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NEW DISTRIBUTIONAL RECORDS OF *SCAPTOMYZA* (*BUNOSTOMA*) *AUSTRALIS* FROM SOUTH PACIFIC ISLANDS AND BIOGEOGRAPHIC IMPLICATIONS

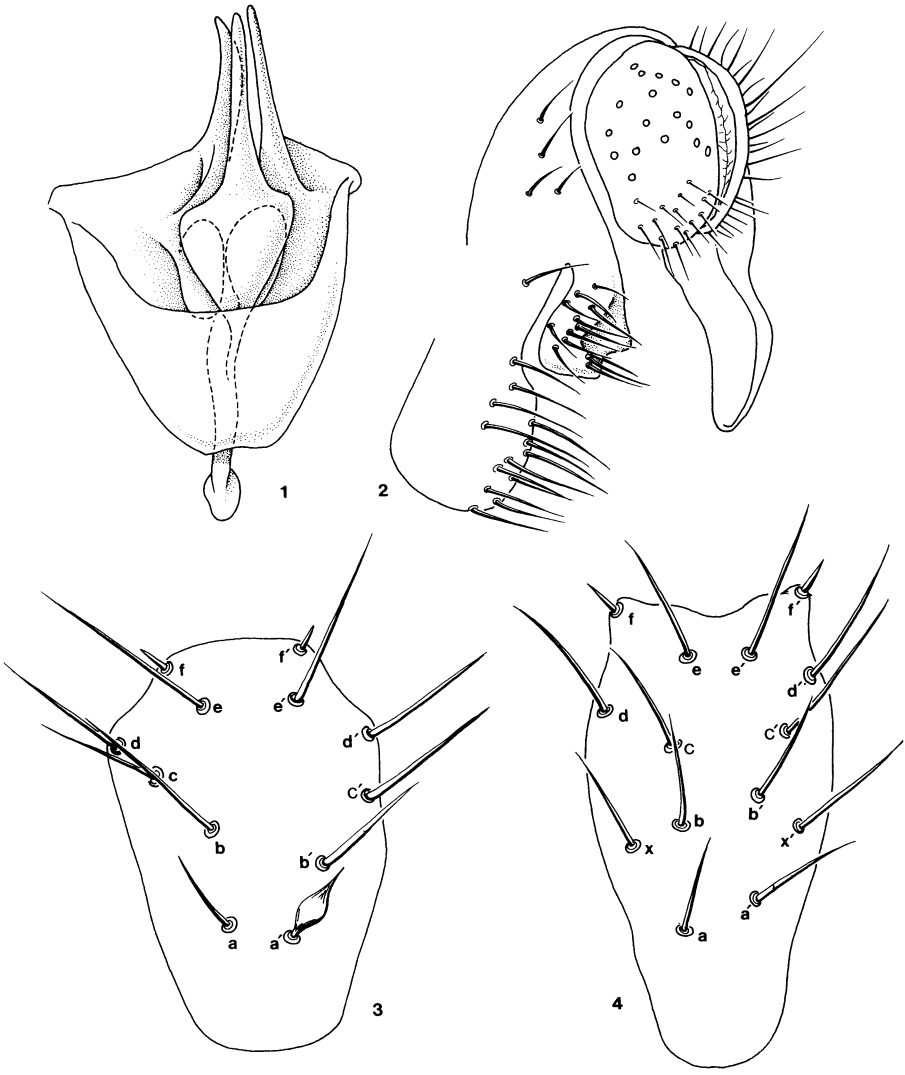
DAVID GRIMALDI

Department of Entomology, The American Museum of Natural History, Central Park West at 79th St., New York, New York 10024-5192

Abstract.—*Scaptomyza australis* Malloch is a common species widespread throughout Australia, and most recently reported as well from Norfolk Island, ca. 900 miles off the east coast of Australia. It is reported for the first time from Pitcairn Island and Tanna, Vanuatu, which extend the range considerably east and north, respectively. Male genitalia of the Pitcairn specimens is described, and slight variation in sternite 8 of the female is documented. The distribution and monophyly of the subgenus *Bunostoma* is briefly discussed, with particular regard to the endemic Hawaiian fauna.

In his large monograph treating the Australian drosophilid fauna, Bock (1977) documented numerous records of *Scaptomyza australis,* ranging from Western Australia to Queensland. He also mentioned that the species is an ecological generalist, and is found in most habitats with the exception of rain forest, but prefers open, sclerophyllic habitats. Later, he reported a large series from Norfolk Island, a possession of Australia about 500 miles south of New Caledonia and about 1,000 miles northeast of Sydney (Bock, 1986). During curation of unsorted drosophilids in the AMNH collection I came upon a specimen collected in Vanuatu (New Hebrides), from Tanna Island, about 700 miles north of Norfolk Island. As a result of recent collecting by Wayne Mathis, of the Smithsonian Institution, 2 additional specimens were discovered on Pitcairn Island. Pitcairn is extremely isolated from other, larger islands and lies approximately 5,000 miles east of Sydney.

Specimen data of the important new records are as follows: PITCAIRN ISLAND: 25°04′S, 130°06′W, Adamstown, 22–26 May, 1987, W. N. Mathis, 1 male, 1 female (genitalia of both dissected by DAG) (in NMNH, Smithsonian Institution); NEW HEBRIDES (VANUATU): Tanna, Lenakel, 0–200 m, March, 1980, N. L. H. Krauss, 1 female (genitalia dissected by DAG) (in AMNH). I examined dissected preparations of specimens from New South Wales, Australia for comparative purposes, but did not examine material from Norfolk Island. Only very slight variation was found in the genitalic and other morphology among specimens from these three localities, and the small series from the islands precluded estimating whether or not such variation is consistent. Figures 1 and 2 show the genitalia of the male specimen from Pitcairn, which is indistinguishable from the genitalia of Australian specimens. The only difference found was that the fine setulae on the ventral margin of the cercus were more numerous in this specimen (15) versus that in the Australian specimens (9–11).



Figs. 1–4. Genitalia of *Scaptomyza australis* from newly discovered distributions. 1. Male: hypandrium, aedeagus, and associated structures, dorsal view (Pitcairn Is.). 2. Male: epandrium, cercus, oblique terminal view (same specimen as in Fig. 1). 3. Female: sternite 8 (Pitcairn Is.). 4. Female: sternite 8 (Vanuatu).

Some obvious variation was found in female sternite 8, which, in most drosophilines is divided into 2 lateral plates and connected anteriorly by a narrow bridge (all of it being the oviscapt). Most species in the subgenus *Bunostoma,* including *S. australis,* have a simple, undivided, setose sternite 8 (Figs. 3, 4). This is undoubtedly a reduction in the groundplan of the drosophiline oviscapt (Grimaldi, 1990), and appears to be correlated in various unrelated drosophilids with the loss of prensisetae

Table 1. *Scaptomyza australis* measurements and counts.

	Australia (NSW)	New Hebrides	Pitcairn
Males			
Ventral lobe of epandrium: no. setae	18–19	—	17/18
	(N = 3)	—	(N = 1)
Ventro-mesal lobe of epandrium: no. setae	14–15	—	13/14
Ventral margin of cercus: no. setulae	9–11	—	15
Thorax length (mean)	0.80 mm	—	0.71
Wing length (mean)	1.96	—	1.60
Females			
Sternite 8: no. setae	11–12	12	10
	(N = 3)	(N = 1)	(N = 1)
Thorax length (mean)	0.97	0.76	0.85
Wing length (mean)	2.26	1.71	1.83
Both sexes: wing indices			
Costal index (mean)	4.70	3.55	3.70
4-V index (mean)	1.61	1.69	1.68

pegs in the male (surstylus), which is also another feature of *Bunostoma.* Pegs on the female and male terminalia are no doubt functionally related. In the Pitcairn female, sternite 8 had 10 setae, and the specimens from Australia and Vanuatu had 11–12 (Fig. 4). Some Australian specimens had asymmetrically arranged pairs of setae, as indicated in the drawing by Bock (1977). The Pitcairn female apparently lacked the supernumerary pair of setae (marked "*x*" in Fig. 3), and possessed an aberrant, scale-like seta in pair *a.* Wing indices and other meristic data are shown in Table 1.

The broad ecological tolerance of *S. australis* obviously accounts for the origin and/or maintenance of the widespread distribution of this species. It is interesting to note that the species is very common on the continent, but apparently rather rare on the South Pacific Islands. This is based not only on the number of museum specimens, but also the manner in which they were collected. For example, Krauss typically collects by sweep netting vegetation in open areas, which yielded very many chloropids in the sample in which the specimen from Vanuatu was found. This is a fauna always associated with *Scaptomyza* elsewhere in the world. Thus, it is conceivable that regimes of insular versus continental population-level processes have influenced the relative abundances.

As indicated by the two male and female genitalic apomorphies (reductions) mentioned above, the subgenus *Bunostoma* is unarguably monophyletic. Other male genitalic features support this fact: the ventral lobe of the epandrium is long (broad in lateral view) and with long setae; long thin lobes flank the distiphallus, which I consider to be the gonopods; paraphyses (parameres) are small and globose, at the base of the aedeagus and gonopods; the aedeagus is thin, cylindrical, straight (with a small apical hook in *S. boninensis* Okada), simple (without vestiture), and usually extended to the level of the gonopod apices. The diagnostic features for *Bunostoma* given by Hackman (1959) are very general but still do not apply to *S. australis* and some other *Bunostoma.* The diagnosis I have given has interesting biogeographic

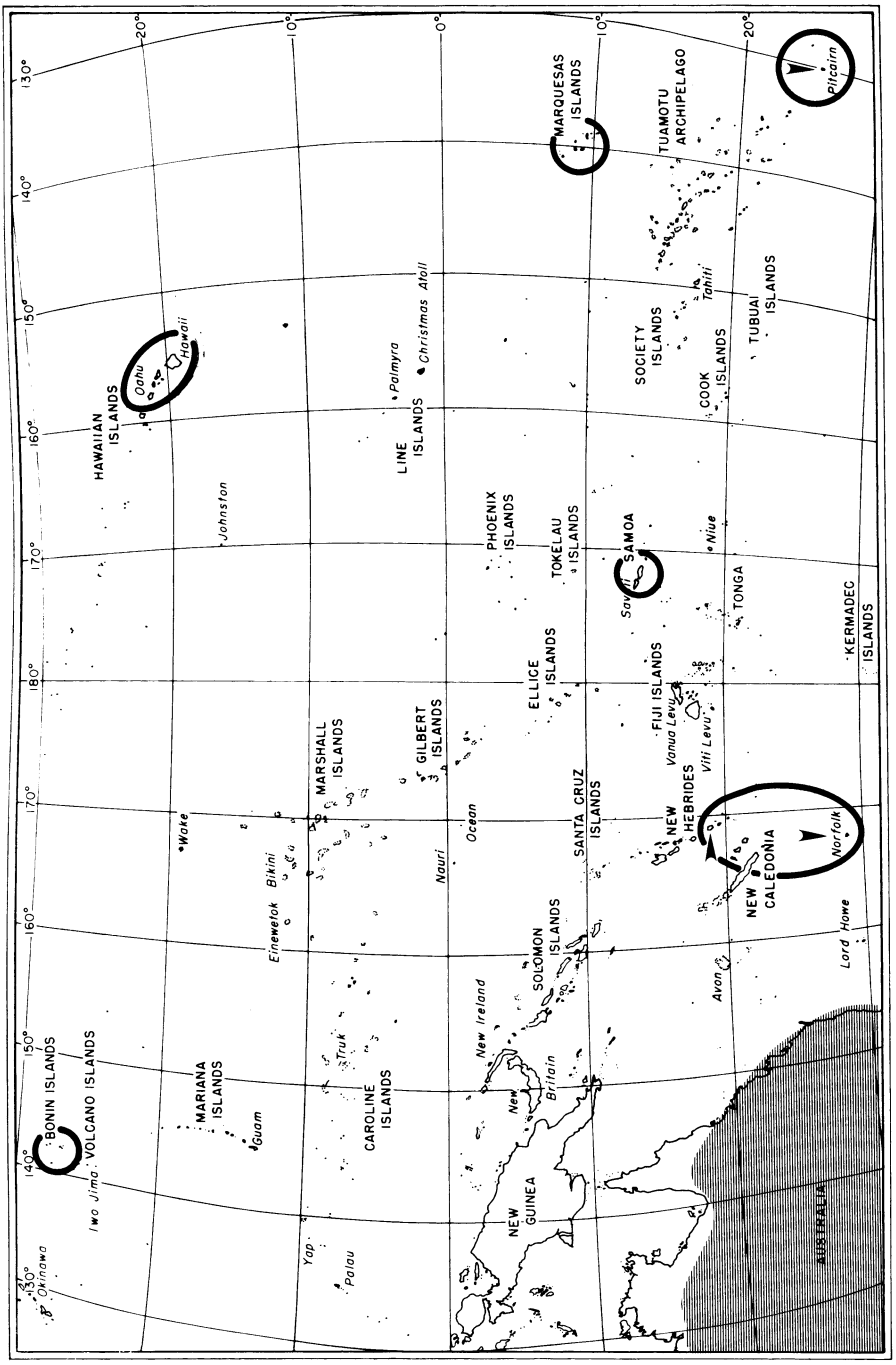


Fig. 5. Map showing a portion of the distribution of *Scaptomyza australis* in Australia (stippling) and the presently known distribution in South Pacific islands (arrows). The bold outlines circumscribe the known distribution of subgenus *Bunostoma*.

implications, since it includes 8 species endemic to Hawaii, and the geographic and phylogenetic relationships of the explosively radiated Hawaiian fauna have remained rather obscure.

Bunostoma presently includes the following species or groups of species: *bicolor* Malloch (Samoa), *boninensis* Okada (Bonin Is.), *philipensis* Bock (Norfolk and nearby Philip Island), *flavifacies* (Malloch) (Marquesas Is.), 8 species from Hawaii (Hardy, 1965), and perhaps *flavella* Harrison and *fuscitarsis* Harrison (both from New Zealand). I, like Hackman, have not examined the two New Zealand species, and Harrison's descriptions are based only on the external male genitalia, not the internal ones. Wheeler (1981) placed these two species in *Scaptomyza* subgenus incertae *sedis,* but Hackman (1982) indicated (on dubious morphological grounds, I feel) that they may be *Bunostoma.* Still, the undisputed sister species of *S. australis* is *S. philipensis,* based on male genitalic features. The male genitalia of these species are remarkably similar to that of *S. anomala* from Hawaii.

I have not examined enough *Bunostoma* species to determine if the Hawaiian species are monophyletic. Unlike Hackman (1962) I don't maintain that *Bunostoma* is the most plesiomorphic group of *Scaptomyza* (Grimaldi, 1990), and, unlike Okada (1973), I don't maintain that the Hawaiian *Scaptomyza* are monophyletic. Prior to the discovery of these three wide-ranging *S. australis* specimens, the notion of biogeographic affinities of Hawaiian species with Australian taxa might have seemed improbable because of distances alone. It is now more plausible that some of the Hawaiian *Scaptomyza* fauna have a southern affinity.

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