

Ants (Hymenoptera: Formicidae) of Samoa¹

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Abstract: The ants of Samoa have been well studied compared with those of other Pacific island groups. Using Wilson and Taylor's (1967) specimen records and taxonomic analyses and Wilson and Hunt's (1967) list of 61 ant species with reliable records from Samoa as a starting point, we added published, unpublished, and new records of ants collected in Samoa and updated taxonomy. We increased the list of ants from Samoa to 68 species. Of these 68 ant species, 12 species are known only from Samoa or from Samoa and one neighboring island group, 30 species appear to be broader-ranged Pacific natives, and 26 appear to be exotic to the Pacific region. The seven-species increase in the Samoan ant list resulted from the split of Pacific *Tetramorium guineense* into the exotic *T. bicarinatum* and the native *T. insolens*, new records of four exotic species (*Cardiocondyla obscurior*, *Hypoponera opaciceps*, *Solenopsis geminata*, and *Tetramorium lanuginosum*), and new records of two species of uncertain status (*Tetramorium* cf. *grassii*, tentatively considered a native Pacific species, and *Monomorium* sp., tentatively considered an endemic Samoan form).

SAMOA IS AN ISLAND CHAIN in western Polynesia with nine inhabited islands and numerous smaller, uninhabited islands. The western four inhabited islands, Savai'i, Apolima, Manono, and 'Upolu, are part of the independent country of Samoa (formerly Western Samoa). The eastern five inhabited islands, Tutuila, Aunu'u, Ofu, Olosega, and Ta'u, are part of American Samoa, an unincorporated territory of the United States.

The ants of Samoa have been well studied compared with those of other Pacific

island groups, prompting Wilson and Taylor (1967:4) to feel "confident that a nearly complete faunal list could be made for the Samoan Islands." Samoa is of particular interest because it is one of the easternmost Pacific island groups with a substantial endemic ant fauna. Wilson and Taylor (1967:1) concluded that "few if any ant species are native to the islands east of Rotuma, Samoa, Tonga, and New Zealand. This part of Polynesia has been populated by tramp species" (i.e., species that associate with humans and are spread by human commerce).

In this study, we combine published, unpublished, and new records from Samoa, increasing the list of ants known from Samoa to 68 species.

Published Records

Wilson and Taylor (1967) summarized published records for ants from Samoa. In addition, they reported new ant specimens collected in Samoa by Sweeney and Zimmerman in 1940, by Woodward in 1956, and by Taylor in 1962. Wilson and Taylor (1967) indicated (in their table 2) that there were 59 ant species recorded from Samoa. Wilson and Hunt (1967), however, listed 61 ant species from Samoa, and we used this second list as a

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starting point, with one exception. We used *Pachycondyla insulana* (Mayr) (formerly *Ectomomyrmex insulanus* Mayr) listed by Wilson and Taylor (1967), instead of *Ectomomyrmex samoanus* (a name not found in Bolton 1995; apparently a typographical error) listed by Wilson and Hunt (1967).

Wilson and Hunt's (1967) list increased to 62 when Bolton (1977) separated Pacific specimens of two taxa that Wilson and Taylor (1967) had synonymized, *Tetramorium guineense* (Bernard) and *Tetramorium guineense macrum* Emery, recognizing the former as an exotic from Southeast Asia, *Tetramorium bicarinatum* (Nylander), and the latter as a Pacific native, *Tetramorium insolens* (Smith). Bolton (2000) reclassified Samoan specimens listed by Wilson and Taylor (1967) as *Smithistruma dubia* Brown [now *Pyramica karawajewi* (Brown)] as a new species, *Pyramica epipola* Bolton. This species is known only from Samoa, but Bolton (2000) thought that it was likely to occur elsewhere in the Pacific.

The 62 ant species with specimens documented in Wilson and Taylor (1967) are listed in Tables 2 and 3 (updated taxonomy from Bolton 1995, 2000). The following 12 species names differ from those used by Wilson and Taylor (1967) (in parentheses): *Anoplolepis gracilipes* (Smith) (*A. longipes*), *Cerapachys biroi* Forel (*Syscia silvestrii*), *Monomorium liliuokalanii* Forel (*M. minutum*), *Monomorium sechellense* Emery (*M. fossulatum*), *Pachycondyla insulana* (*Ectomomyrmex insulanus*), *Pachycondyla stigma* (Fabricius) (*Trachymesopus stigma*), *Pyramica epipola* (*Smithistruma dubia*), *Pyramica membranifera* (Emery) (*Trichoscapa membranifera*), *Rogeria stigmatica* Emery (*R. sublevinodis*), *Strumigenys emmae* (Emery) (*Quadristruma emmae*), *Tetramorium bicarinatum* (*T. guineense*), and *Tetramorium insolens* (*T. guineense*).

Dlussky (1994a,b,c) reported on ants collected during a 1980 visit to Samoa by the Soviet research ship *Kallisto*, adding a new record of one additional species, *Hypoconera opaciceps* (Mayr), raising the number of Samoan ants to 63 species. Although not included in his paper, G. M. Dlussky (pers. comm.) provided us with collection information for these ants (see Results).

Published Records Excluded from Wilson and Hunt's (1967) List

Kami and Miller (1998) compiled a checklist of Samoan insects that included 78 ant taxa, 16 more than the list of 62 in the preceding section derived from records in Wilson and Taylor (1967). In this extremely useful summary of Samoan records, Kami and Miller (1998:i) stated that "in some cases it is clear that the names were misapplied," and this appears to be true of a number of ant records. Of the 16 additional taxa on Kami and Miller's (1998) list, eight were duplicate records, seven were records that Wilson and Taylor (1967) considered but dismissed as doubtful, and one taxon Wilson and Taylor (1967) did not consider (Table 1). Only two of these 16 species [*Solenopsis geminata* (Fabricius) and *Tetramorium lanuginosum* Mayr] are known from elsewhere in Polynesia, and both have been subsequently found in Samoa (see Results).

DUPLICATE RECORDS. Kami and Miller's (1998) checklist included eight pairs of duplicate records, where Samoan specimens were identified as one species, then reidentified as another, but both names were included on the list (name considered valid for Samoan specimens in parentheses): *Camponotus conitborax* Emery (= *C. flavolimbatus* Viehmeyer), *Camponotus novaehollandiae* Mayr (= *C. chloroticus* Emery), *Camponotus rufifrons leucopus* Emery (= *C. flavolimbatus*), *Cerapachys typhlus* (Roger) (= *C. biroi* Forel), *Hypoconera convexiuscula* (Forel) [= *H. confinis* (Roger)], *Monomorium monomorium* Bolton (= *M. liliuokalanii*), *Odontomachus haematodus* (L.) (= *O. simillimus* F. Smith), and *Pheidole tene-riffana* Fore [= *P. megacephala* (Fabricius)].

Wilson and Taylor (1967) reclassified *Camponotus* specimens from Samoa previously identified as *C. novaehollandiae*, *C. conitborax* var. *nautarum*, and *C. rufifrons leucopus*: the first as *C. chloroticus* and the other two as *C. flavolimbatus*. Taylor (1967a:91) wrote that *Syscia typhla* Roger (now *Cerapachys typhlus*) was "known under various names from China, Nepal, Okinawa, Hawai'i, Samoa and Puerto Rico (Wilson and Taylor mss)." Wilson and Taylor (1967), however, used the

TABLE 1
Previously Published Samoan Ant Records Listed in Kami and Miller (1998), but Not Included in
Wilson and Hunt (1967)

Species	Known Regional Range			Status of Samoan Records Based on Wilson and Taylor (1967)
	West Pacific ^a		Polynesia ^b	
	AI	MCSNVF	WSTNCFH	
<i>Camponotus conithorax</i> Emery	--	----V-	-?------	= <i>C. flavolimbatus</i>
<i>Camp. flavomarginatus</i> Mayr	--	-----	-?------	Doubtful
<i>Camp. novaeollandiae</i> Mayr	A-	--SN--	-?------	= <i>C. chloroticus</i>
<i>Camp. rufifrons leucopus</i> Emery	--	---N--	-?------	= <i>C. flavolimbatus</i>
<i>Cerapachys typhlus</i> (Roger)	--	-----	-?------	= <i>C. biroi</i>
<i>Euprenolepis stigmatica</i> (Mann)	--	--S---	-?------	Doubtful
<i>Hypoponera convexiuscula</i> (Forel)	A-	-----	-?------	= <i>H. confinis</i>
<i>Iridomyrmex rufoniger</i> (Lowne)	A-	-----	-?------	Probably erroneous
<i>Monomorium monomorium</i> Bolton	--	-----	-?------	= <i>M. liliuokalanii</i>
<i>Odontomachus baematodus</i> (L.)	--	-----	-?------	= <i>O. simillimus</i>
<i>Oecophylla smaragdina</i> (Fabricius)	AI	---S---	-?------	Doubtful
<i>Pheidole teneriffana</i> Forel	--	-----	-?------	= <i>P. megacephala</i>
<i>Rhytidoponera metallica</i> (Smith)	A-	-----	-?------	Probably erroneous
<i>Solenopsis geminata</i> (Fabricius)	AI	MCSN-F	-ST-CFH	Not considered
<i>Tapinoma wheeleri</i> (Mann)	--	-----	-?------	Not from Samoa
<i>Tetramorium lanuginosum</i> Mayr	AI	MCS---	WST-CF-	Ephemeral

^a A, Australia; I, Indomalaysia; M, Mariana Islands; C, Caroline Islands; S, Solomon Islands; N, New Caledonia; V, Vanuatu; F, Fiji.

^b W, Wallis and Futuna; S, Samoa; T, Tonga; N, Niue; C, Cook Islands; F, French Polynesia; H, Hawai'i.

name *Syscia silvestrii* Forel (now *Cerapachys biroi*) for specimens from Nepal, Okinawa, Hawai'i, and Samoa, writing that W. L. Brown Jr. had examined the type of *C. typhus* and determined that it was a separate species. Wilson and Taylor's (1967) figure for *Syscia silvestrii* is labeled as *Syscia typhla*, an error reflecting their previous identification. Wilson and Taylor (1967) synonymized the Samoan form of *Hypoponera convexiuscula* (described as *Ponera trigona convexiuscula nautarium* Forel), making it a junior synonym of *Hypoponera confinis*. Bolton (1987) established *Monomorium monomorium* as a replacement name for *Monomorium minutum* Mayr. Bolton (1987), however, examined Pacific samples (from Samoa and Hawai'i) that had been assigned to *Monomorium minutum* and found that they were a separate species, *Monomorium liliuokalanii*. Many authors listed *Odontomachus baematodus* from Pacific locales, but Wilson and Taylor (1967:32) assigned all Polynesian *Odontomachus* specimens to *O. simillimus*, writing "*O. simillimus* is a native Indo-Australian species distinct from the

Neotropical *O. baematodus*." Santschi (1919) listed *Pheidole teneriffana* (identified by G. Arnold), but not *P. megacephala*, from Samoa, an opinion he repeated in Buxton and Hopkins (1927). But Santschi (1928) did not list this species, indicating that he dismissed the earlier identification. Wilson and Taylor (1967) concluded that *P. teneriffana* listed by Santschi (1919) was actually *P. megacephala*.

DOUBTFUL RECORDS. Wilson and Taylor (1967) considered "very doubtful" the Samoan record of *Paratrechina stigmatica* Mann [now *Euprenolepis stigmatica* (Mann)], a Solomon Island endemic, based on a single "incomplete" specimen from 'Upolu (Santschi 1928) (Table 1). Wilson and Taylor (1967: 100) questioned Mayr's (1876) record of the Australian *Rhytidoponera metallica* (Smith) as a "probably erroneous record," speculating "if the labeling was correct in the first place, the Samoan *metallica* population was undoubtedly introduced from Australia, and was probably ephemeral in nature" (p. 21). Wilson and Taylor (1967:80) suspected that *Zatapinoma wheeleri* Mann [now *Tapinoma*

wheeleri (Mann)], a species known only from a single soldier listed as "taken in quarantine at Honolulu on plants from Samoa" (Mann 1935), actually did not originate in Samoa. Wilson and Taylor (1967:70) listed *Triglyphotbrix striatidens* (Emery) (now *Tetramorium lanuginosum* Mayr), collected by Swale labeled "Apia 1000 ft" with no date, as "based on a single worn specimen taken many years ago: the species has not been recorded from the islands since, despite intensive collecting" (specimen housed at the American Museum of Natural History, see Results). Finally, Wilson and Taylor (1967) listed three other species with records from Samoa in an appendix of doubtful records. All three were species that were listed but apparently not examined by Santschi (1919, 1928): *Campopnotus flavomarginatus* Mayr, *Iridomyrmex rufoniger* (Lowne), and *Oecophylla smaragdina* (Fabricius).

NOT CONSIDERED. Wilson and Taylor (1967) did not consider one valid taxon with a published record from Samoa (Table 1). Santschi (1919, 1928) listed (but apparently did not examine) *Solenopsis geminata rufa* (Jerdon) (now *Solenopsis geminata*) collected on 'Upolu by H. Swale and identified by G. Arnold.

MATERIALS AND METHODS

In addition to published records of ants from Samoa, we searched for undocumented ant specimens from Samoa in the collections of several museums: the National Museum of Natural History (NMNH) in Washington, D.C.; the American Museum of Natural History (AMNH) in New York; and the Museum of Comparative Zoology (MCZ) in Cambridge, Massachusetts.

From 13 June to 12 August 1995, J.K.W. collected ants on eight inhabited islands: Savai'i, 'Upolu, Tutuila, Ta'u, Ofu, Alleges, Manono, and Aunu'u, and on eight smaller uninhabited islands: Namu'a (east of 'Upolu), Nu'usetoga (north of Tutuila), Nu'utele (west of Ofu), Tauga (also called Camel Rock or Ma'a Kamela, south of Tutuila), Futi (part of Fatumafuti, south of Tutuila), Albatross Island (north of 'Upolu), Nu'upulu (east of

Savai'i), and a very small sand islet next to Nu'usetoga (north of Tutuila). (Note: there is a second small Samoan island also named Nu'utele, east of 'Upolu.) J.K.W. also collected ants on a ferry between 'Upolu and Savai'i. J.K.W. collected by visual search, turning over rocks and logs, stripping the bark off logs, and breaking the logs apart.

From 1998 to 2002, D.L.V. collected ants on Tutuila, Ta'u, and Taputapu (west of Tutuila).

RESULTS

From museum and new specimens, we added five additional species to the list of Samoan ants: *Cardiocondyla obscurior* Wheeler, *Monomorium* sp., *Solenopsis geminata*, *Tetramorium* cf. *grassii*, and *Tetramorium lanuginosum*, raising the number to 68 species. We present Samoan records here for eight ant species not included on Wilson and Hunt's (1967) list (one species split into two plus six newer records).

Cardiocondyla obscurior Wheeler

Savai'i: Asau, in dead branches and strays (J.K.W., 10 July 1995); up forestry road near Mt. 'Elietoga, in logs and under moss on logs (J.K.W., 11–12 July 1995).

'Upolu: Tiavi Falls overlook, in dead branches (J.K.W., 5 July 1995).

Tutuila: Mapusaga, strays around house (J.K.W., 16 June 1995); northwest side of Mt. Matafao, on and in tree (J.K.W., 22 July 1995).

Albatross Island (north of 'Upolu): top of island 15 m, in log (J.K.W., 30 June 1995).

Cardiocondyla obscurior is an Old World tramp species that may be a recent arrival in Samoa. This species is often misidentified as another tramp, *C. wroughtonii*, but may be distinguished from that species based on coloration and discriminant function analysis (B. Seifert, unpubl. data). These two species also show ecological differences, with *C. obscurior* being more arboreal and *C. wroughtonii* more subterranean (S. Cover, pers. comm.). *Cardiocondyla obscurior* has not been recognized previously from the Pacific. However, B. Seifert (pers. comm.) has also identified

specimens from Hawai'i and the Mariana Islands as belonging to this species.

Other authors have recorded *Cardiocondyla wroughtonii* in Hawai'i, including Wilson and Taylor (1967) and Wetterer (1997a). The specimens collected by Wetterer (1997a), however, turned out to be a mix of *C. wroughtonii* and *C. obscurior* (B. Seifert, pers. comm.). Recent surveys have also recorded *C. wroughtonii* in the Cook Islands (Morrison 1997) and French Polynesia (Morrison 1996a,b, 1997). It seems likely that some of these specimens are actually *C. obscurior*.

Hypoponera opaciceps (Mayr)

Upolu: Faisefooa (G. M. Dlussky, August 1980).

Ta'u: Tunoa Ridge, under moss on cliff and under rocks (J.K.W., 28 July 1995).

Aunu'u: Ma'ama'a Cove, oceanside strays (J.K.W., 19 June 1995).

Apolima: no site (G. M. Dlussky, August 1980).

Dlussky (1994a) reported this ant from Samoa but did not include the collection data given here. *Hypoponera opaciceps* is considered a pantropical tramp species originating in the neotropics. It is often overlooked because it is generally subterranean.

Wilson and Taylor (1967) listed this ant in Hawai'i and French Polynesia, and more recent surveys have also found this species in Tonga (Wetterer 2002), the Cook Islands (Morrison 1997), and French Polynesia (Morrison 1996a,b, 1997).

Monomorium sp.

Aunu'u: swamp by Pala Lake, in log (J.K.W., 15 June 1995).

These specimens did not match any *Monomorium* known from Samoa or surrounding island groups. We tentatively consider it an endemic Samoan form, despite the fact that we found these ants only on a small, highly disturbed island. This is not the same species as the undescribed *Monomorium* from Tonga listed by Wetterer (2002). Brian Heterick, at the California Academy of Sciences, is currently evaluating the status of both these *Monomorium* species.

Solenopsis geminata (Fabricius)

Tutuila: Fagaalu Beach (D.L.V., 20 May 2002).

Santschi (1928) listed the tropical fire ant, *Solenopsis geminata*, from Samoa, but it seems unlikely that this very conspicuous ant could have maintained a population in Samoa for the past 70 yr without being recorded. Our new record may represent a recent invasion.

Solenopsis geminata, native to the neotropics, is an invasive pest in many parts of the Pacific, including the neighboring archipelagos of Fiji, Tonga, and the Cook Islands. Whether this ant becomes a pest in Samoa remains to be seen.

Tetramorium bicarinatum (Nylander)

Savai'i: Asau (N. L. H. Krauss, March 1977, in AMNH); 1 km above Vaiola, 300 m, in log (J.K.W., 11 August 1995); Salelologa by road (J.K.W., 12 August 1995); Maota, under moss on log (J.K.W., 12 August 1995).

Upolu: Apia (H. Swale, in Bolton 1977); Apia (P. A. Buxton & Hopkins, 1946, in Bolton 1977); Malololelei (P. A. Buxton, 1946, in Bolton 1977); Afiamalu (O. H. Swezey, 1940, in Bolton 1977); Tapatapao (O. H. Swezey, 1940, in Bolton 1977); Tapatapao (E. C. Zimmerman, 1940, in Bolton 1977); Mulivai (N. L. H. Krauss, January 1978, in AMNH); Apia (N. L. H. Krauss, February 1979, in AMNH).

Tutuila: Pago Pago (W. M. Wheeler, in Bolton 1977); no site (E. C. Zimmerman, 1940, in Bolton 1977); Mapusaga, strays and under rocks around houses (J.K.W., 16 June 1995); Mapusaga, forest, in logs and epiphytes (J.K.W., 19–21 June 1995); Larson's Bay, strays on beach (J.K.W., 17 June 1995); Utulei (J.K.W., 21 June 1995); Mt. Alava, 495 m, under moss on logs and trees (J.K.W., 8 August 1995).

Ta'u: above Faleasao, in yard, 100 m, strays (J.K.W., 24 July 1995); Fitiuta, in logs and strays (J.K.W., 25 July 1995); Tunoa Ridge, 50 m, in logs (J.K.W., 25 July 1995); Tunoa Ridge, 110 m, strays (J.K.W., 25 July 1995); Tunoa Ridge, 250 m, under moss on cliff (J.K.W., 28 July 1995); Si'u, in log on beach (J.K.W., 27 July 1995).

Ofu: top of Mt. Tumutumu, 462 m,

around concrete platform (J.K.W., 31 July 1995).

Olosega: above Lamaga Point, 100 m, strays (J.K.W., 1 August 1995); Lalomano, in banana field (J.K.W., 1 August 1995).

Aunu'u: SW island, between town and school, strays on vegetation (J.K.W., 19 June 1995).

Namu'a: island edge, strays (J.K.W., 28 June 1995).

Nu'utele: near the top 50 m, in logs (J.K.W., 3 August 1995).

Albatross Island: top of island, in logs (J.K.W., 30 June 1995).

Ferry between 'Upolu and Savai'i (J.K.W., 9 July 1995).

Rose Island: (L. P. Schultz, 15 June 1939, in NMNH).

This species has no doubt been established in Samoa for at least 50 yr. Bolton (1977) listed several *Tetramorium bicarinatum* specimens from Samoa, including some listed by Wilson and Taylor (1967) as *Tetramorium guineense* specimens (* = in Wilson and Taylor 1967). *Tetramorium bicarinatum* is considered exotic to the Pacific region but is now widespread throughout the area (Bolton 1977).

Tetramorium cf. *grassii*

Nu'upulu: strays on vine (J.K.W., 13 July 1995).

Tetramorium grassii is considered native to South Africa, and the only previous Pacific records come from New Zealand. The Samoa specimens matched specimens collected in New Zealand well, but did not perfectly match specimens from South Africa. Thus, we believe the Pacific form may be a separate species, which we tentatively consider native to the Pacific, despite having found it only on a very small and very disturbed island.

Tetramorium insolens (Smith)

Savai'i: Palauli (N. L. H. Krauss, February 1955, in MCZ*); Asau (N. L. H. Krauss, March 1977, in AMNH); above Vaiola, in log (J.K.W., 11 August 1995).

'Upolu: Afiamalu (E. C. Zimmerman, June 1940, in MCZ*); Malololei Road (E. C. Zim-

merman, July 1940, in MCZ*); no site (Buxton & Hopkins, 1946, in Bolton 1977).

Tutuila: Fagasa (T. Fulloway, August 1930, in Bolton 1977*); Pago Pago (E. C. Zimmerman, 8 August 1940, in MCZ*); top of Mt. 'Alava, under moss on logs and trees (J.K.W., 8 August 1995).

Santschi (1928) and Wheeler (1935) listed *Tetramorium guineense macrum* (now *Tetramorium insolens*) from Samoa based on specimens collected by Bryan in 1924. Bolton (1977) listed several *Tetramorium insolens* specimens from Samoa, including some listed by Wilson and Taylor (1967) as *Tetramorium guineense* specimens (* = in Wilson and Taylor 1967).

Tetramorium insolens is considered native to the Pacific region. In Polynesia, this species is also known from Tonga (Wetterer 2002), Niue (Taylor 1967b), and Wallis and Futuna (Bolton 1977).

Tetramorium lanuginosum Mayr

Savai'i: Salelologa plantation, under rocks (J.K.W., 12 August 1995).

'Upolu: "Apia 1000 ft" (H. Swale, no date, in AMNH); Lauli'i (T. E. Woodward, January 1956, in MCZ).

Tutuila: Mapusaga, under rocks around house (J.K.W., 16 June 1995); Mapusaga forest, in logs and strays (J.K.W., 18, 20, & 21 July 1995); PX by airport, strays (J.K.W., 17 June 1995); Utulei, strays in Rainmaker Hotel garden (J.K.W., 21 July 1995).

Ofu: Fatuana Point, strays on trees (J.K.W., 30 July 1995).

Aunu'u: dock area at tuna bait and strays (J.K.W., 15 & 19 June 1995); 0.5 km E of school, sweep sample of grass (J.K.W., 19 June 1995).

Namu'a: island edge, strays (J.K.W., 28 June 1995).

Nu'utele: east shore, strays on shore (J.K.W., 3 August 1995).

Nu'usetoga: south cliffs, strays on rocks (J.K.W., 22 June 1995).

Tauga: under rocks and grass roots (J.K.W., 21 June 1995).

Albatross Island: top of island, in logs (J.K.W., 30 June 1995).

Tetramorium lanuginosum is considered a pantropical tramp. Wilson and Taylor (1967) dismissed Swale's record, but we found another early record, from 1956, and we also collected it on nine different islands, primarily in highly disturbed areas. This suggests that *T. lanuginosum* has been in Samoa for many years but perhaps recently expanded its populations.

Wilson and Taylor (1967) listed this ant (as *Triglyphobrix striatidens*) in Polynesia from the Cook Islands and the Line Islands. Additional Polynesian records for this species now include Wallis and Futuna (Bolton 1976), Tonga (Wetterer 2002), and French Polynesia (Morrison 1997).

DISCUSSION

There are now reliable records for 68 ant species from Samoa, more than any other island group in Polynesia. Of these 68 species, 12 species are known only from Samoa or from Samoa and one neighboring island group, 30 species appear to be broader-ranged Pacific natives, and 26 appear to be exotic to the Pacific region (Tables 2 and 3).

Local Endemic Ant Species in Samoa

Of the 12 local endemic ant species in Samoa (Table 3), 10 are known only from Samoa and two are known only from Samoa and one neighboring island group: *Vollenbovia samoensis* Mayr (also Tonga [Wetterer 2002]) and *Strumigenys mailei* Wilson & Taylor (also Fiji [Wilson and Taylor 1967]).

Native Pacific Ant Species in Samoa

Following the classification system of Wilson and Hunt (1967), 30 of the ant species known from Samoa are wide-ranging Pacific natives, though it is not possible to determine reliably which of these species are actually native to Samoa (i.e., predating humans) and which are more recent arrivals from other parts of the Pacific. Two of these species had been classified by Wilson and Hunt (1967) as Samoan

endemics, but now are known to have wider ranges. *Camponotus navigator* Wilson has also been found on Pohnpei in the Caroline Islands, Micronesia (R. Clouse and M. Deyrup, unpubl. data), and *Ponera loi* Taylor was collected in the Mariana Islands, Micronesia [= *Ponera* sp. A in Terayama et al. (1994) and J.K.W. and Bourquin, unpubl. data].

Four ant species that are native to the western Pacific region have invaded other parts of the world. One such "Pacific-native tramp" is *Technomyrmex albipes* (Smith), the "white-footed" ant, which is now found as an exotic in many areas including New Zealand, Hawai'i, California, Florida, South Africa, India, China, Madagascar, and Saudi Arabia (Wilson and Taylor 1967, Wetterer 1997a, 1998, McGlynn 1999). In addition, *Tetramorium tonganum* Mayr is an exotic in Hawai'i and Brazil; *Tetramorium pacificum* Mayr is in Florida, Canada, Central America, and the Caribbean; and *Odontomachus simillimus* is in the Caribbean (McGlynn 1999).

Dlussky (1994a) classified Pacific ant species using a different system than Wilson and Taylor (1967) and Wilson and Hunt (1967), according to proposed geographical origins, but was not explicit about which species predated human arrival in Polynesia. Dlussky (1994a) classified the 30 wide-ranging Pacific natives of Samoa as two Samoan endemics, two regional endemics, eight species of New Guinean origin, three of Asian origin, 11 pantropical species of Asian origin, three not classified due to taxonomic changes, and one not considered because it was not known from Samoa at the time (Table 2). Again, the two Samoan endemics listed here now should be considered regional endemics due to their greater known ranges.

Exotic Ant Species in Samoa

According to the classifications of Wilson and Hunt (1967), 26 ant species found in Samoa are alien tramp species not native to the Pacific, but brought to the region by human commerce.

Dlussky (1994a) classified the exotic ant species found in Samoa as seven pantropical

TABLE 2

Native Pacific Ants of Samoa, Plus Known Records from Well-Sampled Locales in the West Pacific and Polynesia

Species	Known Regional Range ^a			Status ^b
	West Pacific		Polynesia	
	AI	MCSNVF	WSTNCFH	
Local Endemics				
<i>Adelomyrmex samoanus</i> Wilson & Taylor	--	-----	-S-----	ES
<i>Camponotus flavolimbatus</i> Viehmeyer	--	-----	-S-----	ES
+ <i>Monomorium</i> sp.	--	-----	-S-----	o
* <i>Pachycondyla insulana</i> (Mayr)	--	-----	-S-----	ES
<i>Pheidole aana</i> Wilson & Taylor	--	-----	-S-----	ES
<i>Pheidole atua</i> Wilson & Taylor	--	-----	-S-----	ES
<i>Ponera woodwardi</i> Taylor	--	-----	-S-----	ES
* <i>Pyramica epipola</i> Bolton	--	-----	-S-----	**
<i>Rogeria exsulans</i> Wilson & Taylor	--	-----	-S-----	ES
<i>Strumigenys mailei</i> Wilson & Taylor	--	-----F	-S-----	RE
<i>Vollenbovia pacifica</i> Wilson & Taylor	--	-----	-S-----	ES
<i>Vollenbovia samoensis</i> Mayr	--	-----	-ST-----	ES [^]
Indo-Pacific Natives				
<i>Anochetus graeffei</i> Mayr	AI	MCSNVF	WST-CF-	PO
<i>Camponotus chloroticus</i> Emery	-I	MCSNVF	WSTN---	PO
<i>Camponotus navigator</i> Wilson	--	-C----	-S-----	ES [^]
<i>Cryptopone testacea</i> Emery	-I	-CS---	-S-----	OR
<i>Eurhopalothrix procera</i> (Emery)	AI	-CS---	-S-----	OR
<i>Hypoponera confinis</i> (Roger)	-I	-C--VF	-ST-CF-	PO
* <i>Monomorium liliuokalanii</i> Forel	--	MC----	-STNCFH	**
<i>Monomorium talpa</i> Emery	-I	-CS-VF	-STNCF-	NG
<i>Odontomachus simillimus</i> F. Smith	-I	MCSNVF	WSTN-F-	PO
<i>Oligomyrmex atomus</i> Emery	-I	--S--F	WST-----	NG
<i>Paratrechina minutula</i> Forel	AI	-CS-VF	-S-----	PO
<i>Pheidole oceanica</i> Mayr	AI	MCSNVF	WSTNCF-	NG
<i>Pheidole sexspinosus</i> Mayr	-I	-CS-V-	WSTN-F-	NG
<i>Pheidole umbonata</i> Mayr	-I	MCSNVF	WSTNCF-	NG
<i>Platythyrea parallela</i> (Smith)	AI	M-S---	-S---F-	OR
<i>Ponera incerta</i> (Wheeler)	-I	-CS-V-	-ST-----	PO
<i>Ponera loi</i> Taylor	--	M-----	-S-----	ES [^]
<i>Ponera swezeyi</i> (Wheeler)	--	-----	-S---FH	RE
<i>Ponera tenuis</i> (Emery)	-I	MC----	-STN---	NG
<i>Prionopelta kraepelimi</i> Forel	-I	-----	-S-----	PO
* <i>Rogeria stigmatica</i> Emery	-I	-CSNVF	WSTNCF-	**
<i>Solenopsis papuana</i> Emery	-I	-CS--F	WST-CFH	NG
<i>Strumigenys godeffroyi</i> Mayr	AI	MCSNVF	WSTNCFH	PO
<i>Strumigenys szalayii</i> Emery	AI	-CS-V-	-S-----	NG
<i>Tapinoma minutum</i> Mayr	AI	MCS--F	WSTN-F-	PO
<i>Technomyrmex albipes</i> (Smith)	AI	MCSNVF	WSTNCFH	PO
+ <i>Tetramorium</i> cf. <i>grassii</i>	--	-----	-S-----	o
* <i>Tetramorium insolens</i> (Smith)	AI	-CSNVF	WSTN---	**
<i>Tetramorium pacificum</i> Mayr	AI	-CSNVF	WSTNCF-	PO
<i>Tetramorium tonganum</i> Mayr	-I	MCS-VF	WSTNCFH	RE

* Documented by Wilson and Taylor (1967) under a different name.

+, Not documented by Wilson and Taylor (1967).

^a Symbols as in Table 1.^b ES, Samoa endemic; ES[^], changed status due to increased known range; RE, regional endemic; PO, pantropical of Asian origin; OR, Asian origin; NG, New Guinean origin; o, not included in Dlussky (1994a); **, taxonomic status changed since Dlussky (1994a).

TABLE 3
Exotic Ants of Samoa, Plus Known Records from Well-Sampled Locales in the West Pacific and Polynesia

Exotics	Known Regional Range ^a			Status ^b
	West Pacific		Polynesia	
	AI	MCSNVF	WSTNCFH	
* <i>Anoplolepis gracilipes</i> (Smith)	AI	MCSNVF	WSTNCFH	PA/PO
<i>Brachymyrmex obscurior</i> Forel	--	-----	-S----H	PN
<i>Cardiocondyla emeryi</i> Forel	-I	M----F	WSTNCFH	PA
<i>Cardiocondyla nuda</i> (Mayr)	AI	MCS--F	WSTNCFH	PA
+ <i>Cardiocondyla obscurior</i> Wheeler	--	M-----	-S--??H	o
* <i>Cerapachys biroi</i> Forel	--	M-----	-S----H	**
+ <i>Hypoponera opaciceps</i> (Mayr)	--	---N-F	-ST-CFH	PN
<i>Hypoponera punctatissima</i> (Roger)	A-	MCSNVF	WSTN-FH	PA
<i>Monomorium destructor</i> (Jerdon)	AI	M-----	-S-NCFH	PA
<i>Monomorium floricola</i> (Jerdon)	AI	MCSNVF	WSTNCFH	PO
<i>Monomorium pharaonis</i> (L.)	AI	MCS-VF	-ST--FH	PO
* <i>Monomorium secbellense</i> Emery	-I	MC----	-ST-C-H	**
* <i>Pachycondyla stigma</i> (Fabricius)	AI	-CS--F	-S-----	PN
<i>Paratrechina bourbonica</i> Forel	--	MCSN-F	WSTNCFH	PO
<i>Paratrechina longicornis</i> (Latr.)	AI	MCSNVF	WSTNCFH	PO
<i>Paratrechina vaga</i> (Nylander)	AI	MCSN-F	WSTNCFH	PO
<i>Pheidole fervens</i> Smith	-I	MC-N-F	-ST-CFH	OR
<i>Pheidole megacephala</i> (Fabricius)	AI	MC--VF	WSTNCFH	PA
* <i>Pyramica membranifera</i> (Emery)	-I	MCS--F	WST--FH	PA
+ <i>Solenopsis geminata</i> (Fabricius)	AI	MCSN-F	-ST-CFH	PN
* <i>Strumigenys emmae</i> (Emery)	AI	M-SNV-	-ST--FH	PA
<i>Strumigenys rogeri</i> Emery	-I	MCSNVF	WSTN-FH	PA
<i>Tapinoma melanocephalum</i> (Fabricius)	AI	MCSNVF	WSTNCFH	PO
* <i>Tetramorium bicarinatum</i> (Nylander)	AI	MCSNVF	WST-CFH	**
+ <i>Tetramorium lanuginosum</i> Mayr	AI	MCS---	WST-CF-	PO
<i>Tetramorium simillimum</i> (Smith)	AI	MCSNVF	WSTNCFH	PA

^a Symbols as in Table 1.

^b PA, pantropical of African origin; PN, pantropical of neotropical origin; PO, pantropical of Asian origin; OR, Asian origin; o, not included in Dlussky (1994a); **, taxonomic status changed since Dlussky (1994a).

species of Asian origin, 10 pantropical species of African origin, four pantropical species of neotropical origin, and one species of Asian origin, three not classified due to taxonomic changes, and one not considered because it was not known from Samoa at the time (Table 3). Although Wilson and Taylor (1967) and Dlussky (1994a) considered *Anoplolepis gracilipes* to be from Africa, this species is more likely to be native to tropical Asia (J.K.W., unpubl. data).

It is striking that only four exotic ant species in Samoa are of New World origin: *Brachymyrmex obscurior* Forel, *Hypoponera opaciceps*, *Pachycondyla stigma* (Fabricius), and *Solenopsis geminata*. This, no doubt, relates to not only geographic proximity and ocean

currents but also traditional trade routes. Certainly in the future, more arrivals of ants from the New World can be expected.

Future of the Samoan Ant Fauna

A number of widespread native and exotic ants known from the Pacific have not yet been recorded from Samoa (e.g., *Plagiolepis alluaudi* Emery known from many parts of the Pacific, including Samoa's neighbors Tonga, Niue, and the Cook Islands). One destructive tramp ant known in the Pacific that has not yet been found in Samoa is *Wasmannia auropunctata* (Roger). *Wasmannia auropunctata*, native to the neotropics, has become established in several Pacific island groups, in-

cluding the Galápagos (Clark et al. 1982), Wallis and Futuna (Gutierrez 1981 in Jourdan 1997), New Caledonia (Jourdan 1997), the Solomon Islands (Fabres and Brown 1978), and most recently Vanuatu (Rapp 1999) and Hawai'i (Anonymous 1999). In areas where it invades, *Wasmannia auropunctata* can be an important agricultural pest, both due to its painful sting and through enhancing populations of Homoptera (Spencer 1941). In addition, *Wasmannia auropunctata* has direct negative impacts on native invertebrates and vertebrates (Fabres and Brown 1978, Lubin 1984, Jourdan 1997, Wetterer 1997b, Wetterer et al. 1999).

The ants of Samoa are perhaps the best-studied ant fauna in the Pacific. Still, we do not believe that our list is complete. We expect that more endemic Samoa ant species await discovery, particularly in the relatively unexplored and undisturbed highlands of Savai'i, Tutuila, and Ta'u.

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