

# ANNOTATED CHECKLIST OF THE VASCULAR PLANTS ON MIDWAY ATOLL, HAWAII

Prepared by:  
Forest Starr, Kim Starr, and Lloyd Loope  
United States Geological Survey  
Haleakala Field Station  
Contact: [fstarr@hawaii.edu](mailto:fstarr@hawaii.edu)

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## ANNOTATED CHECKLIST OF VASCULAR PLANTS ON MIDWAY ATOLL, HAWAII

The following annotated checklist includes detailed information on all of the vascular plants known from Midway Atoll, Hawai'i. This annotated checklist is a product of a botanical survey done by Forest Starr & Kim Starr over the course of three months in the spring-summer of 1999, and is meant to compliment our earlier report (Starr, F. and K. Martz. 1999. Botanical Survey of Midway Atoll: 1999 Update. In: 1995-1999 Baseline Surveys for Alien Species in Marine and Terrestrial Habitats on Midway Atoll National Wildlife Refuge. U.S. Fish and Wildlife Service, Honolulu, Hawaii.).

Wagner *et al.* (1999) was used as the source for nomenclature, distribution, and status in Hawai'i. Valier (1995) and Wilson (1996) were used for fern descriptions. Neal (1965) was also used, especially for information on cultivated species. Information specific to distribution on Midway was gathered from previous botanical surveys, including our survey in 1999, specimens at Bishop Museum, and from literature searches.

Included here in the following order are pteridophytes, gymnosperms, monocotyledons and dicotyledons. These are further broken down (in alphabetical order) by family name then by scientific name. The scientific name is followed by a common and/or Hawaiian name. The status of the plant on Midway Atoll at the time of the survey is in parenthesis and is abbreviated as follows. Cultivated species are denoted as (cult). Naturalized species are denoted as (nat). Native species which are indigenous to the Hawaiian Islands are denoted as (ind). Native species which are endemic to the Hawaiian Islands are denoted as (end). Extinct species are denoted as (ex). Unknowns are denoted as (?).

Synonyms used in previous surveys of Midway Atoll are listed first and are enclosed in brackets[ ]. The next information included in the species account is place of origin, general distribution in the world, and distribution in Hawai'i. This information is then followed by previous records of the species from Midway Atoll, beginning with the notes from the earliest records, ending with the notes from this survey (the most recent records). Cultivated species that were previously not recorded before this survey are denoted as "New cultivated record to Midway Atoll". Naturalized species that were previously not recorded before this survey denoted as "New island record to Midway Atoll" and are listed with a collection number and the publication source. Most of the new naturalized records were published in the *Bishop Museum Occasional Papers*. If the species was not published, it is noted as such. Lastly, any miscellaneous notes are listed.

This report and other information about the plants of Midway Atoll can be found at ([www.hear.org/starr](http://www.hear.org/starr)).

## PTERIDOPHYTES

### DICKSONIACEAE (Tree fern family)

Cibotium sp. – Hawaiian tree fern, hapu'u -- (cult)

Endemic to the main Hawaiian Islands, but not native to Midway, this large fern was previously reported from Midway (Herbst and Wagner 1992), but not observed in the 1995 (Bruegmann 1998) or 1999 botanical inventories. Midway is probably too dry for hapu'u to do well.

### NEPHROLEPIDACEAE (Sword fern family)

Nephrolepis hirsutula (G. Forst) C. Presl 'Superba'-- Scaly sword fern -- (cult)

Known from Australia, Asia, Fiji, and central Polynesia (Wilson 1996), Apfelbaum *et al.* (1983) are the only observers to report this fern from Midway Atoll. It has not been seen before or since, and could have either died out or been a misidentification of N. multiflora.

Nephrolepis multiflora (Roxb.) F.M. Jarrett ex C.V. Morton – Sword fern -- (cult)

Native to India and tropical Asia (Wilson 1996), this hardy fern often escapes from cultivation in the main Hawaiian islands and was first collected on Midway Atoll by S. Conant (*Conant 122 BISH*) in 1983 growing on the defunct water tank at the old greenhouse of the abandoned Pan American Hotel on Sand Island. Considered rare in 1995 by Bruegmann (1998), in 1999, this fern was still rare, being sparingly cultivated in residential areas and the commercial sport fishing huts.

### POLYPODIACEAE (Common fern family)

Phymatosorus grossus (Langsd. and Fisch.) Brownlie – Laua'e -- (cult)

[Phymatosorus scolopendria (J. Burm.) Ching] Native to the Old World Tropics (Valier 1995), in Hawai'i, this fern grows readily on rocks, trees, or the forest floor, especially in disturbed areas of second growth. It thrives from salt-swept boulder beaches to shaded lowland forests (Valier 1995). This fern was previously reported from Midway (Herbst and Wagner 1992), but was not observed in the 1995 (Bruegmann 1998) or 1999 botanical inventories.

### PSILOTACEAE (Psilotum family)

Psilotum nudum (L.) P. Beauv. – Moa -- (ind)

Native to the main Hawaiian Islands and apparently native to Midway, this fern ally was first reported by Christophersen and Caum (1931) as sparingly present in the sand near the center of Sand Island in 1923. Moa has not been observed on Midway Atoll since then.

## GYMNOSPERMS

### ARAUCARIACEAE (Araucaria family)

Araucaria heterophylla (Salisb.) Franco – Norfolk Island pine -- (cult)  
[Araucaria excelsa R. Br.] Native to Norfolk Island (Neal 1965), and cultivated in Hawai'i, Neff and Dumont (1955) note "A few fine specimens [of this pine-like tree] are growing in the old Cable Company compound area and on the lawns of a few officers' quarters, Sand Island." Observed in 1979 (Apfelbaum et al. 1983) and 1995 (Bruegmann 1998), in 1999, the trees were quite large, occurring in the same localities described by Neff and DuMont (1955).

### CUPRESSACEAE (Cypress family)

Cupressus sp. – Cypress tree -- (cult)  
About 12 species of the genus Cupressus are known from western North America, Mexico, and southeastern Europe to China (Neal 1965). Several of these are cultivated in the Hawaiian Islands. On Midway, two individuals of an unknown species of Cupressus persist on Sand Island. Previously reported by Apfelbaum et al. (1983) and Bruegmann (1998), during this survey, we observed one tree by the Clipper House restaurant and one tree by the marine barracks. According to Neal (1965), trees of this type can sometimes live for centuries. If fertile material is found, it should be collected to determine which species this is.

### CYCADACEAE (Cycad family)

Cycas circinalis L. – Sago palm, cycad -- (cult)  
Native to tropical Asia and some islands in the Pacific (Neal 1965), this palm like tree is cultivated in Hawai'i and was first noted on Midway by Apfelbaum et al. (1983) and later by Bruegmann (1998). In 1999, this large, branching cycad was cultivated in the residential and town areas of Sand Island.

Cycas revoluta Thunb. – Sago palm -- (cult)  
Native to China and Japan (Neal 1965), this smaller usually non-branching version of C. circinalis is also cultivated in the Hawaiian Islands and was previously known from Midway (Herbst and Wagner 1992), but was not observed by Bruegmann (1998) or during this survey.

## MONOCOTYLEDONS

### AGAVACEAE (Agave family)

#### Agave attenuata Salm-Dyck. -- Agave -- (cult)

Native to Central Mexico (Brickell and Zuk 1997), and cultivated in Hawai'i, this soft, succulent, cactus-like plant is also cultivated in the residential area of Sand Island. This observation represents a new cultivated record for Midway Atoll.

#### Agave sisalana Perrine – Sisal, malina, sisal hemp -- (nat)

Native to Yucatan, Mexico, and widely cultivated in tropical areas, in Hawai'i, this large succulent with spiny leaf tips was originally introduced as a commercial fiber crop, and is now locally naturalized in dry sites on all of the main islands except Ni'ihau (Wagner *et al.* 1999). On Midway, Neff and DuMont (1955) report "Occasional plants...occur on Sand Island in the residential and administrative area." Also noted by Apfelbaum *et al.* (1983) and Bruegmann (1998), in 1999, there were two main patches of sisal on Sand Island, one in the southwest corner and the other on the dunes behind Pavilion beach. About a dozen plants were found in each spot, all of which were removed during this survey.

#### Cordyline fruticosa (L.) A. Chev. – Ti -- (cult)

Native range unknown, but possibly indigenous to the Himalayas, southeastern Asia, Malesia, and northern Australia. In Hawai'i, this widely used plant is considered a Polynesian introduction, is extensively cultivated, and occurs widely on all of the main islands except Kaho'olawe (Wagner *et al.* 1999). On Midway, ti was first noted by Hadden (1941) then again by Apfelbaum *et al.* (1983). In 1999, we observed this plant sparingly cultivated around some of the residences.

#### Cordyline sp. -- (cult)

Reported from Midway by Herbst and Wagner (1992). The only Cordyline species seen during this survey was C. fruticosa.

#### Dracaena fragrans (L.) Ker-Gawl. -- Fragrant dracaena -- (cult)

Native to Tropical Africa (Dehgan 1998), and cultivated in Hawai'i. During this survey, D. fragrans was cultivated on Sand Island in pots or tubs in the housing area and the hangar on Sand Island. This collection (*Starr and Martz 990518-2, 990518-3* BISH) represents a new cultivated record for Midway Atoll.

#### Dracaena marginata Lam. -- Money tree -- (cult)

Native to Madagascar (Dehgan 1998), and cultivated in Hawai'i. On Midway, this small tree is cultivated in pots and tubs in the housing area and the hangar on Sand Island. This collection (*Starr and Martz 990518-1* BISH) represents a new cultivated record to Midway Atoll.

#### Dracaena sp. -- (cult)

There are previous references to a Dracaena sp. at Midway (Hadden 1941; Apfelbaum *et al.* 1983, Herbst and Wagner 1992), but no indication as to which species it may have been. In addition, during this survey we observed an as yet unidentified variety of Dracaena which has smaller leaves packed closely together that we called 'pineapple' in the hangar entrance on Sand Island.

Sansevieria trifasciata Prain. -- Mother in law tongue, snake plant -- (nat)  
Native to tropical Africa (Dehgan 1998), Sansevieria is cultivated in Hawai'i and is naturalized on at least the islands of O'ahu (Imada *et al.* 2000). There are previous references to a Sansevieria sp. and S. trifasciata at Midway (Hadden 1941; Apfelbaum *et al.* 1983, Bruegmann 1998). It is currently cultivated in many areas of Sand Island including cross point, the hangar, and the residences, where it is persisting and spreading vegetatively. This species has yet to be collected and published as a new island record for Midway Atoll.

#### ALOEACEAE (Aloe family)

Aloe vera (L.) Burm. -- Aloe -- (cult)  
[Aloe barbadensis Mill.] Widespread in tropical and subtropical regions (Brickell and Zuk 1997), this spiny succulent is widely cultivated in Hawai'i as a medicinal plant and is naturalized on at least the island of Kaua'i (Lorence *et al.* 1995). On Midway, aloe was previously reported by Apfelbaum *et al.* (1983), Bruegmann (1998), and is currently cultivated in the residential and harbor areas of Sand Island.

Unknown sp. -- (cult)  
An unidentified succulent plant with spines similar to Agave or Aloe aristata was observed in the residential area of Sand Island. The determination still needs to be made, but this is probably a new cultivated record for Midway Atoll as nothing similar to this plant has been previously recorded from the atoll.

#### ARACEAE (Taro family)

Alocasia cucullata (Lour.) Schott -- Chinese taro -- (cult)  
From India (Neal 1965), this plant was recorded from Midway by Apfelbaum *et al.* (1983), but has not been seen before or since. We did not observe this species in 1999.

Alocasia macrorrhiza (L.) Schott -- 'Ape -- (nat)  
Occurring from India and Sri Lanka through southeastern Asia to Polynesia, cultivated widely in the tropics and used as a famine food in some areas (Wagner *et al.* 1999). In Hawai'i, cultivated and now naturalized in low elevation mesic valleys, primarily along streams or in other wet sites (Wagner *et al.* 1999). Previously not recorded from Midway, we observed this plant persisting in gardens and near the galley. This observation represents a new cultivated record for Midway Atoll.

Anthurium andraeanum Lind. -- Anthurium -- (cult)

Native to Columbia (Dehgan 1998) and cultivated in Hawai'i, this plant was recorded from Midway Atoll by Apfelbaum et al. (1983), but has not been recorded in any other survey, including this one.

Caladium bicolor (Aiton) Vent. – Caladium -- (cult)

Native to tropical America (Neal 1965). In Hawai'i, this plant is cultivated for its variegated heart shaped leaves (Neal 1965). On Midway, noted as rare in 1995 (Bruegmann 1998), the only time it has been recorded from Midway. Not seen in 1999.

Colocasia esculenta (L.) Schott – Taro -- (cult)

Cultivated since ancient times in the tropics and subtropics of the Old World, and later in the warmer regions of the New World and islands in the Pacific. In Hawai'i, brought by the Polynesians and used as one of the principal foods (Neal 1965). On Midway, recorded in 1979 by Apfelbaum et al. (1983), and again in 1995 by Bruegmann (1998). Not observed in 1999.

Dieffenbachia sp. – Dumb cane -- (cult)

Plants from the warm parts of America (Neal 1965). In Hawai'i, cultivated both indoors and outside (Neal 1965). On Midway, first recorded by Hadden (1941) then again by Apfelbaum et al. (1983). In 1999, it was cultivated in pots in the housing area and the hanger.

Epipremnum pinnatum (L.) – Golden pothos, taro vine -- (cult)

[Raphidophora aurea (Linden and Andre) Bunt.]. Native to Malaysia (Neal 1965). In Hawai'i, cultivated as a vine, sometimes climbing on trees (Neal 1965). On Midway, previously recorded by Apfelbaum et al. (1983). During this survey, planted in housing area, the hanger, and the cable house buildings. The abandoned greenhouse at the cable buildings is covered with this vine.

Monstera deliciosa Liebm. – Monstera -- (cult)

Native to tropical America, one of the more common species of Monstera cultivated in Hawai'i (Neal 1965). On Midway, historically known from literature (Herbst and Wagner 1992) and observed by Bruegmann (1998). During this survey, cultivated in housing area of Sand Island.

Philodendron sp. – Philodendron -- (cult)

Native to tropical America, these climbers are cultivated in Hawai'i for their foliage (Neal 1965). Historically known from literature (Herbst and Wagner 1992). Observed in 1995 as rare on Sand Island (Bruegmann 1998). It was not observed in 1999.

Syngonium podophyllum Schott – Syngonium -- (cult)

Native to tropical America, these climbers are cultivated in Hawai'i for their distinctive palmate foliage (Neal 1965). On Midway, previously recorded in 1979 (Apfelbaum et al. 1983) and in 1995 (Bruegmann 1998). During this survey, cultivated in the housing area of Sand Island.

Syngonium sp. -- Syngonium -- (cult)

An unidentified species of Syngonium was observed in 1999. No previous reference to other species of Syngonium are recorded. This specimen was observed as occasional on Sand Island. Collections still need to be made to determine the proper identification.

Xanthosoma sp. – ‘Ape -- (cult)

Native to tropical America and West Indies (Neal 1965), the tubers of this plant are used as food in native regions, and in Hawai'i are cultivated mainly for ornament (Neal 1965). Noted by Apfelbaum *et al.* (1983). Not observed since.

#### ARECACEAE (Palm family)

Cocos nucifera L. – Coconut -- (cult)

Native origin is unknown, but probably somewhere on the shores of the Indian Ocean (Neal 1965). One of the most well known palms in the world, brought to Hawai'i by the Polynesians, and currently used mostly for ornament (Neal 1965). On Midway, first reported by Hadden (1941) and again by Neff and DuMont (1955) from Sand Island where this pantropical palm was planted by the Cable Company and also the Pan-American Company. Also recorded in 1979 (Apfelbaum *et al.* 1983), and in 1995 (Bruegmann 1998). In 1999, we observed many mature trees, mainly around residential Sand Island. Fruits occasionally hit albatrosses (young and adults) and injure or kill them. Because of this, coconut fruits are currently being harvested before they fall off naturally.

Phoenix sp. – Date palm -- (cult)

Native probably to North Africa or India (Neal 1965). Cultivated in Hawai'i and used for many purposes. Phoenix palms were first recorded by Hadden (1941). A number of Phoenix palms of no specific type were also observed by Neff and DuMont (1955) among Cable and Pan-American plantings and lawns of residences. Recorded in 1979 (Apfelbaum *et al.* 1983) and in 1995 (Bruegmann 1998). However, no Phoenix palms were observed by us in 1999.

Pritchardia sp. – Loulu -- (cult)

A genus of 33 or more species with 26 of these native to Hawai'i, the remainder from Fiji and the Tuamotus (Neal 1965). On Midway, first recorded in 1979 (Apfelbaum *et al.* 1983). Also reported by Bruegmann (1998). In 1999, we observed a few mature trees by the gooney statue and the Midway House. It is not known which species of Pritchardia these palms may be.

Roystonea sp. – Royal palm -- (cult)

Native to southern Florida and Cuba (Neal 1965). Cultivated in Hawai'i. On Midway, previously recorded in 1979 (Apfelbaum *et al.* 1983), but not since then. Not observed in 1999.



Veitchia merrillii (Becc.) H. E. Moore -- Manila palm - (cult)

Native to the Philippines and becoming widely planted for its neat compact habit (Jones 1995), this palm is cultivated in Hawai'i (Neal 1965) and was previously not known from Midway. This collection (*Starr and Martz 990510-3 BISH*) in the town area of Sand Island represents a new cultivated record for Midway Atoll.

#### BROMELIACEAE (Bromeliad family)

Ananas comosus (L.) Merr. -- Pineapple -- (cult)

Native to tropical America and cultivated in Hawai'i for its fruits (Neal 1965). Previously not recorded from Midway Atoll, we observed this edible plant being cultivated on Sand Island. This observation represents a new cultivated record for Midway Atoll.

#### CANNACEAE (Canna family)

Canna indica L. -- Canna -- (cult)

Native of central tropical South America, probably and early introduction to Hawai'i where it is cultivated as an ornamental (Neal 1965). On Midway, recorded as early as 1979 (Apfelbaum *et al.* 1983). Also observed in 1995 (Bruegmann 1998). During this survey, cultivated in the residences where it persists.

#### COMMELINACEAE (Spiderwort family)

Commelina diffusa N.L. Burm. -- Honohono -- (nat)

Native to the Old World tropics, first collected in Hawai'i in 1837, now often forming a conspicuous part of ground cover in disturbed wet areas, known from Midway Atoll and all the main islands except Ni'ihau and Kaho'olawe (Wagner *et al.* 1999). St. John apparently observed this species in 1935 (Neff and DuMont 1955). It has not been observed since. Not observed in 1999.

Dichorisandra thyrsiflora Mikan. -- Blue ginger -- (cult)

This ornamental was only observed once on Midway, where it was found growing in the abandoned greenhouse at the old Pan Am Hotel (Conant 1983).

Tradescantia pallida (Rose) D. Hunt -- Day flower, purple heart -- (cult)

Trailing perennial producing ascending purple stems, native to Mexico (Brickell and Zuk 1997). Cultivated as a groundcover in Hawai'i. On Midway, previously observed in 1979 (Apfelbaum *et al.* 1983) and in 1995 (Bruegmann 1998). During this survey, cultivated in residential area on Sand Island. Collected (*Starr and Martz 990429-8 BISH*).

Tradescantia spathacea Sw. -- Oyster plant, Moses-in-the-cradle -- (cult)

[Rhoeo spathacea (Sw.) Stearn]. Clump forming perennial with rosettes of semi-erect, linear leaves, dark green above and deep purple beneath, native to Central America (Brickell and Zuk 1997). Cultivated in Hawai'i. On Midway, previously observed in 1979 (Apfelbaum *et al.* 1983) and in 1995 (Bruegmann 1998). During this survey,

cultivated in containers and near buildings in the residential areas, the new sport fishing operations, the abandoned marine barracks, and the hanger.

Tradescantia zebrina Bosse -- Wandering jew -- (cult)

Trailing perennial, leaves silver green above and purple beneath, native to S. Mexico (Brickell and Zuk 1997). Cultivated in Hawai'i. Newly naturalized to Kaua'i (Lorence and Flynn 1997). On Midway, previously observed in 1979 (Apfelbaum *et al.* 1983) and in 1995 (Bruegmann 1998). Observed to be rare to occasional on Sand Island during this survey.

CYPERACEAE (Sedge family)

Cyperus involucratus Rottb. – Umbrella plant -- (nat)

[C. alternifolius L. ssp. flabelliformis]. A recent taxonomic change (Herbst and Wagner 1999; Strong and Wagner 1997). Native to tropical Africa, Madagascar, Mauritius, and the Mascarene Islands, often cultivated as an ornamental in greenhouses, in Hawai'i cultivated and naturalized in marshy areas and along streams on Midway Atoll, Kaua'i, Oahu, Maui, and Hawai'i (Wagner *et al.* 1999; Imada *et al.* 2000). On Midway, first collected in 1954 (Neff and DuMont 34 BISH) who noted "two or three densely grown clumps were seen under old ironwoods near the Cable Company compound, a few small plantings about residences, on Sand Island only." Collected in 1979 by Apfelbaum (1983), and numerous other workers (Herbst and Takeuchi 6387 BISH; Meagher *s.n.* BISH; Lamoureux 2276, 2300 BISH). Noted to be rare in 1995 by Bruegmann (1998). In 1999, observed in moist areas, often under ironwood, including the site described by Neff and DuMont (1955), on Sand Island, occasionally forming monotypic stands that ground nesting birds are unable to penetrate. Currently being treated with herbicide.

Cyperus javanicus Houtt. – 'Ahu'awa -- (ind)

[Mariscus javanicus (Houtt.) Merr. and Metcalfe]. Recent taxonomic name change. Mariscus not recognized (Wagner *et al.* 1999; Strong and Wagner 1997; Tucker 1994). Native to tropical Africa and Asia. In Hawai'i, common in moist sites on Midway and all of the main islands except Kaho'olawe (Wagner *et al.* 1999). For Midway, first listed by St. John in 1935 (Neff and DuMont 1955). Observed again in 1995 (Bruegmann 1998). Not observed in 1999. No collections have ever been made from Midway.

Cyperus papyrus L. - Papyrus -- (cult)

Native to eastern tropical Africa and Madagascar (Wagner *et al.* 1999). In Hawai'i cultivated in water gardens and sparingly naturalized on at least Kaua'i and Hawai'i (Wagner *et al.* 1999; Staples *et al.* 2003). Only observed once in 1979 (Apfelbaum *et al.* 1983). No collections have ever been made. Not observed in 1999.

Cyperus polystachyos Rottb. – Sedge -- (ind)

[Pycreus polystachyos (Rottb.) P. Beauv. ssp. polystachyos]. Recent taxonomic name change. Pycreus and subspecies not recognized (Wagner *et al.* 1999; Herbst and Wagner 1999; Tucker 1994). Native to tropical and subtropical regions worldwide. In Hawai'i,

known from Midway and all the main islands except Kaho'olawe (Wagner *et al.* 1999). There are no early collections or observations (that we are aware of) for this species on Midway. Known to occur on Midway by at least 1990 (Wagner *et al.* 1999). Observed in 1995 by Bruegmann (1998). In 1999 we observed this weedy sedge in moist areas on Sand Island, especially near the dump pond, but also on the margins of runways.

Cyperus rotundus L. – Nutgrass, purple nut sedge -- (nat)

A cosmopolitan weed, naturalized in Hawai'i on Kure, Midway, French Frigate Shoals, Ni'ihau, Kaua'i, O'ahu, Lana'i, Moloka'i, Maui, and Hawai'i (Wagner *et al.* 1999; Strong and Wagner 1997; Hughes 1995). On Midway, Neff and Dumont (1955) collected this sedge in 1954 (*Neff and Dumont 44* BISH) and noted it to be "locally abundant on both Sand and Eastern Islands, mostly along the margins of runways, along edges of paved roads, and near foundations of larger buildings where run-off of rainfall apparently controls its distribution". Recorded in 1979 (Apfelbaum *et al.* 1983). Collected in 1980 by Herbst and Takeuchi (6336, 6411 BISH) and noted to be a common weed on Sand Island. In 1999, we did not observe this sedge on Eastern Island, and there are no buildings remaining. We did observe it on Sand Island next to buildings and in gardens.

Fimbristylis cymosa R. Br. – Button sedge, mau'u 'aki 'aki -- (ind)

[F. c. R. Br. ssp. spathacea, F. c. R. Br. ssp. umbellata-capitata, F. pycnocephala Hillebr.]. Widely distributed in coastal areas across the Pacific Basin including Australia, western Malesia, Pacific islands, and the Neotropics; in Hawai'i occurring on Kure, Midway, Laysan, French Frigate Shoals, and all the main islands except Kaho'olawe (Wagner *et al.* 1999). On Midway, first collected by Neff and DuMont (1955) who noted this species was locally common on both Sand and Eastern Island where it was observed near road, runway, and building sites. Also recorded in 1979 (Apfelbaum *et al.* 1983). Conant (1983) collected this species (*Conant 138* BISH), noting "This small sedge was common throughout the island, especially on the runways". In 1995, Bruegmann noted this sedge from all three islands of Midway (Bruegmann 1998). In 1999, this sedge was found to be common on Sand, Eastern, and Spit Islands, especially in open, hard-packed areas and on runways. Two subspecies are sometimes recognized, F. c. ssp. spathacea and F. c. ssp. umbellato-capitata. Wagner *et al.* (1999) report that "At best, these are weak subspecies still in the process of differentiation." In 1999, what appeared to be both subspecies and intermediates between the two were seen on Midway. Plants more closely allied with F. c. umbellata-capitata seemed to be the most common form. For the purposes of the 1999 survey, the two were not split.

#### LILIACEAE (Lily family)

Allium cepa L. – Onion -- (cult)

Onion may have originated in western Asia (Neal 1965). A food crop in many parts of the world and grown in Hawai'i for its large edible bulbs (Neal 1965). On Midway, historically known to be cultivated (Herbst and Wagner 1992). Not observed in 1999.

Allium fistulosum L. -- Green onion -- (cult)

Cultivated in Hawai'i for food (Neal 1965), this common herb is cultivated in the residential area of Sand Island, Midway. This observation represents a new cultivated record for Midway Atoll.

Allium porrum L. -- Leek -- (cult)

Cultivated in Hawai'i for food. Observed to be cultivated in the residential area of Sand Island, Midway, in 1999. This observation represents a new cultivated record for Midway Atoll.

Allium sativum L. -- Garlic -- (cult)

Cultivated in Hawai'i. Observed to be cultivated in the residential area of Sand Island, Midway, in 1999. This observation represents a new cultivated record for Midway Atoll.

Allium schoenoprasum L. -- Chive -- (cult)

Native to Europe, Asia, North America (Brickell and Zuk 1997). Cultivated in Hawai'i. Cultivated in the residential area of Sand Island, Midway, in 1999. Collected during this survey (*Starr and Martz 990429-1 BISH*). This collection represents a new cultivated record for Midway Atoll.

Asparagus plumosus J.G. Baker – Asparagus fern -- (cult)

[Asparagus setaceus (Kunth) Jessop] There has been some confusion over the name, the currently accepted name being A. plumosus (Imada *et al.* 2000). Native to southern Africa and commonly cultivated in Hawai'i, now naturalized on Kaua'i, O'ahu, Maui, and Hawai'i (Starr *et al.* 2002; Oppenheimer and Bartlett 2002; Oppenheimer and Bartlett 2000; Imada *et al.* 2000; Wagner *et al.* 1999; Lorence *et al.* 1995). On Midway, first recorded in 1979 (Apfelbaum *et al.* 1983). Also observed in 1995 (Bruegmann 1998). During this survey, cultivated in residential areas.

Chlorophytum comosum (Thunb.) -- Spider or bracket plant -- (cult)

Native to the Cape of Good Hope and cultivated for foliage and whitish flowers (Neal 1965). This species has not previously been recorded for Midway. During this survey, recorded as rare to occasional on Sand Island. This observation represents a new cultivated record for Midway Atoll.

Crinum asiaticum L. – Crinum lily -- (cult)

Native to tropical Asia and cultivated in Hawai'i (Neal 1965). In 1954, observed on Midway by Fosberg and Neff and DuMont (1955), who noted, "Occasional fine specimens of "spider lilies" may be seen on Sand Island on the lawns of residences and about administrative buildings." Also observed in 1979 (Apfelbaum *et al.* 1983) and in 1995 (Bruegmann 1998). In 1999, persisting in many areas on Sand and Eastern Island.

Hemerocallis sp. – Day lily -- (cult)

A genus of about 13-15 from China, Korea, and Japan, many cultivars are known (Neal 1965). On Midway, previously known from literature (Herbst and Wagner 1992). Not observed in 1999.

Hippeastrum sp. – Amaryllis -- (cult)

Native to tropical America. Many forms are grown in gardens of Hawai'i (Neal 1965). On Midway, previously known from literature (Herbst and Wagner 1992). Not observed in 1999.

Pancratium littorale – Spider lily -- (cult)

Native to southern Europe and cultivated in Hawai'i (Neal 1965). On Midway, previously known from literature (Herbst and Wagner 1992). Not observed in 1999.

#### MUSACEAE (Banana family)

Heliconia psittacorum L. fil. -- Heliconia -- (cult)

Several species of Central and South America are grown in gardens of Hawai'i (Neal 1965). On Midway, previously known from literature (Herbst and Wagner 1992). Reported by Bruegmann (1998). Not observed in 1999.

Musa x paradisiaca L. – Banana -- (cult)

Said to have originated from India (Neal 1965). Many species of Musa are cultivated in Hawai'i. Mr. Steadman, the gardener for Pan-American Airways in 1936, planted many vegetables, including banana. In 1941, Hadden reported that banana could be grown if protected from the winds. Neff and DuMont (1955) note banana as, "few plants were found on Sand Island in the older area near the Cable Company and Pan-American buildings, and an occasional one as an ornamental about a residence. They appear to be surviving but not thriving." Also observed in 1995 (Bruegmann 1998). In 1999, observed in cultivation near residences on Sand Island.

Strelitzia reginae Banks – Bird of paradise -- (cult)

Native to South Africa and grown as an ornamental in Hawai'i (Neal 1965). On Midway, observed by Conant (1983) who notes "two plants...were growing in the old greenhouse of the abandoned Pan Am Hotel." In 1999, this plant was being cultivated near residences and in town.

#### ORCHIDACEAE (Orchid family)

Vanda sp. – Vanda orchid -- (cult)

Recorded from Midway in 1979 (Apfelbaum et al. 1983). Not observed in 1999.

Various spp. -- Unknown orchids -- (cult)

Recorded from Midway in 1979 (Apfelbaum et al. 1983). Not observed in 1999.

#### PANDANACEAE (Screwpine family)

Pandanus tectorius S. Parkinson ex Z. -- Hala, screwpine -- (cult)

Occurring in Pacific islands of Polynesia, Melanesia, Micronesia, also New Caledonia to northern Australia, New Guinea, west to the Philippines, Moluccas, and Java; in Hawai'i occurring on all of the main islands except Kaho'olawe (Wagner *et al.* 1999). On Midway, one of the trees listed as able to survive in a soil and sand mixture (Hadden 1941). In 1954, occasional specimens were observed occurring in the administrative and residential area. In addition, one individual was observed in the Scaevola scrub near the south end of Sand Island (Neff and Dumont 1955). Observed in 1979 (Apfelbaum 1983) and in 1995 (Bruegmann 1998). In 1999, about a half dozen trees were noted. Three trees were observed near the Midway Mall and a few were observed on a sand revetment across the runway from the water storage tanks.

#### POACEAE [GRAMINAE] (Grass family)

Ammophila arenaria (L.) Link – European beach grass, San Francisco grass -- (nat)  
Native to coastal Europe. Introduced from the sand dunes of San Francisco bay as a sand binder. In 1923, the Tanager Expedition collected (*Caum 37* BISH) this plant growing all along the dunes of Sand Island and in places inland, forming a conspicuous element in the vegetation of the island (Christophersen and Caum 1931). In 1954, despite searches, this grass was not found (Neff and Dumont 1955). In 1962, C. H. Lamoureux collected (*Lamoureux 2281* BISH) a few clumps growing among Scaevola plants on sand dunes between Pavilion Beach and the fuel farm (Bruegmann 1998). It has not been observed since 1962 and is now probably extinct on Midway.

Andropogon virginicus L. – Broomsedge, yellow bluestem -- (nat)  
Native to eastern North America (Wagner *et al.* 1999). In Hawai'i, common along roadsides and dry disturbed areas. Wagner *et al.* (1990) cite the distribution as O'ahu and Hawai'i. Also now naturalized on Kaua'i (Imada *et al.* 2000), Lana'i (Herbarium Pacificum Staff 1999), Moloka'i (Hughes 1995), E. Maui (Hughes 1995), and W. Maui (Oppenheimer *et al.* 1999). On Midway, previously collected by K. McDermid (*McDermid sn.* BISH). Also collected in 1999 (*Starr and Martz 990407-1* BISH) near West Beach cart trail on Sand Island and published as a new island record for Midway Atoll (Starr *et al.* 2002).

Bothriochloa pertusa (L.) A. Camus -- Pitted beard grass -- (nat)  
Native to the Paleotropics; in Hawai'i, B. pertusa is naturalized in open, disturbed sites such as pastures, savannas, and along roadsides on all of the main islands (Wagner *et al.* 1999). Previously not recorded on Midway. During this survey, we found it localized only on Sand Island in the mowed lawns on either side of the runway near the water catchment pond. Collected in 1999 (*Starr and Martz 990507-4* BISH). This collection represents a new island record for Midway Atoll (Starr and Martz 2000).

Brachiaria mutica (Forssk.) Stapf – California grass, Para grass (nat)  
[Panicum purpurascens Raddi]. The native range is unknown, now pantropical; in Hawai'i known from Midway, Kaua'i, O'ahu, Lana'i, Maui, and Hawai'i (Wagner *et al.* 1999). On Midway collected in 1954 (*Neff and DuMont 37* BISH) and found in only two

areas on Sand Island, under the ironwoods near the Cable Company compound (Neff and Dumont 1955). Collected on Sand Island in 1962 by C.H. Lamoureux (*Lamoureux 2299* BISH) in the open field under antennae east of Barrier Hangar (Bruegmann 1998). Known from literature (Herbst and Wagner 1992). Not observed in 1979 or 1995 (Apfelbaum 1983, Bruegmann 1998). In 1999, one small patch observed in same spot described by Lamoureux.

Bromus catharticus Vahl – Prairie grass -- (nat)

[B. willdenowii Kunth, B. unioloides Raspail]. Had a taxonomic change in 1997 (Herbst and Clayton 1998). Native to South America; in Hawai'i naturalized on Midway, Kaua'i, O'ahu, Moloka'i, Maui, and Hawai'i (Wagner *et al.* 1999; Lorence and Flynn 1997). On Midway, previously collected in 1979 (Apfelbaum *et al.* 1983) and in 1980 (*Herbst and Takeuchi 6437* BISH). Also observed by Bruegmann in 1995. Found near Pavilion beach, Sand Island, during this survey.

Cenchrus agrimonioides var. laysanensis F. Brown – Kamanomano -- (end, Ex)

[C. calyculatus Cav var. uniflorus Hillebr.] This variety, known from Kure, Midway, and Laysan is now probably extinct (Wagner *et al.* 1999). This variety was last seen alive on Kure in 1961 by C. H. Lamoureux who observed half a dozen clumps in one small area of the central plain (Lamoureux 1961, Wagner *et al.* 1990). On Midway, previously collected by W. A. Bryan in 1902, who states that he saw only two or three bunches inland on Eastern Island (Christophersen and Caum 1931). Not collected or observed since then. It is probably extinct on Midway.

Cenchrus ciliaris L. – Buffel grass -- (nat)

Native to Africa and tropical Asia; in Hawai'i naturalized and common on all of the main islands except Ni'ihau (Wagner *et al.* 1999). Previously not recorded from Midway, the collection of this species in 1999 (*Starr and Martz 990427-1* BISH) represents a new island record for Midway Atoll (Starr and Martz 2000). Buffel grass is known to be invasive on the main Hawaiian Islands and is the dominant grass in the dry lowland areas (Whistler 1995). It was probably not intentionally introduced and seeds may have arrived in soil or attached to something. It is restricted to a few dozen patches on a grassy lawn near the cargo pier and sea plane ramp by Turtle Beach on Sand Island. Plants were controlled with a foliar spray of roundup. The plants were seeding at the time and the area will need to be monitored in the future. This collection represents a new island record for Midway Atoll.

Cenchrus echinatus L. – Sand bur -- (nat)

[C. hillebrandianus Hitchc.] Native to the Neotropics and now widely naturalized; in Hawai'i naturalized in dry disturbed habitats on Kure, Midway, Lisianski, Laysan, French Frigate Shoals, Nihoa and all of the main islands (Wagner *et al.* 1999). On Midway, previously collected from the interior of Eastern Island by E. L. Caum in 1923 (Christophersen and Caum 1931). In 1954, Neff and DuMont (1955) reported finding it mostly along the edges of runways, roads and about larger buildings on Sand and Eastern Islands. It was also observed by Fosberg in 1954 (Neff and DuMont 1955). In 1964,

collected by Long from the west end of east-west runway on Eastern Island (Bruegmann 1998). In 1979, collected on Sand Island and observed on Eastern Island (Apfelbaum *et al.* 1983). In 1980, collected by Herbst and Takeuchi from Sand Island (Bruegmann 1998). In 1995, observed on Sand Island only (Bruegmann 1998). In 1999, observed on Sand Island only, mainly in the town area and along the south side of the east-west runway. There were about a dozen distinct localities, none very large in size.

Chloris barbata (L.) Sw. – Swollen finger grass -- (nat)

[C. inflata Link] Native to Central America, the West Indies, and South America, now widely naturalized; in Hawai'i naturalized in dry, disturbed areas on Kure, Midway, and all of the main islands (Wagner *et al.* 1999; Herbst and Clayton 1998). On Midway, previously observed by Dr. Fosberg in 1954 and collected by Neff and DuMont in the same year who describe it as locally common in open spaces on Sand and Eastern Islands (Neff and DuMont 1955). Collected from Sand Island in 1979 (Apfelbaum 1983). Not seen in 1995 (Bruegmann 1998). Restricted to a few small scattered patches on Sand Island in 1999.

Chloris divaricata R. Br. -- Star grass -- (nat)

Native to New Caledonia and Australia; in Hawai'i naturalized and common in lawns and dry disturbed areas on all of the main islands except Moloka'i and Hawai'i (Wagner *et al.* 1999). Previously not recorded from Midway. During this survey we found this species restricted to a few dozen plants on Sand Island in a clearing in the forest near the Rusty Bucket area. The collection on Sand Island in 1999 (*Starr and Martz 990508-1* BISH) represents a new island record for Midway Atoll (Starr and Martz 2000).

Chloris virgata Sw. -- Feather finger grass -- (nat)

Native to the Neotropics, now widely naturalized; in Hawai'i known from Kure and all of the main island except Ni'ihau (Wagner *et al.* 1999; Herbst and Clayton 1998). Previously not recorded from Midway. During this survey we found this species restricted to a few plants in a lawn near the north-west corner of the inner harbor. The collection on Sand Island in 1999 (*Starr and Martz 990507-5* BISH) represents a new island record for Midway Atoll (Starr and Martz 2000).

Cymbopogon citratus (DC) Stapf -- Lemon grass -- (cult)

Commonly cultivated throughout the tropics and Hawai'i (Wagner *et al.* 1999). Previously not known from Midway and collected in 1999 (*Starr and Martz 990429-15* BISH). On Midway, cultivated in personal gardens on Sand Island. This collection represents a new cultivated record for Midway Atoll.

Cynodon dactylon (L.) Pers – Bermuda grass -- (nat)

Possibly native to tropical Africa, widely cultivated and naturalized; in Hawai'i documented on Kure, Midway, and Pearl and Hermes atolls, Laysan, French Frigate Shoals, and all of the main islands except Ni'ihau (Wagner *et al.* 1999; Herbst and Clayton 1998). On Midway previously observed by Dr. Fosberg and collected in 1954 by Neff and Dumont (46 BISH) who described it as an abundant, common lawn grass which



had spread over much of Sand Island and was locally common on Eastern Island. They considered it the best sand-binder growing on the islands (Neff and DuMont 1955). Also collected in 1979 (Apfelbaum 1983), in 1980 (*Herbst and Takeuchi 3461, 6419* BISH), and at unknown dates by others (*Munro s.n.* BISH; *Frings 2, 31, 26, 32* BISH). In 1995, noted as common on Sand Island and occasional on Eastern Island in 1995 (Bruegmann 1998). In 1999, Bermuda grass was one of the most common grasses on both Sand and Eastern Islands. No collections or observations have been made from Spit Island yet.

Dactyloctenium aegyptium (L.) Willd. – Beach wiregrass -- (nat)

Native to the Paleotropics, now a pantropical weed; in Hawai'i documented on Midway, Kaua'i, O'ahu, Moloka'i, Maui, Kaho'olawe, and Hawai'i (Wagner *et al.* 1999; Wagner *et al.* 1997; Lorence and Flynn 1997). The first collection of this species on Midway was made in 1991 from near Frigate Point, Sand Island (Wagner *et al.* 1997). Other collections at Bishop Museum include (*E. Flint s.n.* BISH, *Herbst and Takeuchi 9075* BISH). Noted in 1995 on all three islands of the Atoll (Bruegmann 1998). In 1999 we observed this curious grass on all three islands, especially near the coast. This grass appears to be an annual on Midway, forming large mats and then dying back. Collected on Spit Island (*Starr and Martz 990623-6* BISH).

Digitaria ciliaris (Retz.) Koeler – Henry's crab grass -- (nat)

[*D. sanguinalis* sensu Hawaiian botanists, non (L.) Scop.] Native to China, Indo-China, Samoa, and the Philippines; in Hawai'i naturalized and abundant in lawns and pastures, forming thick mats, on Kure and Midway atolls, French Frigate Shoals, and all of the main islands (Wagner *et al.* 1999). Previous collections at Bishop Museum from Midway are many, including (*Herbst and Takeuchi 6346, 6421, 6400, 6335; Mr. Cornelison s.n.; Lamoureux 2761*). In 1954, Dr. Fosberg described this grass as rare in open sandy areas on Sand Island (Neff and DuMont 1955). Observed on Sand Island in 1979 (Apfelbaum 1983). Considered rare on Sand Island in 1995 (Bruegmann 1998). Found to be occasional on both Sand and Eastern Islands in 1999.

Digitaria insularis (L.) Mez ex Ekman – Sour grass -- (nat)

Native to the Neotropics; in Hawai'i documented from Midway and all of the main islands except Ni'ihau (Wagner *et al.* 1999). On Midway, previously collected (*Herbst and Takeuchi 6354* BISH), and known of at least from 1990 (Wagner *et al.* 1990). Considered rare on Sand Island in 1995 (Bruegmann 1998). In 1999, we found this grass to be rare on Sand Island, limited to a couple small patches, especially in the northwest corner of the island on the margins of ironwood near Rusty Bucket. This grass is readily distinguished from others on Midway, being much taller.

Echinochloa crus-galli (L.) P. Beauv. -- Barnyard grass -- (nat)

Common in warm temperate to tropical regions worldwide; in Hawai'i documented from all the main islands (Wagner *et al.* 1999). No previous records for Midway Atoll. During this survey, this species was collected near the sea-plane ramp on the north side of Sand Island (*Starr and Martz 990620-1* BISH). This collection represents a new island record for Midway Atoll (Starr *et al.* 2002).

Eleusine indica (L.) Gaertn. – Goose grass, wire grass -- (nat)

Native to the Old World but long-naturalized in warm regions of the New World; in Hawai'i documented from Kure and Midway atolls, French Frigate Shoals and all of the main islands except Ni'ihau and Kaho'olawe (Wagner et al. 1999). Previous collections from Midway at Bishop Museum include (*H.W. Frings 10, 18, 22; Caum 32; Neff and DuMont 6, 13; Herbst and Takeuchi 6357, 6416; C.R. Long 1729*). Observed by Dr. Fosberg and collected by Neff and DuMont in 1954 who describe it as locally common, scattered about in open spaces on both Sand and Eastern Islands (Neff and DuMont 1955). Collected on Sand Island in 1979 (Apfelbaum 1983). Occurring occasionally on Sand and Eastern Islands in 1995 (Bruegmann 1998). In 1999, one of the most common grasses in lawns and waste areas on both Sand and Eastern Islands.

Eragrostis paupera Jedwabn. – Eragrostis -- (ind)

[E. falcata sensu Hawaiian botanists, non (Gaud.) Gaud; E. whitneyi Fosb.; E. w. var. caumii Fosb.] Native to the Pacific equatorial region; in Hawai'i occurring in coastal sites on Kure, Midway, and Pearl and Hermes atolls, French Frigate Shoals, and formerly known from Barber's Point, O'ahu (Wagner et al. 1999). For Midway, there are many collections of this grass at Bishop Museum including (*Neff and DuMont 14; Herbst and Takeuchi 3644, 6399; W.A. Bryan s.n.; C.R. Long 2253; H.F. Clay s.n.*). In 1902, noted as not abundant on Eastern Island but common on the lowland at the west end of Sand Island. Not observed by the Tanager Expedition in 1923 (Christophersen and Caum 1931). Neff and DuMont (1955) reported this species as fairly abundant on parts of Sand Island and locally common on Eastern Island. They observed the species growing along edges and in cracks of runways and plane parking stands. In 1995, observed on Eastern Island in open sand just below the perennial vegetation line as a pioneer species and on Spit Island. In 1997, observed by N. Seto on Sand Island (Bruegmann 1998). In 1999, observed at the runway overrun on the east end of Sand Island where it was rare, and on the south part of Spit Island where it was uncommon. Not found on Eastern Island in 1999.

Eragrostis tenella (L.) P. Beauv. ex Roem. and Schult. – Love grass -- (nat)

[E. amabilis (L.) Wight and Arnott] Native to the Paleotropics and now widely naturalized in the tropics; in Hawai'i documented from Midway, Ni'ihau, O'ahu, Maui, Kaho'olawe, and Hawai'i (Wagner et al. 1999). Collections from Midway at Bishop Museum include (*Neff and DuMont 15, H.W. Frings 1, Herbst and Takeuchi 6444*). In 1954, locally common in open spaces on Sand Island and noted from Eastern Island (Neff and DuMont 1955). Collected on Sand Island in 1979 (Apfelbaum 1983). Occasional on Sand Island in 1995 (Bruegmann 1998). In 1999 we observed this grass commonly occurring in lawns on Sand Island, but did not observe it on Eastern or Spit Island.

Eragrostis variabilis (Gaud.) Steud. – Emoloa, Kawelu -- (end)

[E. cynosuroides Retz.] Endemic to the Hawaiian Islands, occurring on Kure, Midway, and Pearl and Hermes atolls, Lisianski, Laysan, Nihoa and all of the main islands (Wagner et al. 1999). On Midway, collected (*W.A. Bryan s.n. BISH*) from Sand Island in

1902 as E. cynosuroides (Retz.). In 1923, recorded (*Caum 36* BISH) by Tanager Expedition from Sand Island only, where it was fairly common, particularly in the central part of the island. Neff and DuMont (1955) note this grass as rare on Sand Island and found in only two locations, one being near the terminal (*Neff and DuMont s.n., 37a* BISH). Conant (1983) notes "This indigenous grass was exceedingly rare on Sand Island, and I would not have collected it had someone not brought me an inflorescence for identification (*Conant 129* BISH). I found two colonies, less than 100 m apart on the beach in area 7. There were fewer than 15 plants total in the two colonies." During the 1995 survey, Bruegmann (1998) also reports this species as being rare, restricted to a single location at Frigate Point on Sand Island. Other collections at Bishop Museum include (*F.A. Bianchi s.n., V.J. Meagher s.n., D.R. Chrisholm s.n., H.W. Frings 10, Lamoureux 2125*). In 1999 the plants Bruegmann and perhaps Conant refer to were observed. In addition, many additional plants had been out-planted from seed brought in from Laysan and propagated on Midway, and it was beginning to spread on its own. On Eastern Island, there is a large patch near the cross runway and was planted in many other places during this survey. It was not observed on Spit Island.

Eustachys petraea (Sw.) Desv. – Finger grass -- (nat)

[Chloris petraea Sw.] There has been a recent taxonomic name change from Chloris petraea to Eustachys petraea (Wagner *et al.* 1999; Wagner and Herbst 1995). E. petraea was also documented as newly naturalized to the state of Hawai'i occurring on Midway and French Frigate Shoals (Wagner *et al.* 1999; Wagner and Herbst 1995). On Midway, occurring occasionally on Sand Island in 1995 (Bruegmann 1998). One of the most common grass species on Sand Island in 1999. Collected on Spit Island during this survey (*Starr and Martz 990623-7* BISH). This was probably misidentified as St. Augustine grass (Stenotaphrum secundatum) on Spit Island in 1995. We made the same mistake before fertile material was eventually found.

Hordeum murinum Huds. subsp. leporinum (Link) Arcang – Barley -- (nat)

[Hordeum leporinum Link] H. leporinum now H. murinum subsp. leporinum (Wagner *et al.* 1999; Herbst and Clayton 1998). Native to Europe, and naturalized in North America; in Hawai'i naturalized in somewhat moist sites on Midway, Lana'i, Maui, and Hawai'i (Wagner *et al.* 1999). Also noted from Midway by Herbst and Wagner (1992). However, not seen in 1954, 1979, 1995 (Neff and DuMont 1955, Apfelbaum 1983, Bruegmann 1998). Not seen during this survey.

Leptochloa uninervia (K. Presl) Hitchc. and Chase -- Sprangletop -- (nat)

Native to warmer regions of the Americas (Wagner *et al.* 1999). Sprangletop is weedy in wetlands and water ditches on the main Hawaiian Islands. Previously not recorded from Midway. During this survey, a single plant was observed and collected (*Starr and Martz 990507-3* BISH) from a moist area on a hill near the hangar on Sand Island. This collection represents a new island record for Midway Atoll (Starr and Martz 2000).

Lepturus repens (G. Forster) R. Br. – Lepturus -- (ind)

Native to the Mascarene Islands, Sri Lanka, Malaysia, northern Australia, and Polynesia; in Hawai'i occurring near the high tide line in coastal areas of Kure, Midway, and Pearl and Hermes atolls, Lisianski, Laysan, and French Frigate Shoals (Wagner *et al.* 1999). In 1902, collected from Midway on both Sand and Eastern Islands (W.A. Bryan *s.n.* BISH), where it was noted as common in bunches on Sand Island. It was not observed by the Tanager Expedition in 1923. Other collections at Bishop Museum include (C.R. Long 2490, 2491; Herbst and Takeuchi 6417). Observed in 1979 (Apfelbaum *et al.* 1983). Observed as rare on Sand Island in 1995 (Bruegmann 1998). In 1999, occurring on Sand, Eastern, and Spit Islands where it was found at the extreme coastal edge of the vegetation line. On Sand Island it was occasional to common on the north and west beaches. On Eastern Island it was found along the north shore, especially west of the dock. On Spit Island it was restricted to the north section.

Melinis repens (Willd.) Zizka – Natal red top -- (nat)  
[Rhynchelytrum repens (Willd.) Hubbard, R. roseum Stapf and Hubbard ex Bews, Tricholaena rosea Nees, T. repens (Willd.) Hitchc.] Taxonomic name change to Melinis repens (Wagner *et al.* 1999, Herbst and Clayton 1998). Native to Africa, now widely naturalized throughout the tropics; in Hawai'i on Midway and all of the main islands (Wagner *et al.* 1999). On Midway, in 1954, considered rare, being found (Neff and DuMont 17 BISH) in only two or three small areas on the older, undisturbed part of Sand Island (Neff and DuMont 1955). In 1962, collected on Sand Island by C. H. Lamoureux (2161 BISH) who found it as a weed by the roadside in the northeastern part of wooded polygon east of Administration Building and north of Sea-Air rescue Hangar. Observed in 1979 by Apfelbaum *et al.* (1983). In 1980, D. Herbst and W. Takeuchi (6339 BISH) collected it as an uncommon weed on Sand Island (Bruegmann 1998). Not observed 1995 (Bruegmann 1998). In 1999, two small patches observed, one west of the northeast corner of the harbor and the other on the east side of the north-south runway north of the cart trail.

Panicum maximum Jacq. – Guinea grass -- (nat)  
Native to Africa; in Hawai'i common on all of the main islands (Wagner *et al.* 1999) and now also known from Midway (Starr *et al.* 2002). First observed on Midway in 1995 on Sand Island (Bruegmann 1998). In 1999, one small patch was observed on Sand Island, west of the northwest corner of the harbor. This grass is currently restricted to one small patch, but has the potential to expand its range. Control efforts are underway and should be continued. Collected during this survey (Starr and Martz 990505-11 BISH) representing a new island record for Midway Atoll.

Paspalum setaceum Michx. -- Paspalum -- (nat)  
Native to Mexico and the southeastern United States (Whistler 1995). Previously not known from the Hawaiian Islands, on Midway it is widely naturalized and is one of the most common species on the island, occurring wherever there are lawn areas. Collected on Sand Island in 1999 (Starr and Martz 990622-1 BISH) representing a new state record for Hawai'i (Starr and Martz 2000).

Paspalum urvillei Steud. – Vasey grass -- (nat)

Native to the New World; in Hawai'i documented from Midway and all of the main islands except Ni'ihau and Kaho'olawe (Wagner *et al.* 1999). On Midway, collected in 1980 by Herbst and Takeuchi (6371 BISH) and recorded as occasional on Sand Island and rare on Eastern Island in 1995 (Bruegmann 1998). In 1999, occasional on Sand Island and not found on Eastern or Spit Islands. This grass occurs scattered about roadsides and ditches, especially moist areas.

Poa annua L. – Annual blue grass -- (nat)

Native to Europe; in Hawai'i documented from Kure and Midway atolls and all of the main islands except Ni'ihau and Kaho'olawe (Wagner *et al.* 1999). On Midway, observed in 1979 (Apfelbaum *et al.* 1983). Collected in 1980 by Herbst and Takeuchi (6391 BISH). Common on Sand Island in 1995 (Bruegmann 1998) and 1999.

Polypogon interruptus Kunth – Ditch polypogon -- (nat)

Native to South America; in Hawai'i known from Kure and Midway atolls, Kaua'i, O'ahu, Maui, and Hawai'i (Wagner *et al.* 1999; Wagner and Herbst 1995). On Midway, collected in 1980 by D. Herbst and W. Takeuchi (6383 BISH) on Sand Island growing in saturated soil below a dripping air conditioner. In 1999 we found this grass to be locally common on Sand Island growing in moist areas around the fuel farm, dump pond, and runway overrun. Collected near the abandoned marine barracks on Sand Island (*Starr and Martz 990511-2, 990511-3* BISH).

Polypogon monspeliensis (L.) Desf. – Rabbit foot grass -- (nat)

Native to Europe; in Hawai'i documented from Midway, Kaua'i, O'ahu, Maui, and Hawai'i (Wagner *et al.* 1999). Collected in 1945 by G. C. Munro from Midway where it was growing in coral sand with Bermuda grass. Collected from Eastern Island by H. W. Frings (48 BISH) in 1962 and by C. R. Long (1756 BISH) in 1964 who found it common on the middle south side of the east-west runway. In 1980, D. Herbst and W. Takeuchi (6343 BISH) collected it from Sand Island growing along sides of west, shallow ditch. In 1999, locally common on Sand Island in moist areas near dump pond. Not observed on Eastern or Spit Islands in 1999.

Setaria verticillata (L.) P. Beauv. – Bristly foxtail, mau'u pilipili -- (nat)

Native to Europe; in Hawai'i documented from Kure, Midway, and Pearl and Hermes atolls, French Frigate Shoals, Nihoa, and all of the main islands (Wagner *et al.* 1999). Locally abundant in open spaces on both Sand and Eastern Islands in 1954 (Neff and DuMont 1955). Noted as occasional from both Sand and Eastern Islands in 1995 (Bruegmann 1998). Collections at Bishop Museum include (*H.W. Frings 9, 30; Herbst and Takeuchi 6402, 6330, 6402; Lamoureux 2175; Neff and DuMont 7*). In 1999, occasional to common on Sand Island in lawns and waste places. On Eastern Island, occurring over most of the island, especially near revetments. Two small patches were found on Spit Island during this survey and pulled. The bristly seeds stick to passersby and can be transported between islands in the atoll.

Sporobolus africanus (Poir.) Robyns and Tournay – African dropseed -- (nat)  
Native to Africa; in Hawai'i documented from all of the main islands except Ni'ihau (Wagner et al. 1999; Herbst and Clayton 1998). On Midway, observed in 1979 (Apfelbaum et al. 1983) and documented from literature (Herbst and Wagner 1992). In 1999, observed as common on Sand Island. There has been some confusion with this genus. See S. indicus.

Sporobolus indicus (L.) R. Br. – Indian dropseed -- (nat)  
Native to the Neotropics; in Hawai'i documented from Midway, Kaua'i, O'ahu, Lana'i, and Hawai'i (Wagner et al. 1999). On Midway, collected (*Conant 132 BISH*) "from a roadside near the mess hall" (Conant 1983). Also collected by Herbst and Takeuchi (6380 BISH). Bruegmann (1998) listed this species as rare on Sand Island. In 1999, we used S. africanus and not S. indicus, though there was some taxonomic confusion, as there often is with this group, and it is not known whether all the observations were of this species, or of S. africanus, or a mix of both. See S. africanus.

Sporobolus pyramidatus (Lam.) Hitchc. – Sporobolus -- (nat)  
Native to North and South America; in Hawai'i documented from Kure, Laysan, French Frigate Shoals, and O'ahu (Wagner et al. 1999; Wagner and Herbst 1995). Observed by the authors as common on Tern Island at French Frigate Shoals, and restricted to the guano hard pans on Laysan Island in 1999. On Midway, known from literature (Herbst and Wagner 1992). Not observed before or since then. Not observed on Midway in 1999.

Sporobolus virginicus (L.) Kunth – 'Aki'aki, beach dropseed -- (ind)  
Native to coastal sites in tropical and subtropical areas worldwide; in Hawai'i known from Midway, Laysan, and all of the main islands (Wagner et al. 1999). Observed by St. John in 1935 (Neff and DuMont 1955). Not observed before or since then. Not observed in 1999.

Stenotaphrum secundatum (Walter) Kuntze – St. Augustine grass, centipede grass, buffalo grass -- (nat)  
Native to both shores of the Atlantic Ocean, and widely used for in lawns and to bind sand; in Hawai'i documented from Midway, Kaua'i, O'ahu, Moloka'i, Lana'i, Maui, and Hawai'i (Oppenheimer and Bartlett 2002; Oppenheimer and Bartlett 2000; Wagner et al. 1999). On Midway, Neff and DuMont (1955) collected this species (20 BISH) and reported it as, "occasional, in open spots in the older vegetated section of Sand Island." Also collected by Herbst and Takeuchi (6394 BISH). Recorded from all three islands of Midway in 1995 (Bruegmann 1998). In 1999 we found this to be a common lawn grass on Sand Island, especially in the shade. It was not observed on Eastern or Spit islands in 1999.

Vulpia myuros (L.) C.C. Gmelin – Foxtail fescue -- (nat)  
Native to Europe; in Hawai'i documented from Midway and all of the main islands except Ni'ihau and Kaho'olawe (Wagner et al. 1999). On Midway, previously known from

literature (Herbst and Wagner 1992). Not observed in 1995 (Bruegmann 1998). Also not observed in 1999.

Zea mays L. – Corn -- (cult)

Probably native to the Mexican Plateau (Neal 1965). Corn has been cultivated in Hawai'i for more than a century (Neal 1965). Previously not recorded from Midway. In 1999, it was being cultivated in the residential area of Sand Island. This observation represents a new cultivated record for Midway Atoll.

ZINGIBERACEAE (Ginger family)

Alpinia zerumbet (Pers.) Burt and R.M. Sm. – Shell ginger -- (cult)

Widely cultivated in the tropics and a popular ornamental plant in Hawai'i (Wagner et al. 1999). On Midway, recorded in 1979 (Apfelbaum et al. 1983). Not observed in 1999.

Hedychium gardnerianum Ker-Gawl – Kahili ginger -- (cult)

Native to the Himalayas and adjacent regions and cultivated in the tropics; in Hawai'i naturalized on Kaua'i, Maui, Lana'i, and Hawai'i (Wagner et al. 1999). Kahili ginger is known from the literature (Apfelbaum et al. 1983) but the last two botanical surveys failed to locate it.

Unknown zingiber -- Galang -- (cult)

Previously not recorded from Midway, during this survey we observed an unknown ginger like plant being cultivated in planter boxes near the heavy equipment repair shop on Sand Island. This observation probably represents a new island record for Midway Atoll.

## DICOTYLEDONS

### ACANTHACEAE (Acanthus family)

Asystasia gangetica (L.) T. Anderson – Chinese violet -- (nat)

Native to India, Malay Peninsula, and Africa; in Hawai'i commonly cultivated and documented from Midway and probably from all the main islands (Oppenheimer and Bartlett 2000; Wagner *et al.* 1999). On Midway, previously known from literature (Herbst and Wagner 1992). Not observed in 1999.

Odontonema strictum (Nees) Kuntze – Odontonema -- (cult)

Native to Central America (Neal 1965). Cultivated in Hawai'i for its bright flowers (Neal 1965). On Midway, previously known from literature (Herbst and Wagner 1992). Not observed in 1999.

Ruellia brittoniana E. Leonard – Ruellia -- (nat)

Native to Mexico; in Hawai'i on Midway, Kaua'i, Maui, and O'ahu (Oppenheimer and Bartlett 2002; Wagner *et al.* 1999). On Midway, first collected (*Conant 127 BISH*) on Sand Island in 1983 by Sheila Conant who reports "A large colony of these plants was growing around some of the abandoned buildings of the old Pan Am Hotel, and was probably brought in as an ornamental for landscaping purposes." Also observed in 1995 (Bruegmann 1998). In 1999 we found this species persisting in the same area described by Conant, and being cultivated in residential areas on Sand Island.

### AIZOACEAE (Carpetweed family)

Sesuvium portulacastrum (L.) L. – 'Akulikuli, sea purslane -- (ind)

Pantropical in distribution; in Hawai'i occurring in coastal habitats of Midway and Pearl and Hermes atolls, Lisianski, Laysan, Necker, and all of the main islands (Wagner *et al.* 1999; Bruegmann 1999). First collected from Midway on Spit Island in 1995 by Bruegmann. It has since been observed on Sand Island and Eastern Island during this survey in 1999. On Sand Island, it was found at the dump pond where it forms large mats, and at bulky dump where a few small plants have sprung up. On Eastern Island, small patches were found on the south shore, and the west and northeast tips. On Spit Island, it is common, especially around the small pond. During this survey it was also being propagated and out-planted in various places including the Fuel Farm on Sand Island.

Tetragonia tetragonioides (Pall.) Kuntze -- New Zealand spinach -- (nat)

Native to New Zealand, Tasmania, Australia, Japan, and South America; in Hawai'i cultivated and now established on Nihoa, Kaua'i, O'ahu, and Hawai'i (Wagner *et al.* 1999). Now also known from Maui (Oppenheimer *et al.* 1999) and Midway Atoll (Starr and Martz 2000). Previously not recorded from Midway before this survey. New Zealand spinach is highly invasive in the Farallon Islands, California (Peter Pyle pers



comm. 1999). On Midway, it is currently restricted to two small patches on Sand Island. One near the Dump Pond and the other along the South Beach cart trail. Though there was some control work done, follow up work will be necessary due to the large seed bank and persistence of this plant. Collected by Ramashandran Sudarshan near the dump pond on Sand Island (*Starr and Martz 990510-5 BISH*) representing a new island record for Midway Atoll.

#### AMARANTHACEAE (Amaranth family)

Achyranthes atollensis St. John -- Achyranthes -- (end, Ex)

[Achyranthes splendens var. reflexa Hillebr.] Endemic to Kure, Midway, and Pearl and Hermes atolls and Laysan (Wagner *et al.* 1999). Probably extinct or existing as seeds in the soil as no plants were located during a survey by D. Herbst in 1988 (Wagner *et al.* 1999). A. atollensis was last collected by Lamoureux (2794 BISH) in 1964 on Kure Atoll. This collection by Lamoureux had seeds and could potentially provide an opportunity to bring this species back from extinction, though it is uncertain if the seeds were viable or not. On Midway, in 1902 noted by W.A. Bryan as fairly common on Eastern Island, growing up to 4 feet high and growing on the sand mounds of Sand Island. Collected on both Eastern (*Bryan 22448 BISH*) and Sand (*Bryan 22449 BISH*) Islands. Not observed on Midway since 1902 when it was first collected. Not observed on Midway in 1999. Also not observed by us on Laysan or Pearl and Hermes Atoll (Seal-Kittery and Green Islands not checked) in 1999 (Starr and Martz 1999). Presumed extinct on Midway.

Alternanthera tenella Colla – Joyweed -- (nat)

Widespread in tropical regions of the Western Hemisphere; in Hawai'i cultivated and persisting on O'ahu (Wagner *et al.* 1999). On Midway, previously known from literature (Herbst and Wagner 1992). Noted as occasional on Sand Island in 1995 (Bruegmann 1995). It was not observed in 1999 during this survey.

Amaranthus dubius Mart. ex Thell. – Pakai, Spleen amaranth -- (nat)

Native to the Paleotropics; in Hawai'i naturalized on Kaua'i, O'ahu, Lana'i, and Hawai'i (Wagner *et al.* 1999). On Midway, previously known from literature (Herbst and Wagner 1992) and first collected in 1995 (*Bruegmann 2018 BISH*) and noted as rare on Sand Island by abandoned housing and along harbor (Bruegmann 1999). It was not observed in 1999.

Amaranthus hybridus L. – Green amaranth -- (nat)

Cosmopolitan in warmer regions; in Hawai'i sparingly naturalized on Kaua'i, O'ahu and Hawai'i (Wagner *et al.* 1999). On Midway, listed as naturalized by Herbst and Wagner (1992). Not observed in 1995 (Bruegmann 1998) or during this survey in 1999.

Amaranthus lividus ssp. polygonoides (Moq.) Probst – Slender amaranth -- (nat)

Cosmopolitan in warmer areas; in Hawai'i documented from Midway, Kaua'i, O'ahu and Hawai'i (Wagner *et al.* 1999, Bruegmann 1999). First collected in 1995 by Bruegmann

representing a new island record for Midway Atoll (Bruegmann 1999). Noted as rare on Sand Island in 1995. It was not observed during this survey in 1999.

Amaranthus spinosus L. – Spiny amaranth -- (nat)

Widespread in warmer regions; in Hawai'i documented from Kure and all of the main islands except Ni'ihau and Lana'i (Wagner *et al.* 1999) and now known from Midway (Starr *et al.* 2002). On Midway, previously only known from literature (Herbst and Wagner 1992). Not observed in 1995 (Bruegmann 1998) though urban areas were not surveyed extensively. In 1999, it was restricted to a few small patches in lawn on the North part of Sand Island. This collection (*Starr and Martz 990507-2* BISH) represents a new island record for Midway Atoll.

Amaranthus viridis L. – Slender amaranth -- (nat)

Native to tropical and subtropical regions of the world; in Hawai'i known from Kure, Midway, Laysan, Ka'ula, Kaua'i, O'ahu, Lana'i, Moloka'i, Maui, Kaho'olawe, and Hawai'i (Wagner *et al.* 1999; Shannon and Wagner 1996; Hughes 1995; Wagner and Herbst 1995). On Midway, collected in 1988 (*Herbst and Takeuchi 9074, 9080* BISH) representing a new naturalized record for Midway Atoll at that time (Wagner and Herbst 1995). In 1995, observed as occasional on Sand Island by Bruegmann. In 1999, observed as common on Sand Island. This and other Amaranth species are actively sought out and consumed by Midway residents, mostly foreign nationals from Sri Lanka and the Philippines, who use it in the same way spinach would be used.

Gomphrena globosa L. -- Globe amaranth -- (cult)

Native to the Neotropics and originally described from India, cultivated and escaped in many parts of the world; in Hawai'i naturalized on at least Kaua'i and O'ahu (Wagner *et al.* 1999; Lorence *et al.* 1995). On Midway, previously not recorded until this survey when it was collected (*Starr and Martz 990429-17* BISH) from cultivated material in the residential area of Sand Island. This collection represents a new cultivated record for Midway Atoll.

ANACARDIACEAE (Mango family)

Mangifera indica L. – Mango -- (cult)

Native to Asia; in Hawai'i first introduced from Mexico in the early 1800's and often becoming naturalized in valleys (Wagner *et al.* 1999). On Midway, recorded by Apfelbaum *et al.* (1983) during their survey in 1979. Bruegmann did not observe mango in 1995, nor did we observe any in 1999.

Schinus terebinthifolius Raddi – Christmas berry -- (cult)

Native to Brazil; in Hawai'i documented from Midway Atoll and all of the main islands (Wagner *et al.* 1999). On Midway, collected by Neff and Dumont (25 BISH) on Sand Island as an ornamental in 1954, who add "noted only as a hedge plant on Sand Island". Also listed by Bruegmann (1998) as naturalized and rare on Sand Island. In 1999, four trees were observed on Sand Island, two trees by Pacific Cable Company and two trees at

Marine barracks, one of which was female. These appeared cultivated but could have been naturalized. As of July 2000, three had been removed, and only one tree remained, being slated for removal in the near future.

#### APIACEAE (Carrot family)

##### Anethum graveolens L. -- Dill -- (nat)

Native to Eurasia; in Hawai'i occasionally escaping from gardens on O'ahu and Maui (Wagner *et al.* 1999) and now also known from Midway Atoll (Starr *et al.* 2002). Previously not known from Midway, it was collected (Starr and Martz 990505-1 BISH) during this survey from plants that self-seed themselves and re-appear in the garden after disturbance in the residential area of Sand Island. This collection represents a new island record for Midway Atoll.

##### Ciclospermum leptophyllum (Pers.) Sprague – Fine leaved celery -- (nat)

[Apium tenuifolium (Moench) Thell.] Probably native to Brazil; in Hawai'i naturalized on Midway Atoll and all of the main islands except Ni'ihau and Kaho'olawe (Wagner *et al.* 1999). Collected by Apfelbaum *et al.* in 1979. Also collected in 1980 (Herbst and Takeuchi 6373 BISH). Bruegmann (1998) listed this species as common and naturalized on Sand Island. In 1999, this species was common in lawns of Sand Island.

##### Coriandrum sativum L. -- Cilantro, Chinese parsley (cult)

Native to the Mediterranean region; in Hawai'i cultivated and naturalized on O'ahu (Wagner *et al.* 1999). Previously not recorded from Midway. During this survey it was observed in cultivation on Sand Island. This observation represents a new cultivated record for Midway Atoll.

##### Daucus carota L. -- Carrot -- (cult)

Native to Eurasia and Africa and cultivated for over 2,000 years (Neal 1965). On Midway, previously recorded by Hadden (1941) in the Pan American Airways vegetable garden. Though not recorded in any surveys since then, it was recorded during this survey as cultivated in the residential area of Sand Island.

##### Petroselinum crispum Nym. -- Parsley -- (cult)

Native to the Mediterranean region (Neal 1965). Cultivated for flavoring food. Previously not recorded for Midway. During this survey we collected plants (Starr and Martz 990421-15 BISH) from cultivated material in the residential area of Sand Island. This collection represents a new cultivated record for Midway Atoll.

#### APOCYNACEAE (Periwinkle family)

##### Allamanda cathartica L. – Allamanda -- (cult)

Native to Brazil (Neal 1965). Cultivated in Hawai'i. Previously known from literature (Herbst and Wagner 1992). Not observed in 1999.

Carissa macrocarpa (Ecklon) A.L.P.P. de Candolle – Natal plum -- (cult)

Native to South Africa (Whistler 2000). In Hawai'i, often cultivated as a hedge for its attractive foliage, white flowers, and red fruits. On Midway, observed and collected in 1954 growing as a hedge plant in the residential area of Sand Island (Neff and DuMont 1955). It was also observed in 1979 by Apfelbaum *et al.* (1983). This species was not observed in 1995 Bruegmann (1998) or in 1999.

Catharanthus roseus (L.) G. Don – Rosy periwinkle, Madagascar periwinkle -- (cult)

Native to Madagascar (Whistler 2000). In Hawai'i, cultivated in gardens for their attractive flowers (Neal 1965) and now naturalized on probably all of the main islands and Midway Atoll (Wagner *et al.* 1999). On Midway, D.R. Chrisholm noted this species to be cultivated in 1931 (Bryan 1956). Hadden (1941) also lists "periwinkles" as being cultivated. Collected in 1954 (*Neff and DuMont 36 BISH*) who described it "as a flowering ornamental seen near the old Pan-American Gooneyville Lodge on Sand Island." This plant was also observed by Apfelbaum *et al.* (1983) in 1979. However, it was not observed in 1995 by Bruegmann (1998) or in 1999 by us.

Ervatamia sp. – Crape jasmine -- (cult)

Possibly a native of northern India (Neal 1965). In Hawai'i, a few species are grown in cultivation. On Midway, previously known from literature (Herbst and Wagner 1992). Not observed in 1999.

Nerium oleander L. – Oleander -- (cult)

Native from southern Europe to Persia; in Hawai'i, oleander is a common ornamental shrub (Neal 1965). On Midway, collected in 1931 by D.R. Chrisholm (*s.n.* BISH). Neff and DuMont (1955) report St. John including this in a list of new plant additions to Midway Atoll in 1931. They also collected it "as an ornamental and hedge plant in the residential area of Sand Island." Also observed in 1979 by Apfelbaum *et al.* (1983) and in 1995 by Bruegmann (1998). In 1999, we observed both pink and white flowered forms being widely cultivated in the residential and town areas of Sand Island. Collected (*Starr and Martz 990505-8 BISH*).

Plumeria obtusa L. – Singapore plumeria -- (cult)

Native to America (Neal 1965). Cultivated in Hawai'i, its white flowers are often strung into lei (Neal 1965). On Midway, previously known from literature (Herbst and Wagner 1992). During this survey, observed as cultivated on Sand Island.

Plumeria rubra L. – Red plumeria, frangipani (cult)

Native to tropical America; in Hawai'i this plumeria is cultivated and has pink to red, rose colored flowers (Neal 1965). On Midway, *Plumeria* sp. has been recorded previously by Hadden (1941), Apfelbaum *et al.* (1983), and Bruegmann (1998). During this survey, observed as cultivated on Sand Island and collected (*Starr and Martz 990505-9 BISH*).

Thevetia peruviana (Pers.) K. Schum – Be still tree -- (nat)

[Cascabela thevetia (L.) Lippold] Native to tropical America (Neal 1965). In Hawai'i, cultivated as a hedge and now naturalized on Kaua'i, O'ahu, Maui, and probably on the other main islands (Wagner et al. 1999). On Midway, collected in 1954 (*Neff and DuMont* 27 BISH) from cultivated material in the residential area of Sand Island (Neff and DuMont 1955). Also observed in 1979 by Apfelbaum et al. (1983) and in 1995 by Bruegmann (1998). In 1999 this fragrant, yellow-flowered, sappy shrub is still cultivated in the residential area of Sand Island, and is persisting in areas that have been recently cleared near the cemetery on the north part of the island. Not observed on Eastern or Spit Islands. Collected in 1999 (*Starr and Martz* 990505-7 BISH) representing a new island record for Midway Atoll (Starr et al. 2002).

#### ARALIACEAE (Ginseng family)

Polyscias guilfoylei (Bull) Bailey – Panax -- (cult)

Native to southern Polynesia and one of the commonest hedge plants in Hawai'i (Neal 1965). On Midway, previously recorded by Hadden (1941) and by Bruegmann (1998). During this survey we observed this species near the Midway Mall and other places in town.

Schefflera actinophylla (Endl.) Harms – Octopus tree -- (nat)

Native to Australia and New Guinea, widely cultivated indoors and outdoors; in Hawai'i naturalized at least on Kaua'i, O'ahu, Maui, and Hawai'i, but probably on all of the main islands (Wagner et al. 1999). On Midway, previously recorded by Apfelbaum et al. (1983) and by Bruegmann (1998). During this survey, there were several cultivated trees in the town area of Sand Island and it was beginning to spread beyond initial plantings, germinating in trees and on buildings. No naturalized specimens were collected and it has yet to be published as a new island record for Midway Atoll.

#### ASTERACEAE [COMPOSITAE] (Daisy family)

Arctium lappa L. – Gobo, burdock -- (cult)

Native to Eurasia, a weed in many places, including Hawai'i, cultivated by the Japanese as a vegetable (Neal 1965). Previously known from literature (Herbst and Wagner 1992). Not observed during this survey.

Bidens alba L. var. radiata (Schultz-Bip.) Ballard ex Melchert – Spanish needles -- (nat)

Native from Florida to South America and the West Indies; in Hawai'i on Kure Atoll, Midway Atoll, Kaua'i, O'ahu, Maui, Moloka'i, Kaho'olawe, and Hawai'i (Wagner et al. 1999; Hughes 1995). On Midway, there was some taxonomic confusion between this species and B. pilosa. It is unknown which of the two species the plants on Midway represent, or whether they are a possible hybrid of the two. Collections of both B. alba and B. pilosa have been made. B. alba was collected in 1980 (*Herbst and Takeuchi* 6440 BISH) and B. pilosa was collected multiple times (*Frings* 24 BISH, *Herbst and Takeuchi* 6372 BISH, and *Lamoureux* 2164 BISH). Regardless of official name, this plant is

widespread on Sand Island, especially in lawns, but potentially occurring anywhere. This species is also present on Eastern and Spit Islands.

Bidens pilosa L. -- Spanish needles -- (nat)

Native to tropical America but now a pantropical weed; in Hawai'i on Midway Atoll and all of the main islands (Wagner et al. 1999). Neff and DuMont note "Dr. Fosberg found it common in weedy ground on Sand Island." The Bidens on Midway are taxonomically challenging. See B. alba var. radiata.

Calendula officinalis L. – English marigold -- (cult)

Native to southern Europe and cultivated for their showy flowers (Neal 1965). On Midway, recorded by Hadden (1941) as one of the flowers grown during the Pan American Airways era. Not recorded in other surveys. During this survey, recorded as cultivated on Sand Island where it is rare in distribution. Collected during this survey (*Starr and Martz 990421-2 BISH*).

Calyptocarpus vialis Less. – Calyptocarpus -- (nat)

Native from Texas south Guatemala, Costa Rica, and Cuba; in Hawai'i naturalized on Midway Atoll and probably all of the main islands (Wagner et al. 1999; Bruegmann 1999). On Midway, first collected (*Bruegmann 2019 BISH*) by Bruegmann in 1995 (Bruegmann 1999). In 1999, it was occasional in lawn areas of Sand Island. Collected again during this survey (*Starr and Martz 990429-3 BISH*).

Chrysanthemum sp. – Chrysanthemum -- (cult)

Annual and perennial herbs, most of which are from the Eastern Hemisphere, many are cultivated for ornament (Neal 1965). On Midway, previously recorded by Hadden (1941). During this survey, cultivated on Sand Island, rare in distribution.

Conyza bonariensis (L.) Cronq. – Hairy horseweed - (nat)

Possibly native to South America now cosmopolitan in distribution; in Hawai'i known from Kure and Midway Atolls, Laysan, French Frigate Shoals, and all of the main islands (Wagner et al. 1999). This species has been collected many times on Midway. The following specimens are archived at Bishop Museum (*Herbst and Takeushi 6373, 6395; Neff and Dumont 5; Meagher s.n.; Frings 13, Lamoureux 2767*). Neff and DuMont note it being "Locally abundant, mostly along margins of runways and unpaved roadways; also noted in utility areas where the sand has been disturbed, in vacant lots, and in waste land; on both Sand and Eastern Islands." During this survey it was observed as common on Sand Island. See C. canadensis.

Conyza canadensis (L.) Cronq. var. pusilla (Natt.) Cronq. -- Horseweed -- (nat)

Native from southern Canada and the United States south to tropical America; in Hawai'i naturalized on Midway Atoll and all of the main islands except Kaho'olawe (Wagner et al. 1999; Wagner and Herbst 1995). On Midway, first collected by Herbst and Takeuchi (*9072 BISH*) in 1988. There has been some taxonomic confusion in this group, being confused with C. bonariensis. Whichever species it truly is, perhaps both, it is

widespread on the runways of Eastern Island, and common on Sand Island, especially on the beaches. It was also observed on Spit Island. In 1999 it was collected again on Sand Island (*Starr and Martz 990620-2 BISH*), and also on Spit Island (*Starr and Martz 990623-3 BISH*). These collections represent a new island record for Midway Atoll.

Coreopsis grandiflora Nutt. – Coreopsis -- (cult)

Native to the southern United States and cultivated in Hawai'i (Neal 1965). Previously not recorded on Midway. During this survey, it was cultivated on Sand Island, rare in distribution. Collected during this survey (*Starr and Martz 990505-5 BISH*). This collection represents a new cultivated record for Midway Atoll.

Cosmos bipinnatus – Cosmos -- (cult)

Native to Mexico and cultivated in Hawai'i (Neal 1965). Previously not observed on Midway. During this survey, recorded as rare on Sand Island. Collected during this survey (*Starr and Martz 990421-6 BISH*). This collection represents a new cultivated record for Midway Atoll.

Cosmos sp. – Cosmos -- (cult)

Previously not recorded on Midway. During this survey, observed as cultivated on Sand Island, rare in distribution. This observation represents a new cultivated record for Midway Atoll.

Cynara scolymus -- Artichoke -- (cult)

Native to the Mediterranean region and the Canary Islands, cultivated in Hawai'i for food (Neal 1965). Previously not recorded from Midway Atoll. During this survey it was observed as cultivated on Sand Island. This observation represents a new cultivated record for Midway Atoll.

Gamochaeta purpurea (L.) Cabr. – Purple cudweed -- (nat)

[Gnaphalium purpureum L.] Taxonomic name change from Gnaphalium purpureum to Gamochaeta purpurea (Wagner *et al.* 1997). Neff and DuMont (1955) report that Fosberg observed this species on Sand Island and noted "Very rare, found in the shade of a building at the Air Terminal". Not observed before or since. Not observed in 1999.

Helianthus annuus L. – Sunflower -- (cult)

A native of the western United States grown for its ornamental flowers and edible seeds (Neal 1965). In Hawai'i, cultivated and now naturalized on the island of Hawai'i (Wagner *et al.* 1999). On Midway, previously recorded by Hadden (1941). Not observed since then. Not observed in 1999.

Lactuca sativa L. -- Lettuce -- (cult)

Possibly derived from a European weed, grown for its edible leaves (Neal 1965). Previously not recorded from Midway. During this survey, recorded as cultivated in the residential area and other personal gardens on Sand Island. Collected in 1999 (*Starr and*

*Martz 990429-16 BISH*). This collection represents a new island record for Midway Atoll.

Pluchea x fosbergii Cooperr. and Galang -- Hybrid pluchea -- (nat)

A spontaneous hybrid between P. indica and P. symphytifolia (Wagner *et al.* 1999). In Hawai'i known from Midway Atoll, Kaua'i, O'ahu, Moloka'i, and Maui (Wagner *et al.* 1999). Previous collections from Midway at Bishop Museum include (*Lamoureux 2294, Herbst and Takeuchi 6441*). Not observed in any other surveys. Not observed during this survey.

Pluchea indica (L.) Less. – Indian pluchea -- (nat)

Native to southern Asia; in Hawai'i recorded from Midway Atoll, Laysan, and probably all of the main islands (Wagner *et al.* 1999). Previously collected from Midway (*Herbst and Takeuchi 6362, 6442 BISH*) in 1980 and described as not common. Not observed in any other surveys. Not observed during this survey.

Pluchea carolinensis (Jacq.) G. Don – Sour bush -- (nat)

[P. symphytifolia (Mill.) Gillis, P. odorata *sensu auct.*, non (L.) Cass.] Recent taxonomic name change from P. symphytifolia to P. carolinensis (Wagner *et al.* 1999; Wagner and Herbst 1995). Native to Mexico, the West Indies, and northern South America; in Hawai'i naturalized on Kure and Midway atolls, French Frigate Shoals, and all of the main islands (Wagner *et al.* 1999). Many collections from Midway exist as Bishop Museum for this species, including (*Neff and DuMont 1; Herbst and Takeuchi 6424, 6348; Lamoureux 2012, 2266, 2180, 2131; C.R. Long; H.W. Frings 7, 36*). Neff and DuMont (1955) report that this species is "More widespread on Eastern Island than on Sand Island, but abundant on both. This weed species has taken over many open areas where the soil was disturbed by construction work, such as along the margins of runways, and now forms an almost impenetrable barrier to heights of four to five feet." Also observed by Apfelbaum *et al.* (1983) and by Bruegmann (1998). The situation did not seem so bleak in 1999, but scattered individuals and small patches were observed on Sand, Eastern, and Spit Islands. Numerous plants of all life stages were observed near the Dump Pond on Sand Island. On Spit, only one small plant was observed and collected (*Starr and Martz 990623-11 BISH*). The potential range of this plant seems much larger than the current range. During this survey, plants of this species were being controlled.

Pseudognaphalium sandwicense Gaudich. A. Anderb. – 'Ena'ena -- (end)

[Pseudognaphalium sandwicense Gaud. var. sandwicense, Gnaphalium sandwicense Gaud., G. sandwensis f. canum Sherff] There has been recent taxonomic revision and new varietal combinations for those plants formerly treated as species of Gnaphalium (Wagner *et al.* 1999; Wagner *et al.* 1997). Endemic to the Hawaiian Islands (Wagner *et al.* 1999). On Midway, Neff and DuMont (1955) collected this species (4 BISH) and reported it to be "Locally common along margins of runways and in old administrative areas on Eastern Island, and thinly but widely scattered in similar locations on Sand Island." Also collected in 1979 by Apfelbaum *et al.* (1983). Conant (1983) notes "collected from a drainage ditch on the north side of the buildings at



the Midway terminal building (*Conant 131 BISH*) and from sandy soils on the northwest side of the housing area (*Conant 130 BISH*). Other collections include (*Herbst and Takeuchi 6361, 6363, 6426; Lamoureux 2267; C.R. Long 1734, H.W. Frings 51*). In 1995, observed as common on Sand island by Bruegmann (1998). In 1999, this species was observed to be abundant near the fuel farm and occasionally on the pebble covered roofs in town on Sand Island. Collected on Spit Island (*Starr and Martz 990623-9 BISH*), where it was rare. Not observed on Eastern Island.

*Sonchus oleraceus* L. – Sow thistle -- (nat)

Native to Europe; in Hawai'i known from Kure, Midway, and Pearl and Hermes atolls, French Frigate Shoals, Nihoa, Ka'ula, Lehua, and all the main islands (Wagner *et al.* 1999). Collections from Midway Atoll at Bishop Museum for this species include (*H.W. Frings 23, 49, 77; Lamoureux 2239; Herbst and Takeuchi 6445, C.R. Long 1707*). Neff and DuMont (1955) note that "an occasional plant was seen growing along utility roads and in service areas on both Sand and Eastern Islands." Also observed in 1979 by Apfelbaum *et al.* (1983) and in 1995 noted by Bruegmann (1998) on Sand, Eastern, and Spit Islands. In 1999 we found it be occasional on Sand, Eastern, and Spit Islands.

*Tagetes erecta* L. – Marigold -- (cult)

Native to Mexico, cultivated for their attractive flowers (Neal 1965). On Midway, previously not recorded. During this survey, observed as cultivated on Sand Island and rare in distribution. Collected during this survey (*Starr and Martz 990421-7 BISH*). This collection represents a new cultivated record for Midway Atoll.

*Tridax procumbens* L. – Coat buttons -- (nat)

Native to Mexico, Central America, Venezuela, and Colombia to Peru and Bolivia, now widely naturalized; in Hawai'i on Midway Atoll and all of the main islands except Ni'ihau (Wagner *et al.* 1999). On Midway, previously collected by Herbst (6338 BISH). During this survey, observed as occasional in lawns and along runways on the south part of Sand Island.

*Verbesina encelioides* (Cav.) Benth. and Hook. – Golden crown beard -- (nat)

Native to Mexico and the southwestern United States; in Hawai'i known from Kure, Midway, and Pearl and Hermes atolls and all of the main islands except Ni'ihau (Starr *et al.* 2002; Wagner *et al.* 1999). There are many collections from Midway of this species at Bishop Museum, including (*Neff and DuMont 2; Herbst and Takeuchi 6423, 6382; H.W. Frings 8, 21; R.M. Beauchamp 1270; C.R. Long 1749*). Initially recorded for Midway by Neff and DuMont (1955) who reported this species to be "Abundant on both islands, though more widespread on Eastern than on Sand. Forms a dense cover on many of the open areas in the interior of the islands, taking over areas that would be better vegetated if in grasses. Offers the only bit of color on the islands with its multitude of golden blossoms." Also observed by Apfelbaum *et al.* in 1979. Bruegmann recorded this species as dominant on both Sand and Eastern Island, but not from Spit, during her survey in 1995. During this survey in 1999, we found this to be one of the most widespread plants on all three of the islands in the atoll. It was collected from Spit Island during this survey

(*Starr and Martz 990623-4 BISH*) where it is now occasional in distribution. Along with ironwood, this weedy aster is currently a high priority for alien plant control.

Sphagneticola trilobata (L.) Pruski – Wedelia -- (nat)  
[Wedelia trilobata (L.) Hitchc.] Taxonomic name change from W. trilobata to S. trilobata (Wagner *et al.* 1999; Wagner *et al.* 1997). Native to the New World tropics; in Hawai'i cultivated as a ground cover and now naturalized on Midway Atoll and probably all of the main islands (Wagner *et al.* 1999). On Midway, previously collected in 1983 by S. Conant who noted "This creeping herb with its bright yellow flowers is a common ground cover in the main Hawaiian Islands...It was collected (*Conant 118a BISH*) from around a flagpole in front of the school building." This was the first and only time this species was observed or collected on Midway. Not observed in 1999.

Xanthium strumarium var. canadense (Mill.) Torr. and A. Gray – Cocklebur -- (nat)  
Probably native to the New World, now a cosmopolitan weed; in Hawai'i known from Midway Atoll and all of the main islands (Wagner *et al.* 1999). For Midway, Neff and DuMont reported that they "knew of St. John's report [1931] of cockleburs on Midway, but did not find the plant." It was reported in Herbst and Wagner (1992) based on the same information, but was not seen. There is collected material at Bishop Museum (*D.R. Chrisholm s.n.*). Cocklebur has not been observed before or since on Midway. Not observed in 1999.

Zinnia violacea Cav. – Zinnia -- (cult)  
Previously not recorded from Midway Atoll. During this survey it was cultivated on Sand Island. Collected in 1999 (*Starr and Martz 990505-2, 990421-8 BISH*). These collections represent a new cultivated record for Midway Atoll.

#### BALSAMINACEAE (Impatiens family)

Impatiens balsamina L. – Garden balsam, candlestick plant -- (cult)  
Native to southeastern Africa and grown in Hawai'i for ornament (Neal 1965). On Midway, previously not recorded. During this survey it was being cultivated near housing by barracks on Sand Island. Collected in 1999 during this survey (*Starr and Martz 990421-17 BISH*). This collection represents a new cultivated record for Midway Atoll.

#### BASELLACEAE (Basella family)

Basella alba L. – Ceylon spinach, Malabar spinach -- (cult)  
Native to either Africa or tropical Asia, a succulent vine cultivated in Hawai'i for its edible greens that are rich in vitamin A and C (Neal 1965). In Hawai'i, recently documented as naturalized on the island of O'ahu (Wagner *et al.* 1999; Nagata 1995). Nagata notes that previously collected specimens on O'ahu were considered to be escaped, but what appeared to be a truly naturalized population was found in 1988. He notes, "Malabar spinach is slowly becoming naturalized at least on O'ahu." On Midway,

B. alba was first collected by Bruegmann during her survey in 1995. It was going to be published as a new island record for Midway (Wagner *et al.* 1999) but did not appear in Bruegmann's article that year, probably due to its cultivated status. During this survey we observed it being cultivated in the residential areas of Sand Island, persisting longer than other cultivated species. This species was also collected in 1999 (*Starr and Martz 990421-12 BISH*). Plants on Midway may slowly naturalize in a similar fashion as they did on O'ahu and should be monitored and added as a new island record when they do.

#### BIGNONIACEAE (Bignonia family)

Spathodea campanulata P. Beauv. – African tulip tree -- (cult)

Native to tropical Africa, introduced to the main Hawaiian Islands for ornament, this beautiful tree with bright orange flowers is now widely naturalized. On Midway, this species is restricted to a clump of a dozen trees persisting by the 6000 housing and was first recorded by Bruegmann during her survey in 1995. This clump could easily be eradicated from Sand Island.

Tabebuia heterophylla (DC.) Britt. -- Pink tecoma -- (cult)

Native to tropical America (Whistler 2000). In Hawai'i, grown for its attractive foliage and flowers that occur frequently throughout the year (Neal 1965). Tabebuia sp. is previously reported in literature (Herbst and Wagner 1992). T. heterophylla is previously not recorded from Midway, during this survey, we observed a few trees cultivated in the town area of Sand Island where it was collected (*Starr and Martz 990505-14 BISH*). According to Whistler (2000) this species is known to spread out of the garden on its own. Though it has not done so on Midway yet.

#### BOMBACEAE (Baobab family)

Adansonia digitata L. – Baobab tree -- (cult)

Native to the grassy plains of tropical Africa, this is one of the largest and longest-lived trees in the world (Neal 1965). Cultivated in Hawai'i as a specimen tree. On Midway, this species was planted during Pan-American years (around 1936) and was listed by Hadden (1941) as a species that needed soil and fresh water to live. The Baobab tree was not observed by Neff and DuMont in 1954 and has not been seen since. It was not observed in 1999.

#### BORAGINACEAE (Heliotrope family)

Cordia sebestena L. – Kou haole -- (cult)

Native to tropical America (Neal 1965). Commonly cultivated in Hawai'i. On Midway, first recorded by Hadden (1941). Also recorded by Bruegmann (19987). During this survey, two trees were observed near the Midway Mall on Sand Island.

Heliotropium procumbens var. depressum (Cham.) Fosb. -- (nat)

Native from southern United States south to Central and South America and the West Indies; in Hawai'i documented from Midway Atoll, French Frigate Shoals, Kaua'i, O'ahu, and Maui (Wagner *et al.* 1999; Herbst and Wagner 1999). On Midway, previously recorded by Bruegmann (1998) who noted it as occasional on Sand Island. During this survey, we observed it as occasional on both Sand and Eastern Islands.

Tournefortia argentea L. fil. – Tree heliotrope -- (nat)

[Messerschmidia argentea (L. fil.) I.M. Johnst.] Native to tropical Asia, Madagascar, tropical Australia, and Polynesia; in Hawai'i naturalized and common in coastal areas of Kure, Midway, and Pearl and Hermes atolls, Lisianski, Laysan, French Frigate Shoals, and all of the main islands except Kaho'olawe (Wagner *et al.* 1999). Tree heliotrope was reported by Hadden (1941) as one of the trees that were tried and successfully grown during the Pan-American Airways era (about 1936). On Midway, Neff and DuMont (1955) collected this species, noting "Not uncommon, but widely scattered on both Sand and Eastern Islands. Often seen emerging above the Scaevola scrub." Also observed in 1979 by Apfelbaum *et al.* In 1995, Bruegmann reported it as occasional on Sand and Eastern Island and as rare on Spit Island. During this survey, we found this tree to be common on Sand, Eastern, and Spit Islands, especially in the area just behind the high-water mark, but also well inland.

#### BRASSICACEAE (Mustard family)

Brassica spp.

A genus made up of about 40 species, native mainly to the Mediterranean region, and grown as food in Hawai'i and elsewhere (Neal 1965). A few Brassica species and varieties have been reported from Midway as follows.

Brassica campestris var. rapa (L.) Hartm. -- Turnip -- (cult)

Turnips are vegetables that have a rosette of green leaves attached to a tuber. On Midway, turnips were reported by Hadden (1941) as being cultivated in the vegetable garden on Sand Island. It has not been reported since then.

Brassica napus L. var. chinensis (L.) O.E. Schulz -- Pak-choi, Chinese cabbage -- (cult)

Pak-choi are greens that are similar to leaf mustard and have smooth leaves that are long, wide, and with white petioles. Pak-choi is reported by Hadden (1941) as being grown in the vegetable garden on Sand Island during the Pan-American Airways era. It was also being grown in vegetable gardens on Sand Island during this survey.

Brassica napus var. napobrassica (L.) Reichenb. -- Rutabaga -- (cult)

Rutabaga is a tuberous vegetable similar to turnips but with leaves born on a neck above the tuber. Rutabaga was listed in Hadden (1941) but has not been reported since then.

Brassica nigra (L.) W. Koch – Black mustard -- (nat)

Native to Eurasia; in Hawai'i naturalized on O'ahu, Maui, and Hawai'i (Wagner *et al.* 1999). On Midway, first observed by Apfelbaum *et al.* during their survey in 1979.

Bruegmann observed this species as common on both Sand and Eastern Islands during her survey in 1995. During this survey in 1999, we observed it as rare on Sand Island and as occasional to common in parts of Eastern Island, especially the southeast corner, forming monotypic stands. It has not been found on Spit Island yet. It was collected during a return trip to Midway in 2001, representing a new island record for Midway (*Starr and Martz 010526-1 BISH*).

Brassica oleracea L. var. acephala DC. -- Kale -- (cult)

Kale is an edible vegetable that are grown for greens to feed to humans, stock, and poultry (Neal 1965). Kale was reported by Hadden (1941) as being cultivated in the vegetable garden on Sand Island. It has not been reported since then.

Brassica oleracea var. botrytis L. -- Broccoli, Cauliflower -- (cult)

Broccoli and cauliflower are vegetables with many branched edible inflorescences. Broccoli is green and longer branching while cauliflower is white and more compact (Neal 1965). On Midway, broccoli was previously recorded by Hadden (1941) as being grown in the vegetable on Sand Island. During this survey, both broccoli and cauliflower were being cultivated on Sand Island.

Brassica oleracea var. capitata L. – Purple leaved cabbage, Green cabbage, Head cabbage -- (cult)

Head cabbage has numerous round overlapping edible leaves in a round overlapping head (Neal 1965). On Midway Atoll, purple leaved cabbage was reported by Bruegmann (1998) as being cultivated on Sand Island. It was not observed in 1999. Head cabbage was previously reported by Hadden (1941) grown in the vegetable garden at Midway at the time. It was not reported again until this survey where it was being cultivated on Sand Island.

Brassica oleracea var. gongylodes L. -- Kohlrabi -- (cult)

Kohlrabi is a vegetable that looks like a turnip but the swollen edible stem grows above ground (Neal 1965). On Midway, kohlrabi was previously noted by Hadden (1941) from the vegetable garden on Sand Island. During this survey, it was being cultivated in residential gardens on Sand Island.

Capsella bursa-pastoris (L.) Medik. – Shepard's purse -- (nat)

[Capsella rubella Reut.] Taxonomic change from C. rubella to C. bursa-pastoris (Wagner and Herbst 1995). Native to Eurasia; in Hawai'i documented from Midway Atoll, O'ahu, Lana'i, Maui, and Hawai'i (Wagner et al. 1999; Herbst and Wagner 1996). On Midway, represented by the collection (*Herbst and Takeuchi 9087 BISH*) which was the first record of this species for the Northwestern Hawaiian Islands (Herbst and Wagner 1996). During this survey, this species was rare on Sand Island.

Coronopus didymus (L.) Sm. – Swine cress -- (nat)

Native to Eurasia; in Hawai'i known from Midway Atoll, Pearl and Hermes Atoll, and all of the main islands. On Midway, previously recorded in 1979 by Apfelbaum et al. and in

1995 by Bruegmann as common on Sand and Eastern Islands. During this survey, it was common in open, hard packed areas on Sand and Eastern Islands, and rare to occasional on Spit Island.

Lepidium bidentatum var. o-waihiense (Cham. and Schlechtend.) – ‘Anaunau -- (end) [Lepidium o-waihiense Montin] Endemic to the Hawaiian Islands. Previously known from Kure, Midway, and Pearl and Hermes atolls, Laysan, Kaua'i, O'ahu, Moloka'i, Lana'i, Maui, and Hawai'i (Wagner et al. 1999). Now presumed extinct on Kure, Midway, and Laysan. Also becoming rare on the main islands. On Midway, first collected from Eastern Island by Bryan in 1902. Collected by the Tanager Expedition on Eastern Island in 1923 where it was common in the central plain, but also observed as not uncommon on Sand Island. Not observed since 1923. Not seen in 1999 survey. Presumed extinct on Midway. In June of 1999, seeds were collected from Pearl and Hermes Reef and propagated in the Midway nursery for future out-planting at Midway Atoll.

Lepidium virginicum L. – Pepper grass -- (nat)  
Native to eastern United States; in Hawai'i known from Midway Atoll, Kaua'i, O'ahu, Moloka'i, Maui, and Hawai'i (Wagner et al. 1999; Lorence et al. 1995). On Midway, collected in 1954 by Neff and DuMont (1955) who note "Rare, only two or three plants noted on each of the islands." Also observed by Apfelbaum et al. in 1979. Noted as common on Sand Island by Bruegmann in 1995. In 1999, we found this herb widespread on Sand Island, a common weed in lawns and waste places. We did not find it on Eastern or Spit Islands.

Lobularia maritima L. Desv. – Sweet alyssum -- (nat)  
Native to Eurasia; in Hawai'i a common ornamental now naturalized on Kure, Midway, O'ahu, Moloka'i, and Maui (Wagner et al. 1999; Wagner and Herbst 1995; Hughes 1995). On Midway, Neff and DuMont (1955) found "Sweet alyssum grows in abundance over large portions of both Sand and Eastern Islands." Also observed in 1979 (Apfelbaum et al. 1983). Conant (1983) collected (*Conant 136 BISH*) this plant and adds "This common, naturalized ornamental has been on Midway for several decades, and continues to maintain itself". By 1995, Bruegmann reported sweet alyssum as common to dominant on Sand, Eastern and Spit Islands. Similarly, in 1999, we found this fragrant crawler to be common to dominant in many areas of Sand, Eastern, and Spit Islands.

Raphanus sativus L. – Radish -- (cult)  
Native to Eurasia; commonly grown for its root which is eaten raw (Neal 1965); in Hawai'i documented from all of the main islands except Ni'ihau and Lana'i (Wagner et al. 1999; Mature, seeding, semi-cultivated plant collected on Sand Island in 1999 (*Starr and Martz 990429-4 BISH*)).

#### Unknown plants

A few species of vegetable like plants, presumably of the family Brassicaceae, were observed as cultivated plants on Sand Island. None were collected.

## CACTACEAE (Cactus family)

### Epiphyllum oxypetalum (DC.) – Gooseneck cactus -- (nat)

Native to Mexico; a cactus grown for ornament in Hawai'i (Neal 1965). On Midway, first collected (*Conant 370* BISH) in 1983 "growing on the defunct water tank in the abandoned green house of the old Pan Am Hotel." In 1999 we observed possibly the same clump of plants growing on the roof and wall of the abandoned greenhouse south of the old Cable Company buildings (Pan Am Hotel) on Sand Island. The naturalized status on Midway has yet to be properly documented.

### Hylocereus undatus (Haw.) Britton and Rose – Night blooming cereus -- (cult)

Native to Central America and widely cultivated throughout the tropics; in Hawai'i widely cultivated and often spreading vegetatively on all of the main islands (Wagner *et al.* 1999). On Midway, previously known from literature (Herbst and Wagner 1992). Not recorded since then. Not observed during this survey.

### Opuntia cochenillifera (L.) Mill. – Cochineal cactus -- (cult)

Native range unknown, but probably from southern Mexico or northern Central America (Wagner *et al.* 1999). Cultivated as a host for cochineal insects to make dye; in Hawai'i, now spreading from cultivation on Kaua'i and O'ahu (Wagner *et al.* 1999). On Midway, cultivated and first recorded by Bruegmann (1998). During this survey, we observed this cactus being cultivated in the residential area of Sand Island.

### Unknown plant -- (cult)

A small "pencil like" cactus, cultivated on Sand Island, was collected during this survey (*Starr and Martz 990429-9* BISH) but was not identifiable. This collection probably would have represented a new island record for Midway Atoll, but will need to be recollected with fertile material.

## CAPPARACEAE (Caper family)

### Capparis sandwichiana DC – Maia pilo, pua pilo -- (end)

Endemic to the Hawaiian Islands; occurring on Midway Atoll, Pearl and Hermes Atoll, Laysan, and all of the main islands. Probably extinct now from Midway, Pearl and Hermes, and Laysan. On Midway, previously collected and recorded for Eastern Island only, where it was fairly common in 1902 (*Bryan 12190* BISH), but uncommon in 1923 (*Caum 23* BISH) in the central plain (Bruegmann 1998). Not observed since 1923. Not observed in 1999 survey. Presumed extinct on Midway Atoll. Still locally common in some parts of the main islands.

## CARICACEAE (Papaya family)

### Carica papaya L. – Papaya -- (cult)

Native to the Neotropics, in Hawai'i widely cultivated for its edible fruit and naturalized on Kaua'i, Moloka'i, Maui, and Hawai'i and probably also on some of the other main islands (Oppenheimer and Bartlett 2000; Wagner *et al.* 1999). Planted in residences and community garden. A low growing variety of papaya with large fruits is a common cultivar on Sand Island.

#### CARYOPHYLLACEAE (Pink family)

Cerastium fontanum subsp. triviale (Link) Jalas – Common mouse-ear chickweed -- (nat)  
Native to Eurasia and widely naturalized; in Hawai'i naturalized in somewhat wet sites on all of the main islands except Ni'ihau and Kaho'olawe (Wagner *et al.* 1999). On Midway, first recorded by Apfelbaum *et al.* (1983). Also observed by Bruegmann (1998). During this survey, it was rare on Sand Island. Plants were observed in town and the north part of the Harbor.

Dianthus caryophyllus – Pink carnation -- (cult)  
Native to the Mediterranean region and a favorite of the Hawaiians for ornament and lei making (Neal 1965). Previously not recorded from Midway. During this survey it was collected from Sand Island (*Starr and Martz 990421-4* BISH) where it was being cultivated. This collection represents a new cultivated record for Midway Atoll.

Dianthus chinensis L. – Carnation -- (cult)  
Native to eastern Asia and cultivated in Hawai'i (Neal 1965). Previously not recorded from Midway. During this survey it was collected from Sand Island (*Starr and Martz 990421-3* BISH) where it was being cultivated. This collection represents a new cultivated record for Midway Atoll.

Sagina japonica (Sw.) Ohwi -- Pearlwort -- (nat)  
Native to eastern Asia and previously known in Hawai'i from a collection at the Honolulu Airport in 1985 where it was considered probably not established (Wagner *et al.* 1999). Previously not recorded from Midway. During this survey it was collected from Sand Island, where it was uncommon on the hard packed coral runway (*Starr and Martz 990510-6* BISH) representing a new island record for Midway Atoll (Starr *et al.* 2003).

Spergularia marina (L.) Griseb. – Saltmarsh sand spurry -- (nat)  
Native to Eurasia and also apparently from North America; in Hawai'i naturalized on Kure and Midway atolls, French Frigate Shoals, Kaua'i, O'ahu, Moloka'i, and Maui (Wagner *et al.* 1999). On Midway previously recorded in 1979 (Apfelbaum *et al.* 1983) and in 1995 (Bruegmann 1998). During this survey, it was common on Sand, Eastern, and Spit Islands. Found in hard packed areas, sandy areas.

Stellaria media (L.) Vill. – Chickweed -- (nat)  
Native to Eurasia and widely naturalized; in Hawai'i naturalized on Kure Atoll, Kaua'i, O'ahu, Lana'i, Maui, and Hawai'i (Wagner *et al.* 1999). On Midway previously recorded in 1979 (Apfelbaum *et al.* 1983) and in 1995 (Bruegmann 1998). During this survey, it



was uncommon in the lawn in the north part of Sand Island. It was collected during a return trip to Midway in 2001 (*Starr and Martz 010520-2 BISH*) representing a new island record for Midway Atoll (*Starr et al. 2003*).

#### CASUARINACEAE – (Casuarina family)

##### Casuarina equisetifolia L. – Ironwood -- (nat)

Native to Australia, widely cultivated in the tropics and subtropics and also widely naturalized; in Hawai'i documented from Kure, Midway, and Pearl and Hermes atolls, Lisianski, Laysan, French Frigate Shoals, and all of the main islands (*Wagner et al. 1999*). On Midway, some of the first ironwood plantings were begun in 1936 by Mr. Steadman, the gardener for the Pan-American Airlines (*Hadden 1941*). By 1954, Neff and DuMont note, "Abundant on both Sand and Eastern Islands. The original plantings appear to have reached maturity and some are dying. Spreading by natural means the ironwoods have scattered all over Sand Island and trees dully 30 feet high were seen on beach-line dunes on the opposite end of the island from the original plantings. A few trees of similar height were found on Eastern Island and small seedlings occur almost all over this island. Within a few years it, too, will very likely be ironwood-covered." Observed in 1979 (*Apfelbaum et al. 1983*). *Bruegmann (1998)* listed ironwood as common to dominant on Sand and Eastern Islands and as rare on Spit Island. During this survey, ironwood dominated most of Sand Island forming monotypic forest with only an occasional light gap. Almost all trees have been treated on Eastern Island and will soon be felled and burned. All adult trees have been removed from Spit Island, but seedlings are constantly popping up.

##### Casuarina glauca Siebold ex Spreng. – Longleaf ironwood -- (nat)

Native to eastern and southern Australia; in Hawai'i this species persists by root suckers and is documented from Kaua'i, Moloka'i, Lana'i, Maui, Kaho'olawe, and Hawai'i (*Wagner et al. 1999*). *Bruegmann (1998)* was the first to record this species as a new island record to Midway, but for some reason it was not published. During our survey, one patch was found south of the Hangar in the antennae field where a collection was made (*Starr and Martz 990511-1 BISH*) representing a new island record for Midway Atoll (*Starr et al. 2002*).

#### CHENOPODIACEAE – (Goosefoot family)

##### Chenopodium murale L. – Goosefoot -- (nat)

Probably native from the Mediterranean area to southwestern Asia; now a cosmopolitan weed; in Hawai'i documented from Kure and Midway atolls, French Frigate Shoals, and all of the main islands (*Wagner et al. 1999*). On Midway, first observed by *Apfelbaum et al. (1983)*. *Bruegmann (1998)* notes this species as occasional on Sand Island. During this survey, it was also noted as occasional on Sand Island, especially near the fuel farm.

##### Spinacia oleracea L. – Spinach -- (cult)

Native to southwestern Asia, spinach is a common vegetable used for greens and is cultivated in Hawai'i and elsewhere (Neal 1965). Previously not recorded from Midway. During this survey, spinach was being cultivated and observed as rare on Sand Island. This observation represents a new cultivated record for Midway Atoll.

#### CLUSIACEAE (Mangosteen family)

Calophyllum inophyllum L. – Kamani -- (cult)

Native from eastern Africa, India, Taiwan, and Malesia to Australia and the Tuamotus; in Hawai'i this polynesian introduced tree is often used in landscaping and naturalized in low elevation sites at least on Kaua'i, O'ahu, Moloka'i, Maui, and Hawai'i (Wagner et al. 1999). On Midway, first reported by Hadden (1941). Reported as rare on Sand Island by Bruegmann (1998). During this survey, one tree was observed near the Hangar.

Clusea rosea Jacq. – Autograph tree -- (cult)

Native to the West Indies and Florida; in Hawai'i this tree is often used in landscaping and has naturalized in low elevation areas of Kaua'i, O'ahu, Maui, and Hawai'i (Oppenheimer and Bartlett 2000; Wagner et al. 1999). On Midway, previously known from literature (Herbst and Wagner 1992). Not observed during any other surveys. Not observed during this survey.

#### COMBRETACEAE (Indian almond family)

Conocarpus erectus L. – Button mangrove -- (cult)

Native to coastal areas of the Neotropics from Florida and Mexico to Ecuador and Brazil, also in tropical western Africa; in Hawai'i this tree is cultivated for landscaping and is naturalized on Kaua'i, O'ahu, Lana'i, and Maui (Wagner et al. 1999; Lorence and Flynn 1997). Button mangrove is a known invader of wetlands, such as Kealia Pond National Wildlife Refuge on Maui. On Midway, first noted by Hadden (1941) who listed "button bush" as being successfully grown on Sand Island. Known from literature (Herbst and Wagner 1992). During this survey, three trees were observed near the Midway Mall. It is currently being formally sheared as a cultivated tree. No regeneration was noted.

Terminalia catappa L. – False kamani, Tropical or Indian almond -- (nat)

Native to Malesia and widely cultivated for shade and edible seeds; in Hawai'i commonly planted and naturalized in coastal areas in at least Kaua'i, O'ahu, Maui, and Hawai'i (Wagner et al. 1999). On Midway, Neff and DuMont (1954) note that "Scattered trees may be found almost all over Sand Island, and a few nice specimens were seen on Eastern Island." Also recorded by Apfelbaum et al. (1983) and by Bruegmann (1998). In 1999, we found it to be widely planted on Sand Island and spreading beyond original plantings. Individuals were also observed germinating on the beach of Sand Island. We did not observe this tree on Eastern or Spit Islands.

#### CONVOLVULACEAE (Morning glory family)

Ipomoea aquatica Forssk. – Swamp cabbage, ung choi -- (cult)

Pantropical in distribution and widely used in Asia for food; in Hawai'i, cultivated and naturalized in wet areas such as streams or ponds on at least O'ahu, Maui, and Hawai'i (Imada et al. 2000; Wagner et al. 1999). On Midway, first recorded by Bruegmann (1998) as being cultivated on Sand Island. During this survey, this hollow stemmed vine was being cultivated in personal gardens on Sand Island for the edible leaves. It was generally grown in little water ponds lined with plastic. It was collected during this survey (*Starr and Martz 990511-4* BISH).

Ipomoea batatas (L.) Lam – Sweet potato -- (cult)

Of American origin, pantropical in distribution and widely cultivated; introduced to Hawai'i by the Polynesians and naturalized probably on all of the main islands but documented from Kaua'i, O'ahu, and Hawai'i (Wagner et al. 1999). On Midway, first recorded by Hadden (1941) as being cultivated in the vegetable garden. Also observed by Apfelbaum et al. (1983). Observed and collected by Bruegmann (1998). During this survey, it was being cultivated in personal gardens on Sand Island for the edible tuber. Often grown with I. aquatica. Collected in 1999 (*Starr and Martz 990510-2* BISH).

Ipomoea indica (J. Burm.) Merr. – Koali 'awa, Koali 'awania -- (ind)

[Ipomoea indica f. indica] Indigenous to the Hawaiian Islands and pantropical in distribution; occurring on Kure and Midway atolls, Lisianski, Laysan, Nihoa, and all of the main islands (Wagner et al. 1999). On Midway, first recorded in 1902 by W. A. Bryan from both Sand and Eastern Islands, where it was plentiful in the center of Eastern Island. In 1923, found by the Tanager Expedition on Sand Island only, where it was on the beach near the landing (Christophersen and Caum 1931). Neff and DuMont (1955) report collecting this species "growing profusely near residence on Sand Island." and add finding "Several plants growing near an old building in the revetment area on the south shore of the island." Collected (*Conant 128* BISH) in 1983 by S. Conant (1983) who noted this species to be "common in the abandoned housing area on Midway." In 1999, what was determined to be this species was collected (*Starr and Martz 990507-1* BISH) near the old 6000 housing, probably the same area described by Conant, where it was sprawling down a hill into the lawn. It was also observed near the old church site.

Ipomoea pes-caprae ssp. brasiliensis (L.) R. Br. – Beach morning glory, *Pohuehue* -- (ind)

Indigenous to the Hawaiian Islands and pantropical in distribution; in Hawai'i, occurring on beaches on Midway Atoll, Lisianski, Laysan, French Frigate Shoals, Nihoa, and all of the main islands (Wagner et al. 1999). On Midway, it was first observed in 1923 by the Tanager Expedition only on Sand Island where a few plants were found growing inland. Neff and DuMont (1955) collected this species, noting "Locally common, this plant is most often found in open sandy areas in the interior of both islands, or along the sandy upper beach-line." Conant (1983) reports "This attractive, indigenous morning-glory was quite rare on Sand Island...only one small colony (2 plants, each less than a meter long) in Area 7 and another, larger (2 sq. m) colony on the east side of the runway." During the 1995 survey, Bruegmann (1998) found this species as occasional on Sand Island and did not observe it on Eastern Island. In 1999, it was observed on both Sand and Eastern

Islands. On Sand Island, it was common at bulky dump, south beach, and rusty bucket. Scattered plants were also found elsewhere including the harbor and in out-planting sites. On Eastern, it was restricted to one site on the northeast tip of the island. It was absent from Spit Island.

Ipomoea triloba L. – Little bell -- (nat)

Native to the West Indies; in Hawai'i known from Midway Atoll, Kaua'i, O'ahu, Maui, and Hawai'i (Oppenheimer and Bartlett 2002; Wagner *et al.* 1999). On Midway, noted by Herbst and Wagner (1992) but not recorded during any other surveys. During this survey, it was not observed.

Merremia tuberosa (L.) Rendle – Wood rose -- (cult)

Pantropical in distribution; in Hawai'i known from all of the main islands (Wagner *et al.* 1999). On Midway, noted by Herbst and Wagner (1992) but not recorded during any other surveys. Not observed during this survey.

#### CRASSULACEAE (Stonecrop family)

Bryophyllum fedtschenkoi (Hamet and Perrier) – Air plant -- (cult)

Native to Madagascar; in Hawai'i cultivated in rock gardens (Neal 1965). On Midway, previously not recorded before this survey. During this survey, it was collected (*Starr and Martz 990429-11 BISH*) from a cultivated plant on Sand Island. It was rare in distribution. This collection represents a new island record for Midway Atoll.

Crassula sp. – Stonecrop -- (cult)

Several species from South Africa are grown in cultivation in Hawai'i (Neal 1965). On Midway, known from literature (Herbst and Wagner 1992). Observed by Bruegmann during her survey in 1995. During this survey, observed as rare on Sand Island where it was being cultivated in the housing area, generally in pots.

Kalanchoe daigremontiana x tubiflora -- (cult)

Perhaps a hybrid of K. tubiflora (Harv.) Raym.-Hamet. Previously recorded as cultivated (Herbst and Wagner 1992). It has not been observed since. It was not observed in 1999.

Kalanchoe pinnata (Lam.) Pers. – Air plant -- (nat)

Native range unknown but widely established in tropical areas; in Hawai'i naturalized on all the main islands except Kaho'olawe (Wagner *et al.* 1999). On Midway, observed previously in 1979 (Apfelbaum *et al.* 1983) and in 1995 (Bruegmann 1998). During this survey, it was observed at the abandoned Pacific Cable Company buildings. It was also used as a potted plant in the residential areas and at the Hangar.

Kalanchoe tubiflora (Harv.) Raym.-Hamet – Chandelier plant -- (cult)

Native to Madagascar; in Hawai'i naturalized on Kaua'i, O'ahu, Lana'i, Maui, and Hawai'i. Perhaps this is the same plant as above (K. daigremontiana x tubiflora). Previously not

recorded on Midway, during this survey it was rare and observed in the residential area of Sand Island. This observation represents a new island record for Midway Atoll.

#### CUCURBITACEAE (Gourd family)

##### Coccinia grandis (L.) Voigt – Ivy gourd -- (cult)

Native to Africa, Asia, and Australia; in Hawai'i naturalized on O'ahu, Maui, and Hawai'i (Oppenheimer and Bartlett 2000; Wagner *et al.* 1999; Starr *et al.* 1999). Previously not known from Midway, a single sprawling plant was collected during this survey in 1999 (Starr and Martz 990429-18 BISH) in the vegetable garden in the backyard of house #4208 (across from the Midway House). According to the resident, they brought the plant by seeds obtained in Thailand. The plant had only 1 flower and no fruit was seen, probably due to the constant pruning it received, but the person who was cultivating it said the fruit were red. The plant was sparingly naturalized, about a few sq. m in size and was growing on a wood pile / fence surrounding the garden. The plant was controlled mechanically a few times and came back. It was then chemically controlled (Garlon) and has apparently not grown back since (Nancy Hoffman pers. comm.). The revised plant importation rules should help prevent future introductions of noxious weeds such as ivy gourd. Through early detection, swift control, and diligent follow up and monitoring, this potentially harmful species was nipped in the bud. This collection represents a new cultivated record for Midway Atoll.

##### Citrullus vulgaris Schrad. – Watermelon -- (cult)

Native to tropical Africa, widely cultivated for its edible fruit (Neal 1965). In Hawai'i, watermelons have long been cultivated since the arrival of Captain Cook (Neal 1965). Previously not recorded from Midway, during this survey, watermelon was being cultivated on Sand Island. Unlike the main Hawaiian Islands, the fruit flies that sting melons are not yet present on Midway, allowing melons to be grown and harvested for consumption. About 2,000 lbs. of melons of various kinds were harvested during their peak in the summer. This observation represents a new cultivated record for Midway Atoll.

##### Cucumis melo L. var. cantalupensis Naud. – Cantaloupe -- (cult)

Native to tropical Asia or Africa and widely cultivated (Neal 1965). On Midway, previously recorded by Hadden (1941) when cantaloupe was being grown in the vegetable garden on Sand Island. During this survey it was being cultivated on Sand Island.

##### Cucumis sativus L. – Cucumber -- (cult)

Native to tropical Asia and widely cultivated (Neal 1965). On Midway, previously unrecorded. During this survey, it was being cultivated on Sand Island. This observation represents a new cultivated record for Midway Atoll.

##### Cucurbita pepo L. – Squash -- (cult)

Possibly native to America and cultivated in Hawai'i (Neal 1965). On Midway, previously noted by Herbst and Wagner (1992) and by Bruegmann (1998). During this survey, it was being cultivated in the town area of Sand Island.

Momordica charantia L. – Balsam pear, bitter melon -- (nat)

Native from tropical Africa to Australia; in Hawai'i widely cultivated and naturalized on all of the main islands (Wagner *et al.* 1999). Previously not recorded from Midway. During this survey, it was collected (*Starr and Martz 990421-11* BISH) from escaping plants in the residential area of Sand Island. This plant is starting to come up in lawns and waste areas, and has the potential to spread far beyond the current plantings. This collection represents a new island record for Midway Atoll (Starr and Martz 2000).

Trichosanthes cucumerina L. var. anguina (L.) Haines -- Snake gourd -- (cult)

Native to India grown in Hawai'i and elsewhere for its ornamental fruits, which are edible when green (Neal 1965). Previously not recorded from Midway. During this survey it was collected (*Starr and Martz 990505-15* BISH) from a single plant being cultivated in a personal garden near the fuel farm. This collection represents a new cultivated record for Midway Atoll.

Unknown – Canary melon -- (cult)

Proper name and origin unknown. Previously not recorded from Midway. During this survey, canary melons were being cultivated on Sand Island. This observation represents a new cultivated record for Midway Atoll.

#### EUPHORBIACEAE (Spurge family)

Acalypha wilksiana Muell.-Arg. – Beefsteak plant, Copper leaf -- (cult)

Native to Fiji. Hadden (1941) lists an Acalypha, though it is uncertain which species he was referring to. Bruegmann (1998) also observed beefsteak plants being cultivated. During this survey, scattered plants were observed in the town area of Sand Island.

Breynia disticha J.R. Forster and J.G.A. Forster var. rosi-picta – Snow bush -- (cult)

Native to Melanesia and widely cultivated for its variegated pinkish, white, and green foliage (Whistler 2000). In Hawai'i, cultivated and now naturalized on Maui (Wagner *et al.* 1999; Lorence *et al.* 1995). On Midway, previously known from literature (Herbst and Wagner 1992). Also recorded by Bruegmann (1998) as rare on Sand Island. It was not observed in 1999.

Chamaesyce hirta (L.) Millsp. – Hairy spurge -- (nat)

[Euphorbia hirta L.] Native from southern United States to Argentina, the West Indies, and the Paleotropics; in Hawai'i naturalized in low elevations on Kure and Midway atolls, French Frigate Shoals, and all of the main islands (Wagner *et al.* 1999). Reported in Bryan (1955) as observed on Midway by Chisholm in 1931. Neff and DuMont (1955) report this species to be "occasional or locally common. Most frequently seen in open

sandy utility areas where the soil has been disturbed during recent years." In 1999, we found it to be common on Sand Island.

Chamaesyce hypericifolia (L.) Millsp. – Graceful spurge -- (nat)

Native from southern United States to Argentina and the West Indies, widely naturalized; in Hawai'i naturalized on Kure and Midway Atoll, French Frigate Shoals, Kaua'i, O'ahu, Maui, and Hawai'i (Wagner *et al.* 1999). Noted by Herbst and Wagner (1992) as naturalized on Midway. During this survey, it was recorded as occasional to common on Sand Island and rare on Spit.

Chamaesyce hyssopifolia (L.) – (nat)

Native from southern United States to Argentina and the West Indies, naturalized in the paleotropics; in Hawai'i known from Midway Atoll, Kaua'i, O'ahu, Lana'i, Maui, and Hawai'i (Wagner 1999, Bruegmann 1999; Herbarium Pacificum Staff 1999). On Midway, first collected (Bruegmann 2029 BISH) in 1995 where it was noted as uncommon on Sand Island (Bruegmann 1999). This species was not observed in 1999.

Chamaesyce maculata (L.) Small – (nat)

Native throughout eastern United States, naturalized in western United States and Europe; in Hawai'i known only from Kure and Midway atolls (Wagner *et al.* 1999). On Midway, collected in 1980 (*Herbst and Takeuchi 6392* BISH). Also collected during this survey (*Starr and Martz 990623-10* BISH) on Sand Island, where it is common to occasional.

Chamaesyce prostrata (Aiton) Small – Prostrate spurge -- (nat)

[Euphorbia prostrata Aiton] Native from southern United States to South America, the West Indies, and the Paleotropics; in Hawai'i naturalized in low elevations on Midway Atoll and all of the main islands except Ni'ihau (Wagner *et al.* 1999; Hughes 1995). Neff and DuMont (1954) report seeing this species "only occasionally on Sand Island, growing along the edge of paved runways." In 1999, we found it to be occasional on both Sand and Eastern Islands.

Codiaeum variegatum (L.) Bl. var. pictum Muell.-Arg. – Croton -- (cult)

Native from Fiji westward to Australia, a common ornamental in Hawai'i (Neal 1965). On Midway, first reported as cultivated on Sand Island by Hadden (1941). Crotons were also observed being cultivated by Bruegmann (1998). During this survey, it was being cultivated in the residential and town areas of Sand Island.

Euphorbia cyathophora J.A. Murray– Wild poinsettia -- (nat)

Native from eastern and southern United States to northern South America and the West Indies; in Hawai'i naturalized on Midway Atoll, Kaua'i, O'ahu, Moloka'i, and Maui (Wagner *et al.* 1999). Collections at Bishop Museum include (*Neff and DuMont 9*, *Herbst and Takeuchi 6329*, *H.W. Frings 12*). Observed by Apfelbaum *et al.* (1983) and also by Bruegmann (1998). During this survey, it was found occurring in mostly forested areas on Sand and Eastern Islands. This species may decline in abundance as ironwood (Casuarina) forests are removed from the islands.

Euphorbia heterophylla L. – Kaliko -- (nat)

[E. geniculata Ort.] Native from southern United States to Argentina and the West Indies; in Hawai'i naturalized on Midway Atoll and all of the main islands except Moloka'i (Wagner et al. 1999). On Midway, Neff and DuMont (1955) report St. John listing this as an addition to the flora of Midway in 1931, as E. geniculata. They observed this species to be "Abundant on Sand Island, common as an understory among the thinner stands of ironwoods and as dense marginal growth about the edges of this stands. Also present on Eastern Island." It has not been observed since. It was not observed in 1999. It is not known whether this species died out, since it has not been observed since 1954, or whether the 1931 and 1954 determinations were actually the closely related E. cyathophora which now dominates the same habitat described by Neff and DuMont. There are specimens of this species at Bishop Museum (*D.R. Chrisholm s.n.*).

Euphorbia peplus L. – Petty spurge -- (nat)

Native to temperate Eurasia, now a cosmopolitan weed; in Hawai'i naturalized on Midway Atoll, Kaua'i, Maui, and Hawai'i (Wagner et al. 1999; Lorence et al. 1995). Collected by H.W. Frings (28 BISH). In 1999, we found this delicate herb to be common on Sand Island, especially in shady areas.

Euphorbia pulcherrima Willd. – Poinsettia -- (cult)

Native to tropical America, the symbol of Christmas, cultivated in Hawai'i where it flowers for the season (Neal 1965). On Midway, first recorded by Hadden (1941). Neff and DuMont (1954) found this species "growing as an ornamental at one residence formerly occupied by Pan-American employees, on Sand Island." Observed by Bruegmann in 1995 (Bruegmann 1998). In 1999, we found it cultivated in the housing area of Sand Island.

Pedilanthus tithymaloides (L.) Poit. – Slipper flower -- (cult)

Native from the West Indies to northern South America, a succulent plant grown as an ornamental in Hawai'i and elsewhere (Wagner et al. 1999). On Midway, a couple varieties are being cultivated in the housing area of Sand Island. Collected during this survey (*Starr and Martz 990429-12, 14 BISH*) for identification.

Ricinus communis L. – Castor bean, castor-oil bean -- (nat)

Native to Africa and perhaps India; in Hawai'i naturalized on all the main islands (Wagner et al. 1999). On Midway, observed by Fosberg and Neff and DuMont (1955) who report "an occasional small plant was seen on Eastern Island. On Sand Island, there are several fairly large patches, some of them far distant from the residential area." Also observed in 1979 (Apfelbaum et al. 1983) and in 1995 (Bruegmann 1995). In 1999, we found castor bean to be naturalized on Sand Island, where it is occasional on the north part of the island, including some large patches near the cart path. We did not observe it on Eastern or Spit Islands. Control efforts are underway.

FABACEAE – [LEGUMINOSAE] (Pea family)



Acacia farnesiana (L.) Willd. – Klu -- (nat)

Native to the Neotropics; in Hawai'i formerly cultivated during an attempt to create a perfume industry. The attempt failed but klu was successful in naturalizing on all of the main islands except Ni'ihau and Lana'i (Wagner et al. 1999). On Midway, Neff and DuMont (1955) collected this plant in 1954 and found it "as a planted ornamental in some places on Sand Island. One small wild spot has grown up near the enlisted men's residential area." It was observed again in 1995 by Bruegmann (1998). It was not observed in 1999.

Albizia lebbbeck (L.) Benth. – Siris tree -- (cult)

Native to the Paleotropics; in Hawai'i naturalized on Midway Atoll, Ni'ihau, Kaua'i, Maui, O'ahu, and Hawai'i (Oppenheimer and Bartlett 2002; Wagner et al. 1999). On Midway, Neff and DuMont (1955) found this tree "as an ornamental and in a few scattered small wild patches about the older part of Sand Islands." Collected by S. Conant in 1983 (*Conant 126 BISH*) who adds "this tall, attractive shade tree is growing in front of the bowling alley on Midway." Recorded in 1979 (Apfelbaum et al. 1983). In 1999, we observed what is probably the same tree cultivated near the bowling at the Midway Mall on Sand Island. We did not observe this species on Eastern or Spit Islands.

Crotalaria incana L. – Fuzzy rattle pod -- (nat)

Widespread in the tropics and subtropics; in Hawai'i naturalized on Midway Atoll and all of the main islands (Wagner et al. 1999; Hughes 1995). On Midway, first observed in 1931 Neff and DuMont (1955) report that in 1954, "Only two or three plants were seen growing on each of the islands." Also observed in 1979 (Apfelbaum et al. 1983) and again in 1995 (Bruegmann 1998). In 1999, we observed this species and C. pallida in the disturbed, semi-maintained lawn in the Bart Hill area in the north part of Sand Island. It was not common on Sand Island or observed on Eastern or Spit Islands.

Crotalaria pallida Aiton – Smooth rattle pod -- (nat)

[Crotalaria mucronata Desv.] Native to Africa; in Hawai'i naturalized on Midway Atoll and all of the main islands except Ni'ihau and Kaho'olawe (Wagner et al. 1999). On Midway, previously noted by Neff and Dumont (1955) as C. mucronata from St. John's 1935 list. During this survey, we observed this species in the disturbed, semi-maintained lawn in the Bart Hill area in the north part of Sand Island (near C. incana).

Delonix regia (Bojer ex Hook.) Raf. – Royal poinciana, flame tree -- (cult)

Endemic and rare in Madagascar, widely cultivated; in Hawai'i also widely cultivated and sparingly naturalized in low elevations of Moloka'i (Wagner et al. 1999). On Midway, previously recorded by Hadden (1941) and by Apfelbaum et al. (1983) as being cultivated for ornament. During this survey, a few trees were observed being cultivated in the town area of Sand Island.

Desmanthus pernambucanus – Virgate mimosa, slender mimosa -- (nat)

[D. virgatus (L.) Willd.] Taxonomic name change from D. virgatus to D. pernambucanus (Wagner et al. 1999; Wagner and Herbst 1995). Native to the Neotropics; in Hawai'i naturalized on Midway Atoll and probably all of the main islands except Ni'ihau and Lana'i (Wagner et al. 1999). On Midway, previously recorded by Herbst and Wagner (1992) and by Apfelbaum et al. (1983). Not observed in 1995 (Bruegmann 1998). During this survey, we observed this species as occasional in weedy areas on Sand Island, especially the northern part of the island.

Desmodium sandwicense E. Mey – Spanish or chili clover -- (nat)

Native to South America; in Hawai'i widely naturalized and known from Midway Atoll and all of the main islands (Wagner et al. 1999). On Midway, Bryan (1954) notes that it was reported by Chisholm and St. John in 1931 (as D. uncinatum). It was also reported by Neff and DuMont (1955) that St. John listed D. uncinatum for Midway in 1935. This species has not been observed since and was not observed during this survey.

Erythrina variegata var. orientalis L. – Tiger's claw -- (cult)

Native from India to southern Polynesia; in Hawai'i cultivated for its showy scarlet flowers that bloom in January and February (Neal 1965). On Midway, previously recorded in 1979 (Apfelbaum et al. 1983) and again in 1995 (Bruegmann 1998). During this survey, a couple cultivated trees observed near the Midway Mall and the abandoned marine barracks on Sand Island.

Glycine soya (L.) Sieb. and Zucc. – Soy bean -- (cult)

Native to southeastern Asia, widely cultivated for food (Neal 1965). On Midway, previously known from literature (Herbst and Wagner 1992). Not observed in 1999.

Lathyrus odoratus L. – Sweet pea -- (cult)

Native to northern temperate regions and also from South America and Africa, widely cultivated in Hawai'i and elsewhere for ornament. Previously not recorded before this survey. During this survey this species was collected (*Starr and Martz 990421-5 BISH*) for identification from the planter box in front of the boat house on Sand Island. This was one of many non-native plants recently brought in to make the atoll more attractive to visitors. This collection represents a new cultivated record for Midway Atoll.

Leucaena leucocephala (Lam.) de Wit – Koa haole, haole koa -- (nat)

[Leucaena glauca (L. ex Willd.) Benth] Native to the Neotropics, cultivated for various uses including fodder, firewood, and erosion control; in Hawai'i naturalized and very common, sometimes forming the dominant element of the vegetation, on Midway Atoll and all of the main islands (Wagner et al. 1999). On Midway, previously recorded by Neff and DuMont (1955) who report that in 1954, "The only plant seen was growing on the lawn of the Administration Building on Sand Island." It was also observed in 1979 (Apfelbaum et al. 1983) and by 1995 was recorded as occasional on Sand Island. In 1999, we occasionally found this well known weed in waste and urban areas on Sand Island. This species is well established at Midway, but does not appear to have come close to filling its potential range.

Medicago lupulina – Black medick -- (nat)

Native to Europe and temperate Asia; in Hawai'i documented from Midway Atoll, Kaua'i, O'ahu, Maui, and Hawai'i (Wagner *et al.* 1999; Lorence *et al.* 1995). On Midway, previously recorded during a survey in 1954 by Neff and DuMont who note that "Fosberg found it growing as an escape from a lawn. We found a few specimens about the residential area, on Sand Island." Noted as common on Sand Island in 1995 (Bruegmann 1998). In 1999, we found this plant to be common in grassy areas of Sand Island.

Medicago polymorpha L. – Bur clover -- (nat)

Native to Europe and temperate Asia to China and Japan, also in northern India, widely cultivated for fodder; in Hawai'i naturalized on Midway Atoll, Kaua'i, O'ahu, Lana'i, Maui, and Hawai'i (Wagner *et al.* 1999; Bruegmann 1999). First collected (*Bruegmann 2013 BISH*) from Midway in 1995 (Bruegmann 1999). Observed during this survey as occasional in lawns on Sand Island.

Medicago sativa L. – Alfalfa -- (nat)

Native to Europe; in Hawai'i cultivated and naturalized on Midway Atoll, Kaua'i, O'ahu, Lana'i, Maui, and Hawai'i (Wagner *et al.* 1999; Oppenheimer *et al.* 1999; Wagner and Herbst 1995; Wagner *et al.* 1997). On Midway, previously recorded by Hadden (1941). It has not been observed since. It was not observed in 1999.

Melilotus alba Medik. – White sweet clover -- (nat)

Native to Europe, widely cultivated for fodder; in Hawai'i naturalized on Midway Atoll, Moloka'i, Maui, and Hawai'i (Wagner *et al.* 1999; Shannon and Wagner 1996; Wagner and Herbst 1995). On Midway, first collected in 1980 (*Herbst and Takeuchi 6363 BISH*). During this survey, one small patch observed in a lawn near the fuel farm on Sand Island.

Melilotus indica (L.) All. – Sweet clover -- (nat)

Native from the Mediterranean region and southwestern Europe to India; in Hawai'i naturalized on Midway Atoll, Kaua'i, O'ahu, Maui, and Hawai'i. On Midway, previously listed by Herbst and Wagner (1992). Recorded as rare on both Sand and Eastern Island in 1995 (Bruegmann 1998). During this survey, this species was occasional to common in lawn areas on Sand Island. We did not observe this species on Eastern Island.

Phaseolus vulgaris L. – Kidney bean, common bean -- (nat)

Native to tropical America; commonly cultivated in Hawai'i for its pods that are used for forage and food (Neal 1965). On Midway, previously recorded by Herbst and Wagner (1992) and again by Bruegmann (1998). During this survey, this species was occasionally grown in gardens in the residential area of Sand Island.

Pithecellobium dulce (Roxb.) Benth. – Manila tamarind, opiuma -- (cult)

Native to the Neotropics from Mexico to Venezuela, now widely cultivated throughout the tropics; in Hawai'i cultivated as a street tree and now naturalized on all of the main islands except Kaho'olawe (Oppenheimer and Bartlett 2002; Wagner *et al.* 1999). On

Midway, previously not recorded before this survey. During this survey, we collected this species (*Starr and Martz 990510-1 BISH*) from the personal garden adjacent to the galley. There is also another tree on the south side of the galley. The fruits are picked and eaten. This is a fairly weedy, thorny species on the main Hawaiian Islands and should perhaps be controlled before it does the same on Midway. This collection represents a new cultivated record for Midway Atoll.

Prosopis pallida (Humb. and Bonpl. ex Willd.) Kunth – Kiawe, algaroba, mesquite -- (cult)

Native to Peru, Colombia, and Ecuador and now naturalized in Puerto Rico, Hawai'i, and Australia; in Hawai'i this thorny tree is naturalized and often the dominant tree of the coastal lowlands on Midway Atoll and all of the main islands (Wagner *et al.* 1999). On Midway, also known from literature (Herbst and Wagner 1992). Though, it has not been found in recent surveys. It was not observed in 1995 (Bruegmann 1998). We did not observe it in 1999.

Samanea saman (Jacq.) Merr. – Monkeypod -- (cult)

Native to the Neotropics from Mexico to Peru and Brazil, now widely cultivated; in Hawai'i a popular street tree, now naturalized probably on all of the main islands (Wagner *et al.* 1999). On Midway, previously known from literature as cultivated (Herbst and Wagner 1992). It was not observed in 1995 (Bruegmann 1998) nor in 1999 during this survey.

Senna surattensis (N.L. Burm.) H. Irwin and Barneby – Kolomona -- (cult)

Probably native to Australia; in Hawai'i cultivated and now naturalized on Kaua'i, O'ahu, and Maui (Wagner *et al.* 1999). On Midway, previously known from literature (Herbst and Wagner 1992). It was not observed in 1995 (Bruegmann 1998) nor in 1999 during this survey.

Sesbania grandiflora (L.) Poir. – White flowered Sesbania -- (cult)

Commonly cultivated in Hawai'i (Wagner *et al.* 1999). On Midway, previously known as rare on Sand Island (Bruegmann 1998). During this survey, this species was collected (*Starr and Martz 990505-4 BISH*) from cultivated material in the residential area of Sand Island, where a few plants are grown for the edible leaves and flowers.

Tamarindus indica L. – Tamarind -- (cult)

Probably native to tropical Africa and Asia; in Hawai'i a common tree grown mainly for its edible fruits (Neal 1965). On Midway, previously not recorded. During this survey, we observed one tree by the Midway Mall, where it was collected (*Starr and Martz 990428-4 BISH*). This collection represents a new cultivated record for Midway Atoll.

Unknown

An unknown pea being cultivated in a vegetable garden on Sand Island was collected (*Starr and Martz 990429-13 BISH*) but remains unidentifiable.

### Unknown

An unknown pea was found coming up on its own near the coast and West Beach cart trail. The plant was unfertile at the time of collection (*Starr and Martz 990513-1 BISH*) and succumbed to the dry summer months and died before ever flowering or fruiting. It remains unidentifiable. This is an example of a plant that was able to make it to Midway and germinate, but unable to live long enough to perpetuate itself.

### GENTIANACEAE (Gentian family)

#### Centaurium erythraea Raf. subsp. erythraea – Bitter herb -- (nat)

Native to Eurasia, widely naturalized; in Hawai'i on Midway Atoll and all of the main islands except Ni'ihau (Wagner *et al.* 1999). On Midway, previously listed by Herbst and Wagner (1992). Also recorded as occasional on Sand Island in 1995 (Bruegmann 1998). During this survey, we found it occurring in moist areas, especially near the harbor on the east end of Sand Island.

### GERANIACEAE (Geranium family)

#### Pelargonium hortorum Bailey – Fish geranium -- (cult)

Native to South Africa, cultivated in Hawai'i (Neal 1965). On Midway, previously recorded possibly by Hadden (1941) who lists simply "geraniums". Also observed by Apfelbaum *et al.* (1983) and by Bruegmann (1998). During this survey, this species was being cultivated in the residential area and by the hangar on Sand Island.

### GOODENIACEAE (Goodenia family)

#### Scaevola sericea Vahl – Naupaka kahakai -- (ind)

[S. frutescens (Mill.) K. Krause; S. koenigii Vahl] Occurring throughout tropical and subtropical Pacific and Indian Ocean coast; in Hawai'i common in coastal areas throughout the Hawaiian Archipelago, except not on Gardner Pinnacles, Necker, and Nihoa (Wagner *et al.* 1999). On Midway, naupaka was noted as early as 1902 (Bryan 1905) from both Sand and Eastern Island, though as more common on Eastern Island and scarce on Sand Island. This native shrub was also present when the Pacific Cable Company began their endeavors (Hadden 1941). At that time, the Cable Company (on Sand Island) began to spread *naupaka*, along with *alena* (Boerhavia repens) and European beach grass (Ammophila arenaria) to make the island more inhabitable. Naupaka was again recorded by the Tanager Expedition on both Sand and Eastern Islands in 1923 where it completely encircled Eastern island in a broad belt (Christophersen and Caum 1931). Apparently by this time Sand Island had already seen much change due to human occupation and Eastern Island was relatively the same. It was also noted by Neff and DuMont (1955) as "Abundant. The dominant vegetation of both islands. It is gradually creeping to the tops of the old revetments, recapturing areas lost to military destruction. Where undisturbed, in vacant lot, and in waste land." By 1979, while naupaka remained a prominent native plant, damage from rats was apparent. Apfelbaum *et al.* (1983) report that, "We found severe damage to Scaevola especially inland of the

fore-dune where larger Ironwood were present as canopy elements. Rat damage was found only on Scaevola. The rodents chewed succulent apical and lateral buds which reduced lateral and vertical growth potentials of Scaevola. In some places, particularly along the west beach, damage was so severe that we believe Scaevola is certain to be eliminated." In 1995, Bruegmann found similar damage and reported that naupaka was the most commonly observed native species, but that, "Very few seedlings and saplings were observed, and most of the mature individuals appear extremely old." Since then, rats have been eradicated. In 1999, there were numerous seedlings and saplings observed, and adult plants appeared in fine health. Naupaka was common to dominant on Sand, Eastern, and Spit Islands. It is currently propagated and out-planted at various sites on Midway.

#### LAMIACEAE (Mint family)

Majorana hortensis Moench. – Sweet marjoram -- (cult)

Cultivated in Hawai'i (Neal 1965). Previously not recorded from Midway. During this survey, it was being cultivated in a pot on Sand Island. This observation represents a new cultivated record for Midway Atoll.

Mentha cf. aquatica L. – Mint -- (cult)

Native to Eurasia and Australia; in Hawai'i cultivated for food (Wagner et al. 1999). Previously not known from Midway. During this survey, it was being cultivated on Sand Island. Collected in 1999 (*Starr and Martz 990428-2 BISH*). This collection represents a new cultivated record for Midway Atoll.

Ocimum basilicum L. – Basil -- (cult)

Pantropical in distribution; in Hawai'i naturalized on Ni'ihau, O'ahu, Moloka'i, Maui, and Hawai'i (Wagner et al. 1999). On Midway, previously not recorded before this survey. During this survey, a few forms of basil were being cultivated on Sand Island. Collected in 1999 (*Starr and Martz 990421-14, 16 BISH*). This collection represents a new cultivated record for Midway Atoll.

Phyllostegia variabilis Bitter – Native mint -- (end, ex)

Endemic to the Hawaiian Island, formerly occurring on Kure and Midway atolls and Laysan, now presumed extinct (Wagner et al. 1999). On Midway, previously recorded from Eastern Island only, where one moderate sized clump was found in the central plain in 1923 (Christophersen and Caum 1931). In 1923, it had already been eradicated from Laysan Island, and this was the only known occurrence of the species. Not observed in 1999 and probably extinct.

Plectranthus scutellarioides (L.) R. Br. – Coleus -- (cult)

Native to eastern Asia and Malesia, now pantropical through cultivation; in Hawai'i various forms are cultivated and now naturalized at least on Kaua'i, O'ahu, Maui, and Hawai'i (Wagner et al. 1999). Previously recorded from Midway in 1979 (Apfelbaum et al. 1983). It was not observed in 1999.

Stachys arvensis L. – Staggerweed -- (nat)

Native to Europe and Asia, widely naturalized; in Hawai'i known from all of the main islands except Ni'ihau and Kaho'olawe (Wagner et al. 1999). Previously recorded by Herbst and Wagner (1992) and noted by Bruegmann in 1995 as rare on Sand Island (Bruegmann 1998). It was not observed in 1999.

#### LAURACEAE (Laurel family)

Persea americana Mill. -- Avocado -- (cult)

Native to tropical America, widely cultivated and naturalized in the main islands of Hawai'i (Neal 1965, Wagner et al. 1999). On Midway, previously not observed. Known from a cultivated tree in a garden. This observation represents a new cultivated record for Midway Atoll.

#### MALVACEAE (Mallow family)

Abutilon grandifolium (Willd.) Sweet – Hairy abutilon -- (nat)

A widespread tropical weed of New World origin, cultivated for an ornamental; in Hawai'i naturalized on Midway Atoll and all of the main islands (Wagner et al. 1999). On Midway, first recorded and collected by Apfelbaum et al. (1983). In 1995, Bruegmann listed this species as occasional on Sand Island (Bruegmann 1998). During this survey, it was naturalized in weedy areas near the cemetery on the north part of Sand Island.

Hibiscus esculentus L. – Okra -- (cult)

Native to tropical Africa, cultivated in Hawai'i and elsewhere as an edible vegetable (Neal 1965). On Midway, okra is known to be cultivated on Sand Island (Herbst and Wagner 1992). It was not observed in 1995 (Bruegmann 1998). It was not observed during this survey.

Hibiscus rosa-sinensis L. – Red Chinese hibiscus -- (cult)

Native to China, the most commonest hibiscus used for hedges in Hawai'i (Neal 1965). On Midway, H. rosa-sinensis was previously recorded by Bruegmann (1998). During this survey it was being cultivated in the town part of Sand Island.

Hibiscus sp. – Hibiscus -- (cult)

Used in previous surveys (1941, 1954, 1979). It is uncertain which species these are referring to. Not observed in 1999.

Hibiscus tiliaceus L. – Hau -- (nat)

Widespread in the tropics and subtropics worldwide; in Hawai'i known from Midway Atoll, French Frigate Shoals, and probably all of the main islands (Wagner et al. 1999). It is uncertain whether hau is indigenous or a polynesian introduction. On Midway, Neff

and DuMont (1955) collected (26 BISH) this species in 1954 and add "Hau trees are to be found about the residential sector on Sand Island, and one or more near the old control tower on Eastern Island. Occasional specimens occur widely scattered about the Sand Island scrub." In 1999, semi-wild plants were observed spreading vegetatively from initial plantings on gun emplacements in the scrub between North Beach and the runway on Sand Island.

Malva parviflora L. – Cheese weed -- (nat)

Native from the Mediterranean region through Asia Minor to India, a weed throughout the world; in Hawai'i naturalized in disturbed areas on French Frigate Shoals and all of the main islands. Reported in Apfelbaum et al. (1983). Collected in 1988 (*Herbst and Takeuchi* 9077 BISH). Noted by Bruegmann as rare on Sand Island (Bruegmann 1998). During this survey, it was occasional in areas near the fuel farm on Sand Island. Collected in 2001 (*Starr and Martz* 010520-1 BISH). These collections represent a new island record for Midway Atoll (Starr et al. 2004).

Malvastrum coromandelianum (L.) Garcke subsp. coromandelianum – False mallow -- (nat)

[Malvastrum coromandelianum (L.) Garcke] Pantropical in distribution; in Hawai'i documented from Midway Atoll and all of the main islands (Wagner et al. 1999). On Midway, Neff and DuMont (1955) note "occasional plants may be found about the residential area on Sand Island, and two or three are growing near the old control tower on Eastern." Collected in 1979 (Apfelbaum et al. 1998). Also collected (Conant 118 BISH) in 1983 by S. Conant who notes "This weedy plant was collected on Roosevelt Avenue past the cemetery...It is not particularly common on the island." Listed as occasional on Sand Island in 1995 (Bruegmann 1998). In 1999, we occasionally found it in lawn areas on Sand Island. We did not observe this species or any other Malvaceae on Eastern or Spit Islands.

Malvaviscus arboreus Cav. – Turks cap -- (nat)

Native probably to Mexico and now widely cultivated; in Hawai'i cultivated and sparingly naturalized at least on Kaua'i, Maui, and Hawai'i (Wagner et al. 1999). On Midway, previously recorded in 1979 (Apfelbaum et al. 1983). Also recorded by Bruegmann in 1995 (Bruegmann 1998). During this survey, it was cultivated in the residential areas, and sparingly naturalized in and near the courtyard of the abandoned Cable Company buildings. The naturalized status on Midway still needs to be properly documented as a new island record for Midway Atoll.

Sida fallax Walp. – 'Ilima -- (ind)

Native from Pacific islands to China; in Hawai'i documented from Midway Atoll, Nihoa, and all of the main islands (Wagner et al. 1999). On Midway, in 1923, the Tanager Expedition observed and collected only one small plant on Eastern Island (*Caum* 31 BISH). S. Conant (1983) collected it from Sand Islands and adds "This plant was collected (*Conant* 316 BISH) on Roosevelt Avenue across from the cemetery. Although I searched carefully for this species all over the island, the small colony (about 5 plants)



from which a specimen was taken were the only plants I found." Not observed by Bruegmann in 1995 (Bruegmann 1998). Not observed on Sand, Eastern, or Spit Islands in 1999.

Sida rhombifolia L. – Cuba jewt -- (nat)

A pantropical weed; in Hawai'i on all of the main islands. Previously not recorded before this survey. During this survey, a few plants were found on the margin of an ironwood (Casuarina) forest near the abandoned seaplane hangar on Sand Island. This collection (*Starr and Martz 990514-2 BISH*) represents a new island record for this species on Midway Atoll (Starr and Martz 2000).

Thespesia populnea (L.) Sol. ex Correa – Milo -- (cult)

Native to the Old World, now pantropical in distribution; in Hawai'i *milo* is indigenous or possibly Polynesian introduced, used in landscaping, and occurs probably on all of the main islands (Wagner *et al.* 1999). On Midway, Neff and DuMont (1955) report "One milo tree was noted growing on the lawn of the Administration building on Sand Island." Observed as rare on Sand Island in 1995 (Bruegmann 1998). In 1999, we found a few scattered about the northern coast of Sand Island, most likely, these were left over cultivated specimens.

MORACEAE (Mulberry family)

Ficus benghalensis L. – Indian banyan -- (cult)

Native to India, this large evergreen tree is cultivated in Hawai'i (Neal 1965). The pollinating wasp for this species is not yet known to be present in the state of Hawai'i (Nishida 1994) therefore, this species does not develop fertile fruit and is not yet known to spread. On Midway, the Indian banyan is listed among species of trees that were grown successfully in a sand and soil media during the early experimental plantings (Hadden 1941). It was also observed in 1979 (Apfelbaum *et al.* 1983) and in 1995 (Bruegmann 1998). In 1999, we observed it as rare and grown in cultivation. No reproduction was noted.

Ficus benjamina L. – Benjamin tree -- (cult)

Native to India, sometimes called the weeping fig because of its long weeping branches, this graceful fig is commonly cultivated in Hawai'i (Neal 1965). The pollinating wasp for this species is not yet known to be present in the state of Hawai'i (Nishida 1994) therefore, this species does not develop fertile fruit and is not yet known to spread. On Midway, previously not known before this survey. In 1999, we found this close relative of F. microcarpa occasionally planted in the ground, and also used in pots on Sand Island. No reproduction was noted. This observation represents a new cultivated record for Midway Atoll.

Ficus elastica Roxb. – Indian rubber tree -- (cult)

Native to India, cultivated in Hawai'i (Neal 1965). On Midway, what we thought was this species was determined by Derral Herbst and George Staples, of Bishop Museum, to be

F. macrophylla (*Starr and Martz 990512-1 BISH*). Previous authors may have made the same mistake. See F. macrophylla.

Ficus macrophylla Desf. – Moreton Bay fig -- (cult)

Native to Queensland and New South Wales, Australia (Neal 1965). In Hawai'i, this large tree is often planted as a street tree and has an extensive surface root system (Neal 1965). In Hawai'i, this fig was recently published as a newly naturalized record on the island of Maui (Oppenheimer and Bartlett 2000) and as a new island record for the island of Hawai'i (Starr *et al.* 2002). The pollinator wasp is present in Hawai'i, therefore reproduction is possible and occurring. On Midway, F. macrophylla was previously not known to be present before this survey and was probably being misidentified as F. elastica. During this survey, two large trees of what was determined to be this species (*Starr and Martz 990512-1 BISH*) were growing on either side of the cart path between West Beach and the runway on Sand Island. No reproduction was noted. However, the pollinator wasp for F. macrophylla, Pleistodontes froggatti, has been recorded from Midway Atoll (Nishida 1999). The wasp was collected in 1997 in malaise traps near West Beach and town areas. Wasps were also observed in 1999 and again in 2001 (pers. obs.). P. froggatti was published as a new island record for Midway by Beardsley (1999). With the pollinator present, there is a potential for reproduction. Control of this species now before it gets out of control and costly to remove would be prudent.

Ficus microcarpa L. fil. – Chinese banyan -- (nat)

[Ficus retusa *sensu auct., non L.*]Native from Ceylon to India, southern to China, Ryukyu Island, Australia, and New Caledonia; in Hawai'i cultivated and now naturalized at least on Kaua'i, O'ahu, Moloka'i, Maui, and Hawai'i, but probably on all of the main islands (Wagner *et al.* 1999; Hughes 1995; Lorence *et al.* 1995). The pollinating wasp, Parapristina [Euprestina] verticillata, was introduced to the Hawaiian Islands around 1938 (Wagner *et al.* 1999). On Midway, Neff and DuMont (1955) note "A number of banyans of varying size appear to be doing well about the old Cable Company area and about Pan-American's deserted Gooneyville Lodge, on Sand Island." Chinese banyan was also previously observed in 1979 (Apfelbaum *et al.* 1983). In 1995, it was listed as naturalized and rare on Sand Island (Bruegmann 1998). During this survey, Chinese banyan was found to be cultivated and naturalized on Sand Island. In 1999, this was the only species of fig obviously reproducing by seed. Seeds are probably being dispersed by introduced mynah (Acridotheres tristis) birds. Plants may grow in the ground or as epiphytes. Small plants of this species were observed coming up on stumps, buildings, and in the cracks of sidewalks, presenting one of the greatest threats to preservation of historical buildings and structures on Midway. The Cuban Laurel thrip is present on Midway, and creates leaf-folding, gall-forming damage on the leaves of F. microcarpa. The pollinator wasp, Parapristina [Euprestina] verticillata, was not recorded by Nishida in 1998, however, it must be present for this species to be reproducing. Other figs could begin reproducing as well if their wasp were to be introduced. Collected during this survey (*Starr and Martz 990428-3 BISH*) representing a new island record for Midway Atoll (Starr *et al.* 2002).

Ficus sp. -- Unknown fig -- (cult)

An unknown *Ficus* species is historically known from literature (Herbst and Wagner 1992). It was not observed during this survey.

Morus alba L. – White mulberry -- (cult)

Native to China, widely cultivated; in Hawai'i sparingly naturalized on Kaua'i, O'ahu, Moloka'i, Maui, and Hawai'i (Wagner *et al.* 1999). On Midway, Neff and DuMont (1955) note, "Reported by Hadden as growing here; we did not find it but Fosberg located an unhealthy-looking specimen growing in an opening in the scrub on Sand Island". Later, it was one of the species planted near gun emplacements. In 1999, it was observed on Sand Island near gun emplacements, and in the town area.

MORINGACEAE (Moringa family)

Moringa oleifera Lam. – Ben tree, drumstick tree -- (cult)

Native to tropical Africa or India, in Hawai'i grown for ornament, food, and many other uses (Neal 1965). On Midway, previously not recorded. During this survey, it was collected from cultivated material (*Starr and Martz 990622-2 BISH*) in the residential area of Sand Island. The plant resembles a legume and is grown for food. This collection represents a new cultivated record for Midway Atoll.

MYRTACEAE (Myrtle family)

Eugenia uniflora L. – Surinam cherry -- (cult)

Native to Brazil, now widely cultivated; in Hawai'i cultivated on Midway Atoll and all of the main islands, now sparingly naturalized on Kaua'i, Moloka'i, and several other main islands (Wagner *et al.* 1999). On Midway, previously collected (*Conant 120 BISH*) in 1983 by S. Conant who notes "This plant, which may grow to be a small tree bears small, red, edible fruits. It was growing adjacent to the old greenhouse at the abandoned Pan Am Hotel." It was also observed in 1995 (Bruegmann 1998). In 1999, a few plants were observed persisting in the same spot described by Conant, near the greenhouse at the Cable Company buildings.

Psidium guajava L. – Guava -- (cult)

Native to the Neotropics, now widely cultivated and naturalized in tropical and subtropical regions of the world; in Hawai'i a serious weed and naturalized on all of the main islands (Wagner *et al.* 1999). On Midway, previously recorded in 1995 by Bruegmann who notes this species being cultivated by the abandoned Cable Company buildings. She notes that this species could become major threats if allowed to spread (Bruegmann 1998). During this survey, we observed a few plants persisting at the Cable Company buildings and in an opening in the ironwood (*Casuarina*) forest near Rusty Bucket.

Punica granatum L. – Pomegranate -- (cult)

Native to Persia, grown ornamentally in Hawai'i and also for its edible fruit (Neal 1965). On Midway, it was previously recorded by Bruegmann in 1995 as being rare and cultivated on Sand Island. It was not observed in 1999.

#### NYCTAGINACEAE (Four o'clock family)

Boerhavia repens – Alena -- (ind)

[B. diffusa sensu Hawaiian botanists, pro parte, non L.; B. diffusa sensu auct., non G Forster var. tetrandra; B. tetrandra sensu auct., non G Forster] Native from Africa eastward to eastern Polynesia and Hawai'i; occurring on Kure, Midway, and Pearl and Hermes atolls, Lisianski, Laysan, French Frigate Shoals, and all of the main islands (Wagner *et al.* 1999). On Midway, previously collected on both Sand and Eastern Islands in 1902 by W. A. Bryan. Recorded by the Tanager Expedition from both Sand and Eastern Islands where in 1923 it was growing abundantly in the central plain of Eastern Island. Collected by Neff and DuMont in 1954 who note that it was also observed by Fosberg that same year, and was a "common trailing vine found in much of the open or very slightly shaded sandy area of both Sand and Eastern Islands." Observed in 1979 (Apfelbaum *et al.* 1983). Also observed as common to occasional on Eastern, Sand, and Spit Islands in 1995 (Bruegmann 1998). In 1999, it was common on Sand and Eastern, in the same type of habitat described by Neff and DuMont, and also observed on Spit Island.

Bougainvillea spectabilis Willd. – Bougainvillea -- (cult)

Native to Brazil, the most common bougainvillea cultivated in Hawai'i (Neal 1965). On Midway, in 1954, Neff and Dumont (1955) note "A few very nice vines noted growing on residential porches of Sand Island." Noted in almost every botanical survey on Midway, this colorful, spiny, vine-like shrub was still being cultivated in the town area of Sand Island in 1999.

Mirabilis jalapa L. – Four o'clock -- (nat)

Native to tropical America, cultivated for medicinal and ornamental purposes, now widely naturalized and pantropical; in Hawai'i naturalized on Midway Atoll, Kauai, O'ahu, Lana'i, Maui, and Hawai'i (Wagner *et al.* 1999). Previously listed by Herbst and Wagner (1992) and observed as rare and naturalized on Sand Island by Bruegmann (1998). During this survey, it was persisting in the lawn areas near the north part of Sand Island.

#### OLEACEAE (Olive family)

Jasminum sambac (L.) Aiton – Pikake, Arabian jasmine -- (cult)

Native to India, cultivated in Hawai'i for their fragrant flowers (Neal 1965). On Midway, previously collected (*Conant 125 BISH*) by Conant (1983) who notes "This fragrant, ornamental shrub was growing in the old greenhouse at the abandoned Pan Am Hotel." This was the first and only time this species was observed or collected on Midway. Not observed in 1999.

Noronhia emarginata (Lam.) Poir.– Madagascar olive -- (cult)

Native to Madagascar, grown rarely in Hawai'i, this tree resembles kamani (Neal 1965). On Midway, previously noted by Herbst and Wagner (1992) and recorded by Bruegmann in 1995 (Bruegmann 1998). During this survey, one plant was observed at the abandoned Marine Barracks south of the hangar on Sand Island.

Olea europaea ssp. cuspidata (Wall. ex G. Don) Ciferri -- African olive -- (cult)

Native to the Mediterranean region; in Hawai'i, widely cultivated as a hedge or wind break and now naturalized on Kaua'i, Maui, and Hawai'i where it is becoming a serious pest and is spreading rapidly by game birds (Wagner *et al.* 1999; Starr *et al.* 1999; Lorence *et al.* 1995). On Midway, previously not recorded. During this survey, material was collected (*Starr and Martz 990514-1* BISH) from the only known individual on Sand Island. The lone tree is 20 m north of the old seaplane hangar. This collection represents a new cultivated record for Midway Atoll.

#### ONAGRACEAE (Evening primrose family)

Oenothera laciniata J. Hill – Evening primrose -- (nat)

Native to eastern North America, now naturalized in many parts of the world; in Hawai'i known from Kure and Midway atolls, Maui, and Hawai'i (Wagner *et al.* 1999; Wagner and Herbst 1995). On Midway, previously collected (*Conant 370* BISH) by S. Conant (1983). In 1995, it was common on Sand and Spit Islands and occasional on Eastern Island (Bruegmann 1998). In 1999, we found it to be common on Sand Island, occasional on Spit Island, and rare on Eastern Island. This prostrate herb with cute flowers that open near sunset was observed in lawn and runway margins.

#### OXALIDACEAE (Wood sorrel family)

Oxalis corniculata L. – Yellow wood sorrel -- (nat)

Native origin unknown, cosmopolitan in distribution; in Hawai'i known from Midway Atoll and all of the main islands (Wagner *et al.* 1999). On Midway, Neff and DuMont (1955) collected this species and found it to be "occasional, scattered about on both Sand and Eastern Islands." Observed by most botanists visiting Midway since then. In 1999, this cosmopolitan weed was observed to be occasional to common, especially near urban areas on Sand Island. We did not observe it on Eastern Island.

Oxalis corymbosa DC – Shamrock -- (nat)

Native to South America; in Hawai'i naturalized on all of the main islands except Ni'ihau and Kaho'olawe (Wagner *et al.* 1999). On Midway, previously observed in 1979 (Apfelbaum *et al.* 1983) and in 1995 (Bruegmann 1998). During this survey, it was occasional on Sand Island.

#### PASSIFLORACEAE (Passion flower family)

Passiflora edulis Sims – Passion fruit, liliko'i -- (cult)

Native to Brazil, widely cultivated for its edible fruits; in Hawai'i cultivated and naturalized on Kaua'i, O'ahu, Lana'i, Moloka'i, Maui, and Hawai'i (Wagner *et al.* 1999; Hughes 1995). On Midway, previously collected (*Conant 124 BISH*) by S. Conant (1983) who notes "This vine was growing and fruiting vigorously adjacent to and on the old greenhouse of the abandoned Pan Am Hotel." This was the first and only time this species was collected or observed on Midway. Not observed in 1999.

#### PIPERACEAE (Pepper family)

Peperomia obtusifolia (L.) A. Dietr. – Alien peperomia -- (cult)

Native to tropical America, grown in Hawai'i (Neal 1965). On Midway, previously not recorded before this survey. During this survey, it was observed as cultivated in the residential area of Sand Island. Collected in 1999 (*Starr and Martz 990429-10 BISH*), representing a new cultivated record for Midway Atoll.

#### PLANTAGINACEAE (Plantain family)

Plantago lanceolata L. – English plantain, narrow leaved plantain -- (nat)

Native to Europe and north-central Asia, widely naturalized; in Hawai'i naturalized on Midway Atoll, French Frigate Shoals, and all of the main islands except Ni'ihau and Kaho'olawe (Wagner *et al.* 1999). On Midway, Neff and DuMont (1954) note "While this plant was reported 20 years ago [by St. John in 1931], the senior author, thoroughly familiar with it at home, did not find it." This species was observed by almost every other botanist visiting Midway since then. In 1999 we found it to be scattered in grassy areas of Sand Island.

Plantago major L. – Common plantain -- (nat)

Native to Europe and northern and central Asia, widely naturalized; in Hawai'i naturalized on Midway Atoll and all of the main islands except Ni'ihau and Kaho'olawe (Wagner *et al.* 1999). On Midway, previously recorded in 1979 (Apfelbaum *et al.* 1983) and in 1995 (Brueggemann 1998). During this survey, we found it very rare, restricted to one small area just north of the seaplane hangar on Sand Island.

#### PLUMBAGINACEAE (Leadwort family)

Plumbago auriculata Lam. – Plumbago, cape leadwort -- (cult)

Native to South Africa, widely planted; in Hawai'i recently published as a newly naturalized record (Herbarium Pacificum Staff 1999) with collected material from Maui. On Midway, previously known from literature (Herbst and Wagner 1992). Not observed in 1999.

#### POLYGONACEAE (Buckwheat family)

Antigonon leptopus Hook. and Arnott – Hearts on a chain, Mexican creeper -- (nat)

Native to Mexico; in Hawai'i naturalized on Kaua'i, O'ahu, Lana'i, Maui, and Hawai'i (Wagner *et al.* 1999). On Midway, cultivated and rare on Sand Island in 1995 (Bruegmann 1998). In 1999, sparingly naturalized, a small area near the harbor on Sand Island is being over-run by this sprawling vine with pink flowers. Collected in 1999 (Starr and Martz 990505-10 BISH) representing a new island record for Midway Atoll (Starr *et al.* 2002).

Coccoloba uvifera (L.) L. – Sea grape -- (nat)

Native to warm parts of America where it can be found in thickets along sandy shores (Neal 1965). In Hawai'i it was previously thought (Wagner 1999) that sea grape produced fruit but did not reproduce. Later, Herbst (1998) recorded it as naturalized on O'ahu. It has also been documented as naturalized on Maui (Oppenheimer and Bartlett 2002). On Midway, first observed by Fosberg in February of 1954 and collected later that year by Neff and DuMont who noted "Not uncommon, single trees growing widely scattered over both Sand and Eastern Islands." It has been recorded by almost every botanist visiting Midway since then. In 1999, we observed old cultivated plants persisting and spreading on both Sand and Eastern Island, especially near old gun emplacements and other sand hills, in some areas carpets of seedlings could be found beneath parent trees. We collected it as naturalized on Spit Island (Starr and Martz 990401-1 BISH) which represented a new island record for Midway Atoll (Starr *et al.* 2002).

#### PORTULACACEAE (Purslane family)

Portulaca afra Jacq. – Jade tree -- (cult)

Native to South Africa and cultivated as an ornamental in Hawai'i and elsewhere (Neal 1965). On Midway, historically known from literature (Herbst and Wagner 1992). During this survey, we observed this species being cultivated in residential area of Sand Island.

Portulaca lutea Sol. ex G. Forster – 'Ihi -- (ind)

Widespread in the Pacific from New Caledonia to Pitcairn Island north to Polynesia and Micronesia; in Hawai'i on all of the Northwestern Islands except Kure and Pearl and Hermes atolls, and on O'ahu, Moloka'i, Lana'i, Maui, and Hawai'i (Wagner *et al.* 1999). On Midway, in 1923, found by the Tanager Expedition only on Eastern Island, where a few plants grew in the central plain. Bruegmann (1998) notes this species from Eastern Island where it was rare in distribution. Both P. lutea and P. oleracea are historically known from Midway Atoll. In addition, the two readily hybridize. During this survey, we lumped all similar Portulaca species under P. sp.

Portulaca oleracea – Common purslane, pig weed -- (nat)

Probably native to the Old World and nearly cosmopolitan in distribution; in Hawai'i on Midway Atoll, Pearl and Hermes Atoll, Laysan, French Frigate Shoals, Nihoa, and all of the main islands except Kaho'olawe (Wagner *et al.* 1999). On Midway, previously collected in 1954 by Neff and DuMont (1955) who note "Locally abundant, widespread in open sandy areas on both Sand and Eastern Islands." Conant (1983) adds "This is a

common weed on Midway and other NWHI. She also notes P. oleracea as rare on both Sand and Eastern Islands. It was collected near the abandoned Pan Am Hotel (*Conant 133 BISH*). Bruegmann (1998) notes P. oleracea as rare on both Sand and Eastern Islands. Both P. lutea and P. oleracea are historically known from Midway Atoll. In addition, the two readily hybridize. During this survey, we lumped all similar Portulaca species under P. sp.

Portulaca sp. – hybrid Portulaca -- (nat)

The two species of Portulaca, the native 'ihi (Portulaca lutea) and the alien pigweed (Portulaca oleracea) are similar and can not be distinguished unless flowers are present. In addition, the two plants hybridize readily. Because of the taxonomic quandary, even though a few flowers were observed during our surveys, the two were lumped into Portulaca sp. During this survey, it was occasional to common on Sand Island, rare on Spit Island, and occasional to common on Eastern Island.

#### PRIMULACEAE (Primrose family)

Anagallis arvensis L. – Scarlet pimpernel -- (nat)

Native to Europe, widely naturalized; in Hawai'i naturalized on Midway Atoll, and all of the main islands except Ni'ihau (Wagner *et al.* 1999). Previously observed in 1979 (Apfelbaum *et al.* 1983) and in 1995 it was reported as occasional on Sand Island (Bruegmann 1998). During this survey, it was common on Sand Island and occasional on Eastern Island.

#### ROSACEAE (Rose family)

Fragaria x ananassa Duch. – Strawberry -- (cult)

A cultivated variety in Hawai'i (Neal 1965). On Midway, previously unrecorded. During this survey, strawberries were being cultivated on Sand Island for the French restaurant, the Clipper House. This and the 'Quinalt' cultivar below were being grown in 50 gallon drums to provide a fresh, yet affordable desert. Collected in 1999 (*Starr and Martz 990421-9 BISH*). This collection represents a new cultivated record for Midway Atoll.

Fragaria x ananassa Duch 'Quinalt' – Strawberry -- (cult)

A cultivated variety in Hawai'i (Neal 1965). On Midway, previously unrecorded. During this survey, strawberries were being cultivated on Sand Island. Collected in 1999 (*Starr and Martz 990421-10 BISH*). This collection represents a new cultivated record for Midway Atoll.

Rosa sp. – Rose -- (cult)

Many roses are cultivated in Hawai'i (Neal 1965). On Midway, roses have previously been recorded by Hadden (1941) grown for ornament. They were also observed by Apfelbaum *et al.* (1983). During this survey, roses were being cultivated in the residential and town area of Sand Island.



## RUBIACEAE (Coffee family)

### Gardenia sp. – Gardenia -- (cult)

Cultivated in Hawai'i (Neal 1965). On Midway, previously observed in 1979 (Apfelbaum 1983). They have not been observed since. Not observed in 1999.

## RUTACEAE (Citrus family)

### Citrus limonia Osbeck. – Lemon -- (cult)

Native to southeastern Asia, cultivated in Hawai'i and elsewhere (Neal 1965). On Midway, during this survey, cultivated in the Citrus grove on Sand Island. This was the Meyer lemon. (See Citrus sp.). This observation represents a new cultivated record for Midway Atoll.

### Citrus paradisi Macf. – Grapefruit -- (cult)

Native to southeastern Asia, cultivated in Hawai'i and elsewhere (Neal 1965). On Midway, during this survey, cultivated in the Citrus grove on Sand Island. There was both the star-ruby and white grapefruits being grown. (See Citrus sp.). This observation represents a new cultivated record for Midway Atoll.

### Citrus sinensis (L.) Osbeck -- Orange -- (cult)

Native to southeastern Asia, cultivated in Hawai'i and elsewhere (Neal 1965). On Midway, during this survey, cultivated in the Citrus grove on Sand Island. There was valencia, navel, and blood oranges being grown. (See Citrus sp.). This observation represents a new cultivated record for Midway Atoll.

### Citrus sp. -- Citrus -- (cult)

Native to southeastern Asia, cultivated in Hawai'i and elsewhere (Neal 1965). There were a few Citrus trees being cultivated in the residential area which had no fruits, and could not be identified. There have also been previous observations of citrus trees with no specific reference as to what type (Apfelbaum et al. 1983; Bruegmann 1998).

### Murraya paniculata (L.) Jack – Mock orange -- (cult)

Native from India to the Philippines and the East Indies, cultivated in Hawai'i (Neal 1965). On Midway, first recorded by Hadden (1941) as being cultivated. Neff and DuMont (1955) collected this plant (53 BISH), noting "seen only as a planted hedge in the residential area on Sand Island." It was observed for the last time in 1979 by Apfelbaum et al. (1983). Not observed in 1999.

## SCROPHULARIACEAE (Figwort family)

### Bacopa monnieri (L.) Wettst. – 'Ae'ae -- (ind)

Widespread in tropical and subtropical regions; in Hawai'i known from Midway Atoll and all of the main islands except Kaho'olawe (Wagner et al. 1999). On Midway, previously

collected in 1933, (*Meagher 69564* BISH) the only time it was observed. Not observed in 1999.

Russelia equisetiformis Schlecht. and Cham. – Coral plant, firecracker plant -- (cult)  
Native to Mexico, cultivated in Hawai'i (Neal 1965). On Midway, previously not recorded. During this survey, it was being cultivated in the residential area of Sand Island. Collected in 1999 (*Starr and Martz 990429-7* BISH). This collection represents a new cultivated record for Midway Atoll.

#### SOLANACEAE (Tomato family)

Capsicum annuum L. – Nioi, red pepper -- (cult)  
Native to tropical America, cultivated in Hawai'i (Neal 1965). On Midway, previously recorded in 1979 (Apfelbaum *et al.* 1983) and also in 1995 (Bruegmann 1998). During this survey, it was cultivated on Sand Island and one of the most favored plants for its peppers. No personal garden on Midway is caught without a good pepper tree.

Capsicum annuum L. var. grossum – Bell pepper -- (cult)  
Native to tropical America, cultivated in Hawai'i (Neal 1965). On Midway, previously not recorded. During this survey, peppers were being cultivated on Sand Island. Collected in 1999 (*Starr and Martz 990510-4* BISH). This collection represents a new cultivated record for Midway Atoll.

Cestrum nocturnum L. – Night blooming jasmine, night cestrum -- (cult)  
Native to the Antilles and Central America, widely cultivated and naturalized; in Hawai'i cultivated for its fragrant flowers that bloom at night, now naturalized on Kaua'i, O'ahu, and Maui (Oppenheimer and Bartlett 2000; Wagner *et al.* 1999). On Midway, previously not recorded before this survey. During this survey, we observed and collected one plant (*Starr and Martz 990409-1* BISH) in the residential area of Sand Island. This collection represents a new cultivated record for Midway Atoll.

Lycopersicon esculentum Mill.-- Tomato -- (cult)  
Native to western South America, widely cultivated in Hawai'i (Neal 1965). Previously not reported from Midway. It was occasionally observed in gardens in 1999. This observation represents a new cultivated record for Midway Atoll.

Lycopersicon pimpinellifolium -- Cherry tomato -- (cult)  
Native from Peru, cultivated and naturalized in Hawai'i (Neal 1965). Previously not reported from Midway. It was occasionally observed in gardens in 1999. This observation represents a new cultivated record for Midway Atoll.

Solanum americanum Mill. – Glossy nightshade, popolo -- (nat)  
[Solanum nigrum sensu Hawaiian botanists, non L.] Widely distributed in tropical and warm temperate regions; in Hawai'i questionably indigenous and occurring on Kure, Midway, and Pearl and Hermes atolls, Lisianski, Laysan, Nihoa, and all of the main

islands (Wagner *et al.* 1999). On Midway, previously collected by Neff and DuMont (1955) who note it to be "Occasional, found mostly in utility areas about buildings." Conant (1983) adds "This indigenous plant was not common on Midway, but that may be due to the fact that there had been a rather severe dry season. The plants from which this collection was made (*Conant 135 BISH*) were nearly dead, growing on a fence adjacent to the school building." Bruegmann (1998) notes this species as common on Sand Island. In 1999 we found it to be common on Sand Island, and occasional on Eastern and Spit Islands. This species was observed in almost every habitat type on Midway, and collected on Spit Island (*Starr and Martz 990623-2 BISH*) for perhaps the first time. It is not known whether this species is native or not, complicating management recommendations.

*Solanum linnaeanum* Hepper and P. Jaeger – Apple of Sodom -- (cult)

Native to Africa; in Hawai'i this weedy, thorny species is widely established in warm temperate areas and is naturalized in dry areas of Hawai'i and occurs on O'ahu, Moloka'i, Lana'i, Kaho'olawe, Maui, and Hawai'i (Wagner *et al.* 1999; Herbarium Pacificum Staff 1998). On Midway, previously not recorded. During this survey, it was observed being cultivated on Sand Island. This observation represents a new cultivated record for Midway Atoll.

*Solanum melongena* L. – Eggplant -- (cult)

Native to southeastern Asia, cultivated in Hawai'i for food (Neal 1965). On Midway, previously not recorded before this survey. During this survey, it was observed as cultivated in residential areas of Sand Island. There were white and purple flowered forms collected (*Starr and Martz 990429-2, 990511-5, 6 BISH*).

*Solanum nelsonii* Dunal – Popolo -- (end)

[*S. laysanense* Bitter; *S. nelsonii* var. *intermedium* F. Brown] Endemic to the Hawaiian Islands, previously occurring in coastal sites on Kure, Midway, and Pearl and Hermes atolls, Laysan, Nihoa, Ni'ihau, Kaua'i, O'ahu, Moloka'i, Maui, and Hawai'i (Wagner *et al.* 1999). *Popolo* has declined dramatically in the Northwestern and Main Hawaiian Islands and is now presumed extinct on Kure, Laysan, Kaua'i, O'ahu, Maui, and Hawai'i (Wagner *et al.* 1999). On Midway, *S. laysanense* was recorded from both Sand and Eastern Islands in W. A. Bryan's 1902 collection (*Bryan E, F BISH*). *S. nelsonii* var. *intermedium* was recorded only from Eastern Island, where it was observed by the Tanager Expedition to be abundant in the central plain on Eastern Island (*Caum 29 BISH*) in 1923 and then again in 1944 on Sand Island (*Caum 256 BISH*). It was also collected by Meagher in 1933 with no notes as to which island. In 1964 Lamoureux made a collection (*Lamoureux 2768 BISH*) from Eastern Island. And in 1980, Herbst and Takeuchi made a collection on Eastern Island. It was not observed on Midway Atoll in 1995 (Bruegmann 1998), however, reports of it were made in 1996 by Nanette Seto. It was then reported as extinct from Midway Atoll (Wagner *et al.* 1999). This was disproved during this survey by the collection of *S. nelsonii* (*Starr and Martz 990623-1 BISH*) from Spit Island, where a few plants (all life stages) were found on the northeast shore just inside the vegetation line. Seeds were collected and propagated at the Midway nursery for future out-planting at Midway Atoll. It was not observed on Sand or Eastern Island. This species is now rare

in the Hawaiian Archipelago with the population on Spit Island, Midway Atoll one of the few remaining sites.

#### STERCULIACEAE (Cocoa family)

Waltheria indica L. – ‘Uhaloa -- (ind?)

[W. i. var. americana (L.) Hosaka] Pantropical, questionably indigenous to Hawai'i, occurring on Midway Atoll and all of the main islands (Wagner et al. 1999). On Midway, Bryan (1954) notes that it was previously recorded in 1931 by Chisholm. Later, Conant (1983) collected this species (*Conant 134* BISH) and notes "This indigenous plant was not common, but the small colony by the cemetery was vigorous." Also observed in 1995 by Brueggemann. In 1999, a few plants were found southeast of the fuel farm on Sand Island. No plants were observed on Eastern or Spit Islands.

#### TAMARICACEAE (Tamarix family)

Tamarix sp. -- Tamarix -- (cult)

Native from western Europe to the Himalayas, resembling Casuarina, cultivated in Hawai'i (Neal 1965). On Midway, reported by Hadden (1941) as one of the trees planted during the Pan-American era (1936) that has not been seen since. It was not observed during this survey.

#### TROPAEOLACEAE (Nasturtium family)

Tropaeolum majus L. – Garden nasturtium -- (cult)

Native from Mexico to Chile, cultivated in Hawai'i (Neal 1965). On Midway, first recorded as cultivated by Hadden (1941). Previously collected (*Conant 119* BISH) by S. Conant in 1983. Observed as cultivated on Sand Island by Brueggemann in 1995. In 1999, a few cultivated plants were observed in planter boxes at the boat house and at the sport fishing facilities near the harbor on Sand Island.

#### URTICACEAE (Nettle family)

Pilea microphylla (L.) Liebm. – Artillery plant -- (nat)

Native to southern Florida, the West Indies, and Mexico south to tropical South America; in Hawai'i cultivated and naturalized in low elevation, mesic, disturbed sites at least on Kaua'i, O'ahu, Maui, and Hawai'i, but probably on all of the main islands (Wagner et al. 1999). On Midway, previously collected on Eastern Island in 1964 by both Long and Lamoureux (*Long 1748* US, *Lamoureux 2765* US) south of the east-west runway and at edge of runway in southwest corner of island (Shannon and Wagner 1996). In 1988, collected on Sand Island by D. Herbst and W. Takeuchi (*9069* BISH). In 1999, found to be common on the roofs of buildings on Sand Island, but not seen on Eastern Island. One small plant was observed, and removed, from Spit Island. This tiny plant does not usually interrupt natural areas but can be a menace in nurseries.

Pilea serpyllacea (Kunth) Liebmann – Large artillery plant -- (cult)

On Midway, previously not recorded. During this survey it was being cultivated in the residential area of Sand Island, generally in pots. Collected during this survey (*Starr and Martz 990421-13* BISH). This collection represents a new cultivated record for Midway Atoll.

#### VERBENACEAE (Vervain family)

Lantana camara L. – Lantana -- (nat)

Probably native to the West Indies, now widely distributed; in Hawai'i this thorny shrub is also widely naturalized and is now a serious weed, occurring on Midway Atoll and all of the main islands (Wagner *et al.* 1999). On Midway, previously recorded by Neff and DuMont (1955) who found this plant "only as a hedge and ornamental plant in the residential and administrative area of Sand Island." Also observed in 1979 (Apfelbaum *et al.* 1983). In 1995, Bruegmann (1998) listed it as occasional and naturalized on Sand Island. During this survey, it was considered occasional on Sand Island. It was not observed on Eastern or Spit Island. This is another species that appears to have been planted as an ornamental, spread beyond the confines of the garden, and has become sparingly naturalized. Lantana is said to be so dense in the Galapagos that the petrels are inhibited from burrowing in infested areas (Lloyd L. Loope pers. comm. 1999). On Sand Island, this thorny shrub is found scattered in several areas, but is nowhere found in high densities, yet. This noxious species has had many biological controls introduced to thwart its spread in the main Hawaiian Islands. Most of the biological controls are not present on Midway Atoll and if left unchecked, Lantana could spread rapidly. Some control measures have been taken to remove small patches of Lantana. A control plan is needed to tackle the few remaining patches of this harmful alien species before it spreads beyond control. Introduced non-native Myna birds (Acridotheres tristis) probably aid in the dispersal of Lantana. A control plan is needed to tackle the few remaining patches of this harmful alien species before it spreads beyond control.

Phyla nodiflora (L.) Greene -- Phyla -- (nat)

Native to South America, cultivated in Hawai'i as a groundcover (Neal 1965). In Hawai'i, previously thought to be cultivated and occasionally escaped from gardens (Wagner *et al.* 1999). On Midway, previously collected in 1980 (*Herbst and Takeuchi 6364* BISH). During this survey, we found this species to be naturalized, forming dense mats in moist areas on Sand Island. It was collected (*Starr and Martz 990512-2* BISH) and represents a new naturalized record for the state of Hawai'i (Starr *et al.* 2002).

Stachytarpheta dichotoma (Ruiz and Pav.) Vahl – Oi -- (nat)

Native from Cuba and Mexico south to Peru and Argentina, now widely naturalized in the tropics and subtropics; in Hawai'i known from Kaua'i, O'ahu, Lana'i, Maui, and Hawai'i (Wagner *et al.* 1999). On Midway previously recorded by Herbst and Wagner (1992). Not observed in 1995 (Bruegmann 1998). During this survey, it was not observed.

Stachytarpheta jamaicensis (L.) Vahl. -- Owi -- (nat)

Native to tropical and subtropical areas of the New World, now widely distributed; in Hawai'i known from Midway Atoll, Kaua'i, O'ahu, Lana'i, Maui, Kaho'olawe, and Hawai'i (Wagner *et al.* 1999). On Midway, noted by Neff and DuMont (1955) to have been listed by St. John in the 1931 additions to the flora of Midway. In 1999, we found this plant restricted to a small area east of the Midway Mall on Sand Island.

Verbena littoralis Kunth – Ha'uowi, vervain -- (nat)

Native from Mexico through Central America to South America, widely naturalized; in Hawai'i known from Midway Atoll and all of the main islands (Wagner *et al.* 1999). On Midway, previously recorded by Herbst and Wagner (1992). During this survey, it was observed as occasional on Sand Island.

Vitex trifolia var. subtrisecta (Kuntze) Mold. f. subtrisecta – Pohinahina -- (cult)

Native to Asia and Australia, planted for hedges in Hawai'i (Neal 1965). On Midway, Apfelbaum *et al.* (1983) lists Vitex trifolia as being observed. Bruegmann (1998) lists this as rare on Sand Island. During this survey, it was observed as persisting, especially in the area east of the Midway Mall on Sand Island. This is the more common form of the two on Midway.

Vitex trifolia var. subtrisecta f. variegata Mold. – Pohinahina -- (cult)

[Vitex trifolia var. bicolor (Willd.) Mold.] Native to Asia and Australia, cultivated in Hawai'i (Neal 1965). On Midway, Neff and DuMont (1955) collected this plant as an ornamental on Sand Island. Observed as rare on Sand Island in 1995 (Bruegmann 1998). In 1999, we found this plant to be persisting on Sand Island, especially in the area east of the Midway Mall.

#### VIOLACEAE (Violet family)

Viola x wittrockii Gams – Violet -- (cult)

Previously not recorded before this survey, though Herbst and Wagner (1992) note Viola odorata L. as cultivated and known from literature. During this survey, this was another species observed in the planter at the boat house on Sand Island. Collected in 1999 (*Starr and Martz 990421-1 BISH*). This collection represents a new cultivated record for Midway Atoll.

#### VITACEAE (Grape family)

Vitis sp. – Grape -- (cult)

Primarily of tropical and subtropical areas, a few species are cultivated in Hawai'i (Wagner *et al.* 1999). On Midway, previously collected (Conant 123 BISH) by S. Conant in 1983. During this survey, it was observed persisting on the greenhouse south of the Cable Company buildings on Sand Island. It was also grown in cultivation in residential areas of Sand Island.

## ZYGOPHYLLACEAE (Tribulus family)

### Tribulus cistoides L. – Nohu -- (ind)

Native to the Old World, now a pantropical weed; in Hawai'i an indigenous plant occurring on all of the Northwestern Hawaiian Islands except Gardner Pinnacles and Necker, also on all of the main islands (Wagner *et al.* 1999). On Midway, previously recorded by the Tanager Expedition and W. A. Bryan for Eastern Island only, where in 1902 it was observed to be fairly common on the sandy shore and in 1923 was common in the central plain (Christophersen and Caum 1923). Neff and DuMont (1955) described it as a "locally abundant trailing ground cover on sandy areas on both Sand and Eastern Islands." By 1995, Tribulus was all but gone on Midway. Brueggmann (1998) reports that Tribulus "was collected on Sand Island in 1954 and 1966, but no other reports are known and it was not found during this survey." She adds that "only one adult and two seedlings were observed [on Eastern Island during this survey]." In 1997 Nanette Seto with the United States Fish and Wildlife Service reported observing this species on Sand Island. During this survey, we found this thorny native with brilliant yellow, fragrant flowers to be common on Eastern Island, especially the east part, and to be locally abundant on Sand Island, especially near South beach and Frigate Point. It was also present on the north part of Spit Island, where it was collected (*Starr and Martz 990623-5 BISH*), perhaps for the first time. The best correlation with sudden increase in Tribulus seems to be with the removal of rats from Midway Atoll around 1997. It is possible that the rats were damaging the plant and once the rats were removed, the seeds left in the soil germinated, and this species returned to its pre-rat balance. Ground nesting birds and many plants, including naupaka (Scaevola) displayed a similar population explosion with the removal of rats in 1997.

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