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THE GENUS *THELEPHORA* IN IOWA

PAUL L. LENTZ

The genus *Thelephora*, as defined by Fries (Syst. Myc. 1:428. 1821), includes many of the present members of the group and many more which are now placed in other genera. Citing Ehrhart, Crypt. Exsic. No. 178. 1785, as his basis, Fries defined the genus as composed of those fungi having a compact, homogeneous pileus which is coriaceous and persistent. *T. terrestris* Ehrh. is designated the type species. *Thelephora*, as envisioned by Fries, included five "tribes" in the genus proper. In addition he listed *Stereum*, *Phylacteria* and *Leiostroma* as subgenera. Some of these subgroups had been treated as genera by earlier authors, and some of them have since been regarded as worthy of generic ranking.

Other systematists, including Willdenow, Persoon, Link, and Nees, had included *Thelephora* in their systems of classification preceding Fries. But of greater significance are those who since have attempted to define the limits and characteristics of the group. Among the more important of these are Patouillard (1900) and his followers, including Bourdot and Galzin (1927). They recognize *Thelephora* as a genus of their tribe Clavaries, but place many of the species here regarded as belonging to *Thelephora* in the genus *Phylacteria*, one of the subgenera of Fries. On the other hand, they include in *Thelephora* several species which American students refer to *Stereum*.

Burt (1914), whose concept of the genus is followed in this study, characterized *Thelephora* as follows: "Fructifications pileate or clavate, coriaceous; hymenium continuous with the hymenophore and similar to it, inferior, or amphigenous in a few species, even or faintly ribbed or papillose; basidia simple, 4-spored; spores colored, typically muricate but even, or rough-walled in a few species."

The phrase "muricate but even" is not particularly fortunate when applied to *Thelephora*, since all the species have spores which are at least echinulate, and those of many are decidedly irregular in contour, with conspicuous spines or warts.

In general external appearance, and often even in microscopic characteristics, *Thelephora*, especially the upright, narrowly branched species, resembles *Clavaria*. The distinction between

Thelephora and certain species of *Lachnocladium* is even more difficult to define. In fact Patouillard includes *Lachnocladium* in his series of Thelephores. Following Burt, *Clavaria* is here separated from both *Thelephora* and *Lachnocladium* by its fleshy, non-coriaceous texture. Burt would restrict *Lachnocladium* to species with smooth, pale spores, but it may be questioned whether this is practicable.

The various species of *Thelephora*, particularly the erect, much-branched forms, intergrade so closely with one another that it is sometimes impossible to place a specimen into one or another species with complete assurance. In fact, an unbroken series may be established beginning with *T. regularis*, and continuing through *T. multipartita* to *T. anthocephala* and *T. palmata*. Since an abundance of material has been available, the problem has been principally that of attempting to decide where to place the numerous intermediate forms which have appeared.

Thelephora anthocephala and *T. palmata* especially have caused difficulty, and it is with hesitation that they are left as separate species. The "typical" odor of *T. palmata*, which is described by Burt, among others, is not noticeable in our collections except for a pungent odor which seems to be characteristic of all species of *Thelephora* studied. Although distinctive odors have been reported for several species, including *T. palmata*, *T. cuticularis*, and *T. albido-brunnea*, it does not seem possible to accept odor as a distinguishing characteristic. In fact the great number of times that odors have been attributed to various species suggests that this is a generic, rather than specific, characteristic. None of the specimens which were examined had a distinctive odor either when fresh or dry.

The character of the hymenium, another basis for separating *T. anthocephala* from *T. palmata*, likewise is difficult to determine, since it frequently may be inferior on part of the pileus and amphigenous on the remainder of the same pileus. Thus it is often with doubt that a collection is included in one or the other species on this basis. Size, too, seems practically worthless in attempting to distinguish between the two species, if they are separate species. Color is not a good criterion for species distinction among any of these forms, since it is likely to change with age and with conditions of growth.

Burt says that, in his opinion, *T. multipartita* is a variety of *T. regularis*. Many of our collections of *T. multipartita* also con-

tain specimens which, if separated from the remainder of the collection, would certainly be identified as *T. anthocephala*; nevertheless, the four separate groups have been retained here, though with some doubt whether there may be more than two distinct species.

Emmons (1927) reported six species from Iowa: *anthocephala*, *multipartita*, *regularis*, *albido-brunnea*, *terrestris*, and *griseozonata*. *T. terrestris*, as he reported it, included forms which are here referred to *T. intybacea*. The remaining five species are here maintained in the same sense as in his treatment, and five additional species are included.

In the key to the species which follows, an attempt has been made to define the species as distinctly as possible, but it is difficult to present a workable key to a genus having the overlapping and intermediate forms which are found in *Thelephora*. The colors used in the key, and in the descriptions, are based on Ridgway, Color Standards and Nomenclature.

This study was suggested by Professor G. W. Martin and completed under his direction in the mycological laboratory of the State University of Iowa.

Key to the species of *Thelephora*

- a. Pileus effused or incrusting, sometime resupinate when young, eventually with free branches or lobes b
- a. Pileus entirely free, erect, not effused nor incrusting h
 - b. Few to many slender, divided branches present c
 - b. Free portion composed of pileate lobes, not divided d
- c. Incrusting and ascending small plants; free branches few to many, with blunt or fimbriate tips 1. *T. fimbriata*
- c. Effused and incrusting surface litter; free branches numerous, with penicillate tips 2. *T. spiculosa*
 - d. Hymenium drab, becoming sage green in KOH 3. *T. cuticularis*
 - d. Hymenium pallid to ferruginous or fuscous, not becoming sage green in KOH e
- e. Pileus soft, spongy, isabelline, becoming darker only with age, more than 2 mm. thick 4. *T. albido-brunnea*
- e. Pileus subcoriaceous to coriaceous, usually darker than isabelline, less than 2 mm. thick f
 - f. Pileus zonate 5. *T. griseozonata*
 - f. Pileus not zonate g
- g. Pileus with drab or fuscous shades, fibrous-squamulose, with fibers matted to form appressed and completely adnate squamules; margin entire 6. *T. intybacea*

- g. Pileus with ferruginous shades, fibrous-squamulose and usually strigose, the squamules not appressed; margin fibrous-fimbriate 7. *T. terrestris*
 - h. Pileus infundibuliform, entire or becoming tardily divided into a few broad lobes 8. *T. regularis*
 - h. Pileus divided into lobes or branches from early stage i
- i. Branches flattened or flabellate, but retaining infundibuliform arrangement, especially at base of branches 9. *T. multipartita*
- i. Branches slender, numerous, not suggesting infundibuliform arrangement j
 - j. Branches terete; hymenium amphigenous; stipe smooth or nearly so 10. *T. palmata*
 - j. Branches somewhat flattened; hymenium mostly inferior; stipe villose 11. *T. anthocephala*

1. THELEPHORA FIMBRIATA Schw. Trans. Amer. Phil. Soc. n. s. 4:166. 1834. *Merisma fimbriatum* Schw. Schrift. Naturf. Ges., Leipzig, 1:110. 1822. *Thelephora scoparia* Peck, Rep. N. Y. State Mus. 42:123(27). 1889.

Fig. 1.

Fructification coriaceous, united below, and incrusting and ascending twigs and small plants up to 4 cm., with free branches or branch tips 2-10 mm. long, fimbriately incised, brownish drab to snuff brown; hymenium even, pruinose-pubescent; spores umbrinous, irregular, echinulate, 8-9 x 5.5-6.5 μ .

Thelephora fimbriata resembles the erect species of *Thelephora* rather closely, except that its axis is always some twig or small plant. It approaches *T. spiculosa*, but is distinguished from it by having fimbriate instead of penicillate, spiked branch tips, and by its ascending habit of growth, rather than the effused, reclinate habit of *T. spiculosa*.

TYPE LOCALITY: Salem, North Carolina.

SPECIMENS EXAMINED: Iowa: Iowa City.

ILLUSTRATIONS: Burt, Ann. Mo. Bot. Gard. 1:P1. 4, Fig. 3. 1914.

2. THELEPHORA SPICULOSA Fries, Syst. Myc. 1:434. 1821.

Fig. 4.

Fructification coriaceous to fleshy coriaceous, effused and reclining over surface litter, caespitose, at times somewhat incrusting, up to 10 mm. high and 2 cm. broad; branches usually free, up to 1 cm. long, reclinate, penicillate-tipped, vinaceous-buff to Natal brown; hymenium pruinose granular; spores umbrinous, irregular, echinulate, 6.5-10 x 5-6.5 μ .

Thelephora spiculosa commonly appears as a cluster of spiculose-tipped branches, effused, reclining, and sometimes incrusting decaying leaves or other surface litter. It somewhat resembles a much branched, non-erect specimen of *T. multipartita* in general appearance. It may be distinguished from *T. fimbriata* by its spiculose branch tips, and by usually not

having a twig or other small supporting structure for a central axis. One specimen is effused and matted over moss, and has few free branches; thus the fructification is so untypical that it is with some doubt that it is referred to *T. spiculosa*.

TYPE LOCALITY: Sweden.

SPECIMENS EXAMINED: Iowa: Iowa City.

ILLUSTRATIONS: Burt, Ann. Mo. Bot. Gard. 1:Pl. 4, Fig. 2. 1914.

3. *THELEPHORA CUTICULARIS* Berk. Lond. Jour. Bot. 6:324. 1847.

Fig. 2.

Fructification coriaceous-spongy, 1 mm. thick, incrusting and ascending twigs, confluent up to 8 cm., sending out free lobes up to 1 cm. long at intervals; surface soft, silky, fibrillose; hymenium inferior, concave, even, drab to drab brown; spores umbrinous, usually flattened on one side, echinulate, 8-10 x 6-7 μ .

Thelephora cuticularis may be identified by its drab hymenium, which turns green when crushed in KOH solution. The spores have very slender spines and are usually flattened on one side, thus permitting them to be distinguished from the irregular, angular spores of other species. The odor mentioned by Burt was not noticeable even when our specimens were collected.

TYPE LOCALITY: Waynesville, Ohio.

SPECIMENS EXAMINED: Iowa: Iowa City.

ILLUSTRATIONS: Burt, Ann. Mo. Bot. Gard. 1:Pl. 4, Fig. 2. 1914.

4. *THELEPHORA ALBIDO-BRUNNEA* Schw. Trans. Amer. Phil. Soc. n. s. 4:166. 1834.

Stereum Micheneri B. & C. Grevillea 1:162. 1873.

Stereum spongiosum inassee, Journ. Linn. Soc. Bot. 27:172. 1890.

Thelephora odorifera Peck, Rep. N. Y. State Mus. 44:132(22). 1891.

Fig. 3

Fructification coriaceous-spongy, dimidiate, effused-reflexed, usually imbricate, encircling, incrusting, and ascending up to 12 cm., with numerous free lobes, up to 2 cm. long, usually at least 2 mm. thick; surface fibrous-tomentose; hymenium inferior, even, isabelline to cinnamon brown; spores deep olive buff, irregular, verrucose-echinulate, 8-10.5 x 6-8 μ .

Thelephora albido-brunnea is distinguishable by its spongy pileus, which is thicker than that of the other dimidiate and reflexed species of *Thelephora*. *T. albido-brunnea* was called *T. odorifera* by Peck because of the fragrant odor which he thought to be distinctive for the species. Burt did not notice any special odor in his collections.

TYPE LOCALITY: Bethlehem, Pennsylvania.

SPECIMENS EXAMINED: Iowa: Iowa City, Pine Hollow, West Okoboji, Dubuque County; Michigan: Ann Arbor.

ILLUSTRATIONS: Burt, Ann. Mo. Bot. Gard. 1:Pl. 5, Fig. 13. 1914.

5. THELEPHORA GRISEOZONATA Cooke, Grevillea 19:104. 1891.

Fig. 8.

Fructification coriaceous, caespitose, pileoli extended into a short sub-lateral stem, imbricate, applanate, single pilei up to 3 cm. long and 5 cm. broad; surface silky strigose, with hairs closely appressed to pileus in concentric layers to form alternating zones of Rood's brown and light buff; hymenium inferior, rugose, Rood's brown; spores pale fuscous, rounded to irregular, verrucose-echinulate, 8-10 x 6-8 μ .

Thelephora griseozonata is distinguishable from *T. terrestris* by its zonate pileus. The paraphyses are sparingly branched, and divided by septa into short cells.

SPECIMENS EXAMINED: Iowa: Turkey Creek.

ILLUSTRATIONS: Burt, Ann. Mo. Bot. Gard. 1:Pl. 5, Fig. 12. 1914.

6. THELEPHORA INTYBACEA Fries, Syst. Myc. 1:431. 1821.

Fig. 9.

Fructification coriaceous-soft, up to 8 cm. in diameter; single pilei up to 3 cm. long, 4 cm. broad, and 1 mm. thick; surface of strigose, wholly adnate squamules; margin entire; hymenium inferior, papillose; spores snuff brown, angular-tuberculate, 8-10 x 6.5-8.5 μ .

Thelephora intybacea is closely related to *T. terrestris*, but the characteristic squamules are completely adnate, instead of free as in the latter. The pileus of *T. intybacea* has an entire margin, while that of *T. terrestris* has a fimbriate margin.

SPECIMENS EXAMINED: Iowa: Iowa City.

EXSICCATI: Ellis and Everhart, North American Fungi, 2732.

ILLUSTRATIONS: Burt, Ann. Mo. Bot. Gard. 1:Pl. 5, Fig. 11. 1914.

7. THELEPHORA TERRESTRIS Fries, Syst. Myc. 1:431. 1821.

Thelephora caryophyllea var. *laciniata* Pers. Myc. Eur. 1:12. 1822.

Thelephora laciniata Fries, Syst. Myc. 1:431. 1821.

Fig. 5.

Fructification coriaceous-soft, effused over and growing up from fallen leaves and twigs, often incrusting, up to 3 cm. high and 5 cm. broad; lobes 1 mm. thick, surface of strigose, free squamules, margin fimbriate; hymenium inferior, papillose; spores pale fuscous, tuberculate, 6.5-8 x 6-7 μ .

Thelephora terrestris is distinguished from *T. intybacea* by its free, strigose squamules and fimbriate margin. The clusters of *T. terrestris* often grow from a central stipe to form a cone shaped fructification. Usually several fructifications are adherent, and frequently leaves and twigs are incrusting and included in the group of pileoli.

SPECIMENS EXAMINED: Iowa: West Okoboji; Minnesota: Elbow Lake; Latvia: Riga; Germany.

ILLUSTRATIONS: Burt, Ann. Mo. Bot. Gard. 1:Pl. 5, Fig. 10. 1914.

8. *THELEPHORA REGULARIS* Schw. *Schrift. Naturf. Ges., Leipzig.*
1:105. 1822.

Thelephora Ravenelii Berk. *Grevillea* 1:148. 1873.

Fig. 6.

Fructification coriaceous, solitary, erect, infundibuliform, or divided into a few lobes, but still retaining the general funnel shape, up to 2 cm. high and 1.5 cm. broad, vinaceous buff to fawn color; hymenium smooth, pruinose-pubescent; spores melleus to umbrinous, angular-verrucose, 7-8 x 6-7 μ .

Thelephora regularis is characteristically infundibuliform and without lobes or branches, but often once or twice divided. If the divisions are more numerous, the specimen must then be classified as *T. multipartita*. Because of the close relationship of the two species, it is easy, and also logical, to conclude that they probably are different growth forms of the same species. At least the numerous intergrading forms show that there is no very fundamental difference between the species.

TYPE LOCALITY: Salem, North Carolina.

SPECIMENS EXAMINED: Iowa: Iowa City, Estherville.

ILLUSTRATIONS: Burt, *Ann. Mo. Bot. Gard.* 1:Pl. 4, Figs. 6 and 7b. 1914.

9. *THELEPHORA MULTIPARTITA* Fries, *Elenchus Fung.* 1:166. 1828.

Figs. 7 and 10.

Fructification coriaceous, erect, generally infundibuliform, but with several flabellate lobes, up to 4 cm. high and 2.5 cm. broad, cinnamon brown to pallid; hymenium pruinose, spores umbrinous, angular-verrucose, echinulate, 8-10 x 6.5-7 μ . *Thelephora multipartita* is closely related to both *T. regularis* and *T. anthocephala*. It is separated from the former by having more numerous flabellate divisions of the pileus, and from the latter by not being abundantly and finely divided.

TYPE LOCALITY: Island of Lehigh River, Pennsylvania.

SPECIMENS EXAMINED: Iowa: Iowa City.

ILLUSTRATIONS: Burt, *Ann. Mo. Bot. Gard.* 1:Pl. 4, Fig. 7a. 1914.

10. *THELEPHORA PALMATA* Fries, *Syst. Myc.* 1:432. 1821.

Merisma foetidum S. F. Gray, *Brit. Plants*, 1:654. 1821.

Merisma palmatum Duby, *Bot. Gall.* 2:766. 1830.

Thelephora palmata americana Peck, *Rep. N. Y. State Mus.* 53:857. 1900.

Fructification coriaceous-soft, erect, up to 6 cm. high and 6 cm. broad; pileus much divided into slender branches, sometimes terete, sometimes slightly dilated and flattened at the ends, chestnut brown; hymenium amphigenous, smooth, pubescent; spores pale umbrinous, echinulate, 8-10 x 6-8.5 μ .

Thelephora palmata is distinguished from *T. anthocephala* mainly by its amphigenous hymenium. This is not always an easy character to determine because of the gradations between inferior and amphigenous. *T. palmata* also has slightly larger spores, which are paler than the

umbrinous spores of *T. anthocephala*. There may be a tendency for *T. palmata* to be slightly larger than *T. anthocephala*. But this character, like the rest, is not too dependable.

SPECIMENS EXAMINED: Iowa: Iowa City, Estherville; China: Anhwei, Chiu-hua-shan; Latvia: Riga.

ILLUSTRATIONS: Burt, Ann. Mo. Gard. 1:Pl. 4, Fig. 4. 1914.

11. THELEPHORA ANTHOCEPHALA Fries, Syst. Myc. 1:433. 1821.
Merisma anthocephalum Duby, Bot. Gall. 2:766. 1830.

Fig. 11.

Fructification coriaceous, erect, up to 5 cm. high and 3 cm. broad; divisions of pileus numerous, slender, often slightly dilated and quite pubescent at the ends; hymenium inferior, smooth, pubescent, cinnamon brown; spores umbrinous, verrucose-echinulate, 6.5-10 x 5-8 μ .

Thelephora anthocephala includes a wide range of forms between *T. multipartita* and *T. palmata*. Its pileus is more abundantly divided than that of *T. multipartita*, but there is little other difference between the two species. *T. anthocephala* is separated from *T. palmata* by three rather doubtful characteristics. *T. palmata* supposedly is larger than *T. anthocephala*, has a distinctive odor, and an amphigenous hymenium as distinguished from the inferior hymenium of *T. anthocephala*. Size seems to be of comparatively little significance in distinguishing the species of this genus. Whether *T. palmata* may be distinguished by its odor is very debatable. And while the distinction between amphigenous and inferior hymenium would seem to be a good characteristic, this also is subject to question. The broad, flat lobes of a pileus almost invariably have an inferior hymenium, while terete lobes may have either an inferior or amphigenous hymenium. The principal feature which casts doubt upon the validity of *T. palmata* as a species distinct from *T. anthocephala* is the occurrence of both an inferior and an amphigenous hymenium upon the various divisions of a single pileus. Often it is with considerable difficulty that a collection may be placed in one species or the other.

SPECIMENS EXAMINED: Iowa: Iowa City, Big Grove.

ILLUSTRATIONS: Burt, Ann. Mo. Bot. Gard. 1:Pl. 4, Fig. 1. 1914.

STATE UNIVERSITY OF IOWA

IOWA CITY

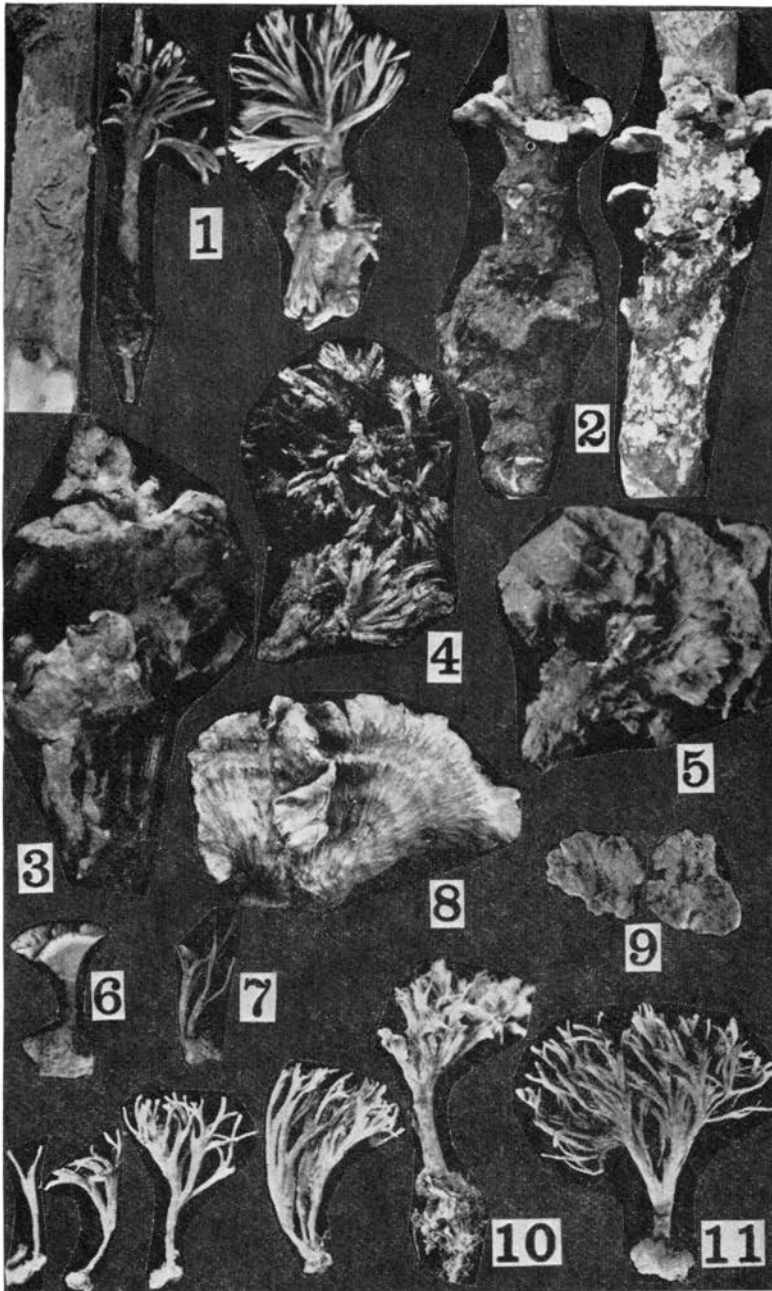
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EXPLANATION OF PLATE

Fig. 1. Three specimens of *Thelephora fimbriata*.

Fig. 2. Two specimens of *T. cuticularis*.



Explanation of Plate Continued

Fig. 3. *T. albido-brunnea*.Fig. 4. *T. spiculosa*.Fig. 5. *T. terrestris*.Fig. 6. *T. regularis*.Fig. 7. *T. multipartita*.

Fig. 8. *T. griseozonata*.

Fig. 9. *T. intybacea*.

Fig. 10. Five specimens of *T. multipartita* from a single collection to show forms ranging from typical *T. multipartita* to those approaching *T. anthocephala*.

Fig. 11. *T. anthocephala*.