

New genera of auricularioid heterobasidiomycetes*

Franz OBERWINKLER**

Abstract

Three new genera of auricularioid heterobasidiomycetes, *Naohidea*, *Kryptastrina*, and *Occultifur*, are described. *Kryptastrina inclusa* is proposed as a new species. *Naohidea* is based on *Platygløea sebacea*, and *Occultifur* is another segregate from *Platygløea* s.l., raising a variety of this unnatural genus, *P. peniophorae* var. *interna*, to generic level. The species grow either as intrahymenial mycoparasites in fructifications of other basidiomycetes or on the surface of pyrenomycetes.

Key Words: *Naohidea sebacea*; *Kryptastrina inclusa*; *Occultifur internus*; auricularioid heterobasidiomycetes; mycoparasites.

Introduction

Auricularioid, simple-pored heterobasidiomycetes of the genus *Cystobasidium* contain parasitic and a few saprobic taxa with variable basidiocarps. Fructifications vary from single, scattered generative hyphae with isolated basidia to corticioid, pulvinate structures. Most commonly the hyphae are efibulate, but clamps occur in several taxa. The ultrastructure of the septal pore is simple and shows no features of dolipore architecture, in contrast to the Auriculariales sensu Bandoni (1984). Probasidia may be well developed and persistent or they are lacking, and mature basidia are transversely septate, developing conspicuous, apically tapering sterigmata. Basidiospores have typically heterobasidiomycetous features, i.e. they are thin-walled and smooth, hyaline, non-amyloid, forcibly abstricted, and germination is mainly by repetition or budding. Most species are included in the genus *Platygløea* s.l., a highly heterogeneous taxon (Oberwinkler et al., 1990b). The genera proposed here are either segregates from *Platygløea* or undescribed taxa.

Materials and Methods

For the descriptions and illustrations in this contribution, the following specimens and cultures were examined. *Naohidea sebacea* (Berk. et Br.) Oberw. as *Dacrymyces sebaceus*

* Dedicated to Prof. Dr. Naohide HIRATSUKA on the occasion of the 88th anniversary of his birthday. Part 88 of a series "Studies in Heterobasidiomycetes".

** Botanisches Institut der Universität Tübingen, Lehrstuhl Spezielle Botanik und Mykologie, Auf der Morgenstelle 1 D-7400 Tübingen 1, FRG.

(Berk. et Br.) Rabenh., in Rabenhorst: Fungi europaei 1359. British fungi in Ann. and Mag. of Nat. hist. Batheaston, June 1869, leg. C.E. Broome (M); as *Platygløea miedzyrzecensis* Bres., on *Quercus* sp., USA, California, Strawberry Canyon, Berkeley, January 1960, leg. R.W. Embree (M); as "*Platygløea*" sp., on dead vine, *Wisteria*?, University of Tsukuba campus, Ibaraki prefecture, Japan, Aug. 17, 1983, leg. R.J. Bandoni, RJB 7252; as *Platygløea sebacea* (Berk. et Br.) McNabb, U.S.A., North Carolina, Highlands, White Mountain, ca. 1,500 m, Sept. 9, 1989, leg. F. Oberwinkler, FO 41359. *Kryptastrina inclusa* Oberw., Colombia, Cundinamarca, Paramo de Cruz Verde, 20 km east of Bogota, 3,000 m, intrahyemically in a corticioid fungus, July 4, 1978, leg. F. Oberwinkler, FO 27748.a. *Occultifur internus* (Olive) Oberw., Germany, Bavaria, Allgäu, Oberjoch near Hindelang, 1,200–1,400 m, in *Dacrymyces stillatus* Nees: Fr. growing on *Picea abies* (L.) Karst., Sept. 1981, leg. F. Oberwinkler, FO 31769, 31775, 31816; U.S.A., North Carolina, Highlands, Sept. 2, 1989, leg. A.-A. et R.J. Bandoni, RJB 8421.

Living and untreated material of different developmental stages was studied with a Zeiss photoscope III, using phase optics and Nomarski's interference contrast optics. For transmission electron microscopy samples were fixed in 2% glutaraldehyde in 0.1 M sodium cacodylate buffer at pH 7.2 overnight or for several days. Following six transfers in 0.1 M sodium cacodylate buffer, the material was postfixed in 1% OsO₄ in the same buffer for 2 h in the dark, washed in distilled water, and prestained in 1% uranyl acetate solution for 1 h in the dark. After five washes in distilled water, the material was dehydrated in acetone, using 10-min changes at 25%, 50%, 70%, and 95% and 3 times 100% acetone. The material was embedded in Spurr's (1969) plastic. Series of sections were cut on a Reichert ultramicrotome using a diamond knife and, after mounting on Formvar-coated single slot copper grids, they were stained with lead citrate (Reynolds, 1963) at room temperature for 3 to 5 min, and washed again with water. The thin sections were examined with a Zeiss EM 109 transmission electron microscope at 80 kV.

Results

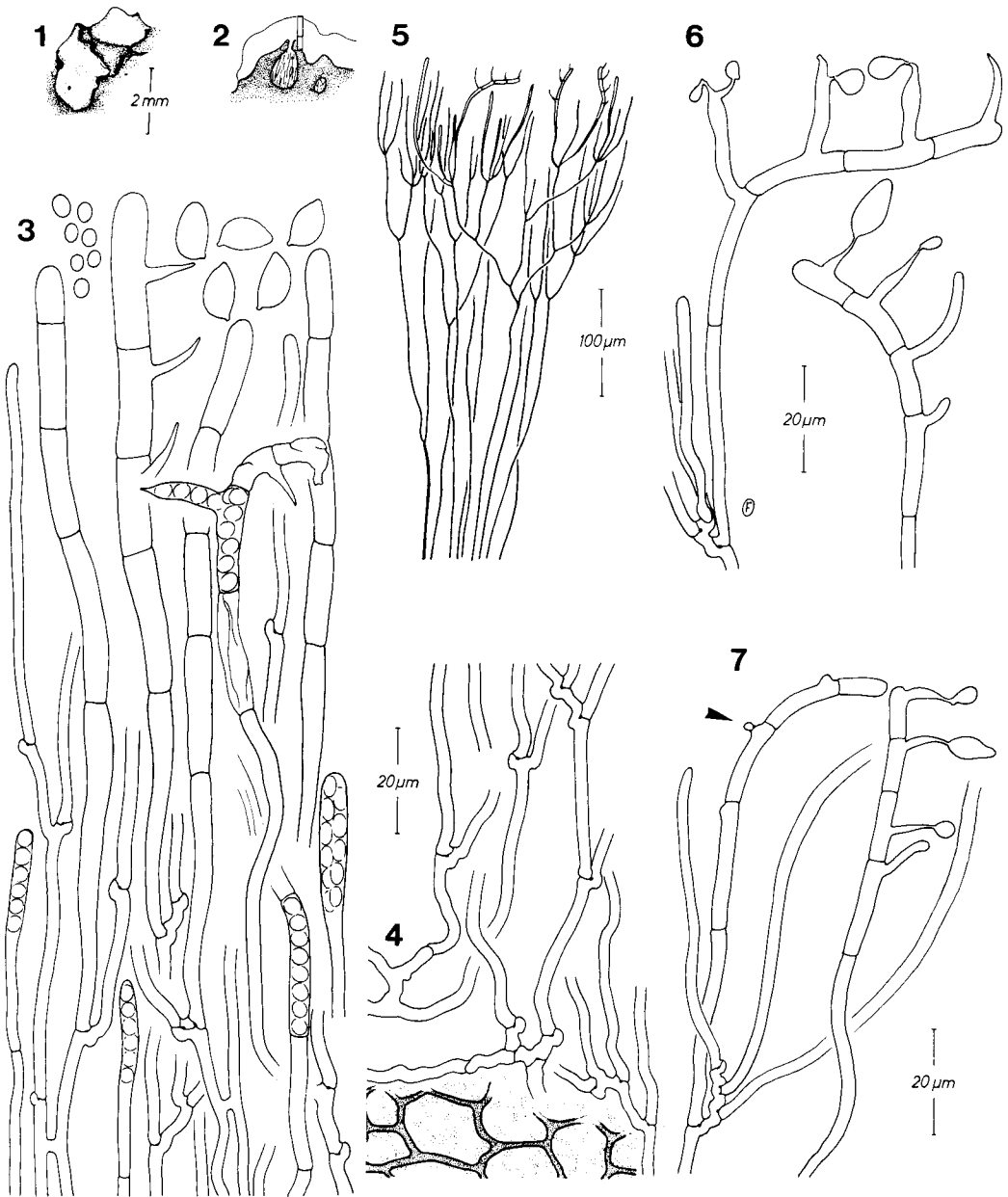
Naohidea Oberwinkler, gen. nov.

Genus mycoparasiticum Heterobasidiomycetum. Carposoma gelatinosum, pulvinatum. Hyphae tenuitunicatae, hyalinae, fibulatae, anastomosantes. Cystidia desunt et hyphidia hyphis apparent. Basidia sine probasidiis, mature longi-cylindracea, transverse tri-septata. Basidiosporae eiectae sunt, hyalinae, tenuitunicatae, tunicis levibus, non amyloideis. Conidia intra cellulas hypharum basidorumque vel externiter formantur, globosa, tenuitunicata, hyalina.

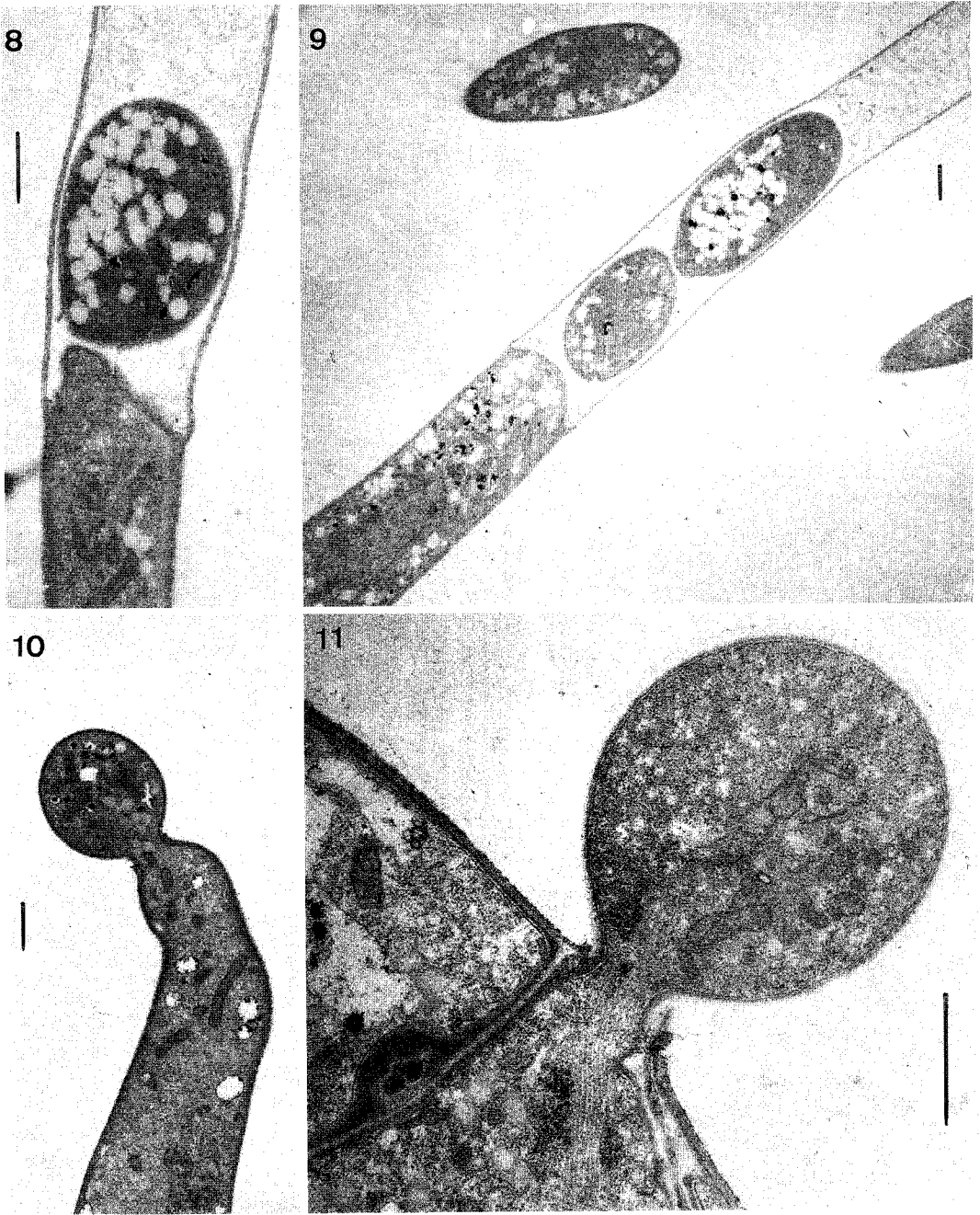
Fungi hujus generis fructificationibus pyrenomycetum consociati, carposomatibus externis.

Typus generis: *Naohidea sebacea* (Berk. et Br.) Oberw., comb. nov., basionym: *Dacrymyces sebaceus* Berk. et Br., Ann. Mag. Nat. Hist., IV, 7, p. 430, 1871.

Etymology: Named in honour of Professor Dr. Naohide Hiratsuka.



FIGS. 1-7. *Naohidea sebacea*. (Figs. 1-4, R.W. Embree 1. 1960; Figs. 5-7, F. Oberwinkler 41359). Fig. 1. Habit sketch showing parasite overgrowing pyrenomycete. Fig. 2. Section of parasite and host indicating positions of detailed drawings (Figs. 3, 4). Fig. 3. Portion of hymenium with hyphidia, basidia of different ages, basidiospores, and globose "endospores". Note "endospore" formation in hyphal and basidial cells. Fig. 4. Basal hyphae growing on stroma of pyrenomycete. Fig. 5. Part of basidiocarp showing loose hyphal arrangement and hymenium. Fig. 6. Basidia with sterigmata and spores. Two sterigmata bifurcate. Fig. 7. Basidia of different developmental stages, one basidial cell with sessile, yeast-like spore (arrowhead).



FIGS. 8-11. *Naohidea sebacea*. (R.J. Bandoni 7252). Transmission electron micrographs. Scale bars = 1 μ m. Figs. 8 and 9. "Endospores" originating from an internal budding locus. Figs. 10 and 11. Sessile basidiospores budded off from basidial cells. Fig. 10. Apical basidial cell with terminal spore. Fig. 11. Lateral budding of basidiospore.

Naohidea sebacea (Berk. et Br.) Oberw.

Figs. 1-13

Dacrymyces sebaceus Berk. et Br. 1871 : 430.

Platygløea miedzyrzecensis Bres. 1903 : 113.

Platygløea sebacea (Berk. et Br.) McNabb 1965 : 188.

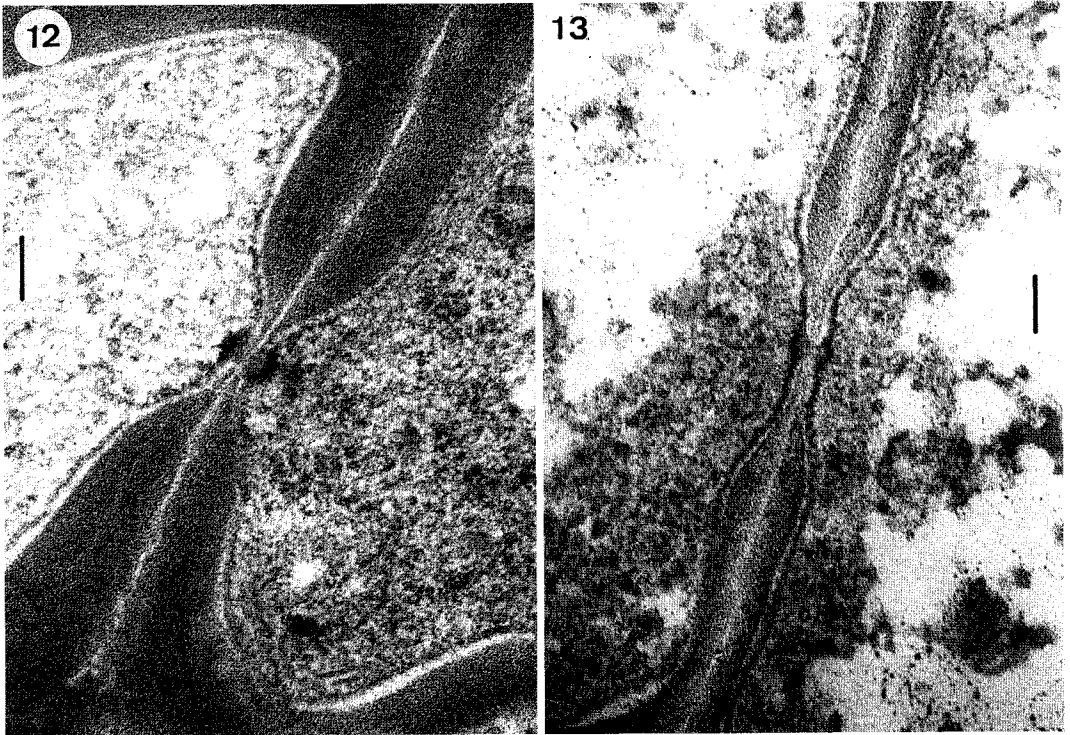
Basidiocarps soft gelatinous, inconspicuously pulvinate, becoming confluent, drying hard, horny, and film-like on pyrenomycetous stromata. Hyphae thin-walled, clamped, hyaline. Cystidia lacking; hyphidia present, inconspicuous. Probasidia lacking. Basidia long-cylindrical, $5-8 \times 100-200$ ($-250-275$) μm ; stalk cell $50-100$ μm long. Sterigmata short, cornute, with conspicuous spicula, sometimes bifurcate (Fig. 6) or lacking. In the latter case spores sessile and produced by budding off from the basidial cell [Figs. 7 (arrowhead), 10, 11]. Basidiospores subglobose to broadly naviculate, $5-7.5 \times (8-10)-12$ μm , germination by repetition or by hyaline, subglobose to globose cells, $2.5-6.5 \times 2.5-5.5$ μm .

Growing in and on fructifications of pyrenomycetes, e.g. *Botryosphaeria quercuum* (Schw.) Sacc. (fide McNabb, 1965), *Botryodiplodia* (fide McNabb, 1965), and "on pycnidia of a *Phialophorophoma*-like fungus" (fide Bandoni, 1973).

Reported from France, Great Britain, Poland, Georgia, California, and British Columbia.

The association of *N. sebacea* with pyrenomycetes was discovered by Olive (1947) in a collection from Georgia and in the type of *Platygløea miedzyrzecensis* from Poland. McNabb (1965) and Bandoni (1973) also reported the species growing with pyrenomycetes. This association was confirmed during this study in all collections. However, details of cellular host-parasite interactions are still unknown.

One of the remarkable features of *N. sebacea* is the extremely long and slender basidium, reaching a length of $100-200$ μm , rarely more than 250 μm (Figs. 3, 5-7). Olive (1947) noted that occasionally the basidia germinate abnormally by producing conidia similar to those produced by the basidiospores. Basidia of that type can be found in very wet or soaked fructifications [Figs. 7 (arrowhead), 10, 11]. Such spore production is also known for submerged basidia of *Cystobasidium lasioboli* (Lagerh.) Neuhoff (Lagerheim, 1898), and for several *Tremella* species (Bandoni, 1984). Basidia of *Platygløea peniophorae* Bourd. et Galz. placed on agar bud with yeast-like spores instead of developing sterigmata and ballistospores (Bauer and Oberwinkler, 1986). Much more unusual is the occasional production of endospore-like cells in hyphal and basidial cells (Figs. 3, 8, 9). These propagules are delimited within the hyphae by efibulate septa, while other septa are fibulate. The production of these cells in basidia may occur after formation of basidiospores. Developmental stages of the endospore-like cells are only poorly known. They appear to develop from budding loci on hyphal septa (Fig. 8). "Endospores" in basidiomycetous mycelial and basidial cells are so far only known in *Cystoflobasidium* (Oberwinkler et al., 1983), originally classified as *Rhodosporidium* (Fell et al., 1973), teliospores of *Sporidiobolus* (Bandoni, 1984), and yeast cells of *Agaricostilbum pulcherrimum* (Oberwinkler and Bauer, 1989). These features not only clearly separate *N. sebacea* from *Platygløea disciformis*, the type species of the genus *Platygløea*, but set it apart from all other simple-



FIGS. 12 and 13. *Naohidea sebacea*. (R.J. Bandoni 7252). Transmission electron micrographs of median sections of hyphal septal pores. Scale bars=0.1 μm .

pored, auricularioid taxa.

Naohidea sebacea shares simple-pored hyphal septa (Figs. 12, 13) with most auricularioid species (Oberwinkler, 1985; Oberwinkler and Bauer, 1989; Oberwinkler et al., 1990a).

Kryptastrina Oberwinkler, gen. nov.

Genus Heterobasidiomycetum. Carposoma nullum. Hyphae agglutinatae, tenuitunicatae, plus minusve indistinctae, hyalinae. Basidia singula formata, mature cylindracea, transverse tri-septata, sterigmatibus brevibus. Basidiosporae obtusipyramidales, hyalinae non amyloideae.

Fungi hujus generis in fructificationibus Corticiacearum crescunt.

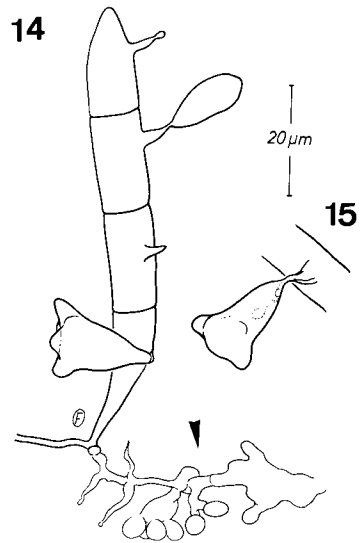
Typus generis: *Kryptastrina inclusa* Oberw., opus ipsum.

Etyymology from Greek: kryptos, hidden; aster, star, referring to spores.

Kryptastrina inclusa Oberw., sp. nov.

Figs. 14 and 15

Hyphae 1.5-3 μm in diam. Cystidia nulla. Hymenium nullum. Basidia 10 \times 80 μm . Sterigmata 2-3 \times 5 μm . Basidiosporae pyramidatae, 10-15 \times 18-20 μm , apiculis conspicuis.



FIGS. 14 and 15. *Kryptastrina inclusa*. (F. Oberwinkler 27748.a).

Fig. 14. Mature, transversely septate basidium with sterigmata and two attached spores. Note thin, branched, basal hypha, possibly attached to hypha of other fungus (arrowhead). Fig. 15. Basidiospore attached to sterigma.

Typus: Tabula illustrationis FO 27748.a (= Figs. 14, 15).

Kryptastrina grows intrahyemially in a corticioid host. The hyphae are very narrow, hyaline, and rather indistinct. It is not known whether they have clamps or not. Basidiocarps, hymenia, cystidia, and hyphidia are lacking. The generative hyphae produce single, scattered basidia. The mature basidium is transversely three-septate, and each basidial cell develops one short, cornute sterigma with an asymmetrically attached spore. Mature basidiospores are pyramidally tetrahedral, thin-walled and smooth, hyaline, and non-amyloid. Germination is not known.

Kryptastrina inclusa is the only known species in the genus. The indistinct hyphae are probably attached to host cells (Fig. 14, arrowhead), but the attachment remained obscure in a light microscopic study. Mature basidia are large, each basidial cell developing a short sterigma. The basidia are apparently scattered, and only the single basidium illustrated (Figs. 14, 15) was found. Pyramid-like basidiospores are unique in heterobasidiomycetes. *Kryptastrina inclusa* was found while examining a neotropical, corticioid fungus. Such scanty material would usually not justify a new description, but the morphological characteristics are absolutely distinctive and unique in heterobasidiomycetes. Pyramid-like, tetrahedric spores are not known in any other heterobasidiomycete.

Occultifur Oberwinkler, gen. nov.

Genus mycoparasiticum Heterobasidiomycetum. Carposoma nullum. Hyphae tenuitunicatae, fibulatae, hyalinae, inter cellulas hospitalium crescunt, saepe cum haustoriis propriis, cellulis conidia gerentibus vel basidiis terminant. Ultrastructura septorum hypharum poris simplicibus sine parenthesomatibus. Cystidia desunt. Basidia cylindracea, mature transverse tri-septata. Basidiosporae hyalinae, tenuitunicatae tunicisque

levibus, eiectae sunt, plerumque cellulas singulas germinantes, raro hyphas producut. Frequenter status anamorphosium conidiis subglobosis, hyalinisque praesens est, mature conidia fibulis absceduntur.

Fungi hujus generis in fructificationibus Dacrymycetalium crescunt.

Typus generis : *Occultifur internus* (Olive) Oberw., comb. nov., basionym : *Platygløea peniophorae* Bourd. et Galz. var. *interna* Olive, Bull. Torrey Bot. Club **81** : 331, 1954.

Etymology from Latin : occultus, hidden ; fur, thief.

Basidiocarps lacking, growth intrahymenial (Figs. 16, 21). Hyphae thin-walled, hyaline, simple-pored (Figs. 27, 28). Haustoria of the *Tremella* type (Figs. 16, 18-22, 24, 25), originating from clamps, terminating in filiform haustorial branches, and attaching to host cells (Figs. 16, 21, 24). Conidiophores and basidia developing from the same generative hyphae (Figs. 17, 18, 22). Clusters of ana- and teleomorphs not arranged in true hymenia. Cystidia and hyphidia absent. Basidia long-cylindrical, irregularly tortuous, without probasidial swellings, transversely three-septate at maturity, producing one sterigma from each basidial cell (Figs. 17, 18, 21, 22, 25). Basidiospores subglobose, with prominent apiculi, thin-walled and smooth, hyaline, non-amyloid. Germination predominantly by budding, occasionally with hyphae (Figs. 18, 21). Secondary spores not observed.

Conidiogenous cells swollen and tapered above, bearing conidia singly, apically, repetitively, each subtended by a clamp (Figs. 16-20, 22, 25, 26). Clamp remnants persistent, forming crown- or step-like series after repeated conidium development. Mature conidia thick-walled, hyaline (Fig. 20).

Growing intrahymenially in fructifications of Dacrymycetales species.

Occultifur internus (Olive) Oberw.

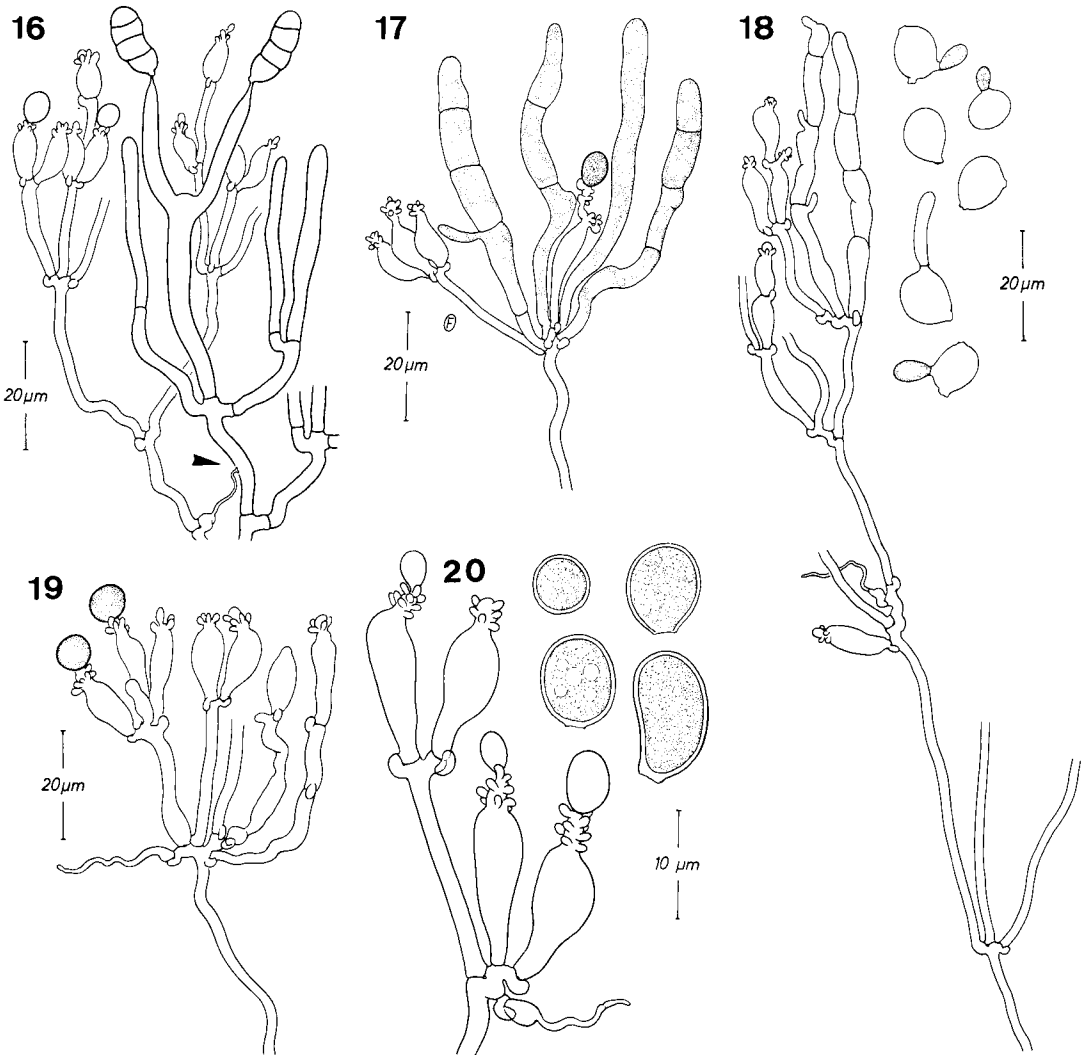
Figs. 16-28

Hyphae narrow, 1.5-3 μm in diam., producing clustered conidiophores and basidia, these not arranged in a hymenium. Cystidia and hyphidia lacking. Mature basidia 4.5-6 \times 45-60 μm , with hyphae-like sterigmata, 1.5-2 μm in diam. Basidiospores mostly subglobose, 8-10 \times 8-11 μm . Conidiogenous cells swollen, but apically constricted, 4-6 \times 10-15 μm . Conidia subglobose to short cylindrical, 6-8 \times 6-12 μm .

Only known to occur intrahymenially in Dacrymycetales fructifications.

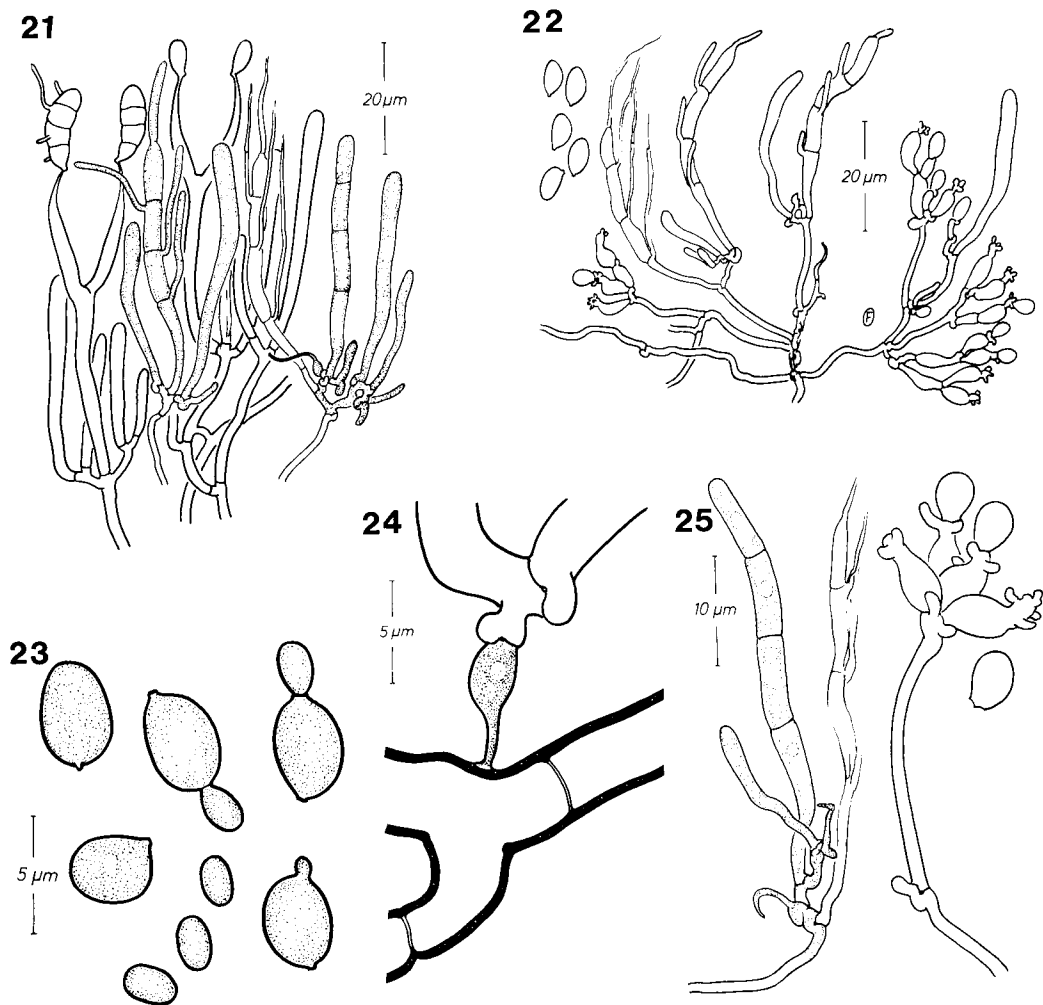
The generic characteristics of *Occultifur* are (1) basidiocarps lacking ; (2) intrahymenial growth ; (3) basidia produced on scattered hyphae ; (4) auricularioid basidia without probasidial swellings ; (5) budding of spores ; (6) production of dikaryotic conidia, abstricted from clamps ; (7) simple septal pores ; (8) mycoparasitic, apparently restricted to dacrymycetaceous hosts ; and (9) tremelloid haustoria. The single species of the genus is easily distinguishable from *Cystobasidium* and *P. peniophorae* by several features, especially the conidiogenesis, and the intrahymenial growth in basidiocarps of dacrymycetaceous fungi.

Olive (1954) described *P. peniophorae* var. *interna*, a taxon occurring in dacrymycetaceous hosts. From the description and a restudy of authentic material, this variety appears to be identical with *O. internus*. Christiansen (1954) described a species which he



FIGS. 16-20. *Occultifur internus*. (F. Oberwinkler 31769). Fig. 16. Anamorph stage of parasite growing in the hymenium of *Dacrymyces stillatus* Nees: Fr. Note haustorium attached to host (arrowhead). Figs. 17 and 18. Conidiophores and basidia arising from one supporting hypha. Note budding basidiospores. Figs. 19 and 20. Conidiophores and conidia in different stages of development.

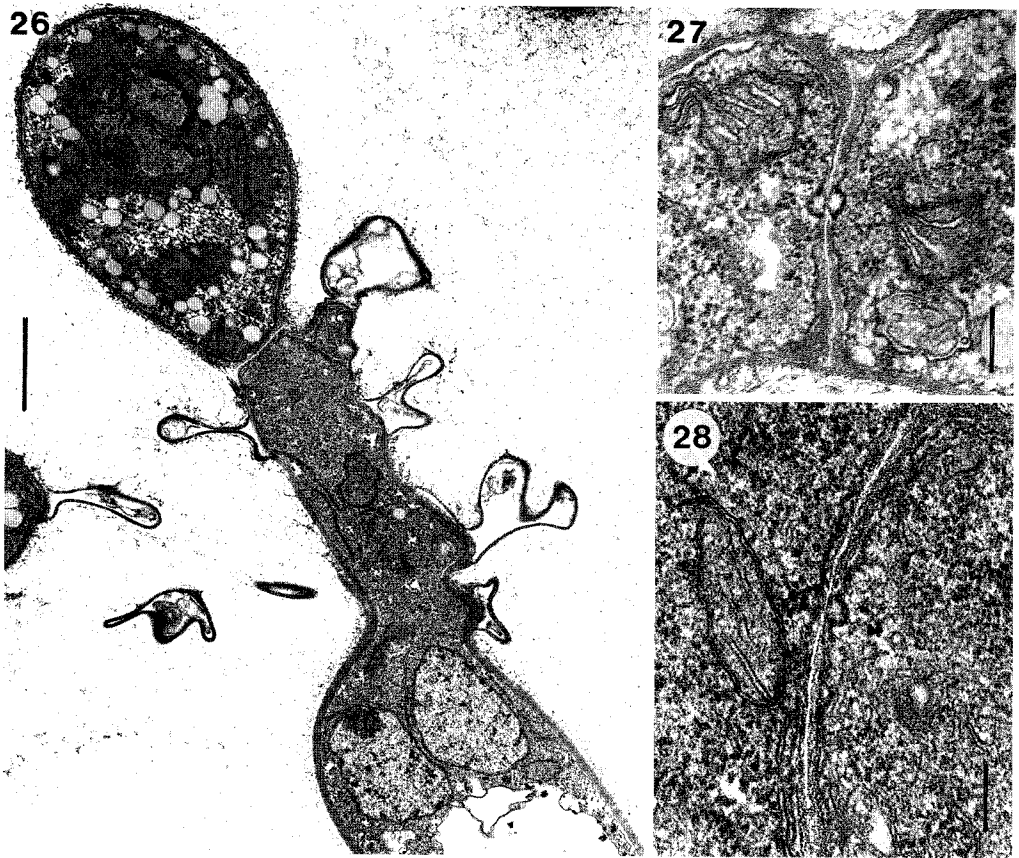
called *Tremella obscura* (Olive) M.P. Christ., supposedly based upon *T. mycophaga* Martin var. *obscura* Olive. However, examination of Christiansen's material has shown that the description was based upon parts of two different taxa, viz. one with tremellaceous basidia and another with the *O. internus* conidial apparatus. From reports in the literature (Olive, 1946; 1947), and from examination of my own collections it is assumed that the taxon is a parasite, restricted to *Dacrymyces* hosts.



FIGS. 21-25. *Occultifur internus*. (R.J. Bandoni 8421). Fig. 21. Basidial stage of parasite growing in the hymenium of *Dacrymyces* sp. Fig. 22. Cluster of basidia and conidiophores originating from one supporting hypha. Fig. 23. Basidiospores, several budding off small yeast cells. Fig. 24. Tremelloid haustorium attached to host cell. Fig. 25. Basidia and cluster of conidiophores, one conidium released.

The species is obviously not closely related to *Platygløea disciformis*, the type species of the genus *Platygløea*. *Platygløea disciformis* produces erumpent, distinctly pustular to discoid basidiocarps on *Tilia* branches. The hyphae and hyphidia are mainly thick-walled and conspicuous even in young hymenia. *Occultifur internus* differs also from *P. peniophorae*, another mycoparasitic species of *Platygløea* s.l., in its conidial formation, its hosts, and the lack of basidiocarps. *Platygløea peniophorae* is a parasite of aphyllorhaceous fungi, forming distinct basidiocarps on hymenial surfaces of their hosts.

Two additional species have been described as parasites of dacrymycetaceous fungi, viz.



FIGS. 26-28. *Occultifur internus*. (F. Oberwinkler 31769). Transmission electron micrographs. Fig. 26. Conidiophorous cell showing dikaryon, former insertion of released conidia, and terminal conidium. Scale bar = $2\ \mu\text{m}$. Figs. 27 and 28. Simple septal pores. Scale bars = $0.3\ \mu\text{m}$. Note electron dense arches surrounding pores on both sides.

Platygløea arrhytidiae Olive, and *P. fungicola* Olive var. *interna* Olive. The first mentioned differs in lacking clamps, its conidiophores and conidiogenesis, and in having persistent probasidia (fide Olive, 1951). The presence of hyphidia was reported from *P. fungicola* var. *interna* (Olive, 1958). Further study is required to determine the taxonomic position of these two taxa.

Discussion

The genus *Platygløea* was reviewed in a preliminary survey by Bandoni (1956). The 23 taxa treated by him were considered to represent a heterogeneous assortment of taxa, but systematic reinterpretation of the genus is still wanting. The type species, *P. disciformis*, appears to be taxonomically isolated, i.e. closely related species are not known. The

conspicuous, erumpent, discoid basidiocarps of *P. disciformis* are composed of efibulate, strongly thick-walled hyphae with porous, spongy hyphal walls (Aoki et al., 1986; Oberwinkler et al., 1990b). Disarticulating basidia and conspicuous, thick-walled hyphidia are common in the hymenium. Such features are lacking in *Naohidea*, *Kryptastrina*, and *Occultifur*.

In *K. inclusa* and *O. internus*, basidia develop on scattered hyphae, growing internally in host fructifications. *Phragmoxenidium mycophilum* (Oberwinkler et al., 1990c) and several *Sebacina*-like species (Oberwinkler, 1964) are other examples of intrahymenial heterobasidiomycetes. These mycoparasites do not produce basidiocarps. In some cases their occurrence may be macroscopically visible in the structural decay of host fruitbodies. *Naohidea sebacea* has pulvinate basidiocarps, as do species of the genera *Platygløea*, *Jola*, and *Mycogloea*. Such fructifications are comparatively conspicuous only under wet conditions. Upon drying, they quickly shrink to an almost invisible, varnish-like film.

Most species of auricularioid heterobasidiomycetes examined to date, except *Auricularia* s.l. and *Myliopsis*, have simple septal pores, as has been briefly summarized by Oberwinkler (1985). Thus, they deviate strongly from the Auriculariales, which possess dolipores with parenthesomes, as demonstrated by several workers and reviewed by Kahn and Kimbrough (1982) and Oberwinkler (1985).

Considerable variation occurs in development, structure and function of basidia in the simple-pored, auricularioid heterobasidiomycetes. There are species with prominent and persistent probasidia, similar to those of Septobasidiales. For example, basidial morphology in *Coccidiodyton inconspuum* (Septobasidiales; Oberwinkler, 1989) is nearly identical with that in *Cystobasidium* species. Formation of endospore-like cells in hyphae and basidia has been found in several collections of *N. sebacea* (Figs. 3, 8, 9). No developmental and karyological details are known. "Endospore" formation occurs also in basidia of *Cystoflobasidium capitatum* (Fell et al.) Oberw. et Bandoni (Oberwinkler et al., 1983; Fell et al., 1973, sub *Rhodosporidium capitatum*), probasidia of *Sporidiobolus* (Bandoni, 1984), and yeasts of *Agaricostilbum pulcherrimum* (Oberwinkler and Bauer, 1989).

Morphological and functional features of basidiospores of simple-pored, auricularioid heterobasidiomycetes are characteristically heterobasidiomycetous: smooth, thin-walled, hyaline, non-amyloid, germinating by repetition or budding, occasionally by forming germ tubes. A unique exception in heterobasidiomycetes is the pyramid-like spore of *K. inclusa* (Figs. 14, 15).

Of the taxa included in simple-pored, auricularioid heterobasidiomycetes, yeast stages are reported for *Cystobasidium lagerheimi* (Lagerheim, 1898), *P. peniophorae* (Bandoni, 1984), *Mycogloea* spp. (Bandoni, 1984), and *Tjibodasia pezizoidea* Holtermann (Holtermann, 1898). During the present investigations, yeast budding of basidiospores has been observed in *O. internus* (Figs. 18, 23). To my knowledge, no other examples of yeasts have been reported in simple-pored, auricularioid heterobasidiomycetes which generally produce ballistospores. Unfortunately, most species are rarely collected, and only a few culture experiments have been carried out.

Mitotically developed propagules are not rare in species of the simple-pored, auricular-

oid heterobasidiomycetes. Such conidia are commonly produced from conidiogenous cells which can arise from the same hyphae as the basidia. *Occultifur internus* and *P. peniophorae* agree in the formation of terminal, dikaryotic conidia subtended by clamps and released along the clamped septa (Figs. 16-20, 22, 25). The conidiophore remains dikaryotic during conidium formation and repeats terminal conidiogenesis several times (Fig. 26). The conidium breaks off and the conidiogenous cell continues its growth through the clamp loop.

Most of the species included in the simple-pored, auricularioid heterobasidiomycetes are parasites of fungi, mosses, ferns, and flowering plants. Mycoparasitic taxa occur in the Cystobasidiaceae. They are associated with ascomycetes or basidiomycetes. Because of their simple fructifications, or lack thereof, and plasticity of the anamorph and teleomorph stages, these taxa are interpreted as representing phylogenetically old groups. However, many are parasites of relatively advanced fungi, e.g. pyrenomycetous, discomycetous, dacrymycetaceous or corticiaceous fungi. Moreover, they appear to be biotrophic parasites and must consequently be considered as highly specialized physiologically. This specialization probably is an important factor in permitting survival of otherwise "primitive" species.

Mycoparasitic species of the Cystobasidiaceae occur either intrahyemially, as in *K. inclusa* and *O. internus*, or develop gelatinous, pustular basidiocarps externally on the host fructifications, as in species of *Cystobasidium*, *Platyglöea*, and *Naohidea*. In *O. internus* haustoria of the *Tremella*-type could be found (Figs. 16, 18-22, 24, 25). *Kryptastrina inclusa* is characterized by tetrahedric basidiospores, and intrahyemial growth, lacking basidiocarps. *Occultifur internus* lives in the hymenia of Dacrymycetales species (Figs. 16, 21). The gelatinous, pulvinate *P. peniophorae* is known as a parasite of Corticiaceae. *Naohidea sebacea* is associated with pyrenomycetes.

Some simple-pored, auricularioid heterobasidiomycetes appear to be related to the Septobasidiales. *Platycarpa polypodii* (Couch) Couch (Couch, 1949) was originally described as a *Septobasidium* species (Couch, 1929), but it lacks the characteristic association with scale insects. *Coccidiodictyon inconspicuum* (Oberwinkler, 1989) has cystobasidiaceous probasidia and meiosporangia, but it is associated with scale insects by *Septobasidium*-type haustoria. Another connection may exist with the Uredinales. Several taxa of the simple-pored, auricularioid heterobasidiomycetes are parasites of higher plants. Phylogenetically interesting are the fern-inhabiting species of the genera *Herpobasidium*, *Platycarpa*, and *Ptechetelium* (Oberwinkler and Bandoni, 1984). *In-solibasidium*, a parasite of Caprifoliaceae and Cornaceae, possesses conidia comparable to rust uredospores (Oberwinkler and Bandoni, 1984).

Acknowledgments: I am indebted to Drs. R. Bauer and K. Vánky for critically reading the manuscript. Dr. R.J. Bandoni made available several important collections. Mrs. S. Silberhorn and Dr. R. Bauer assisted in the investigations with the transmission electron microscope. Financial support from the "Deutsche Forschungsgemeinschaft" is gratefully acknowledged.

References

- Aoki, T., Tubaki, K. and Bandoni, R.J. 1986. On two unreported species of *Platygløea* from Japan. *Trans. Mycol. Soc. Japan* **27**: 371–385.
- Bandoni, R.J. 1956. A preliminary survey of the genus *Platygløea*. *Mycologia* **48**: 821–840.
- Bandoni, R.J. 1973. *Epistolae mycologicae* II. Species of *Platygløea* from British Columbia. *Syesis* **6**: 229–232.
- Bandoni, R.J. 1984. The Tremellales and Auriculariales: an alternative classification. *Trans. Mycol. Soc. Japan* **25**: 489–530.
- Bauer, R. and Oberwinkler, F. 1986. Experimentell-ontogenetische Untersuchungen an Phragmobasidien. *Z. Mykol.* **52**: 259–269.
- Christiansen, M.P. 1954. Tre ejendommelige *Tremella*-Arter: *Tremella mycophaga* Martin, *Tremella simplex* Jacks. & Martin og, *Tremella obscura* Olive. comb. n. paavist i Danmark. *Friesia* **5**: 55–64.
- Couch, J.N. 1929. A monograph of *Septobasidium*. Part I: Jamaican species. *J. Elisha Mitchell Sci. Soc.* **44**: 242–260.
- Couch, J.N. 1949. The taxonomy of *Septobasidium polypodii* and *S. album*. *Mycologia* **41**: 427–441.
- Fell, J.W., Hunter, J.L. and Tallman, A.S. 1973. Marine basidiomycetous yeasts *Rhodosporidium* spp. n. with tetrapolar and multiple allelic bipolar mating systems. *Can. J. Microbiol.* **19**: 643–657.
- Holtermann, C. 1898. *Mykologische Untersuchungen aus den Tropen*. 1–122, Berlin.
- Khan, S.R. and Kimbrough, J.W. 1982. A reevaluation of the Basidiomycetes based upon septal and basidial structures. *Mycotaxon* **15**: 103–120.
- Lagerheim, G. 1898. *Mycologische Studien*. I. Beiträge zur Kenntnis der parasitischen Pilze, 1–3. [3, *Jola(Cystobasidium) Lasioboli* nov. spec.]. *Bihang till K. Sv. Vet.-Akad Handl. Afd. II* **24**: 15–21.
- McNabb, R.F.R. 1965. Some auriculariaceous fungi from the British Isles. *Trans. Br. Mycol. Soc.* **48**: 187–192.
- Oberwinkler, F. 1964. Intrahymeniale Heterobasidiomyceten. Fruchtkörperlose *Sebacina*-Sippen und ihre systematische Stellung. *Nova Hedwigia* **7**: 489–499.
- Oberwinkler, F. 1985. Anmerkungen zur Evolution und Systematik der Basidiomyceten. *Bot. Jahrb. Syst.* **107**: 541–580.
- Oberwinkler, F. 1989. *Coccidiodyctyon* gen. nov. and *Ordonia* Racib., two genera in the Septobasidiales. *Opera Bot.* **100**: 185–191.
- Oberwinkler, F. and Bandoni, R. 1984. *Herpobasidium* and allied genera. *Trans. Br. Mycol. Soc.* **83**: 639–658.
- Oberwinkler, F., Bandoni, R., Blanz, P. and Kisimova-Horovitz, L. 1983. *Cystofilobasidium*: a new genus in the Filobasidiaceae. *Syst. Appl. Microbiol.* **4**: 114–122.
- Oberwinkler, F. and Bauer, R. 1989. The systematics of gasteroid, auricularioid Heterobasidiomycetes. *Sydowia* **41**: 224–256.
- Oberwinkler, F., Bauer, R. and Bandoni, R.J. 1990a. Heterogastridiales: A new order of Basidiomycetes. *Mycologia* **82**: 48–58.
- Oberwinkler, F., Bauer, R. and Bandoni, R.J. 1990b. *Colacogloea*: a new genus in the auricularioid Heterobasidiomycetes. *Can. J. Bot.* (in press).
- Oberwinkler, F., Bauer, R. and Schneller, J. 1990c. *Phragmoxenidium mycophilum*, an unusual mycoparasitic heterobasidiomycete. *Syst. Appl. Microbiol.* **13**: 186–191.
- Olive, L.S. 1946. New or rare heterobasidiomycetes from North Carolina — II. *J. Elisha Mitchell Soc.* **62**: 65–71.
- Olive, L.S. 1947. Notes on the Tremellales of Georgia. *Mycologia* **39**: 90–108.
- Olive, L.S. 1951. New or noteworthy species of Tremellales from the southern Appalachians. *Bull.*

- Torrey Bot. Club **78**: 103-112.
- Olive, L.S. 1954. New or noteworthy species of Tremellales from the southern Appalachians. — III. Bull. Torrey Bot. Club **81**: 329-339.
- Olive, L.S. 1958. The lower Basidiomycetes of Tahiti. Bull. Torrey Bot. Club **85**: 5-27, 88-100.
- Reynolds, E.S. 1963. The use of lead citrate at high pH as an electron opaque stain in electron microscopy. J. Cell Biol. **17**: 208-212.
- Spurr, A.R. 1969. A low-viscosity epoxy embedding medium for electron microscopy. J. Ultrastr. Res. **26**: 31-43.

摘 要

キクラゲ類様異担子菌類の新属

Franz OBERWINKLER

キクラゲ類に似た異担子菌類の3つの新属, *Naohidea*, *Kryptastrina* および *Occultifur* が記載され, *Kryptastrina inclusa* が新種として提案されている。*Naohidea* は, *Platygløea sebacea* を基準種とする。*Occultifur* は, 不自然な広義の属 *Platygløea* における一変種とされてきた *P. peniophorae* var. *interna* を種に格上げして基準種とする属で, *Platygløea* から分離されたものである。これらの種は, 他の担子菌類子実体の子実層内寄生菌として生育するか, あるいは核菌類の表層に生育する。
