

TYPE SPECIMEN STUDIES IN PLEUROTUS

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An epitype specimen is designated for *Pleurotus cornucopiae*. Morphological examination of Mexican material and the type specimen of *P. opuntiae* showed that the distribution of this species includes North Africa and the highlands of Mexico. The type specimen of *Lentinus (Pleurotus) eugrammus* reveals that Singer based his proposal of *Nothopanus* on a mistaken interpretation of *L. eugrammus*, and that the concept of *Nothopanus* requires a new name and type species. *Neonothopanus* is proposed to solve this problem. Morphological reports are supplemented with data on mating systems.

Although much literature has appeared, both theoretical and applied, on species of *Pleurotus*, several epithets have been without documented type specimens, and therefore have been potentially open to widely varying interpretations (see Petersen, 1995, for more on this subject and an introduction to the literature). In previous papers, Petersen & Hughes (1993) secured the identity of *P. pulmonarius*, and Petersen & Krisai-Greilhuber (1996) designated an epitype specimen for *P. ostreatus*. In this paper, we report on three additional species, *P. cornucopiae*, *P. eugrammus*, and *P. opuntiae*, securing each to type specimens and modern circumscriptions, including deposition of cultures and reports of mating systems.

MATERIALS AND METHODS

In descriptions below, colours cited by alphanumeric designations are from Kornerup & Wanscher (1973). Colours enclosed in quotation marks are from Ridgway (1912).

Pleurotus cornucopiae (Paulet ex Persoon) Rolland

The earliest binomial referring to this species apparently was proposed by Jean-Jacques Paulet. The circumstances of this name-giving are obscure, however. Paulet (1793) issued two volumes of his *Traité des Champignons*, consisting of text material only, and never mentioning the name he intended, *Dendrosarcos cornucopiae*. Persoon (1828: 37) attributed the basionym to Paulet, but recombined the epithet into *Agaricus cornucopiae*. Fries (1830: 703) rejected Persoon's combination, considering *A. cornucopiae* to be synonymous under *A. (Panus) conchatus*, but again attributing the basionym to Paulet. To make matters worse, by Fries not adopting the epithet in any sanctioning volume, according to the ICBN the name dates from Paulet, as attested to by Persoon (1828).

But if the epithet was not used in Paulet's (1793) text, where did it appear so as to gain recognition by Persoon? Apparently (see Stafleu & Cowan, 1983: 110–111; Pfister et al., 1990), the original plates to which Paulet referred in 1793 were issued in fascicles over the subsequent decade. Lévillé (1855) discovered Paulet's plates, and knew that very few fasci-

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cles had actually been distributed. He had the plates struck off again, wrote new textual material to accompany them, and distributed the result. In his introduction to the re-issue, L veill  wrote of the rarity of Paulet's original plates, but as part of the text accompanying the re-issued plates, L veill  (1855: 14) used the combination *Agaricus cornucopiae* Persoon, with the basionym *Dendrosarcos cornucopiae* Paulet. All told, we are led to conclude that the original proposal of *D. cornucopiae* was by Paulet in text accompanying the original fascicle of plates, including plate 28 (Fig. 1). Inquiries at WU, W, K, NY, and L revealed that none of these libraries owned the original plates, Pfister et al. (1990) did not see them, so they seem not to be at FH, and Pegler (pers. comm.) indicates that they are not at PC. Reluctantly, our conclusion concerning the original proposal of *D. cornucopiae* cannot be verified.

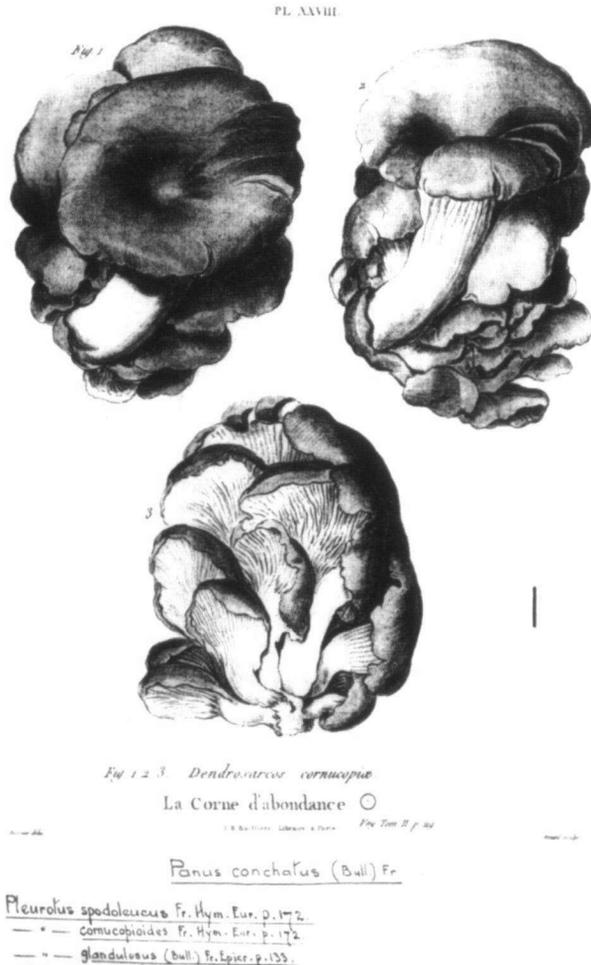


Fig. 1. *Pleurotus cornucopiae*. Plate from L veill 's reproduction of Paulet's plate 28. — Bar = 1 cm.

Luckily, the L veill  re-issued plates are faithful to the originals in their black-ink impressions. Colour tinting, of course, was accomplished by hand, and because we cannot find a copy of the original plates, we cannot attest to the accuracy of the colours in the L veill  (1855) edition. We can report, however, that the NY and WU plate 28 differ in the amount of pink colouration used on the lamellae, with the NY copy distinctly more pink than the copy at WU.

It can be argued that Paulet's original plate 28 can serve as a lectotype, since it was executed under Paulet's direction, and cited in his 'Traite'. This is so, of course, but the plate does not show hyphal construction, spore dimensions, or cystidia. Thus, an epitype specimen should be designated in which all structures are present, and from which cultures have been derived.

Dr. Jean Mouchacca (PC) and Dr. Machiel Noordeloos (L) (pers. comm.) inform us that no Paulet fungus herbarium exists, but at Leiden (L), there is a candidate Persoon specimen (L no. 910.256-1808). Conceivably, it could serve as an epitype together with Paulet's plate as lectotype. The specimen was annotated in Persoon's hand as "*Agaricus cornucopiae*. *Mycol. Europ.* [the preceding twice], *prope Parisior*." On another annotation slip in unknown hand [initial R. ?S.: perhaps Rolf Singer]: "Poor material. Spores not found. Hyphae thin-walled as far as seen. Clamps seen."

The specimen comprises two basidiomata, both pressed, and in terrible condition. One basidioma [left side] was glued to the sheet with the pileus surface toward the paper. Although the entire basidioma is now brittle, woody and dark red-brown, it can be seen that the pileus margin is inrolled, and lamellae (or the suggestion which remains) seem close but not crowded. Small portions of stipe tissue were squashed in KOH, revealing: 1) abundant mold spores and slender, septate hyphae in mycelial fragments; 2) spores of appropriate dimensions (9–11 × 3.8–4.4 µm) for *Pleurotus*; 3) fragments of thin-walled, clamped generative hyphae; and 4) short fragments of refringent, apparently thick-walled hyphae. The second basidioma [right side] seems to be glued on the lamellar side, with the pileus surface outward. A squash of the pileipellis revealed: 1) abundant *Pleurotus* spores as above, but no mold spores; 2) a lattice of refringent, thick-walled hyphae which could be interpreted as skeletal; and 3) fragments of hyaline, thin-walled, clamped generative hyphae.

All in all, although the specimen is no longer totally identifiable, two characters are semi-diagnostic: 1) refringent skeletal hyphae; and 2) characteristic *Pleurotus* basidiospores. These are enough to tie the specimen and the name to the dimitic group within *Pleurotus*, and perhaps, chiefly based on geographic location, to *P. cornucopiae*. Other members of the dimitic clade are either subtropical (i.e., *P. opuntiae*, *P. djamor*) or subcentrally stipitate (i.e., *P. dryinus*).

The specimen is so poorly preserved (in the original drying process) that it can hardly serve to furnish modern characters, especially if future analysis requires more than the diagnosis furnished above. For this reason, we have chosen an Austrian specimen to serve as epitype, as follows.

Epitype specimen: AUSTRIA, Lower Austria, distr. Krems an der Donau Land, 4 km W of Krumau am Kamp, forest SW of the Dobrasperre dam, grid map square 7458/1, 16.VI.96, I. Krisai-Greilhuber 6467 (IK, WU), culture tracking number at TENN 8763, iso-epitype specimen, no. 54646 (TENN).

Mature basidiomata (Fig. 2) 96–200 mm broad; immature pileus slightly convex at first, umbilicate, soon expanding to become plane; margin of immature pileus inrolled; mature

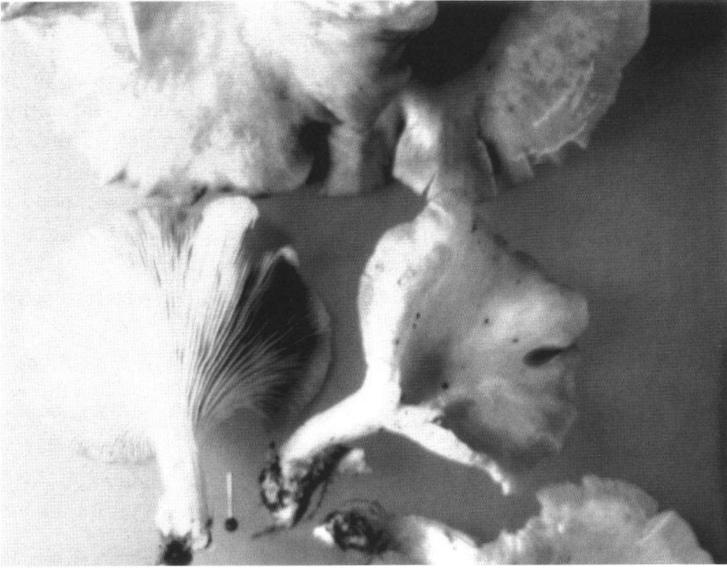


Fig. 2. *Pleurotus cornucopiae*. Basidiomata of epitype specimen (Krisai-Greilhuber 6467). — Bar = c. 1.7 cm.

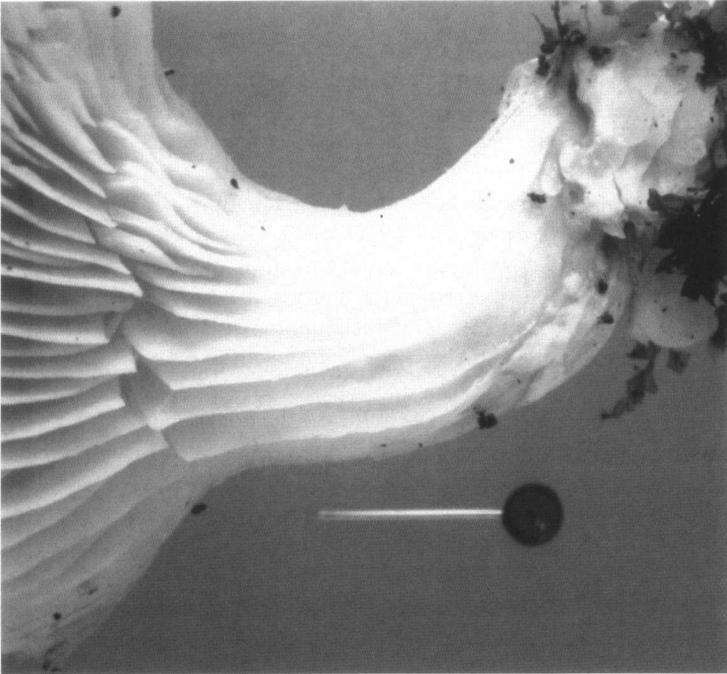


Fig. 3. *Pleurotus cornucopiae*. Epitype specimen; detail of decurrent lamellae (Krisai-Greilhuber 6467). — Bar = c. 0.7 cm.

pileus 70–105 mm broad (from attachment to stipe to margin), 20–30 mm thick, more or less circular to pulmonate from above, depressed to infundibuliform, smooth, hygrophanous, colour of fresh, moist areas cream-ochre to greyish ochre (5A4, 5B3–5, occasionally 5B5), older pilei slightly darker, brownish ochre with slight orange tinge (5C4–5), drier areas champagne colour, ivory, platinum blond, sand (4B3–4, 4A2–3), with many fresh basidiomata paler in colour; margin of mature pileus subcrenulate, short-striate, often slightly irregular, lobed. Pileus flesh more or less soft, not fibrous or tough, up to 10 mm thick inward, cream white to cream. Lamellae strongly decurrent (Fig. 3), sometimes to the stipe base, tapering downward from pileus to attachment to stipe, interspersed with shorter costal lamellulae which sometimes anastomose near attachment to stipe, 8–10 mm deep under pileus near stipe attachment, not ventricose, thin, elastic, off-white when young, mellowing to whitish cream or cream [4A2–3(–4)]; lamellar margin entire, concolorous with lamella face. Spore print distinctly pinkish violet. Stipe 35–75 mm long, 13–20 mm thick, when young longer than pileus width, less so in mature specimens, terete, tapering downward, rooting deeply in wood, almost central when young, by maturity eccentric to strongly eccentric, but never lateral, costate with lamella bases, between costae smooth to minutely velutinous, more or less uniformly cream (4A2–3), sometimes slightly darker, ivory to light orange cream (5A4). Stipe flesh tough, off-white to pallid cream. Odour pleasant, somewhat mealy with hint of anise; taste mild. Dried specimen without yellow colouration.

Pileus surface of repent hyphae; hyphae 3.5–6.0 μm diam., yellowish to yellow-ochre under phase contrast microscopy, thin-walled, radially parallel, adherent, with thin (less than 10 μm) film of slime. Pileus trama monomitic; hyphae thick-walled (wall 0.4–1.2 μm thick, yellow and glassy when unusually thick), frequently septate, frequently anastomosed; clamp-connections frequent but not consistent, often obscured by hyphal branching; “cloisons de retrét” common in hyphal fragment with unusually thick wall. Lamellar trama monomitic; hyphae 3.5–9.8 μm diam. (tending to sort into narrow and wide hyphae), thin- to thick-walled (wall up to 0.5 μm thick), hyaline, interwoven, with common clamp-connections. Gloeoplerous hyphae frequent, 3.5–5 μm diam., subrefringent, rarely branched, rarely bending into hymenium as basidiolar pseudocystidia but not emergent. Subhymenium well-developed; hyphae often slightly inflated, frequently branched, giving rise to basidia directly or from clamp-connections; hymenium of basidia. Basidia 28–35 \times 7.2–8.2 μm , clavate, clamped, hyaline, thin-walled; contents more or less homogeneous; sterigmata (1–2–3–)4, up to 5.5 μm long, slender, spindly. Pleurocystidia and cheilocystidia not observed.

Basidiospores ($n = 22$) (7.6–) 8.0–10.4 (–12.0) \times (3.6–) 4.0–4.8 (–5.6) μm [$Q = 1.82$ –2.27 (–2.60); $Em = 2.08$; $Lm = 9.09 \mu\text{m}$], elongate-ellipsoid, slightly more convex abaxially than adaxially, smooth, thin-walled, hyaline; contents more or less homogeneous; hilar appendix small, eccentric, papillate.

Stipe surface a trichodermium; trichodermal hyphae 1.5–2.0 μm diam., emergent up to 300 μm , hair-like, thin- to thick-walled (wall up to 0.4 μm thick near basal clamp-connection, thin near terminus), acerose, hyaline. Stipe trama dimitic; generative hyphae thick-walled (wall 0.4–1.0 μm thick), variously inflated (3.5–6.5 μm diam.), hardly constricted at septa, often but not invariably clamped; skeletal hyphae thick-walled (wall 0.8–2.5 μm thick, often obscuring the cell lumen), aseptate, yellow and glassy or refringent under phase contrast microscopy, rarely branched, ending in acerose terminus.

Habitat — Cespitose in dense clusters to almost solitary on fallen, rotting trunk of *Fagus sylvatica* in almost virgin *Fagus sylvaticus* forest with occasional *Quercus*, on steep, north-east-facing slope, at 540 m elevation, over silicate soil.

Culture characters — Monokaryon and dikaryon cultures white, varying from appressed to loosely plumose but not forming a felt or tomentum; odour floral (similar to the odour of cultures of *P. pulmonarius* but not as brash). Microdroplets large (up to 30 µm diam.), occasional to abundant. Hyphae 2.5–7.5 µm diam., hyaline, occasionally to commonly septate, with clamp-connections in dikaryon state, without evidence of skeletal hyphae.

Mating system — When 12 SBIs were paired in all combinations, a tetrapolar mating system was revealed (Fig. 4). Isolates 5, 9, 10, 11, 13* were A_2B_2 ; 7* A_1B_1 ; 1, 2, 3, 4, 6, 8* = A_2B_1 ; A_1B_2 was not represented in the sample. No distinctive barrage or flat contact zone morphologies were noted, but lethal reactions within the contact zone were common.

Twelve SBIs of the epitype collection were paired with 12 SBIs of a collection from the Caucasus region of Russia (Caucasia, southern slopes of Mt Aichcha, 43° 38.677' N, 40° 26.668' E, 21.IX.96, coll. RHP, on dead *Alnus*, no. 8966, TENN 55626; pairing number = 24), resulting in 100% intercompatibility.

In the vicinity of Vienna, *P. cornucopiae* fruits in large clusters, very similar to that pictured by Paulet in the plate accompanying his description of the organism (from Lèveillé's reprint plate). It would appear that the species epithet referred to the umbilicate to infundibuliform shape of somewhat immature basidiomata, vaguely reminiscent of a cornucopia (Figs. 1, 2). Individually, we have consulted the plates re-issued by Lèveillé, and in one (WU) the lamellae are virtually devoid of pinkish colouration, being ivory or pallid cream colour. In another copy (NY), the same illustration (pl. 28) shows a distinct rosy tint to the cream-coloured lamellae. Such variation is to be expected in old illustrations which were

	A_2B_1						A_1B_1	A_2B_2				
	1	2	3	4	8	6		7	9	10	11	13
1		-	L	-	-	-	L	-	-	-	-	-
2	-		-	-	-	L	-	-	-	-	-	B
3	L	-		-	L	-	-	F	-	-	L	-
4	-	-	-		-	-	-	-	-	L	-	-
8	-	-	L	-		-	-	L	L	L	L	L
6	-	L	-	-	-		L	F	L	-	-	-
7	L	-	-	-	-	L		+	+	+	+	+
9	-	-	F	-	L	F	+		L	-	L	-
10	-	-	-	-	L	L	+	L		L	F	-
11	-	-	-	L	L	-	+	-	L		-	-
13	-	-	L	-	L	-	+	L	F	-		-
5	-	B	-	-	L	-	+	-	-	-	-	-

Fig. 4. *Pleurotus cornucopiae*. Self-cross using ex epitypus monokaryon cultures.

hand coloured in aquarelle. Current colour illustrations can be found in Phillips (1981: 184; colour somewhat flat) Dörfelt & Görner (1989; colour without fleshy tint), and the cover photo of *The Mycologist* [vol. 11 (3) August, 1997; colour about natural].

Persoon (1828) used the phrase "*pileo carnosio albido-pallide rufescente glabro*," and mature pilei of the epitype basidiomata showed a slight orange tint together with the pallid tan to brownish ochre pileus surface. Of the diagnostic characters furnished by Persoon (1828), the following are fulfilled by the epitype specimen: 1) on deciduous trees; 2) sometimes in cespitose clusters but usually single; 3) pileus pallid-whitish, becoming reddish; 4) stipe villose, thick; 5) pileus usually infundibuliform; and 6) lamellae with non-intervene bases. Other diagnostic characters are not matched by the epitype specimen, namely: 1) autumnal; and 2) stipe very short. These latter characters, however, are well within the variation for such a species.

One of us (IK-G) has observed that rarely basidiomata of *P. cornucopiae* in nature exhibit bright yellow pilei, perhaps a 'local' mutant within individual cespitose clusters. The yellow form of the species has been given its own binomial, *P. citrinopileatus*, and seems to be the only form of the species present in northern Asia (northern China, northern Japan, and far eastern Russia). Hilber (1982) showed that *P. cornucopiae* was genetically isolated (i.e., incompatible with other *Pleurotus* species), but he lacked monokaryon isolates of *P. citrinopileatus* and could not report on their compatibility. Ohira (1990) demonstrated that *P. citrinopileatus* was intercompatible with *P. cornucopiae*, and this was confirmed by Peterson & Hughes (1993) using other isolates.

Hilber (1982) noted that basidiomata of *P. cornucopiae* produced under laboratory conditions sometimes formed an evanescent veil. This character is similar to the same phenomenon in *P. levis* (= *Panus strigosus*), where virtually no evidence of the veil can be found on basidiomata in nature. The habit of *P. cornucopiae* (i.e., distinct stout stipe) might cause the comparison with *P. levis* to be carried further, but basidiomata of *P. calyptratus* also form a veil: indeed, the taxon is diagnosed by this structure. Basidiomata of *P. calyptratus*, however, are strictly pleurotoid, more closely resembling those of *P. djamor*, another species with dimitic hyphal construction. Vilgalys & Sun (1994) used DNA sequences to construct a generic phylogeny. *Pleurotus cornucopiae* and its variant *P. citrinopileatus* shared identical sequences, with *P. djamor* and *P. calyptratus* within the same clade. The clade was labelled as the *P. djamor-cornucopiae* clade. *Pleurotus levis* was well-separated, appearing within the '*P. ostreatus* clade', in spite of its dimitic hyphal construction.

The large size of microdroplets in cultures of *P. cornucopiae* is consistent with data from other similar species exhibiting dimitic hyphal construction (*P. djamor*, *P. calyptratus*). This is in contrast to the small microdroplets in cultures of monomitic taxa (*P. ostreatus*, *P. pulmonarius*, etc.). The odour of cultures of *P. cornucopiae* is quite similar to that found in cultures of *P. pulmonarius*, however, indicating that the same general chemistry may be present across the genus.

***Pleurotus eugrammus* (Mont.) Dennis**

Fries (1838) placed the species in *Lentinus* but attributed the species epithet to Montagne as "*in sched.*," but Montagne (1845) did not publish the name until later. Thus the nomenclatural position of the basionym is in *Lentinus*, although that generic name was used in a broad sense at that time. Because of Fries' attribution, the type specimen is to be found in herb. Montagne.

Singer (1944) segregated *Nothopanus* from *Pleurotus* based on his own concept of *N. eugrammus*. Horak (1968: 485), placed *Nothopanus* in synonymy under *Pleurotus*, but also (Horak, 1968: 679) furnished a description and illustrations of the 'type specimen' of *N. (Lentinus) eugrammus*. Most recently, Singer (1986) placed *Pleurotus eugrammus* sensu Singer in *Pleurotus* sect. *Pleurotus*, which included both monomitic and dimitic hyphal construction. While such placement can be accepted merely on miticity, other characters disallow placement of Singer's *N. eugrammus* in *Pleurotus* at all.

In examining several specimens (almost all from NY) under various combinations of *eugrammus*, it became evident that most represented small, marasmielloid basidiomata (i. e., stipitate-pleurotoid, often semi-everted), while some comprised or at least included large, pleurotoid basidiomata with only rudimentary stipes. Two taxa obviously were represented. The former was found to agree with the description by Corner (1981), and subsequently to agree with common usage of *Nothopanus* (see below under specimens examined of *Nothopanus* sensu Singer). The two taxa shared a lobate and invariably sulcate-striate pileus margin, but very different hyphal construction and basidiospore shape. This discrepancy led to an investigation of *Lentinus eugrammus*, the type specimen of which is described below.

***Lentinus eugrammus* Mont. — Fig. 5, 6**

Lentinus eugrammus Mont. *apud* Fries, *Epicrisis* (1838) 396.

Pleurotus eugrammus (Mont.) Dennis, *Kew Bull.* (1953) 36, fig. 8.

Nothopanus eugrammus (Mont.) Sing., *Mycologia* 36 (1944) 364.

Holotypus: Cuba, comm. D. Ramon de la Sagra, no date, on tree stems, herb. Montagne, *s. n.* (PC!), [see also Horak (1968: 679–681)].

Basidiomata up to 12.5 × 8.5 cm, dimidiate to broadly reniform, laterally attached on almost absent stipe, pleurotoid; pileus surface matt, subtly to coarsely sulcate-striate up to 3 cm from margin, apparently white to off-white when fresh, upon drying and storage pallid ochraceous buff with somewhat darker margin; lamellae broad (up to 6 mm deep), apparently tough (not fragmented during drying or long storage), in three ranks, with long lamellae reaching the rudimentary attachment, probably white to off-white when fresh, now dull orange-ochre; stipe represented by a very small knot, white and remaining so, hispid to arachnoid.

Stipe, lamella and pileus trama dimitic; generative hyphae 3.5–8.0 µm diam., hyaline, thin- to thick-walled (wall up to 0.5 µm thick), frequently branched, conspicuously and commonly clamped; skeletal hyphae 4.5–8.0 µm diam., consistently arising from a clamped septum on generative hypha, thick-walled (wall up to 2.4 µm thick, commonly obscuring the cell lumen), highly refringent to yellowish in KOH, often branched dichotomously near terminus, gradually tapering (over more than 1000 µm length) to a flagelliform tip (thin- to slightly thick-walled).

Basidiospores (n = 23; Cuba, Earle/Murrill no. 435, NY) 8.0–11.6 × 3.6–4.8 µm (Q = 2.00–3.11; Em 2.42; Lm = 9.77 µm), [Horak, 1968, ex typus: 8.5–10 × 3–4 µm; Dennis, 1953, 7–10 × 3–3.5 µm], elongate-ellipsoid to subboletoid, smooth, thin-walled, more or less homogeneous in content; hilar appendix small, eccentric.

Additional specimens examined. CUBA: De la Sagra, date and collector unknown, as *Lentinus eugrammus*, annotated D. N. Pegler, holotype (PC); same location, 'type' (PC); prov. Santiago de Cuba, Alto Cedro, 19–20.III.05, coll. Earle & Murrill 435 [as *Panellus eugrammus* (Mont.) Murrill; type of *Geopetalum album* Earle] (NY); prov. Pinar del Rio, vic. Herradura, 28–31.VIII.10, coll. N. L. Britton

& F. S. Earle 6535 (as *Panellus eugrammus*) (NY); prov. Oriente, Gran Piedra, 4–5.III.11, coll. J. A. Shafer 9120 (as *Panellus eugrammus*) (NY); prov. Pinar del Rio, Havana, Vedado, Sierra de Oluafe, 10.X.16, coll. G. Leon, P. Mi Roca, T. R. Cazanas 6825 (as *Panellus eugrammus*) (NY). — GUADELOUPE: Basse-terre, 1902, coll. P. Duss 1885 “sur im *Bignonia pentaphylla*” (as *Lentinus eugrammus*) (NY). — UNITED STATES: Florida, Dade Co., Royal Palm Hammock, ‘Exploration of the Everglade Keys, tropical Florida,’ 29.I.16, coll. J. K. Small & R. L. Lowe 7107 (NY); same location, same date, coll. J. K. Small & R. L. Lowe 7116 (NY); Florida, Dade Co., Hammocks, Long Key, 12–13.I.16, coll. J. K. Small s.n. (NY); Florida, Dade Co., Goodburn Hammock, 17.III.15, coll. J. K. Small & C. A. Mosier 5404 (NY).

These specimens represent *Lentinus (Pleurotus) eugrammus* sensu vero. Horak (1968) examined the ‘type specimen’ of *Lentinus eugrammus* from PC, and while he did not explicitly describe a dimittic hyphal construction, his illustrations of tramal and pileus surface hyphae could be interpreted as such, his spore measurements (with illustration) surely could represent a *Pleurotus*, and in discussion, Horak indicated *Nothopanus* as a synonym under *Pleurotus*. Horak’s observations were correct, and based on examination of much additional material, the spores measured and illustrated by Horak were also correct (there are several spore types adhering to the type specimen, at least three of which represent basidiospores).

Singer (1950) examined fresh material of what he thought was *Lentinus eugrammus*, and used his own (Singer, 1944) interpretation as the type of *Nothopanus*. Horak (1968: 679–681) examined the type specimen of *L. eugrammus*, and concluded that this specimen was not the same as Singer’s sense of the species.

Our examination of Singer’s specimens under *N. eugrammus* (see below under specimens examined) has confirmed that Singer’s (1944) interpretation of *L. eugrammus* does not match the type specimen of that species, and therefore represents a misapplication of that epithet. Art. 7.5 of the ICBN (1994) states that a type specimen applies to all combinations of the epithet. Modern placement of *L. eugrammus* is important because this placement brings the genus name *Nothopanus* with it. Like Horak (1968) we consider the type specimen of *L. eugrammus* to be a *Pleurotus*, and Singer’s *Nothopanus* to be a synonym of that genus. Nevertheless, Singer’s (1944) concept of *Nothopanus* as taxonomically distinct is correct.

Given this entire situation, two nomenclatural avenues are open: 1) propose conservation of *Nothopanus* Singer with a different type species, requiring a separately published proposal with justification; or 2) accept *Nothopanus* Singer as a synonymous genus name, and propose a new genus name to represent Singer’s concept, with a new type species for the concept. We have chosen the latter path, as follows:

***Neonothopanus* Petersen & Krisai-Greilhuber, gen. nov.**

Tricholomatacearum genus. Pileo excentrice ad lateraliter stipitato. Lamellis plus minusve adnato ad decurrentibus. Stipite breviusculo vel distincto. Carne tenaci in adultis, ex hypharum crassitunicatis. Sporis in cumulo albis, hyalinis, ellipsoideis ad subglobosis, tenuitunicatis, inamyloideis. Cystidiis nullis. Hyphis fibuligeris. Habitatio in ligno putrida.

Nothopanus Singer sensu Singer, Mycologia 36 (1944) 364–365 [see also Horak (1968: 679)].

Typus: *Neonothopanus nambi* (Speg.) Petersen & Krisai-Greilhuber, comb. nov. [see also Singer (1950: 168); Horak (1968: 681)]. Basionym: *Agaricus nambi* Speg., An. Soc. Cient. Argentina 16 (5) (1883) 247.; *Pleurotus nambi* (Speg.) Saccardo, Syll. Fung. 5 (1887) 372.

Basidiomata marasmielloid, eccentrically (not laterally) stipitate, petaloid to somewhat everted, up to 3 cm broad, broadly spatulate, nearly semicircular to broadly reniform; pileus surface white and remaining so or mellowing to pallid ochraceous buff upon storage, with occasional radial dark streaks, matt, broadly sulcate outward but hardly striate; pileus flesh

tough, white, very thin over lamellae; lamellae decurrent, shallow, distant, in 2–3 ranks or forking dichotomously, white but mellowing to cream on drying, with common evidence of dark staining in radial streaks on and between lamellae; stipe up to 4×3 mm, distinct and invariable, white, very tough, minutely hispid to minutely strigose.

Pileus, lamella and stipe trama monomitic. Hyphae of pileus surface 4–8 μm diam., hyaline, thick-walled (wall up to 1.0 μm thick), often subtly transversely banded (but not encrusted), conspicuously clamped, mostly repent, with integral, generally radial hyphal bundles (up to 75 hyphae) which usually end as blunt, short, erect fascicles (up to 40×40 μm); hyphae of pileus trama 3.5–8 μm diam., hyaline, thin- to thick-walled (wall up to 1.2 μm thick), often with wall gelatinizing or with a gelatinous sheath (in KOH squash mounts) extending up to 1.2 μm from the cell wall, conspicuously and commonly clamped, loosely interwoven, frequently branched; gloeoplerous hyphae rare, 3–5 μm diam., yellowish, hardly refringent, aseptate, occasionally branched. Lamellar trama with parallel mediostratum and thick, densely interwoven lateral stratum; hyphae 2–4 μm diam., clamped, hyaline, not gelatinized, thick-walled near pileus trama, thin-walled downward; subhymenium extensive, isodiametric, adherent; hymenium of basidia and pleurocystidia; basidia 17–30 μm long, narrowly clavate, apparently adherent, clamped, with fertile basidia emergent up to 15 μm , four-sterigmate; cheilocystidia and pleurocystidia non-emergent, clavate with subcapitate to bluntly tapered apex.

Basidiospores [Singer B-7497: (n = 10) (4.0–)4.8–5.6 \times 2.8–4.0 μm ; Q = 1.209–1.86; Em 1.57; Lm = 4.96 μm]; [Watling 52A/95; (n = 15) (5.2–)5.6–6.4 \times 3.2–4.0 μm ; Q = 1.40–2.00; Em = 1.70; Lm = 5.89 μm]; [Lodge 1308: (n = 22) (4.0–)4.8–5.6(–6.4) \times 3.2–4.0 μm (Q = 1.209–1.75; Em = 1.52; Lm = 5.31 μm ; Wm = 3.49 μm); [Honduras, as *Plicatura obliqua*, NY; n = 12. 6.4–8.0 \times 4.0–4.8 μm ; Q = 1.58–1.82(–1.90); Em = 1.74; Lm = 7.40 μm]; ovate, smooth, thin-walled, inamyloid; contents more or less homogeneous; hilar appendix small, eccentric. Stipitipellis a trichoderm; hyphae 4–8 μm diam., hyaline, thick-walled (wall –0.5 μm thick), clamped, linear or branched in rudimentary penicillus; stipe tramal hyphae monomitic, skeletalized, hyaline, clamped, frequently branched, somewhat tortuous to sinuate, with common protuberances; hyphal branches 1) as parents; 2) gradually tapering to rounded tip (not acerose or flagelliform).

Culture characters — Colonies off-white, rapidly growing (30 mm radius within six weeks), with abundant aerial mycelium, loosely cottony and radially combed. Aerial mycelium roughened with light crystal incrustation, somewhat reminiscent of *Panellus stypticus* etc.; hyaline exudate droplets abundant on aerial mycelium, especially away from the agar surface. Hyphae of two types: 1) 'lead' hyphae (4.5–7.5 μm diam., very long-celled) usually developed away from the agar surface; with 2) narrower side branches (1.5–3.5 μm diam.) and other hyphae nearer the agar (thus appearing like cultures of *Flammulina*). Aerial chains of arthroconidia common to abundant, with conidiophore morphology variable, including simple, oppositely branched, whorled, lax-penicillate, and penicillate. Conidia 3.5–13 \times 1.5–3.0 μm , pencil-shaped, bacilliform, ellipsoid, to broadly keg-shaped.

Mating system — [specimen PR-1308, MAD (see below)] When 12 SBIs were paired in all combinations, a tetrapolar mating system was revealed (Fig. 7). Isolates 1*, 4, 6, 24 = A₂B₂; 3*, 15, 18, 21 = A₁B₁; 5*, 22 = A₂B₁; 7*, 19 = A₁B₂. Subordinate mating types were assigned based on scattered clamps on 5/22 \times 3/15/18/21 = slight barrage = common-B (although this contact zone morphology was also common in other sectors; i.e., within-group 3/15/18/21).

Two categories of barrage morphology were noted: 1) very narrow zone of increased hyphal branching not within the contact zone, but extending to either side with general appearance of mustaches; and 2) wider, thicker zone of increased hyphal branching covering the contact zone and extending away from it. Category 2 was always associated with compatible pairings; category 1 was common but unpatterned.

Mating system — [specimen Watling 193-95, E (see below)]: When 12 SBIs were paired in all combinations, a tetrapolar mating system was revealed. Isolates 1*, 9, 16, 21 = A_1B_1 ; 10* = A_2B_2 ; 15*, 20 = A_2B_1 ; 6*, 13, 14, 19, 25 = A_1B_2 . Ill-defined barrage and flat contact zone morphologies were common and generally patterned, and subordinate mating types were assigned based on these patterns.

Intercollection pairings — Intra-Malaysia [W7399 × Watling 63A]: In a 4×4 grid ($n = 16$); three pairings were compatible, producing luxuriant growth of both donors and contact zone (and there an ill-defined barrage effect). In addition, other compatible pairings exhibited a phenomenon called 'localized compatibility syndrome' by Petersen & Ridley (1995). In this phenomenon 3–4 clamps were produced on single agar-surface hyphae, well-separated from other such hyphae, and with significant lethal reactions. Concomitantly, incompatible pairings showed little or no lethal reaction, and little or no crystal deposition. Flat and barrage contact zone morphologies were quite clearcut; flat comprised a distinct crevasse bordered by 'lips' of increased hyphal branching; barrage was a well-defined single narrow zone of increased hyphae. Intra-Puerto Rico [PR1308 × PR3137]: In a 4×4 grid ($n = 16$), all pairings were compatible. Clamp-connections, while distributed sparsely, were seen on aerial hyphae as well as agar-surface hyphae.

	A_2B_2				A_2B_1		A_1B_1				A_1B_2	
	1	6	4	24	22	5	15	18	3	21	19	7
1		F	–	F	F	–	+	+	+	+	–	F
6	F		F	–	–	–	+	+	+	+	F	F
4	–	F		–	F	–	+	+	+	+	F	F
24	F	–	–		–	–	+	+	+	+	+	–
22	F	–	F	–		–	F	F	F	F	+	+
5	–	–	–	–	–		F	F	F	F	+	+
15	+	+	+	+	F	F		F	F	–	–	–
18	+	+	+	+	F	F	F		F	–	–	–
3	+	+	+	+	F	F	F	F		F	–	F
21	+	+	+	+	F	F	–	F	F		–	–
19	–	F	F	+	+	+	–	–	–	–		–
7	F	F	F	–	+	+	–	F	F	–	–	

Fig. 7. *Neonothopanus nambi*. Self-cross of collection PR-1308.

Puerto Rico [PR3137] × Malaysia [W7399]: In a 12 × 12 grid (n = 24 pairings), universal compatibility was observed. Ill-defined flats and barrages were common, together with lethal reactions, but clamps were consistently seen on agar-surface hyphae and on aerial hyphae. Both donors produced arthroconidia on and in juxtaposition to donor blocks.

Intercollection/interregional pairings of monokaryon isolates confirm that *Neonothopanus nambi* is distributed through large areas of the tropics on both sides of the Pacific Ocean. It might be inferred that minor spore size differences on which Singer (1973) based additional species and varieties (in herb.) are within the species' phenotypic plasticity.

Specimens examined of Neonothopanus nambi. BAHAMA ISLANDS: New Providence, Coppice, Waterloo, 12.IX.04, coll. E. G. Britton 713 (as *Plicatura obliqua*) (NY); New Providence, Lake Cunningham, 8.IX.04, coll. E. G. Britton 623 (as *Plicatura obliqua*) (NY); New Providence, Coppice, Waterloo, 12.IX.04, coll. E. G. Britton 718 (NY). — BELIZE (as British Honduras): location unknown, 1906, coll. Morton E. Peck s.n. (NY). — COLOMBIA: Valle, Buenaventura, Calima, Camp. Pulpapel, 18.IV.68, coll. R. Singer, ad lignum dicotyl., no. B-6225 (F). — CUBA: vic. Santiago de las Vegas, 11.IX.04, collector unknown, on dead stems and roots of *Eugenia ?jambis* no. 185 (type of *Geopetalum eugeniae* auct.) (NY); Alto Cedro, date unknown, coll. Underwood & Earle 1640 (as *Plicatura obliqua*) (NY); location unknown, Fungi Cubenses Wrightiani, date unknown, coll. C. Wright 167 (as *Lentinus eugrammus* Montagne) (NY). — ECUADOR: Napo, Lago Agrio, 16.V.73, coll. R. Singer B-7497, ad lignum (F). — MALAYSIA: Negri Sembilan, Pasoh Forest Reserve, 12.IX.95, coll. R. Watling 52A/95, on rotten log on trail in logged-over area (E no. 26613; TENN 56940) [single-basidiospore isolates and dikaryon culture: TENN]; Negri Sembilan, Pasoh Forest Reserve, 12.IX.95, coll. R. Watling 63A/95, on old rotten buttress of tree fallen across trail in unlogged lowland dipterocarp forest (E no. 16614; TENN 56938); location unknown, Watling 193/95 (CULTENN no. 7399) [single basidiospore isolates and dikaryon: TENN]. — UNITED STATES: Puerto Rico, Colon, 6.I.10, coll. M.A. Howe s.n. (as *Plicatura obliqua*) (NY); Rio Piedras, 18.VIII.12, coll. J.R. Johnston 551 (as *Plicatura obliqua*) (NY); Mayaguez, 22.XII.15, coll. B. Fink, Murrill 64 (NY); Rio Piedras, 8.IX.12, coll. J. R. Johnston 743 (NY); Cayey, campus of Collegio Universidad de Cayey, 17.X.93, coll. D. J. Lodge PR-1308 (MAD; TENN 56940) [basidiomata, single-basidiospore isolates, dikaryon cultures: MAD]; vic. Rio Sabina, 17.I.96, coll. D. J. Lodge PR-3136 (TENN 56941; cultures as 8281); Luquillo Mts, Bisley Watershed, 27.I.96, coll. D.L. Lodge PR-3137 (TENN 56939; basidiomata and spore print; cultures as 8282).

On the sheet with the Belize specimen (NY) there are two annotation slips: 1) "*L[entinus]. verae-crucis*. Vera Cruz, Aug. 1854, no. 4. So near 35 & 36 I cannot disting. See description Wrights Cuba all = 35", and 2) "Cub. Fungi 303. *Verae-crucis*. 169. *L. verae-crucis*, B. ms (40 pro parte). *Pileo tenui flabelliformi farinaceo-tomentoso albo, stipite brevi cylindrico; lamellis distantibus integris latiusculis*. On stumps in woods. November. Pileus 1–1.5 inches across; stems 2 lines high, farinaceous. Hab. Vera Cruz, August 1854". We do not know these handwritings, and so we do not know what these slips mean. Murrill (1911) listed *L. verae-crucis* in synonymy under *Plicatura obliqua*, together with several other names.

Pleurotus opuntiae (Durieu & Lév.) Sacc.

The name *Pleurotus opuntiae* has been used to represent at least three concepts: 1) a North African *Pleurotus* illustrated by Durieu & Lévillé (1846), Malençon & Bertault (1975) and Pegler (1977); 2) fleshy basidiomata with prominent stipe occurring on rotten basal parts of large *Agave* plants in the Mexican highlands, illustrated by Petersen (1995); and 3) basidiomata with negligible stipe, reportedly parasitic on *Cordyline* ('cabbage tree') in New Zealand (Rees-George et al., 1990; Segedin et al., 1995).

The first interpretation must rest on examination of the type specimen, and is taken up below. The third interpretation has been tested. After the first clues on sexual intercompatibility between various morphological variants within *P. djamor* (Petersen & Hughes, 1993), monokaryon isolates cited by Rees-George et al. (1990), together with isolates from other basidiomata with similar morphology were found to be sexually compatible within the group, as well as with monokaryon isolates of other macromorphological forms represented by other names (i.e., *P. djamor* for a white to pallid olivaceous form, *P. ostreatoroseus*, *P. flabellatus*, *P. salmoneostramineus* for pink forms; Petersen & Hughes, 1993; Petersen, 1995; Nicholl, 1997). Corner (1981) had summarized the morphotaxonomic situation, and all these forms could be represented by the oldest name, *P. djamor*.

In order to test the use of the name *P. opuntiae* by Mexican workers, it was again necessary to examine the type specimen, and to compare it to Mexican material. Because authoritative cultures were not available from North Africa, intercompatibility tests could not be performed. Only morphological comparison is possible at this time, and it is reported below.

***Pleurotus opuntiae* (Durieu & Lév.) Sacc. — Fig. 8, 9**

Pleurotus opuntiae (Durieu & Lév.) Sacc., Sylloge Fungorum 5 (1887) 363.

Agaricus opuntiae Durieu & Lév., Exploration scientifique de l'Algérie (1846) 15, pl. 32, fig. 1 (PC!).

Type specimen outside label: *Agaricus flabellatus* Sur ... vieux tronc pourri de Cactus opuntia. [?] Balazoan. 22 Janvier 1840. Inside on sheet to which specimen is glued: Cryptogamie, ex herb. Durieu de Maisonneuve. L. Motelay (1878). Annotation: Rev[ised]. Dr. Albert Pilát, Museum Nationale Prague, as *Pleurotus opuntiae* D. et L. 4.VI.1935.

The type specimen comprises three pilei: 1) 70 mm diam., with lamellae exposed (pileus surface glued to sheet); margin thin, lobate to indistinctly lacerate, inrolled, with no evidence of striation, now dark brown; lamellae close, thin, fragile, more or less 3 mm deep, not noticeably marginate, now ochraceous brown; flesh insect-riddled; 2) (left side) fragments of flesh, no lamellae, pileus cuticle glued to sheet; and 3) (right side) pileus surface exposed (lamellae apparently glued to sheet), surface undulate but smooth, apparently inrolled (margin toward mounting sheet); flesh insect-riddled, colour neutral brown. One stipe (40 mm long below lamellar attachment, up to 12 mm thick) with lamellae over upper 45 mm (total basidioma = 85 mm high), apparently solid, expanded somewhat downward, irregular in section, with some evidence of having been rooted; colour neutral brown; lamellae with no evidence of reticulation.

Hyphae of stipe flesh of two types: 1) generative, 1.5–4 µm diam., thin-walled, hyaline, clamped, branched, obscured by skeletal; and 2) skeletal, 1.5–3.5 µm diam., thick-walled (wall < 1.0– > 2.0 µm thick, often obscuring the cell lumen), refractive and glassy under phase contrast microscopy, aseptate, rarely branched, sinuate to undulate, hyaline. Pileus surface (peridermal scalp): blackening in KOH (result of 'poisoning'?), with microscopic amorphous crystalline products in squash mount; hyphae radial, shearing in sheets or fascicles when squashed as though in a coherent skin; generatives only (skeletal restricted to hypodermium and pileus trama), 1–4 µm diam., thin-walled, occasionally clamped, probably hyaline.

Skeletal hyphae extending through hymenophoral trama. Basidia and cheilocystidia not observed. Basidiospores 8.8–11.2 × 3.6–5.2 µm (Q = 1.83–2.80; Em = 2.31; Lm 9.83 µm; Wm = 4.27 µm), cylindrical to elongate-ellipsoid, smooth, hyaline, thin-walled; contents more or less homogeneous (through age?); hilar appendix lateral, not prominent.

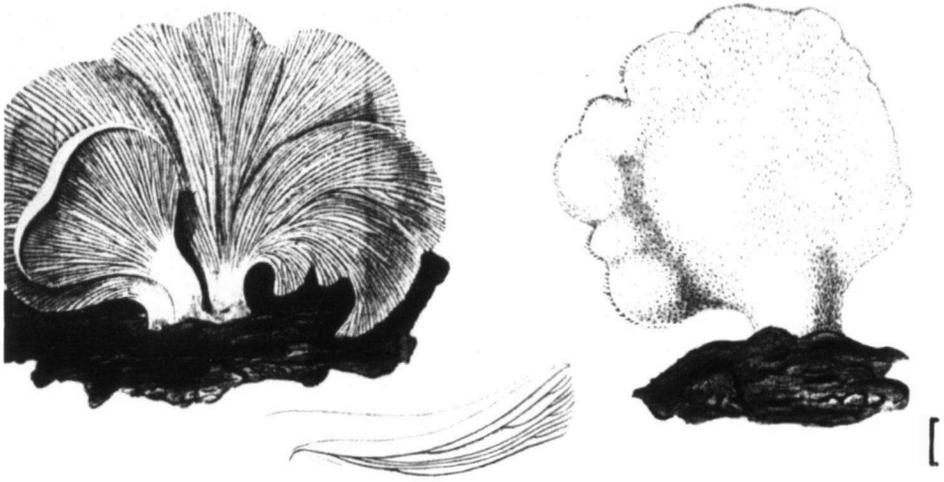


Fig. 8. *Agaricus opuntiae*. Illustration from Durieu and L veill . — Bar = 1 cm.



Fig. 9. *Agaricus opuntiae*. Holotype specimen. — Bar = 1 cm.

Durieu de Maisonneuve & L veill  (1846) furnished three illustrations of *Agaricus opuntiae* (Fig. 8), all of macroscopic characters (no spores, cystidia, etc.). The following can be observed from the figures and added to the description of the type specimen above: 1) basidiomata have a prominent stipe; 2) lamellae appear close to somewhat crowded; 3) basidiome margin is inrolled, at least in youth; 4) colour is pale [white to off-white; 3A2–3B2 [Kornerup & Wanscher, 1973]; 5) there seems to be no protrusion of the pileus behind the stipe attachment (i.e., no ‘lip’); 6) lamellae are interspersed with at least three ranks of lamellulae; and 7) pileus surface is not glabrous – perhaps radially fibrillose.

A more complete description can be offered using better material from Mexico, as follows.

Pileus (Fig. 10) up to 110 mm broad, distinctly radially fibrillose, occasionally areolate into coarse patches in age, 'pale ochraceous buff' to off-white, patches 'tulleul buff', especially in age and in bright sunlight; margin not striate, inrolled at all ages, tightly so when immature; flesh up to 12 mm thick near stipe, gradually becoming thinner outward, white, solid, homogeneous, prone to insect infestation. Lamellae deeply decurrent, close to subdistant, rather thick but shallow (< 4 mm deep), not reticulate or anastomosing downward, in four ranks, off-white ('pale cinnamon pink'). Stipe stout (up to 120 × 23 mm), rooting into central mass of host plant, tough, strigose below, 'pale cinnamon pink' with distinct tomentum of 'pale smoke gray', with no evidence of asexual spore production; annulus or partial veil absent. Odour and taste distinctly pleurotoid. Hyphae of pileus margin 2.0–6.5 µm diam., more or less parallel, hyaline, thin-walled, commonly septate with clamp-connections, surmounted by common clavate, thin-walled circumcystidia 35–48 × 7–11 µm; hyphae of pileus surface over disc generative, thick-walled (skeletalized; wall up to 1.2 µm thick), remaining septate with clamp-connections, tightly interwoven and somewhat adherent (i.e., as though forming a skin), without circumcystidia; crystalline deposits common at margin, copious over disc; skeletal hyphae absent at margin, abundant over disc but not within 20–50 µm of the pileus surface.

Hyphae of stipe, pileus and hymenophore trama of two types: 1) generative, 1.5–4.5 µm diam., hyaline, thin-walled, commonly septate with clamp-connections, tightly interwoven in pileus and stipe, loosely interwoven in hymenophoral trama; and 2) skeletal, 1.5–4 µm diam., thick-walled (wall usually obscuring the cell lumen), yellowish in KOH, refractive, aseptate, in all tramal tissues; apex acerose, < 1 µm broad. Subhymenium rudimentary, pseudoparenchymatous. Basidia 26–33 × 7–8 µm, broadly clavate to subcylindrical, hyaline, with clamp-connection; contents heterogeneous but without distinct structure; sterigmata 4, up to 6 µm long, subcornute, slender. Pleurocystidia none; cheilocystidia roughly basidiolar, 28–34 × 5.6–6.4 µm, subclavate, often irregularly rounded at apex, hyaline, thin-walled, with clamp-connection, not lecythiform. Basidiospores 9.2–12.0 × 4.4–5.6 µm ($Q = 1.77\text{--}2.42$; $Em = 2.10$; $Lm = 10.75$ µm), cylindrical to elongate-ellipsoid, smooth, hyaline, thin-walled; contents heterogeneous but amorphous; hilar appendix lateral, not prominent.

Culture characters (material used: Mexico: Est. Tlaxcala, ET-3313, basidiomata in herb. *Estrada-Torres*, Universidad Autonoma de Tlaxcala; polyspore dikaryon culture) — In rapidly growing colonies, morphology was of sparsely cottony fans, and in slow colonies, growth was by compact fans, often of more compressed hyphae. All colonies produced common to abundant 'microdroplets', with two notable characteristics: 1) microdroplets were extremely large (5–17 µm diam.) when compared to those produced by other species, including *P. djamor* forms; and 2) microdroplets are formed on hyphal tips as well as on shorter side branches, contrary to other taxa which produce microdroplets only on short, slender side branches.

Mating system (same specimen used; monokaryon isolates derived from spore print) — When 11 single-basidiospore isolates were paired in all combinations, a tetrapolar mating system was revealed (Fig. 11). Isolates 2, 5, 6, 8, 9, 12*, 14 = A_1B_1 ; 3*, 11 = A_2B_2 ; 7* = A_1B_2 ; 10* = A_2B_1 . Isolate 4 = dikaryon.

Several isolates grew slowly, and were reluctant to make contact, thus mimicking a flat contact zone morphology. When these pairings finally met, however, there was no pattern,

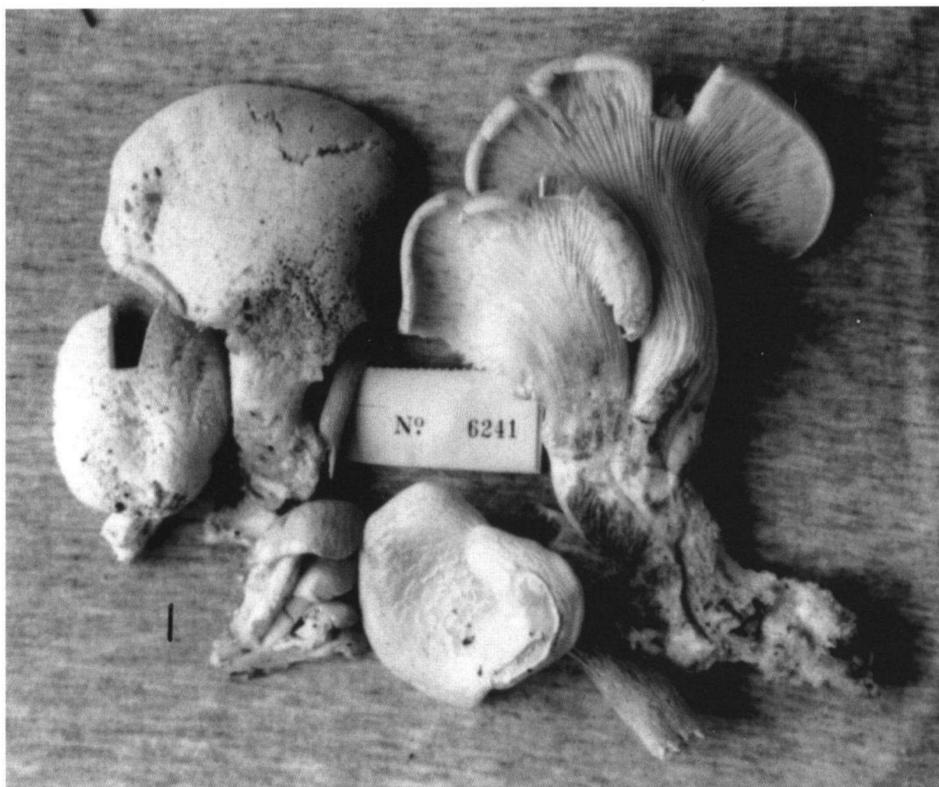


Fig. 10. *Pleurotus opuntiae*. TENN 52368. — Bar = 1 cm.

with several being compatible. No evidence of barrage contact zone morphology was noted, so subordinate mating types were assigned arbitrarily.

Specimens examined. MEXICO: Est Tlaxcala, Ciudad Tlaxcala, purchased in city markets, 18.VII.93, RHP & K.W. Hughes 6276 (TENN no. 52369); road to Tlaxco, 12.VII.93, coll. K.W. Hughes 6241 (TENN no. 52368) on basal rotten leaves of *Agave*; same location, date, collector, no. 6277 (TENN s.n.).

Macro- and micromorphological characters from the type specimen and Mexican material are so similar that we conclude that *P. opuntiae* fruits in North Africa and Mexico, and that the Mexican use of the name is correct.

Although generative hyphae are more common than skeletal in the stipe of the type specimen, the generatives do not refract light, crumple easily and shatter in squash mounts, so the eye is drawn to the skeletal as though they were the only hyphal type present.

Pegler (1977) furnished a description and figures under *P. opuntiae*, but the following characters differ from the type specimen: 1) stipe 'usually very short'; and 2) context monomitic. Except for these prominent differences, however, Pegler's description closely fits the type specimen of *P. opuntiae*.

Diagnostic characters for this species are as follows: 1) basidiomata pleurotoid; 2) lamellae deeply decurrent, non-reticulating; 3) stipe prominent; 4) pileus surface pallid; 5) hyphal construction dimitic; and 6) pileus flesh thick.

	A ₂ B ₂		A ₁ B ₁						A ₂ B ₁	A ₁ B ₂	
	11	3	5	6	2	8	9	12	14	10	7
11	-	-	+	+	+	+	+	+	+	-	-
3	-	-	+	+	+	+	+	+	+	-	-
5	+	+		-	-	-	-	-	-	-	-
6	+	+	-		-	-	-	-	-	-	-
2	+	+	-	-		-	-	-	-	-	-
8	+	+	-	-	-		-	-	-	-	-
9	+	+	-	-	-	-		-	-	-	-
12	+	+	-	-	-	-	-		-	-	-
14	+	+	-	-	-	-	-	-		-	-
10	-	-	-	-	-	-	-	-	-		+
7	-	-	-	-	-	-	-	-	-	+	

Fig. 11. *Pleurotus opuntiae*. Self-cross of collection ET 3313.

No evidence of asexual propagule production has been seen in *P. opuntiae*, but basidiomata of *P. australis* from nature also show no evidence of asexual spore production, although basidiome primordia fruited under laboratory conditions produce a turf of dark gray to black arthospores (see Petersen et al., 1997). Asexual reproduction in *P. opuntiae* cannot be ruled out, therefore.

Basidiomata of *P. levis*, with dimitic hyphal construction, prominent stipe, and pale colours, produce a partial veil, at least in some fruitings. Its range includes at least some Caribbean islands (i. e., Puerto Rico), but the pileus surface is composed of a strigose trichoderm, not repent hyphae. Production of a partial veil and trichodermoid pileus surface separate *P. levis* from *P. opuntiae*. Likewise, *P. dryinus* also is diagnosed by the presence of a partial veil. Moreover, cultures of *P. dryinus* consistently produce brown, thick-walled arthroconidia, and the species seems limited to the North Temperate Zone.

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