

Stinkhorns of the Hawaiian Islands

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Abstract: Additional members of the Phallales are recorded from the Hawaiian Islands. *Aseroë arachnoidea*, *Phallus atrovolvatus*, and a *Protuberata* sp. have been collected since the publication of the field guide *Mushrooms of Hawaii* in 2002. A complete list of species and their distribution on the various islands is included.

Key Words: *Phallales*, *Aseroë*, *Phallus*, *Mutinus*, *Dictyophora*, *Pseudocolus*, *Protuberata*, Hawaii.

Roger Goos made the earliest comprehensive record of members of the Phallales in the Hawaiian Islands (Goos, 1970) and listed *Anthurus javanicus* (Penzig.) G. Cunn., *Aseroë rubra* Labill.: Fr., *Dictyophora indusiata* (Vent.: Pers.) Desv., *Linderiella columnata* (Bosc) G. Cunn., and *Phallus rubicundus* (Bosc) Fr. Later, Goos, along with Dring and Meeker, described the unique *Clathrus* species, *C. oahuensis* Dring (Dring et al., 1971) from the Koko Head Desert Botanical Gardens on Oahu. The records of *Dictyophora indusiata* and *Linderiella columnata* in Goos's paper actually came from observations by N.A. Cobb in the early 1900's (Cobb, 1906; Cobb, 1909) who reported these two species in sugar cane fields on Hawai'i Island (also known as the Big Island) and Kaua'i, respectively, and thought they might be parasitic on sugar cane. To our knowledge, neither *Linderiella columnata* (now known as *Clathrus columnatus* Bosc) nor *Clathrus oahuensis* has been seen in the islands since these early observations. In our surveys and inventories studies of mushrooms of Hawai'i over the past 15 years, we have frequently encountered *Aseroë rubra* and have collected *Pseudocolus fusiformis* (reported as *Anthurus javanicus* by Goos) and *Phallus rubicundus* (Hemmes and Desjardin, 2002). In addition, we have collected *Aseroë arachnoidea* E. Fisch., *Phallus cinnabarinus* (Lee) Kreisel, *Phallus multicolor* Berk. & Broome, *Phallus atrovolvatus* Kreisel & Colonge, *Mutinus bambusinus* (Zoll.) E. Fisch., *Mutinus elegans* (Mont.) E. Fisch., and a species of *Protuberata*.

By far the most commonly encountered stinkhorn in the islands is *Aseroë rubra*, the "starfish stinkhorn." *Aseroë rubra* has been seen in *Eucalyptus* forests on all the major islands, but can also be found in composted wood chips and other disturbed areas. Hundreds of fruiting bodies were observed in composted woodchips spread around landscaping trees at a park in Honoka'a on the Big

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Figure 1. *Aseroë rubra* is commonly encountered in *Eucalyptus* plantations in Hawai'i but these fruiting bodies are growing in wood chip mulch surrounding landscape plants in a park.



Figure 2. *Aseroë arachnoidea* forming fairy rings on a lawn in Hilo.

Island in 2006 (Fig. 1). Fruiting bodies with 6 to up to 10 arms were noted. In 2007 a resident of Hilo called the University to inquire about some stinky growths on a newly established lawn. After chasing away mounds of flies covering the fruiting bodies, we found a half dozen fairy rings of *A. arachnoidea* (Fig. 2), the first record of this species in Hawai'i. The underlying soil for this new lawn had been delivered from a local source near town, so a best guess of how the fungus arrived would be in the grass seed, but it is difficult to know exactly what conditions were present for the establishment of these fairy rings. No fruiting bodies were found on contiguous lawns.

Mutinus spp. in Hawai'i include *M. bambusinus* and *M. elegans*. The two species are easily differentiated as *M. bambusinus* has a distinct and abrupt demarcation between the red-colored upper half of the fruiting body, which is covered by the gleba, and white to pinkish lower half (Fig. 3), whereas the orangish-red color in *M. elegans* gradates from top to bottom (Fig. 4). *Phallus rubicundus* (Fig. 5) is especially common in woodchip compost at Ho'omaluhia Botanical Garden on Oahu and in community garden plots in



Figure 3. The gleba has been washed off these fruiting bodies of *Mutinus bambusinus*.

Manoa Valley on Oahu, and *Pseudocolus fusiformis* (Fig. 6), with its wretched odor, like these other three species, is also found around agricultural areas and garden plots, in banana patches, and especially in well composted wood chip mulch.

Phallus cinnabarinus (also known as *Dictyophora cinnabarina* Lee) with its orangish-pink, cinnabar-colored indusium, appears on lawns and in composted wood chip piles on the windward side of the Big Island from MacKenzie Park to Honoka'a (Fig. 7). It is interesting that one lawn will be covered with fruiting bodies of *Ph. cinnabarinus* while at the same time contiguous lawns have none. We surmise it may have to do with the source of the soil that was brought in to start the lawn, the source of the grass seed, or the type of fertilizer application. *Phallus cinnabarinus* is probably what Cobb reported from Pepeekeo along the Hamakua Coast of Hawai'i Island as *Dictyophora indusiata* in 1907 because he stated those specimens had yellow indusia. *Phallus multicolor*, with its

relatively short, lemon-yellow indusium, is much more restricted in its distribution and has been found only at MacKenzie Park on the Big Island, where it can be relatively common during rainy periods (Fig. 8). Netted stinkhorns have not been recorded from any other Hawaiian island at this point.

Both of these netted *Phallus* species may occasionally produce a fruiting body with a pure white indusium. A solitary fruiting body with a purely white indusium was observed in the midst of a large grouping of *Ph. cinnabarinus* on a lawn in Hilo (Fig. 9). The indusium was fresh and turgid and had not faded to white. *Phallus multicolor*, too, may occasionally drop a near-white indusium (Fig. 10). In 2007 a large grouping of *Phallus* with white indusia (Fig. 11) closely resembling *Phallus atrovolvatus*, a species described from Costa Rica (Calonge et al., 2005), appeared at the University of Hawai'i at Hilo agricultural farm. These fruiting bodies have a dark gray volva, a white indusium that expands to midway between the receptacle and volva, and have the habit of growing in composted wood chips. The only noticeable difference is that the surface of the unexpanded fruiting bodies of *Ph. atrovolvatus* is described as black, whereas the fruiting bodies of the Hawaiian specimens are gray.

Finally, a *Protuberia* species was collected recently from Koke'e, Kaua'i, in a mixed forest area containing *Eucalyptus* and *Acacia koa*. The surface of this secotioid species is white and has a gelatinous, convoluted interior (Fig. 12). A summary list of phalloid fungi currently known from the Hawaiian Islands and their known distribution at this point is found in Table 1.

We have received photos of what resembles *Lysurus mokusin* (L.:Pers.) Fr. from pastures surrounding Haleakala on Maui and a red *Clathrus* from the National Tropical Botanical Garden on Kaua'i but the photos were of poor quality and no specimens were collected for analysis. Our search for additional species of this interesting group of fungi in the Hawaiian Islands continues.

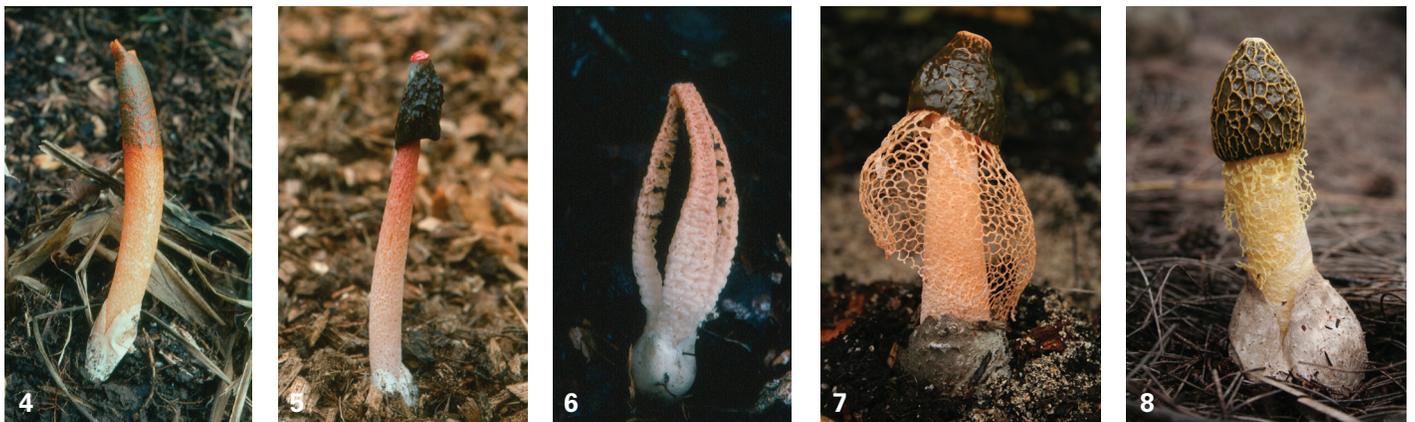


Figure 4. *Mutinus elegans* frequents well-manured agricultural areas. Figure 5. This fruiting body of *Phallus rubicundus*, and many more like it, appear in senior-citizen gardens in Manoa Valley on Oahu. Figure 6. The best description of the odor of *Pseudocolus fusiformis* is fresh pig manure. Figure 7. *Phallus cinnabarinus*, with its elegant cinnabar-colored indusium, fruits on lawns and in wood chip piles on the windward side of Hawai'i Island. Figure 8. *Phallus multicolor* at Mackenzie Park on Hawai'i Island.

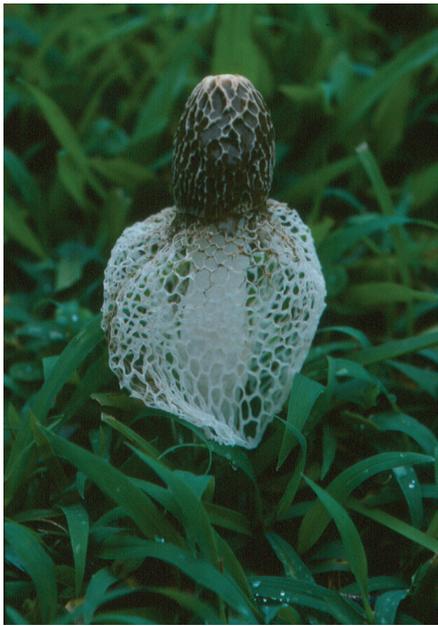


Figure 9. A fruiting body of *Phallus cinnabarinus* with a white indusium.



Figure 10. A fruiting body of *Phallus multicolor* with a near white indusium.



Figure 11. A newly found *Phallus* that closely resembles *Phallus* (= *Dictyophora*) *atrovolvatus* described from Costa Rica. Note that the white indusium on *Dictyophora atrovolvatus* extends to no more than one-half of the length of the stipe.



Figure 12. A *Protuberata* sp. from the Koke'e region of Kaua'i.

Table 1

Genus/species	Location
<i>Aseroë arachnoidea</i>	H
<i>Aseroë rubra</i>	H,K,L,Ma,Mo,O
<i>Clathrus columnatus</i>	K
<i>Clathrus oahuensis</i>	O
<i>Phallus atrovolvatus</i>	H
<i>Phallus cinnabarinus</i>	H
<i>Phallus multicolor</i>	H
<i>Phallus rubricundus</i>	H,O
<i>Mutinus bambusinus</i>	H
<i>Mutinus elegans</i>	H
<i>Pseudocolus fusiformis</i>	H,K
<i>Protuberata</i> sp.	K

Key:

H =	Hawai'i Island	Ma =	Maui
K =	Kaua'i	Mo =	Moloka'i
L =	Lana'i	O =	Oahu

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