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# Aquatic fungi of Iceland:

# Brevilegnia bispora Couch, and some related forms.

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ABSTRACT: The morphology of 19 isolates of *Brevilegnia* grown on hempseed in sterile tap water (at 25°C) and in some modified cultural conditions is described. The resulting growth patterns and characteristics allow four taxa to be recognized: *B. bispora, B. parvispora,* and two unnamed ones. Structural features of *B. bispora* and *B. parvispora* were modified in experimental cultures, but the chief characteristics of the two unnamed fungi were relatively stable. Semisolid nutrient media did not support sexually-reproducing colonies of all isolates.

## INTRODUCTION

HOWARD [9] first recognized and isolated a *Brevilegnia, B. parthenospora,* from soils in Iceland. Subsequently, he and coworkers [12] examined other Brevilegnias, and concluded that *B. parthenospora* (a *nomen nudum)* was in fact *B. unisperma* var. *montana* Coker and Braxton [3]. Among the species recovered [12] two were identified as *B. minutandra* Höhnk [7, 8], one as *B. parvispora* Höhnk [7, 8], and one was left unnamed but allied provisionally with the latter. In this study, we [12] emphasized that there were three features common to all the isolates of *Brevilegnia* at hand: sympodial branching of the

oögonial stalks, the production of glomeruli (openly or compactly branched oögonial stalks bearing lateral and terminal oögonia; Figs. 9, 15, 23 40), and the formation of broadly apiculate oögonia. We did not propose any taxonomic changes, but regarded *B. unisperma* var. *delica* Coker and Alexander [2], *B. unisperma* var. *montana, B. parvispora,* and *B. minutandra* as taxa with very close structural alliances.

In 1972 and 1973, I collected several additional Brevilegnias from various localities in Iceland. Table I lists the isolates (the numerical designation is a convenient though provisional scheme for referring to the fungi since species names could not be applied in all instances). All isolates had certain characteristics in common, including both brevilegnoid and achlyoid spore discharge patterns. One isolate (*10753*) appeared initially to align with *B. parvispora* or *B. minutandra.* Six (*Brevilegnia 3141*) were assigned provisionally to *B. bispora,* ten (*Brevilegnia 4399*) could not be identified readily with any known species, and two (*Brevilegnia 6767*) had some features suggestive of *B. bispora* and *B. parvispora.*

Originally [5], *Brevilegnia bispora* Couch was separated from other species in the genus because its sporangia released spores in an achlyoid as well as a brevilegnoid fashion. *Brevilegnia unisperma* var. *montana* [12], *B. parvispora* [7, 12], and *B. variabilis* [10] likewise had these two types of spore discharge.

Morphological variability exists [12, 14] among the Brevilegnias, and some notion of its magnitude is necessary for taxonomic purposes. SALVIN [14] grew an unnamed *Brevilegnia* in certain environmental stresses, and found striking variations. Repeating his procedures with

TABLE 1. Isolates related to *Brevilegnia bispora* Couch.

| Taxonomic Groups | Isolate (Herbarium) Number | Identification |
|---|---|---|
| *Brevilegnia 10753* | 10753 | ? |
| *Brevilegnia 3141* | 3141, 4692, 5801, 8160, 10638, 10982 | *B. bispora* |
| *Brevilegnia 4399* | 4399, 5001, 5927, 6555, 6711, 7282, 9596, 11127, 11182, 11260 | ? |
| *Brevilegnia 6767* | 6767, 11149 | *B. parvispora* |

other species, neither PADGETT [12] nor I [11] noted any substantial morphological changes. I propagated representative isolates from among the 19 at hand in modified culture conditions, and this paper describes the structure of those fungi. The results of the study are applied to taxonomic problems in the genus.

## MATERIALS AND METHODS

The fungi were collected on hempseed, isolated into pure culture by the usual single-spore technique, and then characterized from colonies growing on hempseed in 40 ml of sterile tap water at 25°C. (The exceptional purity of cold tap water in Iceland makes the use of distilled water unnecessary.) Such cultures were the controls for the experiments in which selected isolates were propagated and characterized in 40 ml of sterile tap water at 18°C, and in 40 ml of sterile staling, pond, or soil extract water at 18° or 25°C.

Staling water was produced from several sets of 10—15 colonies of each isolate grown for 3 weeks in Petri plates containing 50 ml of sterile tap water. The water was poured off, diluted with an equal amount of cold tap water, and autoclaved (121°C, 5 minutes). Pond water came from the edge of a small, marshy lake. Samples were filtered through cheesecloth and absorbent cotton, then through No. 42 Whatman paper, and autoclaved (121°C, 10 minutes). Soil extract was prepared as follows. Approximately 100 g of potato garden soil was steeped (with occasional stirring) in one liter of cold tap water for 6 hours. The extract was filtered through cheesecloth and absorbent cotton, reconstituted to a liter with cold tap water, and autoclaved (121°C, 20 minutes).

Inoculum for experimental purposes was prepared on hempseed. A sporulating colony (2—4 weeks old) was transferred aseptically to a Petri plate containing 40 ml of sterile tap water. Two or three halves of sterile hempseed were added, and the culture was incubated at 25°C. Within 24—30 hours, when they were infested with young vegetative hyphae only, the hempseed halves were transferred aseptically to the test cultures.

The isolates were propagated on several nutrient media in addition to hempseed: YPSS agar and broth (1/4 and 1/8 strength), and on the agar media devised by BOOTH and BARRETT [1], SEYMOUR [15] and WILLOUGHBY [16]. I also grew isolates on the semisolid medium formulated by FULLER, *et al.* [6], but made up in tap water.

In the account to follow, the sizes in parentheses are the 70% median range. These figures were derived from 200 measurements in six preparations.

Representative specimens of the isolates (Table I) are deposited in the Museum of Natural History, Reykjavík. Collection data accompany the specimens.

## COMPARATIVE MORPHOLOGY

Certain features of all isolates were relatively stable in culture: oöspore number and size, and oögonial diameter, to name three. Except in isolate *6767*, gemmae were not present in the control cultures nor were these structures induced experimentally. The growth of all isolates was scanty and slow at 18°C, and the onset of reproduction was noticeably delayed at this temperature.

The isolates grew on all nutrient media (semisolid or broth). However, not one medium supports reproductively mature specimens of all the isolates. As a consequence, the fungi could not be compared morphologically on a substratum other than hempseed.

Pertinent morphological observations on the representatives of the genus (Table I) follow. Because I could not apply with confidence any species names to *Brevilegnia 10753* and *4399*, formal descriptions of the isolates in these groups (Table I) are provided.

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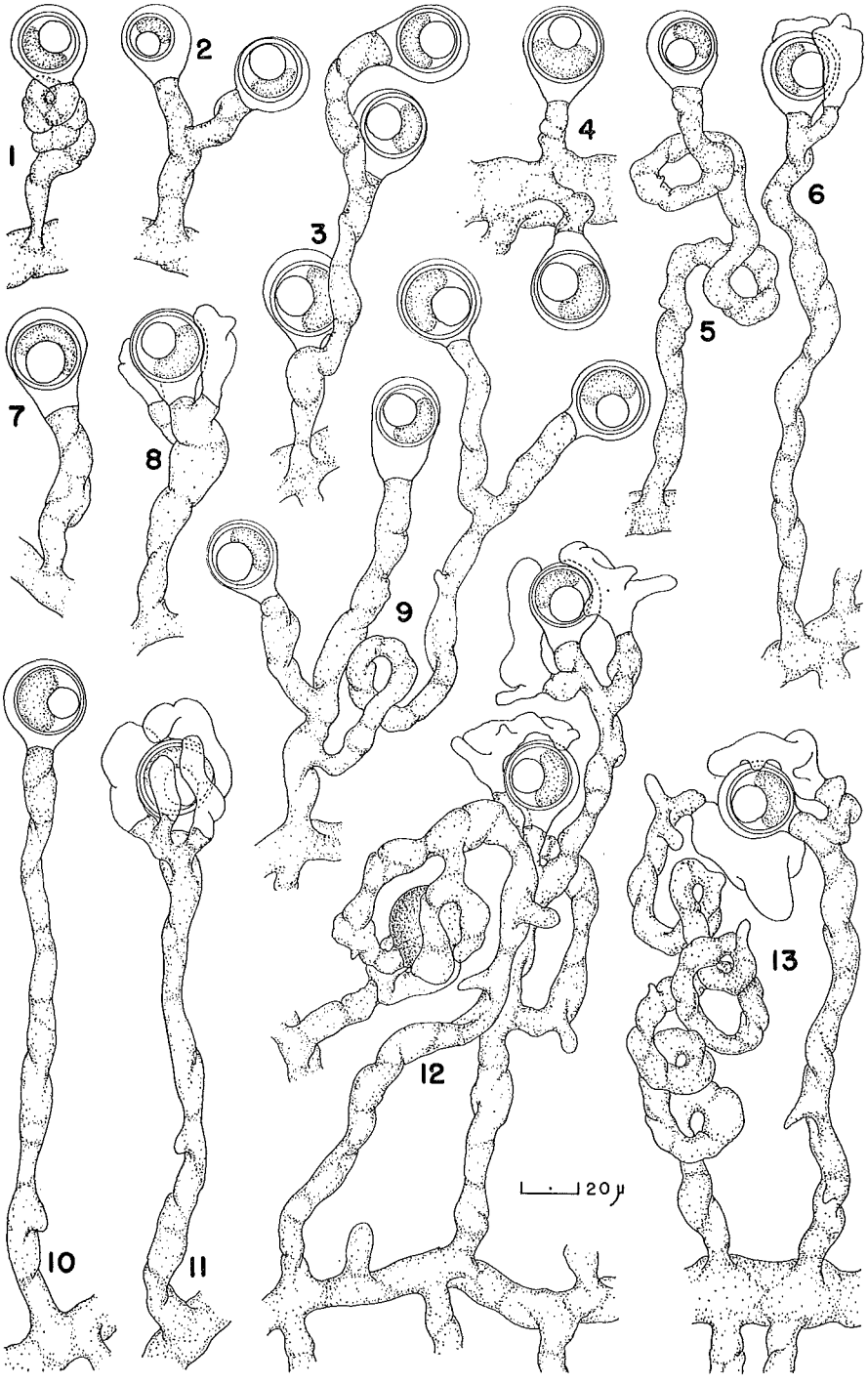
FIGURES 1–11. *Brevilegnia 10753*. 1. Oögonium on a tightly coiled stalk. 2. Oögonia on a branched stalk. 3. A sympodially branched oögonial stalk. 4. Two short-stalked oögonia. 5. Oögonium on a long, loosely coiled stalk. 6. Oögonium with an attendant androgynous antheridial branch. 7. Broadly pyriform oögonium on a short, thick stalk. 8. Oögonium with two androgynous antheridial branches. 9. A glomerulus. 10. Oögonium on a long stalk. 11. Oögonium on a long irregular stalk; three of the short, androgynous antheridial branches bear large, irregular antheridial cells. FIGURES 12, 13. *Brevilegnia bispora 3141* (from experimental cultures). 12. A cluster of oögonia on long, thick, contorted stalks. Immature oögonium (left) has attendant androgynous and diclinous antheridial branches. Mature oögonia are on a sympodially branched stalk, and are attended by androgynous antheridial branches with large, irregular, lobed antheridial cells. 13. Oögonium on a long, twisted stalk; one coiled, monoclinous antheridial branch, and a short, androgynous one. All figures same scale.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**Brevilegnia 10753.**

Specimens of *Brevilegnia 10753* were remarkably stable in culture, but some variations were noted in the antheridial branches. About 6% of the oögonia in control colonies had antheridia, and the branches were short and androgynous (Figs. 6, 8). Nineteen per cent of the oögonia on plants grown at 25°C in 40 ml of soil extract had antheridial branches, and there was a tendency for multiple filaments (Fig. 11) to occur.

Four structural features bearing on the identification of *Brevilegnia 10753* were found consistently (Figs. 1—11) in the experimental and control cultures. The oögonial stalks were stout, twisted, and irregular and the antheridial cells were likewise somewhat irregular. The fungus also produced glomeruli (Fig. 9) and sympodially branched oögonial stalks (Fig. 3). The latter two characteristics show an alliance of *Brevilegnia 10753* to *B. parvispora 6767* and *B. bispora 3141.*

A description of *Brevilegnia 10753* in hempseed culture follows.

Mycelium dense; colony on hempseed 1—1.5 cm in diameter. Gemmae absent. Sporangia abundant; fusiform, clavate, or cylindrical; sympodially renewed; 69—(201—253)—307 $\mu$ long by 14—(24—31)—38 $\mu$ in diameter. Primary sporangia discharging spores in a brevilegnoid or achlyoid fashion; secondary sporangia brevilegnoid; encysted planonts 8—(9—11)—13 $\mu$ in diameter. Oögonia abundant; lateral or terminal; spherical or pyriform, occasionally obovate; wall inconspicuously thickened, smooth, unpitted; spherical and pyriform ones 18—(24—27)—36 $\mu$ in diameter, obovate ones 26—(31—34)—48 $\mu$ long by 17—(24—26)—31 $\mu$ in diameter. Oögonial stalks of various lengths; stout, twisted, irregular, or coiled, and occasionally with one or two short, papilla-like protrusions; usually simple, but occasionally sympodially branched, or having a simple side branch; commonly forming glomeruli. Antheridial cells simple; lobed, or irregular; laterally appressed; fertilization tubes not observed. Oöspores single, not filling the oögonium; eccentric; thick-walled; spherical; 15—(21—24)—33 $\mu$ in diameter; germination not observed.

**Brevilegnia 4399.**

In the control cultures, *Brevilegnia 4399* produced very stout and irregular (Figs. 24—30) oögonial stalks. These resembled (except for length) those produced by colonies of *B. bispora 3141* grown under experimental conditions (Figs. 12, 13, for example). Moreover, the stout aspect of the oögonial branches was like that of *Brevilegnia 10753,*

but the stalks of *Brevilegnia 4399* were considerably more irregular. The antheridial cells of *Brevilegnia 4399* were similar to those of *Brevilegnia bispora 3141* (Figs. 13–16, 21, 22). Sympodially branched oögonial stalks were produced by *Brevilegnia 4399,* but there were no glomeruli.

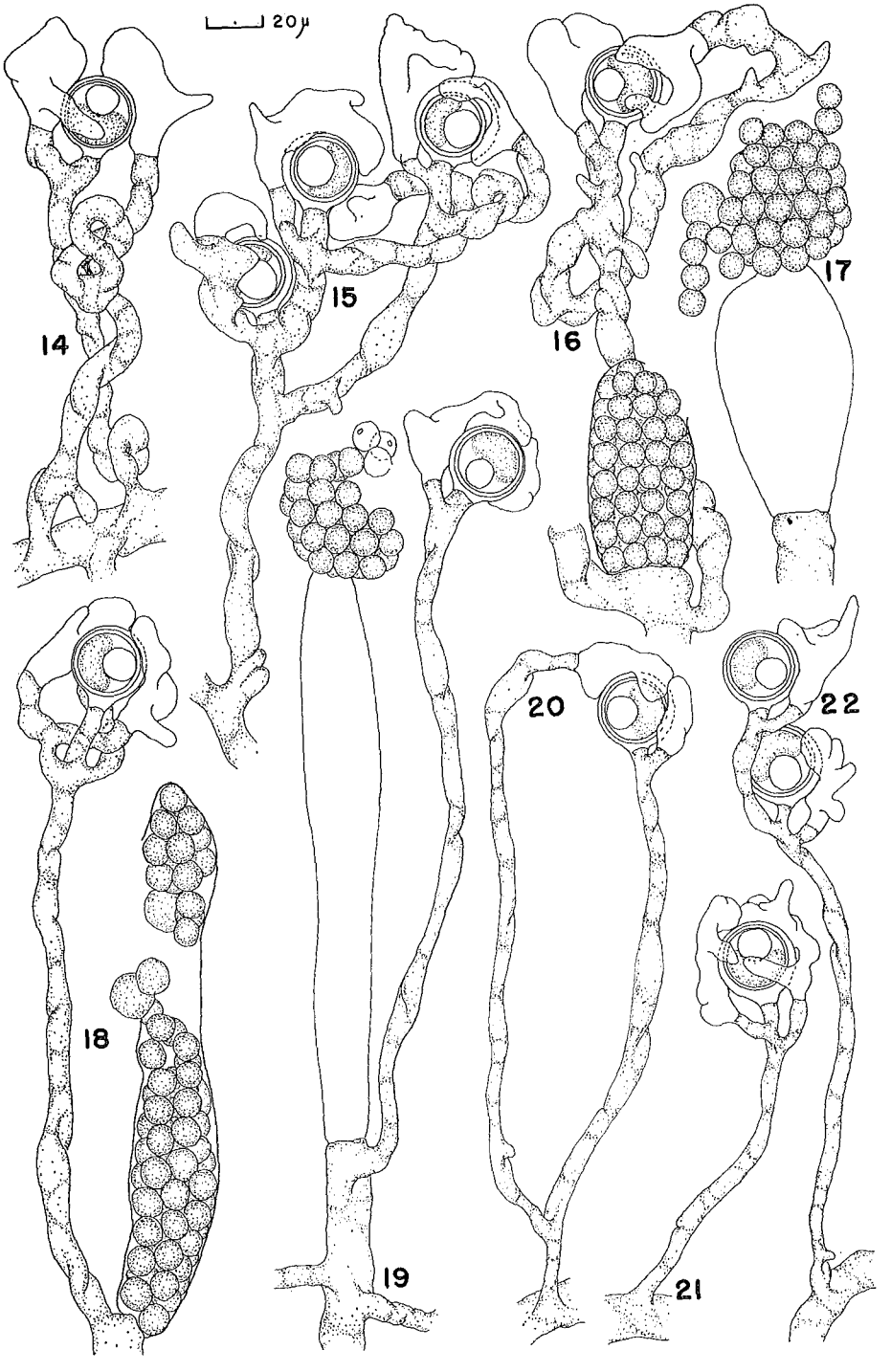
Between 60 and 87% of the oögonia of *Brevilegnia 4399* bore antheridial branches. Nearly 30% of these branches were monoclinous, but among the other fungi used in the study only the experimental plants of *B. bispora 3141* formed such filaments (Figs. 13, 14). About 55–65% of the antheridia in *Brevilegnia 4399* were androgynous; an origin held in common with individuals in the other taxonomic groups (Table I). Oögonia of *Brevilegnia 4399* without antheridia resembled those of *Brevilegnia 10753* (Figs. 10, 32), and in shape and size were not substantially different from *B. bispora 3141.* The same may be said for oöspore size in these fungi.

Three isolates representing this taxonomic group, Nos. *4399, 7283,* and *11260,* were propagated in the modified cultural conditions. With some exceptions, the morphology of these fungi remained largely unchanged.

Colonies grown at 18° and 25°C in soil extract and staling water produced only short-stalked oögonia, and these branches were even more contorted than in the controls. Plants developed in soil extract at 18° and 25°C had a higher percentage of oögonia without antheridial branches (55–73%) than did the control cultures (13–40%). There were no achlyoid sporangia in any colonies incubated at 18°C in pond water.

A description of the characteristics of *Brevilegnia 4399* in hempseed culture follows.

Mycelium dense; colony on hempseed 1–1.8 cm in diameter. Gemmae absent. Sporangia sparse; fusiform, clavate or cylindrical; renewed sympodially; 47–(166–183)–281 $\mu$ long by 16–(23–29)–33 $\mu$ in diameter. Primary sporangia discharging spores in brevilegnoid or achlyoid manner; spore release from secondary ones brevilegnoid, rarely dictyoid; encysted planonts 8–(9–11)–16 $\mu$ in diameter. Oögonia abundant; lateral or terminal; spherical or pyriform, infrequently broadly obovate or irregular; wall inconspicuously thickened; smooth or, infrequently, slightly undulant or irregular; unpitted; spherical and pyriform ones 19–(24–26)–33 $\mu$ in diameter; obovate ones up to 51 $\mu$ long by 39 $\mu$ in diameter. Oögonial stalks thick, stout, irregular, twisted, or coiled, sometimes inflated at points along their length, and often provided with short, lateral lobes or evaginations; occasionally branch-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ing sympodially, then bearing 2–4 oögonia. Antheridial branches, when present, short or long, predominantly androgynous, occasionally monoclinous and diclinous; stout, thickened, irregular, twisted, loosely coiled, or contorted, and often sparingly branched or provided with short, lateral protrusions. Antheridial cells generally large, very irregular, lobed and branched, but occasionally small and simple; laterally appressed; fertilization tubes not observed. Oöspores single, rarely 2 in an obovate oögonium; eccentric, thick-walled; spherical; 13–(20–23)–32 $\mu$ in diameter; germination not observed.

**Brevilegnia bispora 3141.**

In the control cultures (Figs. 18–23), *Brevilegnia bispora 3141* produced small, spherical or pyriform oögonia 19–(23–25)–28 $\mu$ in diameter. The eccentric oöspore, 16–(21–24)–26 $\mu$ in diameter, usually nearly filled the oögonial cavity. Androgynous antheridial branches of near (Fig. 21) or distant (Fig. 20, in part) origin were present on 97% of the oögonia. The laterally appressed antheridial cells were generally large and irregular or lobed (Figs. 21, 22). Oögonia usually terminated relatively long (median 70%, 125–190 $\mu$; maximum length, 285 $\mu$), slender, somewhat irregular or twisted stalks. There were sympodially branched stalks (Fig. 22) and glomeruli (Fig. 23) in the colonies. Catenulate oögonia were formed only on glomeruli.

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FIGURES 14–17. *Brevilegnia bispora 3141* (from experimental cultures). 14. Oögonium on a twisted, coiled stalk; monoclinous and androgynous antheridial branches. 15. A glomerulus; note irregular and coiled nature of the stalk and antheridial branches. 16. Portion of hypha showing a short, cylindrical, brevilegnoid sporangium and a sympodially-produced oögonium with its androgynous antheridial branches. 17. A short-clavate, terminal sporangium with achlyoid spore discharge. FIGURES 18–22. *Brevilegnia bispora 3141* (from tap water cultures). 18. An oögonium from a sympodial branch below a long, slightly irregular sporangium with brevilegnoid spore discharge. Oögonial stalk is stout, twisted, and irregular; androgynous antheridial branches with large, irregular antheridial cells. 19. Oögonium from a sympodial branch below a long, cylindrofusiform sporangium with achlyoid discharge. Oögonial stalk is slender but twisted and irregular. Antheridial cell large, lobed and irregular. 20. Oögonium with two androgynous antheridial branches. 21. Oögonium on a slender, relatively short stalk. 22. Oögonia on a sympodially branched stalk. All figures same scale.

Since the six isolates (Table I) of this *Brevilegnia* were nearly identical in their characteristics when grown in sterile tap water, only two (Nos. *3141, 10638*) were selected for experimental purposes. Structural changes occurred when colonies of these fungi were propagated in soil extract or pond water at 18° and 25°C. The two isolates were not modified to the same degree, but a definite variational pattern existed (Figs. 12–17).

In the experimental plants the sporangia (Figs. 16, 17) were invariably short and cylindrical or clavate, rather than long and fusiform as in the control specimens (Figs. 18, 19). Some greatly enlarged spore cysts were produced (Fig. 17) in both the achlyoid and brevilegnoid sporangia.

Specimens grown in pond water and soil extract produced irregularly thickened oögonial stalks and antheridial filaments (Figs. 14, 15) that often bore short, lateral lobes or branches (Fig. 12). The antheridial cells were large and prominently irregular or lobed. Whereas oögonia of the control plants had only androgynous antheridial branches (Figs. 20–23), 11–43% of those on experimental plants of the two isolates produced monoclinous ones (Figs. 13, 14) as well. The oögonial stalks of isolates in staling water at 25°C were more irregular than those of the controls.

Vigorous colonies of *Brevilegnia bispora 3141,* prior to the onset of reproduction, were transferred from pond water and soil extract to sterile tap water and incubated at 25°C. The plants matured into colonies with characteristics indistinguishable from those of isolates grown continually in the control conditions. In this group of *Brevilegnia* isolates, therefore, a modest degree of reversal in characteristics could be induced.

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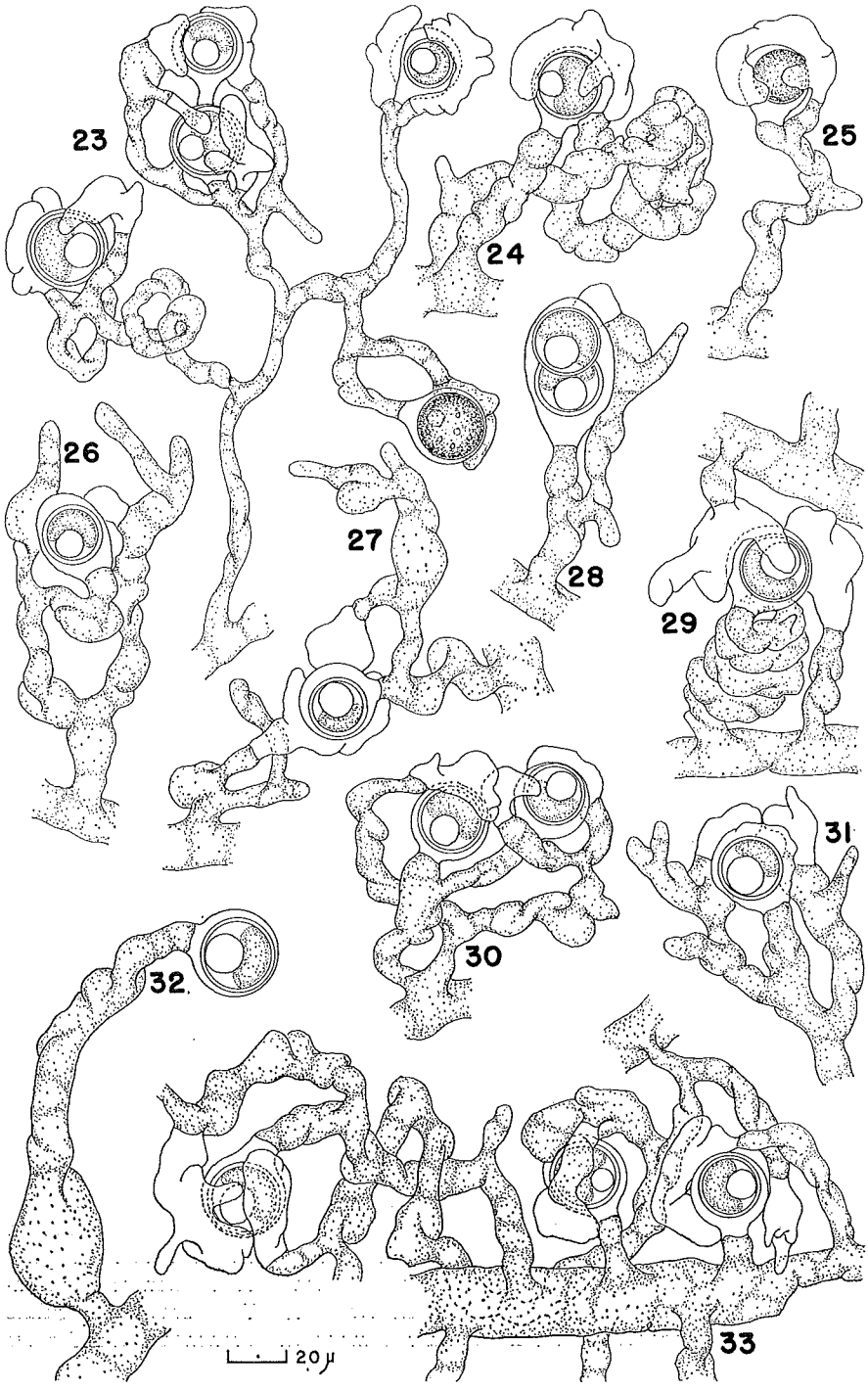
FIGURE 23. *Brevilegnia bispora 3141* (from tap water cultures). A glomerulus. FIGURES 24–33. *Brevilegnia 4399.* 24. A Short-stalked oögonium, and its coiled, twisted, monoclinous antheridial branch. 25. Oögonium on a twisted, irregular stalk; androgynous antheridial branch. 26. Oögonium with two androgynous antheridial branches. 27. Oögonium with an androgynous and diclinous antheridial branch. 28. Obovate oögonium containing two oöspores. 29. Oögonium on a tightly coiled stalk; note large, irregular antheridial cells on the attendant monoclinous and diclinous antheridial branches. 30. Two oögonia on a sympodially branched stalk. 31. An irregular, terminal oögonium. 32. Oögonium on an inflated, contorted stalk. 33. Portion of hypha with oögonia. All figures same scale.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**Brevilegnia 6767.**

Like *Brevilegnia bispora 3141,* specimens of *Brevilegnia 6767* showed a degree of variability not evident in either *Brevilegnia 10753* or *Brevilegnia 4399.* Colonies of *Brevilegnia 6767* grown in control cultures (and at 18°C) produced oögonia on very long [181—(280—330)—495 $\mu$], slender, slightly twisted or contorted, occasionally branched stalks (Figs. 35, 36). No other isolates possessed such extreme oögonial filaments, though in *B. bispora 3141* (Figs. 20, 22) the stalks were also slender and moderately irregular. Approximately 20% of the oögonia produced by *Brevilegnia 6767* were broadly apiculate, a shape not found in the other isolates. While the oögonial stalks were branched on occasion, this pattern was not sympodial (as in *B. bispora 3141* for instance), nor were glomeruli developed. *Brevilegnia 6767* universally formed androgynous antheridial branches and large, irregular or lobed antheridial cells in the controls. These structures were like those of *B. bispora 3141.*

The most obvious morphological changes that occurred in isolates *6767* and *11149* when they were propagated in pond water and in soil extract (18° and 25°C), were in the nature of the oögonial stalks. Though these branches of the experimental plants were slender like those of the controls, they were shorter, and noticeably more irregular and twisted. In addition, glomeruli (Fig. 40) appeared in these experimental colonies, and sympodial branching (Fig. 43) developed.

Antheridial branch origin was not modified in response to culture environment, but gemmae (Figs. 37—39) appeared in colonies propagated in staling water (18° and 25°C). The antheridial cells of speci-

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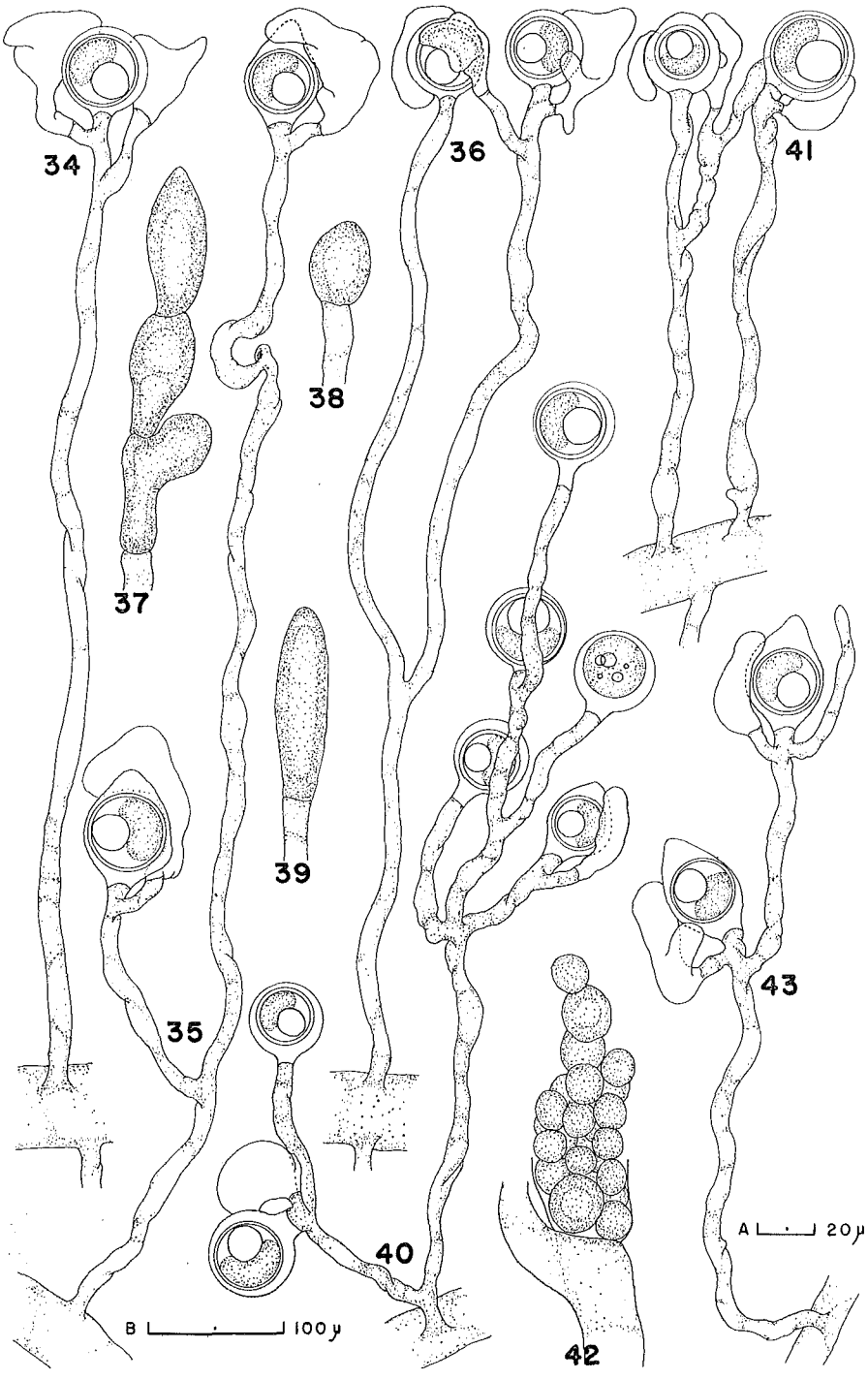
FIGURES 34—36. *Brevilegnia parvispora 6767* (from tap water cultures). 34. Oögonium on a long, slender stalk; two androgynous antheridial branches. 35, 36. Oögonia on long, branched stalks, androgynous antheridial branches and large, irregular and lobed antheridial cells. FIGURES 37—43. *Brevilegnia parvispora 6767* (from experimental cultures). 37—39. Gemmae. 40. An oögonial glomerulus: some oögonia provided each with a single, androgynous antheridial branch. Note that the uppermost oögonium (lacking an antheridium) arises on a sympodial branch. 41. Two lateral oögonia on slender, irregular stalks; androgynous antheridial branches. 42. Portion of a sporangium with brevilegnoid discharge. 43. Two broadly apiculate oögonia on a long, slender, sympodially branched stalk. Figures 37—39, scale B; others, scale A.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mens propagated in soil extract at 18° and 25°C were generally smaller than those formed by the control plants (compare Figs. 34, 41).

Reproductively immature specimens of *Brevilegnia 6767* subcultured from colonies in pond water or soil extract produced short oögonial stalks (some sympodially branched), small antheridial cells, and glomeruli when transferred to sterile tap water. Thus, the long-stalked condition was not again developed by specimens grown in the environment in which the feature had originally appeared. Furthermore, when subcultures of the two isolates (*6767* and *11149*) were carried through several "generations" on hempseed in sterile tap water (25°C) the exceptionally long oögonial stalks diminished in frequency until they were eliminated from some colonies. In those colonies where the frequency of long-stalked oögonia was greatly reduced, glomeruli and sympodially branched oögonial filaments appeared. The production of gemmae on the contrary, could be inhibited by growing young colonies subcultured from experimental specimens again in sterile tap water.

## TAXONOMY

Since all the isolates used in the study (Table I) discharged spores in an achlyoid as well as a brevilegnoid fashion, they were obviously allied to *Brevilegnia bispora* [5], *B. parvispora* [7, 8], and *B. variabilis* [10]. If the morphology of all the plants grown only under the control conditions is considered, the isolates in the *Brevilegnia 3141* series fall within the boundaries of a known species *(B. bispora)*. The remaining isolates grown under similar control conditions, might be assumed to represent underscribed species. However, it is possible to recognize in the structure of these fungi, after growth in the experimental culture conditions, certain affinities with each other and with known species.

Isolates in the *Brevilegnia 3141* group (Table I) diverge from *B. bispora* [5] in four ways: shape and size of the antheridial cells, absence of gemmae, sympodial branching, and the production of glomeruli. Thus, identification of my specimens with COUCH's species requires justification.

The formation of gemmae by *Brevilegnia* species is so variable [9, 12] that it has no decisive weight taxonomically and the same may be said for antheridial cell size. I am therefore admitting to *B. bispora* specimens with glomeruli and sympodially branched oögonial stalks, and enlarging the limits of the species to do so. This is not ill-advised

in view of the widespread occurrence of these structures in other species [2, 7, 12]. The alternative — to set off my specimens from *B. bispora* on the basis of only two characters — is unacceptable.

Some of the variations induced in *Brevilegnia bispora 3141* approach the characteristics of *B. variabilis* [10], and certainly oögonial and oöspore sizes in my plants are like those given by INDOH for his species. *Brevilegnia variabilis* is not satisfactorily illustrated, but from one figure, I conclude that the antheridial branches are similar to those of some Iceland specimens grown in experimental culture. As INDOH described the species, *B. variabilis* lacks large, irregular antheridial cells, but these are characteristic of my isolates of *B. bispora.* Only rarely have I found *Dictyuchus*-type sporangia in my cultures; these were presumably common in INDOH's plants. Although direct evidence is lacking, I suspect that *B. variabilis* is a species of *Dictyuchus* as its growth pattern [10] suggests.

If *Brevilegnia 3141* and its companion isolates are admitted to *B. bispora,* there is no basis on which to exclude isolates *6767* and *11149* from the same taxon. These fungi have in common with *B. bispora* slender, simple or branched oögonial stalks, androgynous antheridia, and similar sizes of oögonia and oöspores. Also like *B. bispora* (*sensu* COUCH) isolates *6767* and *11149* lack glomeruli under certain culture conditions.

On the other hand, the variations induced among the fungi in the *Brevilegnia 6767* group and those allied with *B. bispora 3141* are too pronounced to be ignored. The experimental plants of the two groups (Figs. 12—17; 40—43) expressed very different growth patterns. *Brevilegnia bispora 3141* in soil extract formed stout antheridial and oögonial filaments, whereas individuals of *Brevilegnia 6767* in the same environment formed slender (though irregular) ones. Antheridial branch origin was altered experimentally in *B. bispora 3141,* but not in *Brevilegnia 6767. Brevilegnia 6767* therefore cannot be equated completely with *B. bispora.*

In its structure, *Brevilegnia 6767* has certain obvious affinities with *B. parvispora.* HÖHNK's species [7, 8, 12] has long, slender oögonial stalks, sympodial branching, glomeruli, some broadly apiculate oögonia, and androgynous antheridial branches. These features (Figs. 37—43) predominate in the experimental plants of *Brevilegnia 6767.* Aside from small differences in oögonium and oöspore size between *Brevilegnia 6767* and *B. parvispora,* the only features that could conceivably separate the two are those of antheridial cell size and relative abundance of the antheridial branches. Cell size has no real taxonomic value

as the variations in the Iceland specimens and other members of the genus show. HÖHNK regarded antheridia in *B. parvispora* as rare, and in some specimens from Iceland [12] this was certainly the case. Thus, to admit *Brevilegnia 6767* to *B. parvispora* modifies the description of the species to include isolates with abundant antheridial branches. This single modification is inconsequential taxonomically, as is the production of the exceptionally long oögonial stalks (which did not persist in culture).

With the inclusion of isolates *6767* and *11149* in *Brevilegnia parvispora* its alleged [12] very close alliance to *B. minutandra* Höhnk [7, 8] is less evident. By the same token, *B. parvispora* then is not as easily distinguishable from *B. bispora* as had been earlier [12] supposed. My specimens of *B. bispora* have no apiculate oögonia, the antheridial cells are consistently very large and irregular, and monoclinous antheridial branches may be induced. Only these features now appear to separate *B. bispora* and *B. parvispora.*

It is tempting to identify *Brevilegnia 10753* with *B. parvispora* because certain of its features — sporangium type, oögonial stalk structure, short, androgynous antheridial branches — also characterize HÖHNK's species. The oögonia and oöspores of *Brevilegnia 10753* are larger than the strictest interpretation of *B. parvispora* would admit, but size is probably of little taxonomic worth (especially not within the ranges expressed in the Iceland plants). No apiculate oögonia such as are found in *B. parvispora* appeared in *Brevilegnia 10753,* and its stout, irregular oögonial stalks do not compare favorably with the slender ones of HÖHNK's species.

Support for separating *Brevilegnia 10753* from any of the species in the *B. bispora* group [5, 7, 10] and others [13] comes from its apparent stability in culture. However, under more refined methods of culture this unnamed fungus might well be exceptionally variable. In any event, it is unwise to regard *Brevilegnia 10753* as a new taxon based on a single collection.

As the illustrations bear out, *Brevilegnia 4399* has certain characteristics in common with *B. bispora* and related forms, but also enjoys some exclusive features. This taxon is noteworthy for the very stout antheridial and oögonial branches that seem to be reasonably stable in culture. On antheridial branch origin alone, *Brevilegnia 4399* could be assigned either to *B. unisperma* var. *unisperma* Coker and Braxton [2, 4] or to *B. linearis* Coker and Braxton [2, 4]. Moreover, the pronounced irregularity of oögonial stalks and antheridial branches [3, pl. 12, figs. 2, 3] of B. unisperma var. unisperma are reminiscent of those

in *Brevilegnia 4399*. That variety produces strongly irregular oögonia (which my specimens do not), and is alleged to have only a brevilegnoid spore release pattern. The range of variability in the variety *unisperma* is an unknown quantity, and therefore its possible alliance to the Iceland plants cannot be summarily dismissed.

Separation of the taxa revolving around *Brevilegnia unisperma* var. *montana* is not yet feasible [12], and the same seems to be the case for this cluster of isolates allied with *B. bispora*. Moreover, some elements of both taxa overlap. Previous descriptions of these taxa were based on a limited numer of isolates, and are thus inadequate. To add yet other species — such as one represented by *Brevilegnia 4399* — without a prior thorough analysis of the entire genus would make future identifications even more uncertain.

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## ÚTDRÁTTUR

Lýst er nítján sýnum af ættkvíslinni *Brevilegnia*. Sýnin voru einangruð á ýmsum stöðum á Íslandi og ræktuð á hampfræi í steriliseruðu vatni. Þau flokkuðust í 4 tegundir eða afbrigði, *Brevilegnia bispora, B. parvispora* og tvær ónafngreindar tegundir. Ekki er talið æskilegt að svo stöddu að lýsa þeim sem nýjum tegundum, nema algjör endurskoðun ættkvíslarinnar geti farið fram um leið, ásamt ýtarlegum rannsóknum á breytileika einkenna innan hverrar tegundar. Aðgreining þeirra afbrigða, sem falla undir *Brevilegnia unisperma* var. *montana*, og áður var lýst (12), er ekki enn tímabær, og sama gildir um þann afbrigðahóp, sem hér er flokkaður undir *B. bispora*.

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