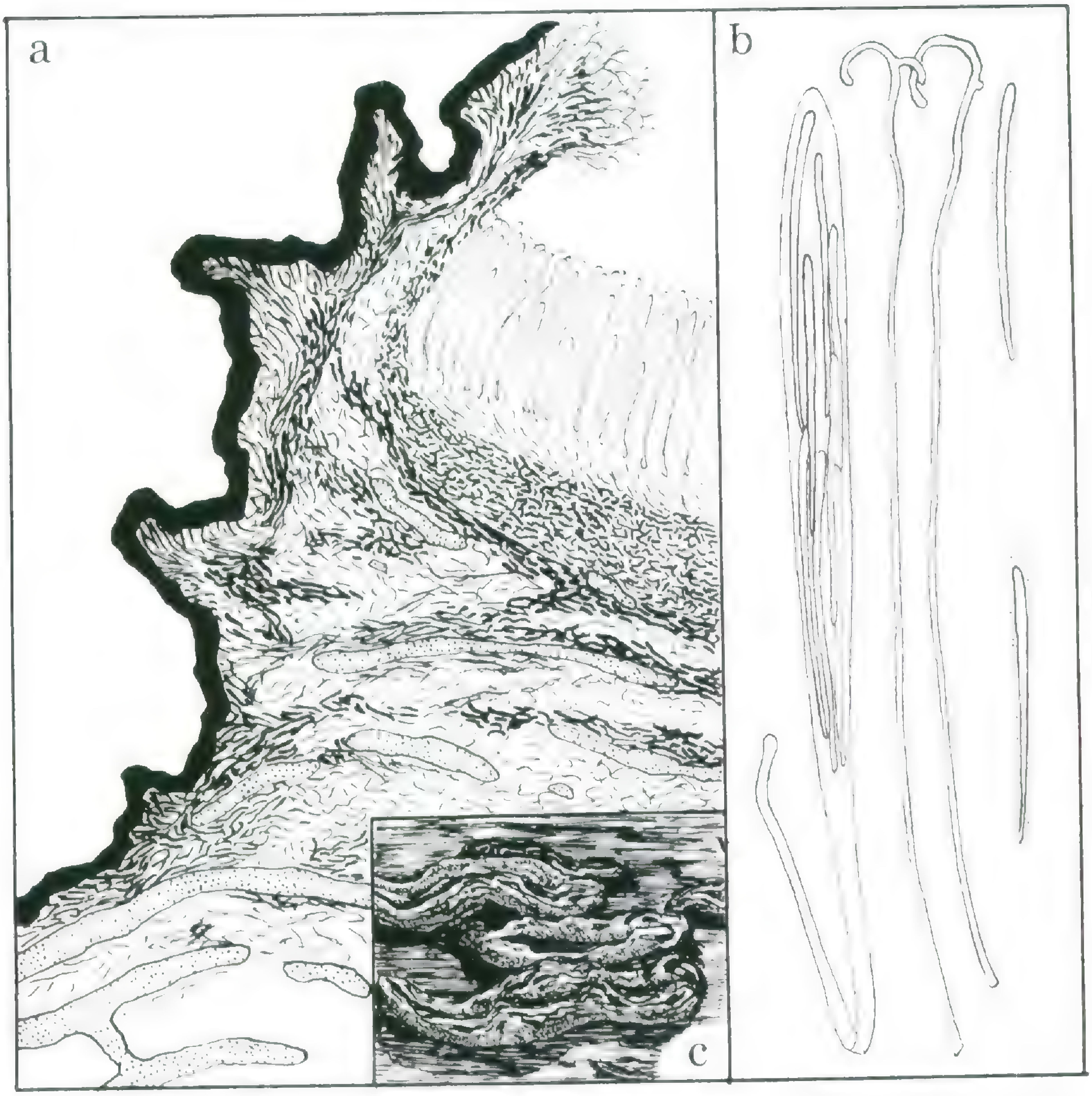

FIGURE 1. *Colpoma deusta*. *a*. Cross section of apothecial stroma, ×112.5. *b*. Asci, paraphyses, and ascospores, ×750. *c*. Habit sketch, ×7.5. Drawn from the holotype.

Colpoma (Phacidiales: Rhytismataceae) is characterized by corticolous or lignicolous hysterothecial fruitbodies opening by a longitudinal slit, and by acicular to filiform ascospores. The genus is sometimes known as *Clithris* (Fr.) Rehm, a later synonym. The distinction between *Colpoma* and *Lophodermium* Chev. is accepted by most authors; the grounds for the distinction, however, are various, ranging from the absence of periphyses or lip cells (Tehon, 1939) to a massive basal stroma (Darker, 1967) or occurrence on wood (Korf, 1973). There is no recent comprehensive treatment of the genus, but *C. deustum* appears to be distinct from the species of *Colpoma* hitherto reported from North America. *Colpoma crispum* (Pers. ex Fr.) Sacc., *Clithris graphis* Rehm, *C. morbida* (Pk) Ell., and *C. sequoiae* Bonar, all reported on conifers from Western North America, have asci and ascospores of similar dimensions, but usually occur on bark rather than on wood, do not occur beneath a common stromatic crust, and have much narrower ascocarps. The blackening of the host substrate mimics charred wood, but appears to be caused by the action of the fungus. *Coccomyces cembrae* Rehm and *Schizoxylon bipartitum* Kauffm. (not a *Schizoxylon*) are two additional Rhytismataceous fungi on wood which occur beneath a common stromatic crust; however, they open by teeth rather than by a longitudinal slit.

SPECIMENS EXAMINED (see also holotype, above): North America: USA: Oregon, Reference Stand 20, H. J. Andrews Experimental Forest, Blue River, Lane Co., Oregon, 8.VIII. 1978, leg. Sherwood (FH).

SCHIZOXYLON Pers., Ann. Wetterauische Ges. Gesammte Naturk. 2:11, 1810.

Schizoxylon juniperinum Sherw., Mycotaxon 5:126 (1977) var. **cylindrospermum** Sherw., var. nov. FIGURE 2.

Ascocarpi primum immersi, haud erumpescentes, non profunde cupulati, 0.6–1.0 mm diam., margine integro, nigro, cinereo-pruinoso, disco cinereo-caerulescente. Margo in sectione transversali 20 μm crassus, siccus ab hymenio se non abrumpens, ex hyphis intertextis brunneis constans. Paraphyses filiformes, ramosae, 200 × 1.5 μm, apice ad 3 μm incrassatae, brunneae, in iodo caerulescentes. Asci 150–200 × 3–3.5 μm, cylindrici, 8-spori. Sporae 100–150 × 3.0–3.5 μm, cellulis 5–7 μm longis, ad septa se disjungentibus et articulos cylindricis simplices formantibus.

Hab: In ligno decorticato *Tamarici*, Turkmenian S.S.R.

Holotypus: TAA, on dead branches of *Tamarix* sp., Turkmenian S.S.R., central Kara-Kum desert, near Teze-Yel, 20.V.1967, leg. I. P. Prolov. Isotypus: FH.

Etymology: cylindrospermum (Gr.), with cylidrical propagules, since the variety is so distinguished from the type of the species which has spherical part-spores.

Apothecia immersed, at first visible as a white-pruinose dot on the surface of the substrate, becoming erumpent, orbicular or somewhat elongate with the grain of the substrate, 0.6–1.0 mm diam, with a raised black shining margin, externally grey-pruinose, and a concave, brown, greenish grey-pruinose disc. Margin in cross section 20 μm diam, of interwoven non-carbonized brown hyphae 2–3 μm diam., externally crystalliferous, not splitting away from the hymenium when dry. Subhymenium 30 μm thick, colorless, resting on a colorless subiculum of hyphae 2 μm diam. Parphyses filiform, 1.5 μm thick, much-branched and inflated to 3.0 μm at the apex, brown, J+ blue, forming an epithecium. Asci 150–200 × 9–11 μm, without a visible apical cap when mature, 8-spored. Ascospores 100–150 × 3–3.5 μm, the cells 5–7 μm long, breaking up into simple cylindrical part-spores.

On decorticated, bleached twigs of *Tamarix* sp., Turkemenian S.S.R. The taxon differs from typical *Schizoxylon juniperinum*, described from material on *Juniperus* from Pakistan, in having cylindrical rather than spherical part-spores. Since describing *S. junipernum* I have seen an additional specimen of the typical variety from Pakistan. *Schizoxylon compositum* Ell. & Everhart, from North America, is similar to both, differing in having somewhat broader spores, a KOH+

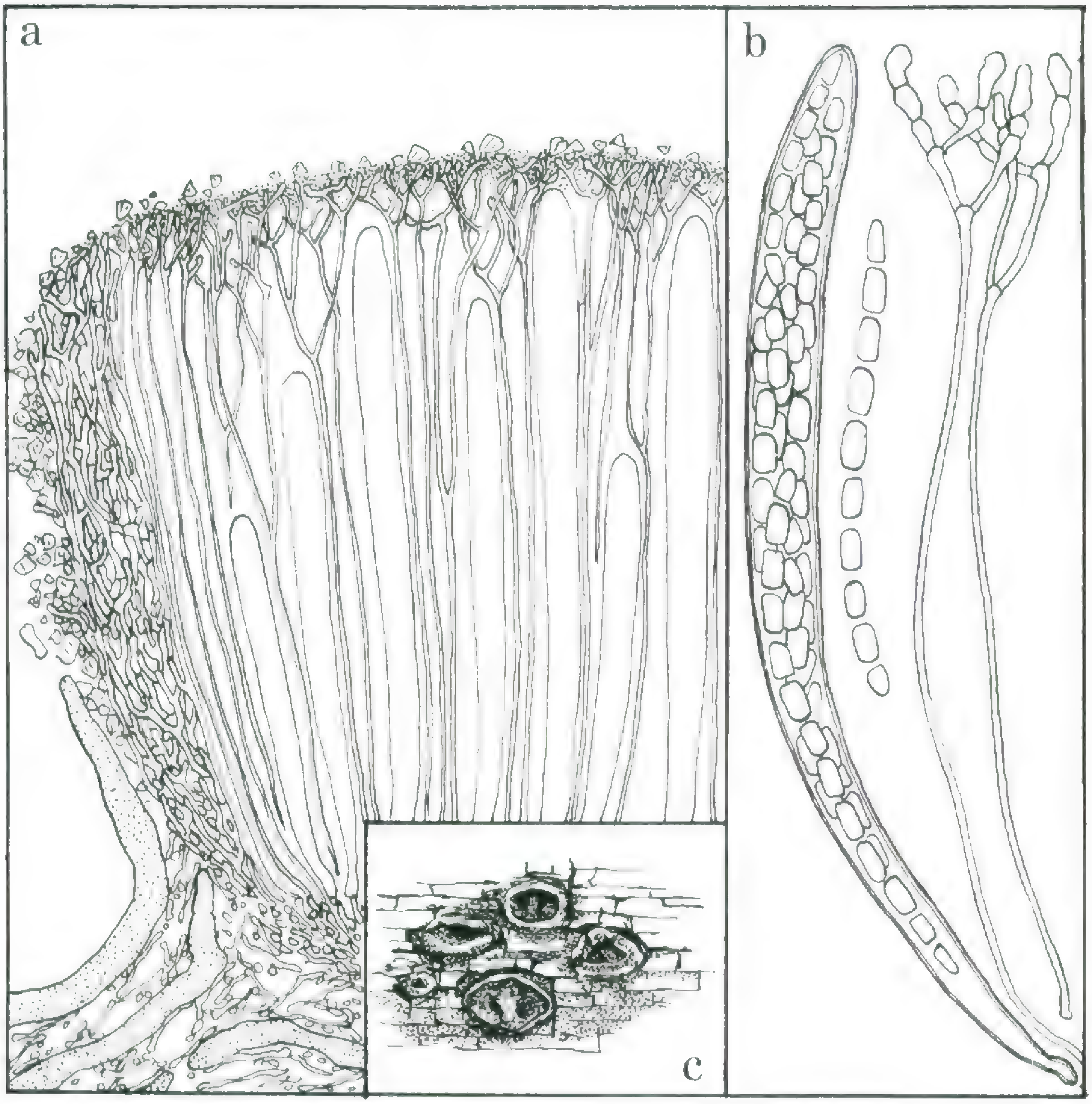

FIGURE 2. *Schizoxylon juniperinum* var. *cylindrospermum*. *a*. Cross section of apothecium, ×375. *b*. Ascus, paraphyses, and part-spores, ×750. *c*. Habit sketch, ×7.5. Drawn from the holotype of the variety.

yellow reaction of the margin, and larger, more erumpent, often compound ascocarps.

SPECIMENS EXAMINED (see also holotype, above): Asia: USSR: on *Tamarix*, Turkmenian S.S.R., central Kara-Kum desert, near Musy, 20.V.1967, leg. I. P. Prolov (TAA; FH).

Schizoxylon punctatum Sherw., spec. nov. FIGURE 3

Ascocarpi primum immersi, non erumpescentes, non profunde cupulati, 0.3–0.5 mm diam, margine nullo, disco pallide brunneo. Paraphyses filiformes, simplices vel ramosae, leniter circinatae, brunneae, in iodo non caerulescentes. Asci 250–300 × 8–9 (–12) μm, apice 2.5 μm crassi, 8-spori. Sporae 200 × 2.5–3.0 μm, cellulis 3–5 μm longis, ad septa se disjungentibus et articulos simplices formantibus.

Hab: in ramulis *Cassiae*, India.

Holotypus: **FH**, on *Cassia spectabilis*, J. N. Agricultural University Campus, Jabalpur, Madhya Prov., India, 1.III.1978, leg. N. D. Sharma (#2).

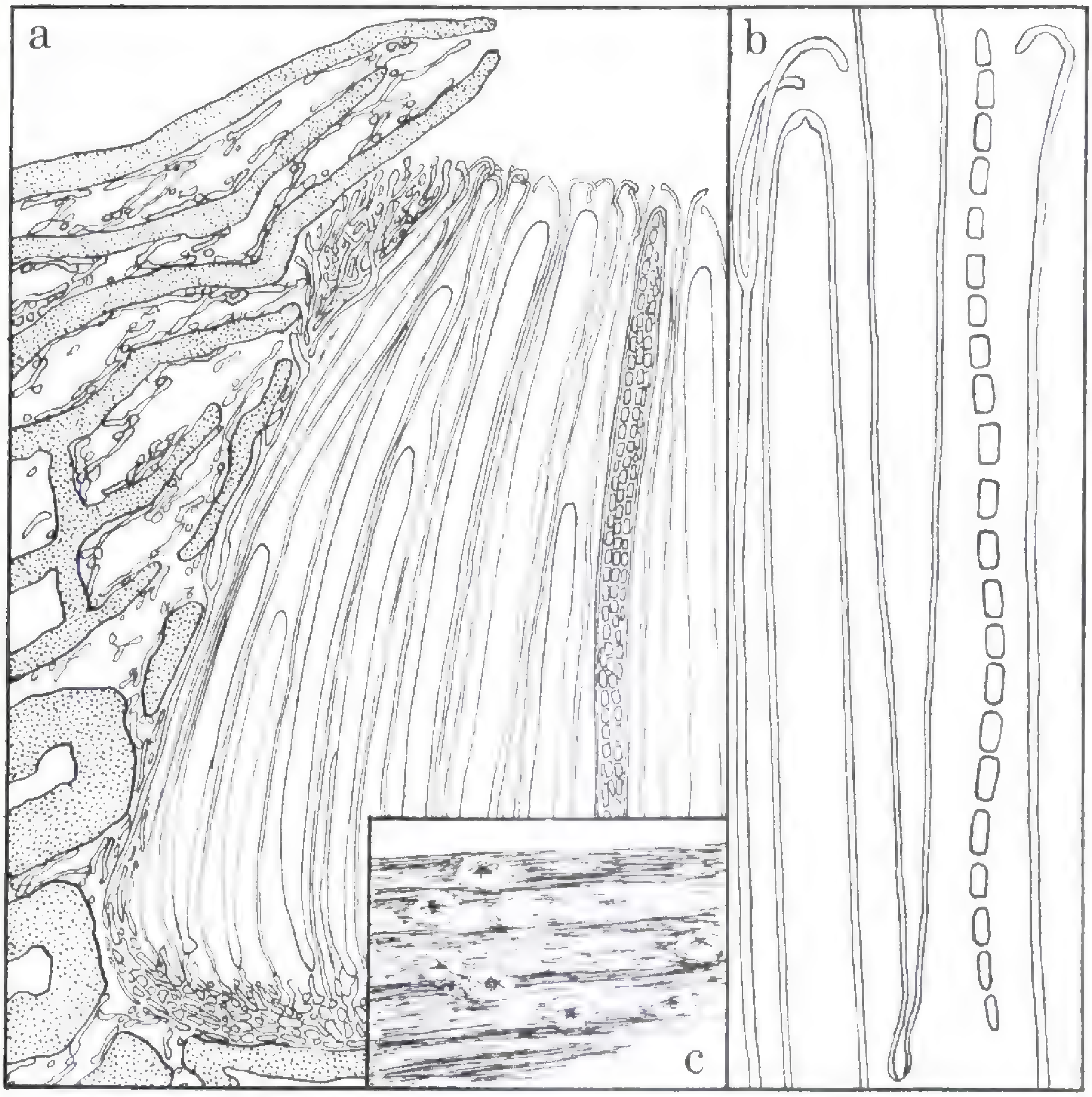

FIGURE 3. *Schizoxylon punctatum*. *a*. Cross section of apothecium, ×300. *b*. Ascus paraphyses, and part-spores, ×750. *c*. Habit sketch, ×7.5. Drawn from the holotype.

Etymology: punctatum (L.), spotted, referring to the tiny apothecia, which appear as a swarm of black dots on the substrate when rehydrated. This epithet was chosen rather than the more appropriate *punctiformis* (having the aspect of dots), because the latter epithet has been used in the allied genus *Stictis*.

Apothecia immersed, minute, very inconspicuous, raising the substrate into pustules 0.3–0.5 mm diam, not bordered by crystals, without a visible margin, the disc pale brown, sunken when dry, visible as a tiny translucent brown disc on the surface of the substrate when wet. Margin essentially obsolete, marked by a few more richly-branched paraphyses at the junction of the apothecium and the surrounding host tissue. Subhymenium colorless, 20 μm thick. Paraphyses filiform, a little longer than the asci, sometimes branched, weakly circinate, 2.0 μm diam, faintly brown above, J-. Asci 250–300 × 8–9 (–12) μm, the cap 2.5 μm thick, not well-defined, 8-spored; ascospores 200 × 2.5–3.0 μm, soon breaking up into unicellular cylindrical part-spores 3–5 μm long.

On small pithy twigs of *Cassia spectabilis*, Madhya Province, India. This is clearly quite different from the only other species of *Schizoxylon* reported from India, *S. lantanae* (Tilak & Nanir) Sherw., which has a thick black margin and non-disarticulating spores. *Schizoxylon punctatum* is closer morphologically to *S. floridanum* Sherw., but the apothecia are much smaller and there is no crystalline margin.

The material sent for identification consisted of four small packets with the same collection data, labelled 1, 2, 3, and 4. According to N. Sharma (personal communication) portions of these collections are also deposited at IMI.

Stictis Pers., Obs. Mycol. **2**:73. 1799.

Stictis radiata Pers., l.c. var **aggregata** Sherw., var. nov. Figure 4.

Ascocarpi primum immersi, profunde cupulati, 0.5–1.0 mm diam, margine lacerato, albo, disco pallide ochraceo. Margo in sectione transversali 100 μm crassus, siccus ab hymenio se abrumpens, hypharum pariete 1.5 μm diam, achromo. Stratum crystallinum 70 μm crassum. Periphysoidea 30 × 1.5 μm, ramosa. Paraphyses filiformes, non ramosae, achromae, in iodo caerulescentes. Asci 250–300 × 9–11 μm, apice 5–6 μm crassi, 8-spori. Sporae 150 × 4.5–5.5 μm, vagina gelatinosa inconspicua involutae, cellulis 3–4 μm longis.

Hab: In ramis *Piri(?)*, Chile.

Holotypus: FH-on dead, corticate stems of *Pyrus*-like tree, Corral, Chile, Roland Thaxter, December, 1905. Isotypi: UC, CUP.

Etymology: aggregatus (L.), referring to the densely clustered apothecia.

Apothecia abundant, gregarious, 0.5–1.0 mm diam, at first immersed, raising the overlying substrate into small pustules and eventually becoming suberumpent, the margin prominent, lacerate, white-pruinose, the disc deeply immersed, pale ochraceous, splitting away from the margin when dry. Margin in cross section 3-layered, colorless, the wall up to 40 μm thick, of colorless, slightly gelatinous hyphae 1.5 μm diam, the crystalline layer prominent, up to 70 μm thick, composed of colorless, heterogeneous, non-rosettiform crystals; periphysoids ca. 30 × 1.5 μm, abundantly branched, forming a compact layer adjacent to the hymenium. Asci 250–300 × 9–11 μm, the cap 5–6 μm thick, with a distinct pore, 8-spored. Ascospores ca. 150 × 4.5–5.5 μm, in two irregular bundles in the ascus, obscurely sheathed in a mucilaginous matrix, septate, constricted at the septa, the cells 4–5 μm long. Paraphyses filiform, not markedly enlarged at the apex, generally unbranched, J+ blue.

On bark of branches of a *Pyrus*-like tree, Corral, Chile. *Stictis radiata* var. *aggregata* is identical in all respects except the dimensions of the asci and ascospores to typical *S. radiata*. It differs from other broad-spored species of *Stictis* with colorless margins (*S. brachyspora* Sacc. & Berl.; *S. hawaiiensis* Cash) in having long branched periphysoids and a generally broader, stellate margin. The present taxon does not correspond to any reported from Chile by Spegazzini (1910), but may be what Spegazzini (1887) referred to when he reported *S. radiata* forma "*a*," with spores 3–4 μm broad, from Tierra del Fuego.

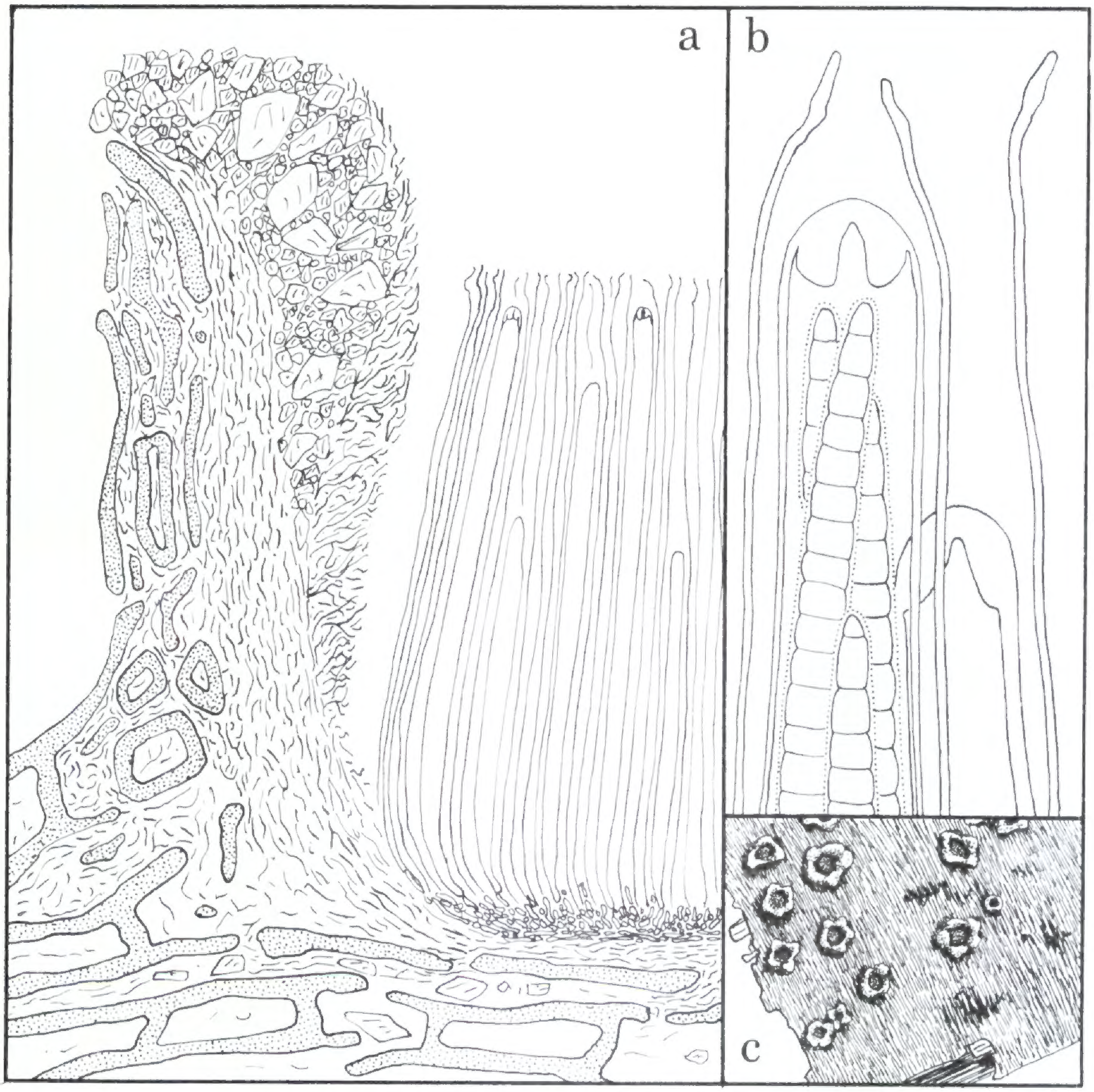

FIGURE 4. *Stictis radiata* var. *aggregata*. *a*. Cross section of apothecium, ×225. *b*. Detail of apices of asci, paraphyses, and spores, ×1500. *c*. Habit sketch, ×7.5. Drawn from the holotype of the variety.

Stictis reticulata Sherwood, spec. nov. FIGURE 5.

Ascocarpi primo immersi, erumpescentes, profunde cupulati, 0.6–1.0 mm diam, margine lacerato, dilute flavido-roseo, albo-pruinoso, disco pallide ochraceo. Margo in sectione transversali 200 μm crassus, siccus ab hymenio se abrumpens, hypharum pariete 2.5 μm diam, achromo. Stratum crystallinum internum abest. Periphysoidea 200 × 2.5–4 μm, ramosa, reticulata. Paraphyses filiformes, simplices vel ramosae, circinatae, apice non incrassatae, in iodo non caerulescentes. Asci 150–175 × 4.5–5.0 μm, cylindrici, apice 2.5–3 μm crassi, 8-spori. Sporae 120–150 × 1.0 μm, cellulis 5–8 μm longis.

Hab: In culmis dejectis *Ferulae*, Kirghiz S.S.R.

Holotypus: TAA 60109, on *Ferula*, Tian-Shan, Sary-Tschelek Reserve, Kirghiz S.S.R., 24.V.1968, leg. A. Raitviir. Isotypus: FH.

Etymology: reticulata (L.) netted, referring to the appearance of the periphysoids.

Ascocarps at first immersed in swarms on slightly discolored herbaceous stems, becoming erumpent, 0.6–1.0 mm diam, the margin thick, lacerate, pale pinkish-flesh

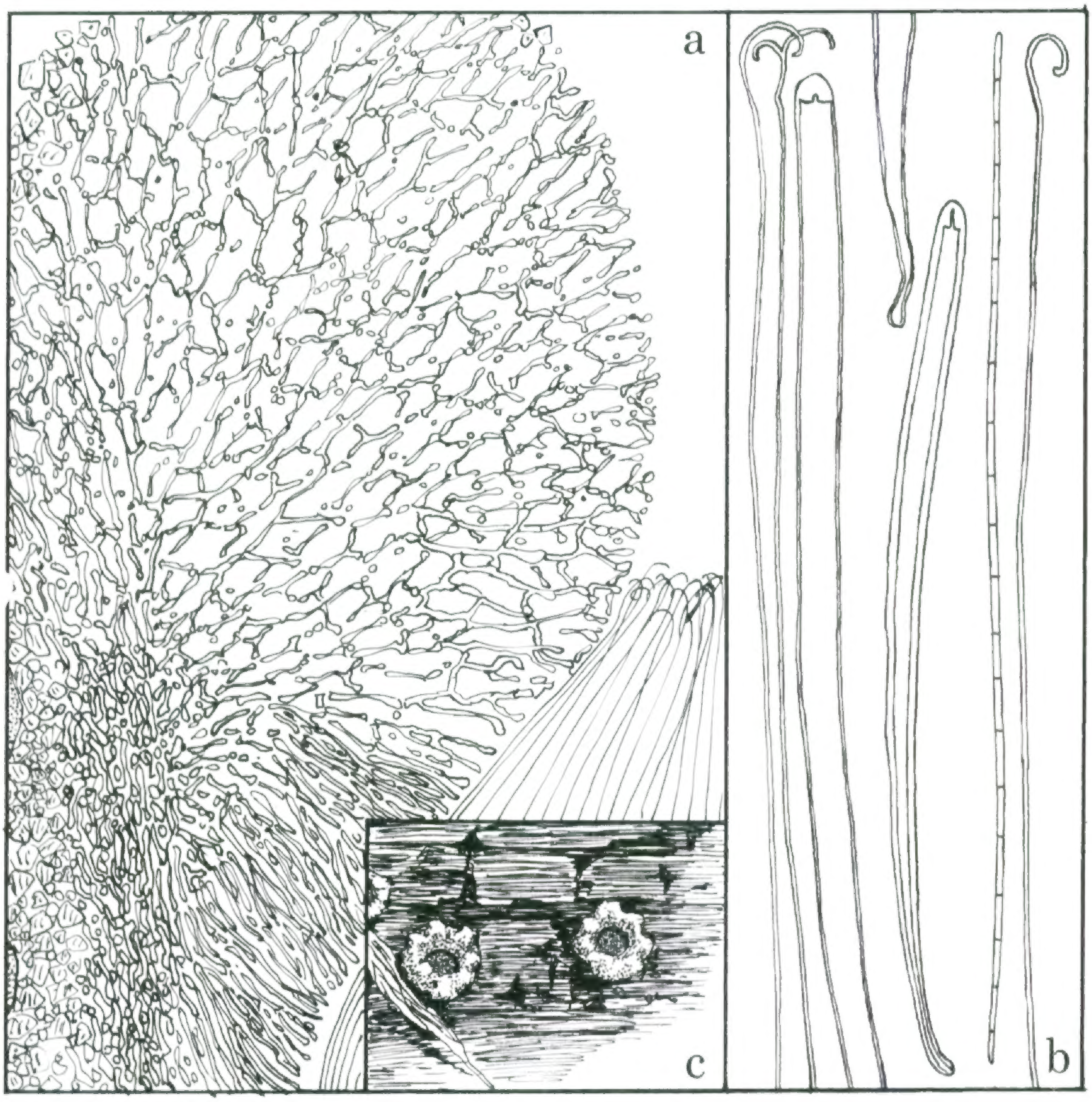

FIGURE 5. *Stictis reticulata*. *a*. Cross section of upper portion of margin, ×375. *b*. Asci, paraphyses, and ascospore, ×750. *c*. Habit sketch, ×7.5. Drawn from the holotype.

colored, white-pruinose, the disc deeply immersed, pale ochraceous. Margin in cross section 200 μm thick, splitting away from the hymenium when dry, the wall colorless, of interwoven hyphae 2.5 μm diam, continuing beneath the subhymenium. Internal crystalline layer absent; numerous crystals produced externally. Periphysoids simple to sparingly branched below, merging above into a layer 200 μm thick of branched and netlike interwoven periphysoids 2.5–4 μm diam, widely spaced in a gel. Paraphyses filiform, J-, sometimes branched, circinate, not enlarged above. Asci 150–175 × 4.5–5.0 μm, the cap 2.5–3 μm thick, 8-spored. Ascospores 120–150 × 1.0 μm, the cells 5–8 μm long.

On *Ferula* sp., Kirghiz S.S.R. The hymenial elements are like those of *S. hydrangeae*, but with shorter asci. The very thick margin with ornate, netlike periphysoids is not found in any other species of *Stictis* with a colorless margin.

The following two species of *Stictis* were encountered among collections from asiatic U.S.S.R., and represent significant range extensions. The morphology of both agrees exactly with that of specimens from North America.

Stictis bicolor Ell. & Ev.

This species was previously known only from Colorado.

On *Betula*, western Pamir, Vantsch Mts., Tadzhikistan, 8.VI.1978, leg. A. Raitviir; Tadzhikistan, Hissar, Kondara, Raitviir 26.V.1978 (TAA).

Stictis conotremoides Sherw.

This species was previously known only from the type locality in northern Alaska. Its occurrence in eastern Siberia is not surprising.

On *Betula fruticosa*, Magadan distr., Severo-Evenski, Kegali R., 6.VIII.1976, leg. L. Vasiljeva (TAA).

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