July 19, 2004

Ms. Gale Norton
Secretary of the Interior
Department of the Interior
1849 C Street, N.W.
Washington, D. D. 20240
Fax: (202) 208-6956

Mr. Jim Bartel
Field Supervisor
Carlsbad Fish and Wildlife Office
6010 Hidden Valley Road
Carlsbad, CA 92009
Fax: (760) 431-9624

Dear Ms. Norton and Mr. Bartel,

Enclosed please find a petition to list 16 insect species endemic to the Algodones Dunes, Imperial County, California as threatened or endangered pursuant to the Endangered Species Act, 16 U.S.C. 1531 et seq. The petition is submitted by the Center for Biological Diversity, Public Employees for Environmental Responsibility, and the Sierra Club. Petitioners will be sending supporting documentation in a follow-up mailing.

Thank you for your consideration of this petition.

Sincerely,

Monica L. Bond
Center for Biological Diversity

Karen Schambach
Public Employees for Environmental Responsibility

George Barnes
Sierra Club

Petition to List 16 Endemic Insect Species from the Algodones Sand Dunes, Imperial County, California as Federally Endangered or Threatened under the Federal Endangered Species Act

Photo by Andrew Harvey

The Center for Biological Diversity hereby formally petitions to list: two sand wasps (*Microbembex elegans* Griswold and *Stictiella villegasi* Bohart); two bees (*Perdita algodones* Timberlake and *P. glamis* Timberlake); one vespid (*Euparagia* n. sp.); two velvet ants (*Dasymutilla nocturna* Mickel and *Dasymutilla imperialis* Manley and Pitts); three jewel beetles (Algodones sand jewel beetle, *Lepismadora algodones* Velten, Algodones white wax jewel beetle, *Prasinalia imperialis* (Barr), and Algodones Croton jewel beetle, *Agrilus harenus* Nelson); two scarab beetles (Hardy's dune beetle, *Anomala hardyorum* Potts and *Cyclocephala wandae*); and four subspecies of Roth's dune weevil (*Trigonoscuta rothi rothi*, *T. r. algodones*, *T. r. imperialis*, and *T. r. punctata*) as threatened or endangered pursuant to the Endangered Species Act, 16 U.S.C. 1531 et seq. (hereafter referred to as "ESA"). This petition is filed under 5 U.S.C. 553 (e) and 50 CFR 424.14 (1990), which grants interested parties the right to petition for issue of a rule from the Secretary of the Interior. Petitioners also request that critical habitat be designated for the species concurrent with the listing, pursuant to 50 CFR 424.12, and pursuant to the Administrative Procedures Act (5 U.S.C. 553).

The entire known geographic range of each of these 16 insect species is restricted to the Algodones Dunes system of Imperial County in southeastern California, U.S.A. and northern Baja California, Mexico. Even within the dune system, these species are classified as rare by entomologists who have conducted extensive surveys for insects on the Algodones Dunes and their environs. Any activities that result in direct mortality of individuals, as well as the general decline of plant cover and the specific decline of their respective host plants, would threaten the survival of these species with highly restricted geographical ranges and highly specific habitat needs.

Habitat for these species has suffered destruction and modification by extensive use of off-road vehicles ("ORVs") during the past three decades. Current and proposed management of the species' habitat by the Bureau of Land Management ("BLM") allows ORV use in the overwhelming majority of the areas known to harbor these species. A new management plan for the Algodones Dunes proposes to allow access to approximately 86 percent of the dune system to ORVs. The BLM has failed to acknowledge the existence of these species, let alone implement protections to prevent their extinction. Without management measures that prohibit ORV use in the majority of habitat for the species, these rare insects endemic to the Algodones Dunes face a real and imminent threat to their continued existence in the wild.

Petitioners are grateful to Dr. Chuck Bellamy, Dr. Alan Hardy, Dr. Terry Griswold, Dr. James Pitts, and Dr. Doug Yanega for providing us with valuable published and unpublished information regarding the endemic insect species they have collected at the Algodones Dunes throughout the years. Without their cooperation, this petition would not have been complete.

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I. INTRODUCTION

The Algodones Dunes are a large sand mass located along the border of the Imperial Valley in southeastern California, U.S.A., extending northwest to southeast into Baja California, Mexico (Figure 1). The dune system is approximately 64.4 km long, of which the southernmost 6.4 km extend into northern Mexico. The system varies in width from 4.8 km to 9.7 km, with the narrowest point being at the northernmost tip. Dune crests range between 60 m to greater than 90 m high (BLM and CDFG 1987). The Algodones Dunes are the largest sand dune system in the United States, and are currently managed by BLM.

The sand that formed the Algodones Dunes was derived from wave action during the formation of beaches along the fossil Lake Cahuilla (Song 1974). Lake Cahuilla was created by a drainage change of the Colorado River during the Pleistocene pluvial period. Geologically, the Cahuilla Basin is at the northern end of a large trough which extends several hundred kilometers south and is largely occupied by the Gulf of California (Song 1974). Currently, the bottom of the Cahuilla Basin is occupied by the Salton Sea. The Algodones Dunes block a drainage system which once extended from the southern Chocolate and Cargo Muchacho mountains to the bottom of the Cahuilla Basin (Song 1974).

The northern part of the Algodones Dunes is a ridge with the highest peaks in the center. The middle section is characterized by slip faces which cross the main trend, becoming more prominent towards the south. In the southern part of the dunes, some slip faces overlook flat-floored sand-free depressions (Song 1974). The central and southern parts of the dune system are composed of nearly parallel ridges along the western edge, and a 2.4-km-wide sandy apron which ends feather-like against the desert floor along the eastern edge.

Dominant plants on the Algodones Dunes include creosote (*Larrea divricata*), palo verde (*Cercidum floridum*), ironwood (*Olneya tesota*), smoke tree (*Psorothamnus spinosa*), *Hymenoclea salsola* (T. and G.), mesquite (*Prosopis juliaflora*) and desert willow (*Chilopis linearis* (Cav.)) in microphyll woodland to the east of the dune system, and Mormon tea (*Ephedra trifurca*), desert buckwheat (*Eriogonum deserticola*), desert dicoria (*Dicoria canescens*), common sandpaper plant (*Petalonyx thurberi*), desert panicum (*Panicum urvilleanum*) and plicate coldenia (*Tiquilia plicata*) in psammophytic scrub within the interior dune system, where active and partially stabilized dunes of fine sand occur (Andrews et al. 1979, BLM 2002). The dunes also support many annual plants, including *Oenothera*, *Palafoxia*, *Spheralcea*, *Malvastrum*, and others, especially composites (Andrews et al. 1979).

Deserts are among the most temporally variable and unpredictable habitats on earth. Dunes in general are hotspots of biological diversity in desert regions, possibly because they are more mesic than other desert habitats due to their ability to store water (Dr. Terry Griswold, Utah State University, personal communication July 9, 2004). The Algodones Dunes are no exception, harboring dozens of rare endemic insects and plants within its habitat island. Insect species endemic to the Algodones Dunes are adapted to the hot, arid environment and often exhibit habitat specialization, such as dependence upon a particular host plant. Narrow endemic

species and habitat specialists are considered more prone to extinction than widespread habitat generalists (Rabinowitz 1981, Sarre et al. 1995, Fischer and Stocklin 1997, Henein et al.1998).

The most significant human impact on the Algodones Dunes is intensive use by off-road vehicle enthusiasts - the dune system will occasionally experience upwards of 240,000 ORV users on a single busy weekend. ORVs at the Algodones Dunes include sand rails, motorcycles, trucks, and ATVs whose tires cut deeply into the sand even when accelerating on level ground (Stebbins 1995).

During daylight and early evening, perhaps 80% of desert fauna are buried underground, and are subsequently crushed and maimed by ORV tires (Stebbins 1995). For example, surveys comparing areas used by ORVs with unused areas at the Algodones Dunes indicate that ORVs cause drastic reductions in the abundance of several beetle species (Luckenbach and Bury 1983). These ORVs also result in reduced plant cover, further threatening the survival of the rare endemic species of the Algodones Dunes that depend on these plants for food and breeding sites. Studies at the dunes have indicated that even moderate ORV use results in significant reductions of plant cover (Luckenbach and Bury 1983, Hess in prep.).

Three of the four alternatives in the Draft Environmental Impact Statement ("DEIS") for the proposed management plan for the Algodones Dunes, or the "Imperial Sand Dunes Recreation Area," (BLM 2002) would permit ORVs in an astounding 198,220 acres and protect only 25,800 acres which are already designated "wilderness." One alternative protects more acreage (roughly half the dune system) but without any consideration of the myriad rare endemic insects that are the subject of this petition. In fact, the DEIS listed only five insect species as "known to occur or having the potential to occur" at the Algodones Dunes, and only three of the species are endemics or near-endemics (Andrew's dune scarab beetle, Carlson's dune beetle, and Hardy's dune beetle). Therefore, the BLM has utterly ignored the nearly two dozen other endemic insects at the Algodones Dunes for which information has long been available in the scientific literature. Petitioners were able to locate information on these endemics readily in published journals, reports to the agency, and via personal communication with entomologists familiar with the area. It is therefore perplexing why the BLM made no acknowledgement of these species in their management plan.

The BLM has proposed their abysmal management plan despite demonstrated adverse impacts of ORVs on the species that inhabit the Algodones Dunes. Therefore, vulnerability from anthropogenic (historic, ongoing, and imminent human-caused habitat destruction) and environmental (restricted range, habitat specialist) pressures, as well as a complete failure of the existing regulatory mechanisms to protect this fragile dune habitat and the species it supports from excessive ORV use, puts the rare endemic insects at the Algodones Dunes at risk of extinction.

II. TAXONOMY, DESCRIPTION, CURRENT DISTRIBUTION, AND LIFE HISTORY

ORDER HYMENOPTERA

Hymenopterans, the "membrane-winged" insects, include bees, ants, and wasps. This order is perhaps the second largest order of insect in the world after the Coleoptera. The Hymenoptera include famous examples of insects with eusocial behaviors, such as honeybees and true ants. These insects have developed regimented social systems in which members are divided into worker, drone, and queen castes and may live together in nests or hives of many thousands of individuals, all descended from a single queen (UCMP 2004). However, not all hymenoptera are social; some are solitary and come together only for a brief mating (UCMP 2004).

The order Hymenoptera also includes the many families of parasitoid wasps. Parasitoids lay their eggs in living hosts, which hatch into larvae that feed on the host's tissues before emerging, usually killing the hosts (UCMP 2004). These wasps often parasitize the eggs or larvae of other insects.

Parthenogenesis, a form of reproduction in which the ovum develops into a new individual without fertilization, is more common in the Hymenoptera than in any other order of animals. Fertilized eggs become females workers and queens and unfertilized eggs become male drones.

Family Sphecidae

Sphecids are solitary wasps that provision their nests with characteristic prey such as bugs, planthoppers, grasshoppers, cicadas, flies, beetles, and spiders (Foltz 2002). Some of the species in the family Sphecidae include mud daubers, thread-waisted wasps, and cicada killers.

Sphecid wasps are distinguished from vespids and pompilids by their short, collarlike pronotum and small rounded lobes extended towards the tegulae (Foltz 2002).

***Microbembex elegans* Griswold (Hymenoptera: Sphecidae)**

TAXONOMY AND DESCRIPTION

The sand or "digger" wasp *Microbembex elegans* Griswold was first described by Griswold (1996). The species is in the genus *Microbembex* Patton 1979, a small genus of New World bembicine wasps that are found in sandy environments (Griswold 1996). *Nomina Insecta Nearcitca* (2004) classifies this species as follows:

> Class Insecta: Infraclass Pterygota: Division Neoptera: Subdivision Endopterygota (Holometabola): Order Hymenoptera: Family Sphecidae: Genus *Microbembex*: Species *elegans* Griswold (Griswold 1996).

The species is notable for several distinctive morphological characters separating it from all other species in its genus (Griswold 1996). In particular, the carina on the midcoxa is present in both species (although strongest in the male). Males are also unique among the *Microbembex* in the modified mid- and hind legs, the lateral humps of sterna 3–4, the shape of sterna 7, and the dorsal spine of sterna 8. Females differ from all other North American *Microbembex* by the shape and densely punctate clypeus, an apical process on the forecoxa, and the densely punctate and narrowly notched tergite 6; females differ from other species in the continental U.S. by the all-white rake setae on the foretarsi (Griswold 1996). The males are 12 mm in length, with a forewing length of 8 mm. Females are 9–10 mm in length, with a forewing length of 7–7.5 mm.

Griswold (1996 at 143) provides a detailed description of the species: generally, males and females look similar although males are slightly larger than females, and mesosomal marking on females are more nearly white.

CURRENT DISTRIBUTION

Microbembex elegans is found only at the Algodones Dunes. The male holotype was taken 1 mile west of Glamis (Griswold 1996). Eight additional paratypes were taken from the same location, and one male was taken 4 miles south of Ogilby.

Bohart and Horning (1971) documented that all but one of the seven North American *Microbembex* species were relatively widespread. The discovery of *M. elegans* marks the second species within its genus that occurs in a highly restricted range, the other being *M. rufiventris* Bohart, known from only two sites in the southern San Joaquin Valley (Griswold 1996). Collections of more than 2,000 specimens of *Microbembex* species throughout the deserts of California outside the Algodones Dunes failed to yield *M. elegans*, providing evidence that the species is endemic to this dune system.

LIFE HISTORY

A. Habitat

M. elegans is restricted in its use of habitat even within the Algodones Dunes system (Griswold 1996). The species was found only around the bases of shrubs where detritus collects, on active slip faces of the dunes. At the time the specimens were collected, a search of stabilized dunes and areas of high off-road vehicle use with no vegetation failed to yield *M. elegans* (Griswold 1996).

B. Activity Patterns

Collections of this species are dated from September 29 to October 10.

C. Reproduction

Like other species in the genus *Microbembex, M. elegans* makes shallow nests in the soil that are provisioned with dead and morbund arthropods (Griswold 1996).

D. Natural Sources of Mortality

Mutillids are ectoparasites of bembicine wasps, and in fact some species of *Dasymutilla* are parasitic on *Microbembex*. It is therefore likely that *Microbembex elegans* Griswold is the host of *Dasymutilla imperialis* (Dr. James Pitts, Utah State University, personal communication July 16, 2004).

***Stictiella villegasi* Bohart (Hymenoptera: Sphecidae)**

TAXONOMY AND DESCRIPTION

This species of sand wasp is in the genus *Stictiella* J. Parker 1917. It was first described by Bohart (1982). *Nomina Insecta Nearcitca* (2004) classifies this species as follows:

> Class Insecta: Infraclass Pterygota: Division Neoptera: Subdivision Endopterygota (Holometabola): Order Hymenoptera: Family Sphecidae: Genus *Stictiella*: Species *villegasi* Bohart.

The *Stictiellina* presently includes 5 genera of Bembicini or sand wasps (Bohart 1982). Distinguishing characteristics of *Stictiella* are the evenly convex labrum, irregular or serrate lower margin of the male midfemur, 6–4 palpal formula, and the midocellar remnant as well as the surrounding raised area about as broad as long or slightly broader (Bohart 1982).

A complete description of the species is found in Bohart (1982 at 596). *S. villegasi* Bohart can be recognized by its nearly entirely yellow appearance and a combination of other characteristics: distinct arolium, mostly non-hirsute underneath hindfemur, clear wing membrane, and female flagellomere-1 is as long as the scape. Markings are similar to those of *Xerostictia longilabis* Gillaspy, but that species has a much longer labrum, as well as fewer palpal segments.

CURRENT DISTRIBUTION

The holotype male was collected from Glamis, and all other individuals are from the same location (Bohart 1982).

LIFE HISTORY

A. Habitat

No data presented about habitat.

B. Activity Patterns

Specimens were collected in mid-October.

C. Reproduction

No data are available for this species.

D. Natural Sources of Mortality

No data are available for this species.

Family Andrenidae

Andrenidae is a large family of solitary, short-tongued bees, most of which burrow in the ground. Bees are extremely important to the ecology of most habitats as they are the primary pollinators of insect-pollinated plants. Bees feed their larvae on honey, a mixture of pollen and nectar which they have collected from flowers. The genus *Perdita* includes over 500 species of small, oligolectic (pollen specialist) bees with peak diversity in the arid regions of North America (Danforth 1999).

Perdita algodones **Timberlake (Hymenoptera: Andrenidae)**

TAXONOMY AND DESCRIPTION

Perdita algodones Timberlake is in the genus *Perdita* Smith 1853. The species was first described by Timberlake (1971–1980). *Nomina Insecta Nearcitca* (2004) classifies this species as follows:

> Class Insecta: Infraclass Pterygota: Division Neoptera: Subdivision Endopterygota (Holometabola): Order Hymenoptera: FamilyAndrenidae: Subfamily/Tribe Panurginae/Perditini: Genus *Perdita*: Species *algodones* Timberlake.

A detailed description of the species is found in the University of California Publications in Entomology Supplementary Studies on the Genus Perdita Part II (Timberlake 1971–1980 at 26). The length is 4.3–4.5 mm, anterior wing is 2.87–3 mm, and width of abdomen is 1.2–1.5 mm. In general, the head and thorax are a shining dark blue-green (except frons and vertex are dull), with a very narrow line on the interior orbits to the middle of the eyes. The abdomen is black with two small spots on the disk of tergite 1, an abbreviated band at the base of tergites 2 and 3, a short oblique streak on each side of tergites 2 to 6 (those on tergite 6 continue across the disk). Wings are whitish and subopaque.

CURRENT DISTRIBUTION

The holotype male was collected from 3.5 miles northwest of Glamis, and paratypes also have been collected one mile west and three miles northwest of Glamis (Timberlake 1971–1980).

LIFE HISTORY

A. Habitat

No data available for this species.

B. Activity Patterns

All records of *Perdita algodones* Timberlake were collected during the month of April (Timberlake 1971–1980). Adult activity and reproduction in desert bees in general are known to be limited to a short period of time following the desert rainy season (Danforth 1999). Photoperiod, temperature, and rainfall are likely to be important phenological cues triggering emergence in desert oligolectic bees (Danforth 1999).

Danforth (1999) provided evidence of emergence triggered by rainfall, and that emergence during any given year is dependent on larval condition. Delayed emergence of pupating larvae and induced emergence triggered by rainfall apparently occurs in many species of pollen-specialist desert bees, enabling bees to survive harsh, arid environments by timing emergence with plant bloom and by minimizing catastrophic losses in drought years (Danforth 1999).

C. Reproduction

Data on reproduction in this species are not available. However, larvae of desert bees tend to be small and buried in the soil (Danforth 1999).

D. Natural Sources of Mortality

Larvae of *Perdita* species are exposed to high temperature and low humidity while buried in the soil. At these times, they are vulnerable to attack by foraging ants, fungal and other pathogens, and dessication (Danforth 1999).

Perdita glamis Timberlake (Hymenoptera: Andrenidae)

TAXONOMY AND DESCRIPTION

Perdita glamis Timberlake is described in Timberlake (1971–1980). This species is in the genus *Perdita* Smith 1853. *Nomina Insecta Nearcitca* (2004) and Michener (2000) classify this species as follows:

> Class Insecta: Infraclass Pterygota: Division Neoptera: Subdivision Endopterygota (Holometabola): Order Hymenoptera: FamilyAndrenidae: Subfamily/Tribe Panurginae/Perditini: Genus *Perdita*: Subgenus *Hexaperdita* Timberlake: Species *glamis* Timberlake.

Timberlake (1971–1980) describes the species as "remarkable." The length is 5 mm, anterior wing is 4 mm, and width of abdomen is 1.5 mm. It is allied to *xanthisma* Ckll., with a "macrocephalous male having the head in some cases much broadened anteriorly with diverging orbits; the mandibles are thick, with an attenuate incurved apical part, and they reach to the base of each other; and the cheeks are much wider than the eyes." Further descriptive detail is provided in Timberlake (1971–1980 at 17).

CURRENT DISTRIBUTION

Two specimens of this rare bee were found in Glamis.

LIFE HISTORY

A. Habitat

No data available on this species.

B. Activity Patterns

The two records of this species were collected on June 13.

C. Reproduction

Data on reproduction in this species are not available.

D. Natural Sources of Mortality

Larvae of *Perdita* species are exposed to high temperature and low humidity while buried in the soil. At these times, they are vulnerable to attack by foraging ants, fungal and other pathogens, and dessication (Danforth 1999).

Family Vespidae

The common name for vespids are wasps, yellowjackets, and hornets. Vespidae can be either social or solitary. Identifying characteristics of the family Vespidae include legs of normal length (not as long as those of the Pompilidae); wings folded longitudinally at rest; inner margin of eye usually notched; and pronotum extending back to the tegulae, appearing triangular when viewed from the side and horseshoe-shaped when viewed from above (Foltz 2002).

Euparagia n. sp. (Hymenoptera: Vespidae)

TAXONOMY AND DESCRIPTION

This species of *Euparagia* is currently being named by Dr. James Carpenter at the American Museum of Natural History (Dr. James Carpenter, AMNH, personal communication July 7, 2004). *Nomina Insecta Nearcitca* (2004) classifies this genus as follows:

> Class Insecta: Infraclass Pterygota: Division Neoptera: Subdivision Endopterygota (Holometabola): Order Hymenoptera: Family Vespidae: Genus *Euparagia*: new species.

Petitioners were unable to find a published description of this species.

CURRENT DISTRIBUTION

Specimens of this species were collected northwest of Glamis, along Ted Kipf Road (Dr. Doug Yanega, U.C. Riverside Department of Entomology, personal communication July 9, 2004).

LIFE HISTORY

A. Habitat

Euparagia are beetle predators, digging burrows in the sand and provisioning them with beetle larvae (Dr. James Carpenter, AMNH, personal communication July 7, 2004). Species of this genera are found on ephemeral flower clumps. The specimens of this as-yet-unnamed species had no associated data on host plants, but a possible host plant is *Tiquilia plicata* (Torre) (Boraginaceae), as this is the host plant of a similar species collected from the Kelso Dunes (Dr. Doug Yanega, U.C. Riverside Department of Entomology, personal communication July 9, 2004). *T. plicata* is also the host plant for the endemic Algodones sand jewel beetle *Lepismadora algodones* (see below).

B. Activity Patterns

No data are available for this species.

C. Reproduction

No data are available for this species.

D. Natural Sources of Mortality

No data are available for this species.

Family Mutillidae

The Mutillidae is a family of several thousand wasps which are ectoparasitoids of other Hymenoptera, normally ground-nesting bees and wasps (Dr. James Pitts, Utah State University, personal communication July 16, 2004). The geographic ranges of mutillids tend to be restricted by hosts rather than other factors.

The females are all wingless with no apparent division between the thorax and the abdomen, whereas the males are winged (Earthlife 2004). Both sexes are mostly red and black in color with patches of silvery hairs from which they derive their name (Earthlife 2004).

Dasymutilla nocturna Mickel (Hymenoptera: Mutillidae)

TAXONOMY AND DESCRIPTION

The velvet ant,*Dasymutilla nocturna* Mickel, was first described by Mickel (1928) based on two female specimens. Mickel also described a species, *D. subhyalina*, based on two males but acknowledged that the specimens were likely to be female and male of the same species.

> Class Insecta: Infraclass Pterygota: Division Neoptera: Subdivision Endopterygota (Holometabola): Order Hymenoptera: Family Mutillidae: Genus *Dasymutilla*: Species *nocturna* Mickel (Manley 1999).

At the time of their original descriptions, it was supposed that *D. nocturna* and *D. subhyalina* were female and male of the same species, but Mickel (1928) refrained from making that supposition based only on the fact that one female and two males were collected at the same time and location (Manley 1999). Sexing of many *Dasymutilla* species is complicated by the varying male and female color patterns.

Two other specimens of *D. nocturna* were subsequently collected and described as a new species, *D. paranocturna* (Hurd 1951). Manley (1999) determined that the holotype of *D. paranocturna* was actually a specimen of *D. nocturna* with a slight variation in color of the pubescence and integument. The specimens identified as *D. paranocturna* from the Algodones Dunes closely resemble *D. nocturna*. In addition, collections of *D. nocturna* near Preston, Nevada was likely mislabeled and was actually collected at the Algodones Dunes (Manley 1999).

Manley (1999) concluded that *D. nocturna*, many of the specimens of *D. paranocturna*, and *D. subhyalina* were members of a single species, based on the fact that all are nocturnal, all

share the same geographic range, numerous individuals were found in the same location at the same time, and males were observed attempting to mate with caged females.

CURRENT DISTRIBUTION

The holotype female and both the holotype and paratype males were collected "near Andrade, Imperial County" and the paratype female was collected "near Brawley, Imperial County." Manley (1999) collected 29 additional specimens of *D. nocturna* from the Algodones Dunes, and defined the type locality as Colorado Sand Desert, near Andrade, Imperial County. Other locations are described in Manley (1999).

LIFE HISTORY

A. Habitat

No data are available for this species.

B. Activity Patterns

While most species of *Dasymutilla* are diurnal, *D. nocturna* Mickel is nocturnal (Manley 1999). All specimens of *D. nocturna* were crepuscular, matinal, or nocturnal; i.e., active at dusk, during darkness, or right at dawn (Manley 1999). Specimens were collected year-round.

C. Reproduction

No data are available for this species.

D. Natural Sources of Mortality

No data are available for this species.

Dasymutilla imperialis Manley and Pitts (Hymenoptera: Mutillidae)

TAXONOMY AND DESCRIPTION

The velvet ant, *Dasymutilla imperialis* Manley and Pitts, is first described in a paper currently in press by Drs. Donald G. Manley and James G. Pitts. *Nomina Insecta Nearcitca* (2004) classifies this species as follows:

> Class Insecta: Infraclass Pterygota: Division Neoptera: Subdivision Endopterygota (Holometabola): Order Hymenoptera: Family Mutillidae: Genus *Dasymutilla*: Species *imperialis* Manley and Pitts.

A detailed description of *D. imperialis* Manley and Pitts is found in Manley and Pitts (in press). This species is entirely black, both the integument and the pubescence. The sternite 2 possesses a median pit filled with setae. The pit is oval, almost as wide as long, and is just posterior of center. The last tergite lacks an apical fringe of setae. The antennal scrobes are carinate. Males range in length from 10–12 mm. A female description is unknown.

Manley and Pitts (in press) note that the only previously described species of *Dasymutilla* known from these sand dunes were *D. nocturna* Mickel (female only) and *D. subhyalina* Mickel (male only), which have since been synonymized (Manley 1999; see above). Extensive

collecting by Dr. Donald Manley in the Algodones Dunes over many years has failed to produce any additional specimens of this species. No female has been associated with this male, although several possibilities exist based on distributional data.

The *Dasymutilla* species-groups are currently being overhauled; therefore, *D. imperialis* is not placed into a species group for the time being.

CURRENT DISTRIBUTION

Seven all-black, male specimens of *Dasymutilla* were collected by Dr. Terry Griswold in 1987 and 1988 from the Algodones sand dunes near Glamis (Manley and Pitts in press). The holotype male was collected 1 mile west of Glamis. Six paratypes have been collected at the Gecko Campground, southwest of Glamis.

LIFE HISTORY

A. Habitat

Because this species is a likely ectoparasite of *Microbembex elegans* or another sand wasp, the species is assumed to frequent active slip faces of the dunes where its host resides.

B. Activity Patterns

D. imperialis Manley and Pitts is a nocturnal species (Dr. James Pitts, Utah State University, personal communication July 16, 2004). Many of the known hosts of *Dasymutilla* are ground-nesting sphecids, such as *Sphecius* or *Bembex*, and some species are also parasitic on *Microbembex*. The species is likely an ectoparasitoid of *Microbembex elegans* Griswold or another endemic sand wasp on the Algodones Dunes.

Specimens have been collected in September and October.

C. Reproduction

No data are available for this species.

D. Natural Sources of Mortality

No data are available for this species.

ORDER COLEOPTERA

Beetles are of the insect order Coleoptera, one of the largest and most diverse orders of living organisms in the world (Hogue 1993). The most distinctive feature of Coleoptera are the thick, hard or leathery forewings, called elytra (Evans and Bellamy 2000). The elytra cover and protect the hind wings and meet in a straight line down the back; only the hind wings are used for flight. Beetles are holometabolous, or undergo a complete metamorphosis from egg, larvae, pupa to adult.

Family Buprestidae

The family Buprestidae (“jewel, or metallic wood-boring, beetles”) includes wood, root, stem borers and leaf miners. Most of these species break down dead or dying plant tissue,

helping to recycle the woody tissue back into the general nutrient cycle of many different habitats. A feature common to all jewel beetles is the serrate antennae and the fused basal two abdominal ventrites (Bellamy and Nelson 2002).

The best available scientific data indicate that the three buprestid beetle species described below are endemic to areas of fine sand at the Algodones Dunes. Much of the taxonomy, description, distribution, and life history information on the three beetles was provided by Dr. Chuck Bellamy, California Department of Food and Agriculture by personal communication, November 3, 2003.

Lepismadora algodones **Velten (Coleoptera: Buprestidae)**

TAXONOMY AND DESCRIPTION

The genus *Lepismadora*, and the species *L. algodones*, was first described by Velten, in Velten and Bellamy (1987). The monotypic genus is unique in the fauna of North America, not being particularly close morphologically to any other member of the family (see Bellamy and Nelson 2002). So far, the best guess at an extant relative is the small genus *Eudiadora* from Argentina (see Bellamy 1991). The Algodones sand jewel beetle is the only member of its genus and Lawrence and Newton (1995) classify *Lepismadora algodones* as:

> Class Insecta: Infraclass Pterygota: Division Neoptera: Subdivision Endopterygota (Holometabola): Order Coleoptera: Suborder Polyphaga: Series Elateriformia: Superfamily Buprestoidea: Family Buprestidae: Subfamily Chalcophorinae: Tribe Dicercini: Subtribe Hippomelaniina: Genus *Lepismadora:* Species *algodones* Velten, (Velten and Bellamy 1987) (the Algodones sand jewel beetle).

The Algodones sand jewel beetle is small, yet robust, with well-developed flight wings, as noted by the very fast flight observed during the heat of the day (i.e. 11 am – 1 pm) from mid-June to early July. The elytra are sand-colored, perhaps to lend some protective coloration, while their head and thorax are faintly metallic under a dense covering of a waxy pulverulence, often found in jewel beetles, which is thought to help prevent dessication for those living in arid habitats. The entire underside of the beetle is densely covered in white squamae, flattened setae that overlap like the scales on a butterfly wing, again likely to help regulate body temperature and prevent dessication. For a complete description, see Velten and Bellamy (1987). Of interest is the fact that the general size and coloration of *L. algodones* is very close to several other jewel beetles that are found in the Algodones dune habitats, including *Acmaeodera ephedrae* Barr, *Acmaeodera pubiventris yumae* Knull and *Acmaeoderoides stramineus* Nelson.

CURRENT DISTRIBUTION

The Algodones sand jewel beetle is highly restricted in range, found only at the Algodones Dunes and then within only a narrow north-south corridor along the western edge of the dunes. *L. algodones* has been studied by several of the current specialists, but is not yet completely understood biologically amongst the several species of jewel beetles endemic to the Algodones Dunes.

Previous specimens of *L. algodones* were recorded from the old canal bed that runs along the western edge of the dune system, with some records on the western flank of the Algodones Dune system. No other specimens have been found elsewhere, e.g. the eastern flank of the dunes, or more than one mile north or south of Highway 78.

The entire known geographic range of the Algodones sand jewel beetle is restricted to the western edge of the Algodones sand hills, with all known specimens having been observed or collected adjacent to or within the abandoned canal north and south of Highway 78. Its larval host plant is unknown. The totality of data about this species exists from specimens collected from the mid-1980s through 2002.

LIFE HISTORY

A. Habitat

The Algodones sand jewel beetle has been found only along the western perimeter of the dunes. *L. algodones* habitat is described as psammophytic or desert dune sand plant community by BLM and CDFG (1987). This habitat includes areas of active and partially stabilized dunes with widely scattered perennial vegetation cover (BLM and CDFG 1987). Psammophytic vegetation is adapted to deep water percolation and relatively high sand fluidity and mobility, and many of the perennial shrubs of the deep sands are endemic to the Algodones Dunes (Luckenbach and Bury 1983). The Algodones Dunes are wet just a short distance below the surface due to the sponge-like effect of the sand (Song 1974). *L. algodones* have been observed flying to the flowers of *Tiquila plicata* (Torre) (Boraginaceae), a plant widespread on the western flank of the dunes, but the beetles have mostly been seen and collected from these flowers on plants growing in the old canal to the west of the dunes. During the day the beetles are active only at the hottest part of mid-day (ca. 11 am to 1 pm); where they rest or hide before and after this short flight period is unknown as the combination of their fast flight habit, small size, and sandy colored dorsal appearance make following them against the sandy substrate impossible.

B. Activity Patterns

Observations of *L. algodones* have been made in June and July, with most from mid-June through early July (Velten and Bellamy, 1987, unpubl. data). Generally, observations indicate that the beetles become active in the late morning, experience a brief period of activity where they visit flowers of *Tiquila plicata* to feed on pollen or nectar and to rendezvous with potential mates, and rapidly disappear, with the exception of a few stragglers. *L. algodones* is active on these flowers for only an hour or two during the heat of the day for about 3–4 weeks in mid-summer and for the rest of the year the immature stages are developing in the yet to be determined larval host plant(s). Several attempts have been made to look for evidence of small jewel beetle larvae at work within the roots of *T. plicata*, *Larrea tridentata*, and other perennial plants growing along the canal, on the western edge of the dunes and in the general area of creosote bush scrub, all with no success.

C. Reproduction

Reproductive behavior of *L. algodones* can be generalized as follows: upon rendezvous at the flowers of *Tiquila plicata*, the female will fly to the oviposition site on the yet unknown larval host plant(s), lay one or several eggs, and likely repeat this several times, until all eggs are deposited. The eggs are likely affixed to the outside of dead or dying plant tissue, where the first instar larva will hatch directly into the plant tissue and begin boring into the wood or root crown, depending upon which plant proves to be the larval host. The life cycle is probably annual, considering the small size of the adults and the probable eleven or so months that the developing larvae would have to complete metamorphosis.

D. Natural Sources of Mortality

Predation, particularly by lizards and possibly small mammals, is probably a secondary source of mortality of these three jewel beetles. Predation by parasitic wasps (Hymenoptera), predatory flies (e.g. Asilidae), or other predatory insects is likely the predominant source of mortality.

L. algodones is active for only about two hours a day, for 3–4 weeks in mid-summer. For the rest of the year it lives buried in the sand. The mid-summer active season for this species does not coincide with a heavy-use season for ORVs because the weather is extremely hot at the Algodones Dunes during this time. While the ORV traffic likely does not crush adult beetles, because the traffic is limited in mid-summer, and the beetles are very fast fliers that would probably leave the area prior to an ORV driving over the adult host plants, the ORV traffic has serious impacts on the adult plants as well as the general flora in the area. For wood, or stem, boring insect larvae, especially those that develop within dying tissue or the woody root crown of a living plant, if the host plant is killed, the larva(e) will die.

*Prasinalia imperialis (*Barr) (Coleoptera: Buprestidae)

TAXONOMY AND DESCRIPTION

The genus *Prasinalia* contains only two species, *P. imperialis* (Barr 1969) and *P. cuneata* (Horn 1868) which is much more widely distributed from the southern San Joaquin valley south into northern Baja California and into western Arizona. These species and other relatives were discussed and distinguished by Nelson and Bellamy (1996). The species is classified as follows:

> Class Insecta: Infraclass Pterygota: Division Neoptera: Subdivision Endopterygota (Holometabola): Order Coleoptera: Suborder Polyphaga: Series Elateriformia: Superfamily Buprestoidea: Family Buprestidae: Subfamily Agrilinae: Tribe Agrilini: Subtribe Agrilina: Genus *Prasinalia:* Species *imperialis* (Barr 1969) (the Algodones white wax jewel beetle).

The Algodones white wax jewel beetle is about one inch in length, a strong flier during the heat of the day, but which rests on the stems of the host plant during the cooler parts of the day during the flight period in June and July. Freshly emerged specimens are covered with a heavy white waxy covering, a substance that seemingly provides camouflage to blend into the

white or very light green glaucous stems of the desert buckwheat host plant. Beneath this waxy covering, in older and abraded specimens, the specimens are quite attractively reddish-purple.

CURRENT DISTRIBUTION

The Algodones white wax jewel beetle (*Prasinalia imperialis* (Barr)) is highly restricted in range, found only at the Algodones Dunes and further restricted by its association with the dune buckwheat, *Eriogonum deserticola* S. Watson. Although this host plant is found in appropriate habitat in western Imperial County, the beetle has never been found outside of the Algodones dunes.

LIFE HISTORY

A. Habitat

P. imperialis habitat is described as psammophytic or desert dune sand plant community by BLM and CDFG (1987). This habitat includes areas of active and partially stabilized dunes with widely scattered perennial vegetation cover (BLM and CDFG 1987). Psammophytic vegetation is adapted to deep water percolation and relatively high sand fluidity and mobility, and many of the perennial shrubs of the deep sands are endemic to the Algodones Dunes (Luckenbach and Bury 1983). *P. imperialis* is restricted to its host plant, *Eriogonum deserticola*, flying between such plants to rendezvous with potential mates or to escape predation or disturbance.

B. Activity Patterns

P. imperialis has been collected from the foliage of *E. deserticola*, the desert buckwheat, and larvae have been found within the roots and crown of this plant. *P. imperialis* are active as adults during several weeks in very late spring to early summer.

C. Reproduction

The reproductive biology of *P. imperialis* is similar to that of *L. algodones* except it is restricted to the foliage of its host plant *E. deserticola*, adults feed on foliage, and eggs are laid at the root/soil interface or in the lower stem.

D. Natural Sources of Mortality

Predation, particularly by lizards and possibly small mammals, is probably a secondary source of mortality of these three jewel beetles. Predation by parasitic wasps (Hymenoptera), predatory flies (e.g. Asilidae), or other predatory insects is likely the predominant source of mortality.

Agrilus harenus Nelson (Coleoptera: Buprestidae)

TAXONOMY AND DISTRIBUTION

The genus *Agrilus* is a very large assemblage of jewel beetles, with more than 2,700 described species distributed in all biogeographical regions of the world. The fauna of *Agrilus* from North America currently numbers 171 species (Bellamy and Nelson 2001) and was last revised by Fisher (1928) with a number of species, including *A. harenus*, being described

subsequently. Most species of *Agrilus* appear to be restricted to a single species or several species of the same host plant genus. *A. harenus* is classified as:

> Class Insecta: Infraclass Pterygota: Division Neoptera: Subdivision Endopterygota (Holometabola): Order Coleoptera: Suborder Polyphaga: Series Elateriformia: Superfamily Buprestoidea: Family Buprestidae: Subfamily Agrilinae: Tribe Agrilini: Subtribe Agrilina: Genus *Agrilus:* Species *harenus* (Nelson 1994) (the Algodones Croton jewel beetle).

The Algodones Croton jewel beetle is small (4.5–7.0 mm in length), elongate, and a good flier but one that will not fly any long distance from the host plants except to locate a mate or perhaps to escape a predator. The adults are active in the late summer and early fall, with the original type series listed from late July through late September. The adults are described as aeneocupreous, a brassy coppery color.

CURRENT DISTRIBUTION

A. harenus Nelson is highly restricted in range, found only at the Algodones Dunes and further restricted within the dunes system by its association with the larval host plant *Croton wigginsii* Wheeler. No specimens from the original type series of *A. harenus* nor any subsequent collections come from outside of the Algodones dunes.

LIFE HISTORY

A. Habitat

A. harenus habitat is described as psammophytic or desert dune sand plant community by BLM and CDFG (1987). This habitat includes areas of active and partially stabilized dunes with widely scattered perennial vegetation cover (BLM and CDFG 1987). Psammophytic vegetation is adapted to deep water percolation and relatively high sand fluidity and mobility, and many of the perennial shrubs of the deep sands are endemic to the Algodones Dunes (Luckenbach and Bury 1983). *A. harenus* is restricted to its host plant, *C. wigginsii* Wheeler, flying between such plants to rendezvous with potential mates or to escape predation or disturbance.

B. Activity Patterns

A. harenus has been collected from the foliage of the perennial subshrub *C. wigginsii*. Larvae work within the lower stems and root crown. *A. harenus* are active as adults during several weeks from the middle summer to early fall.

C. Reproduction

The reproductive biology of *A. harenus* is similar to *L. algodones*. Individuals are restricted to the foliage of their host plants, *C. wigginsii* Wheeler, adults feed on foliage, and eggs are laid at the root/soil interface or in the lower stem.

D. Natural Sources of Mortality

Predation, particularly by lizards and possibly small mammals, is probably a secondary source of mortality of these three jewel beetles. Predation by parasitic wasps (Hymenoptera),

predatory flies (e.g. Asilidae), or other predatory insects is likely the predominant source of mortality.

Family Scarabaeidae

The family Scarabaeidae ("scarab beetles") includes june beetles, chafers, and dung rollers. A feature common to all scarab beetles is antennae with a terminal club composed of leaf-like plates which may be opened and closed (Hogue 1993). The scarab beetles in the Great Basin show a high degree of endemism and dune adaptation (Andrews et al. 1979).

Anomala hardyorum Potts (Coleoptera: Scarabaeidae)

TAXONOMY AND DESCRIPTION

The Hardy's dune beetle, *Anomala hardyorum* Potts, was first described by Potts (1976). *Nomina Insecta Nearcitca* (2004) classifies this species as follows:

> Class Insecta: Infraclass Pterygota: Division Neoptera: Subdivision Endopterygota (Holometabola): Order Coleoptera: Family Scarabaeidae: Genus *Anomala*: Species *hardyorum* Potts (Potts 1976) (the Hardy's dune beetle).

A detailed description of this species is found in Potts (1976 at 221–222). The species is pale straw-colored, and the clypeal margin, anterior and posterior pronotal margins, sides of scutellum and elytral suture are very narrowly reddish-brown. The pronotum and elytra are immaculate but variably pale due to irregular sclerotization. The antennal club is thin and slightly asymmetrical, notably longer than the stem. The clypeus is trapezoidal, more than twice as wide as long. The elytra is broadest near the middle. Males range in size from 7 to 10 mm, and females range from 7 to 9 mm. The size and length of the upper ramus of the larger protarsal claw was quite variable in both sexes.

CURRENT DISTRIBUTION

The type locality of the species is 3 miles northwest of Glamis (Potts 1976). Previous records are from Glamis, 2 miles northwest of Glamis, 3.2 miles north of Glamis, 3.5 miles north of Glamis, west Cactus, and "various stations near Glamis," (Hardy and Andrews 1980).

LIFE HISTORY

A. Habitat

A. hardyorum Potts is known only from the Algodones dunes system, on active north- or east-facing slip faces (Hardy and Andrews 1980). Adults have not been observed associated with any particular species of host plant; adults have been sifted from sand beneath a wide variety of plants (Hardy and Andrews 1980).

B. Activity Patterns

Adult Hardy's dune beetles are active at dusk (Hardy and Andrews 1980). Dates of records of the species range from February 12 through May 5.

C. Reproduction

Nothing is known of the immature stages.

D. Natural Sources of Mortality

Predation, particularly by night hawks, is an important source of mortality of another dune beetle endemic to the Algodones Dunes (*Pseudocotalpa andrewsi*). Foxes and coyotes are known to feed upon emerging beetles in other areas (Hardy and Andrews 1980).

Predation by lizards and possibly small mammals, as well as predation by parasitic wasps (Hymenoptera), predatory flies (e.g. Asilidae), or other predatory insects are likely to be additional sources of mortality.

Cyclocephala wandae Hardy (Coleoptera: Scarabaeidae)

TAXONOMY AND DESCRIPTION

Nomina Insecta Nearcitca (2004) classifies this species as follows:

> Class Insecta: Infraclass Pterygota: Division Neoptera: Subdivision Endopterygota (Holometabola): Order Coleoptera: Family Scarabaeidae: Genus *Cyclocephala*: Species *wandae*.

Petitioners were unable to locate a published description of the species.

CURRENT DISTRIBUTION

C. wandae is known from four specimens from the north end of the Algodones Dunes system (Dr. Alan Hardy, California Department of Food and Agriculture, personal communication June 3, 2004).

LIFE HISTORY

A. Habitat

C. wandae is known only from the Algodones dunes system (Andrews et al. 1979). Very little is known about the specific habitat, but Andrews et al. (1979 at 41) described the species as "endemic, known only from a particular dune and dependant upon the sand dune environment."

B. Activity Patterns

Andrews et al. (1979, Appendix B at 79) collected 3–9 specimens in September and October.

C. Reproduction

No data are available for this species.

D. Natural Sources of Mortality

Predation, particularly by night hawks, is an important source of mortality of another dune beetle endemic to the Algodones Dunes (*Pseudocotalpa andrewsi*). Foxes and coyotes are known to feed upon emerging beetles in other areas (Hardy and Andrews 1980).

Predation by lizards and possibly small mammals, as well as predation by parasitic wasps (Hymenoptera), predatory flies (e.g. Asilidae), or other predatory insects are likely to be additional sources of mortality.

Family Curculionidae

The family Curculionidae includes weevils and snout beetles. The family contains about 2,500 species in North America and about 40,000 species worldwide, and all species consume plants. Some identifying characteristics of curculionids are a broad to narrow snout, antennae usually elbowed with a club segmented into three parts, and a body often covered with scales.

***Trigonoscuta rothi* Pierce (Coleoptera: Curculionidae)**

TAXONOMY AND DESCRIPTION

The Roth's dune weevil *Trigonoscuta (Eremocatoecus) rothi* Pierce is in the genus *Trigonoscuta* Motschulsky 1853. The species was described by Pierce (1970). *Nomina Insecta Nearcitca* (2004) and Pierce (1970) classify this species as follows:

> Class Insecta: Infraclass Pterygota: Division Neoptera: Subdivision Endopterygota (Holometabola): Order Coleoptera: Family Curculionidae: Genus *Trigonoscuta*: Subgenus *Eremocatoecus*: Species *rothi* Pierce (Pierce 1975).

The weevils of the genus *Trigonoscuta* are gray, sand-colored, and oval-shaped. *T. rothi* Pierce is endemic to the Algodones Dunes, and the species is further subdivided into four subspecies. These four subspecies were described by Pierce (1975 at 73–74):

1) *Trigonoscuta rothi rothi*

Males range in length from 6.8–8.2 mm and in width from 4.0–5.0 mm. Females range in length from 6.6–7.0 mm and in width from 4.0–4.1 mm. The subspecies is generally pale green to greenish-white with thick, wrinkled spermatheca and low, wide nodus directed forward at an acute angle to the ramus, which is small and apically constructed.

2) *Trigonoscuta rothi algodones*

Males range from 7.2–9.2 mm in length and 3.7–5.3 mm in width. Females range from 7.0–8.9 mm in length and 4.0–4.5 mm in width. Aedeagus with short beak directed downward. Ring segment with lobes united to their middle, and thence narrowly divaricate. Very unusual spermatheca in that the ramus is reduced completely to an angle below the nodus, which reaches forward at an obtuse angle and almost attains the ramus-cornu line.

3) *Trigonoscuta rothi imperialis*

This name was given to a dessicated female from the collection of *T. r. algodones*, because of completely different spiculum ventrale; undivided; stem with enlarged tip; plate inflated at base each side of stem; apical part bilobed; deeply emarginate with very irregular outline; setose.

4) *Trigonoscuta rothi punctata*

Males range in length from 6.0–9.3 mm and width from 3.4–5.5 mm, and females range in length from 6.5–9.4 mm and in width from 3.8–5.8 mm. Even when fully clothed with scales, the strial punctures are evident and the striae depressed. In most specimens the striation is also evident in the color pattern due to the mottling of black scales among the white. Antennae with scape longer than funicle; first funicular equal in length to last three, and club not equal in length to the last four funiculars. Labium of shape are entirely distinct from the other desert species. Thick aedeagus, with short beak. Ring segment unusual in that the two chitinous lobes are short, acute triangles at the base but their outer pubescent processes are contiguous at the base. Thick, wrinkled spermatheca with stout nodus directed forward at an acute angle; ramus short, constricted at apex, with inflation at its base. Spiculum ventrale very wide and short, two-winged plate.

CURRENT DISTRIBUTION

The type locality for *T. r. rothi* and *T. r. punctata* were both from 13 miles west of Winterhaven on the Algodones Dunes, on north side of Highway 99, east side of All-American Canal, not more than a few hundred yards from the bridge (Pierce 1970). The type locality for *T. r. algodones* and *T. r. imperialis* were 15 miles northwest of Yuma, 1/4 mile east of the big bridge over the All American Canal (Pierce 1970).

LIFE HISTORY

A. Habitat

Weevils of the genus *Trigonoscuta* live on sand dune plants, breeding on the roots and buried stems of plants growing on the edge of the tidal waters and on plants growing on dunes or relict dunes at the edge of ancient salt water seas (Pierce 1975). They are described as "sand obligates," restricted to the sand environment where they live directly in the sand or are restricted to other biotic entities that are themselves restricted to the sand habitat (Andrews et al. 1979).

All specimens of *T. r. punctata* were collected under creosote bushes (*Larrea divricata*) (Pierce 1970). Specimens of *T. rothi algodones* were collected in April by E. R. Tinkham in the 1950s. Tinkham's notes read: "Many weevils were crawling around on the bare sand about 8–9 PM. Weevils were found on six different plants. When the vegetation is sparse the chief host plant of this weevil is the sand dune buckwheat, *Eriogonum deserticola L.*, up which they climb at night, to feed on the leaves. In wet years when many plants populate the dunes, the weevils feed on other plants as well, such as *Palefoxia linearis* (I saw them feeding on the leaves), also on *Milaria rigida*, *Coldenia plicata*, *Oenothera deltoides*, and *Croton california*. I believe *Eriogonum* and *Palefoxia* were preferred. At 9:00 PM the air and soil surface temperature was 65 degrees F," (as cited in Pierce 1975 at 74).

B. Activity patterns

Trigonoscuta weevils are all nocturnal (Pierce 1975). *T. rothi rothi* were collected in March; *T. rothi algodones* were collected in April; and *T. rothi punctata* were collected in March. Only one individual female *T. rothi imperialis* has been collected, date unknown.

C. Reproduction

Trigonoscuta weevils breed on the roots and buried stems of plants on the Algodones Dunes. Petitioners were unable to discern a specific host plant from the available published literature.

D. Natural Sources of Mortality

No data are available for these subspecies.

III. NATURE AND DEGREE OF THREAT

Threats common to the rare endemic insects at the Algodones Dunes include: highly restricted geographic ranges; specialized habitat needs; and historic, ongoing, and future disturbance from heavy ORV use (Luckenbach and Bury 1983). Vulnerability from anthropogenic (historic, ongoing, and imminent human-caused habitat destruction) and environmental (restricted range, habitat specialist) pressures puts these rare insects at risk of extinction.

In addition to the two sand wasps, two bees, one vespid, two velvet ants, three jewel beetles, two scarab beetles, and four subspecies of Roth's dune weevil that are the subject of this petition, at least two species of bee (*Perdita frontalis* Timberlake and *Perdita flavicincta*), one unnamed sphecid (*Plenoculus* n. sp.), and an unnamed species of sand roach *(Arenivaga* n. sp.), are known to be endemic to the Algodones Dunes (Dr. Doug Yanega, U.S. Riverside Department of Entomology, personal communication April 22, 2004). Andrews et al. (1979) list several more species of Coleoptera as endemic to the Algodones Dunes, including two additional species of scarab beetle (*P. andrewsi* Hardy and *Diplotaxis corbula* Vaurie), a dermestid (*Novelsis* sp.), an undescribed genus and species in the family Pedilidae, and a tenebrionid (*Eusattus fortineri*). The Andrew's dune scarab beetle (*P. andrewsi* Hardy) was petitioned for listing under the Endangered Species Act by the U.S. Fish and Wildlife Service ("USFWS") in 1978 and the Center for Biological Diversity in 2002. With the exception of *P. andrewsi* Hardy, adequate data on habitat use and life history of these additional species were unavailable at the time of this status review; therefore, they were not included in this petition. However, the existence of these additional endemic species further attests to the rich diversity of insects on the Algodones Dune system.

A. <u>Restricted range/habitat specialist</u>

Deserts are among the most temporally variable and unpredictable habitats on earth. The variation in potential evapotranspiration between years in deserts is greater than in any other biome, and the variability in annual precipitation is negatively correlated with overall rainfall in U.S. deserts (Danforth 1999). Dunes in general are hotspots of biological diversity within desert regions, possibly because they are more mesic than other habitats due to their ability to store water (Dr. Terry Griswold, Utah State University, personal communication July 9, 2004). The Algodones Dunes are particularly rich in aculeate Hymenoptera and scarab beetles, for example, and contain no fewer than four endemic subspecies of *Trigonoscuta* weevils. Andrews et al. (1979) reported that 149 genera and 196 species in the order Coleoptera alone were collected from the Algodones Dunes – a greater taxonomic diversity than other dune systems in the California desert.

Endemic insect species exhibit adaption to the hot, arid dune environment as well as habitat specialization, such as dependence upon a particular host plant. Given their restricted geographic ranges, narrow endemic species are considered more prone to extinction than widespread species (Rabinowitz 1981). In addition, habitat specialists are more vulnerable to extinction than habitat generalists (Sarre et al. 1995, Fischer and Stocklin 1997, Henein et al.

1998). Hardy and Andrews (1976 at 20–21) stated that "species with wider distribution patterns would undoubtedly be in less trouble than others which may be restricted to only one dune ... We feel that the Coleoptera cited ... as endemic to a given dune face possible extinction or population decline if habitat destruction continues or escalates as the result of human activity..." As the insect species that are the subject of this petition are endemic organisms, as well as being locally rare, no colonization source exists should these populations be eliminated.

B. Historic, ongoing, and potential disturbance from ORVs

A study of ORV use in California conducted by the State Parks Department reports a 90% increase in registrations of dune buggies and sand rails between 1983 and 2000 (California State Parks 2002). The DEIS (BLM 2002) states that over 3 million visitor-use days occur annually at the Algodones Dunes. Dune buggies and sand rails are the most popular ORVs used on the Algodones Dunes. These are relatively light vehicles with open tubular frames, rear-mounted engines, and large tires that may be equipped with paddles for better traction in loose sand (Bury et al. 1977). Three and four-wheeled ATVs with wide tires are also popular. Four-wheel-drive trucks and motorcycles are used on the Dunes as well.

Several published studies have documented the deleterious effects of ORVs on desert arthropods as well as on mammals, birds, amphibians, reptiles, and vegetation (Busack and Bury 1974, Hardy and Andrews 1976, Bury et al. 1977, Berry 1980, Bury and Luckenbach 1983, Luckenbach and Bury 1983, Schultz 1988, Brooks 1995, Stebbins 1995, Brooks 1999). Two such studies (Hardy and Andrews 1976, Luckenbach and Bury 1983) were conducted in the Algodones Dunes. Hardy and Andrews (1976) reported that in areas of the Algodones Dunes containing pockets of accumulated vegetative material or crusted deposits, which are possible larval nurseries for endemic insects, ORVs could damage the surface so that ecological niches would be destroyed.

Luckenbach and Bury (1983) compared paired unused versus ORV-used plots and animal tracks along sand sweeps in the Algodones Dunes, and found ORVs significantly reduced the biota. The authors investigated effects of ORVs on vegetation species composition and biomass; lizard species composition, abundance, and biomass and rates of tail loss; mammalian species composition, abundance, and biomass; and animal tracks (including beetles). Areas with heavy ORV use had little or no vegetation: control plots contained 2.5 times the number of plant species, 10 times the density, 10 times the cover, and 4 times the volume of shrubby perennials as compared with ORV-impacted plots. The authors noted that "[i]t is obvious that ORVs have had a major detrimental impact on dune plant communities. In addition, control plots had 1.8 times the number of vertebrate species, 3.6 times the number of individuals, and 5.8 times more biomass of reptiles than ORV areas, and 1.3 times more species, 2.2 times more individuals, and 2.2 times the amount of biomass of rodents than ORV plots." Arthropod (mostly beetle) tracks were 24 times more abundant in control than in ORV-impacted plots (Bury and Luckenbach 1983). Figure 2 shows the significant reduction in number of beetle tracks in ORV versus unused areas at the Algodones Dunes. The authors concluded that "[t]he findings of this study clearly demonstrate that ORV activities in the Algodones Dunes are highly detrimental to dune biota. Both herbaceous and shrubby perennial vegetation are greatly reduced in habitats where ORVs operate. The sand-adapted desert kangaroo rat (*Dipodomys deserti*) and fringe-toed lizard

(*Uma notata*) are severely reduced in areas frequently used for ORV recreation. Judging from information obtained on tracks, there also is a marked decline in the number of arthropods in ORV-used areas."

Schultz (1988) observed the direct effects of ORV use on local populations of the tiger beetle *Cicindela oregona maricopa* Leng along riverbanks in the Central Highlands region of Arizona. The author returned to a site at which adults and larvae were seen the year prior to heavy ORV use, and found no larvae on the heavily disturbed beach, and no evidence of cicindelids on censuses later in the spring and fall of the following two years. Adults and larvae were found only on remaining undisturbed portions of the beach. The author reported that similar sudden disappearances of *C. oregona* were documented at other disturbed sites at other localities.

Busack and Bury (1974) recorded negative effects of ORVs on three lizard species in the Dove Springs area of the Mojave desert, near California City. One species, *Callisaurus wislizenii*, was found only in undisturbed areas, and number and biomass of *Uta stansburiana* and *Cnemidophorus tigris* were higher in undisturbed versus heavily and moderately used areas. Bury et al. (1977) compared reptile, mammal, and bird species composition, abundance, and biomass in control areas, pit areas, and areas moderately or heavily used by ORVs in five creosote communities throughout the Mojave desert. Diversity, density, and biomass of all taxa were inversely related to level of ORV use. Results showed an average of 1.63 more species of reptiles and 1.25 more species of small mammals on control than ORV-used sites. The number of individuals in heavily used and pit areas was 55% and 20%, respectively, of control sites, and biomass estimates were only 23% and 17%, respectively, of control sites. The authors concluded that:

> "The impact of ORV activity on the desert vertebrate fauna is both direct and indirect. The ORVs have a direct impact by killing or maiming ground-dwelling animals; we have observed such effects in the field. ORVs can also destroy wildlife by crushing ground nests or breaking bushes and shrubs containing nests and cover. ORVs collapse burrows that are important retreats for tortoises and other wildlife. Harassment by ORV activity may place a considerable energy strain on individuals and may cause incubating birds to abandon nests. Noise from ORV activity probably interferes with the establishment and maintenance of territories. Indirect effects are perhaps the most significant and result from the destruction of vegetation and disturbance of soil. Vegetation is destroyed by crushing and root exposure...One result is a reduction in the number of spring annuals in areas of ORV use. The loss of these annuals likely means the loss of seeds and forage as well as the loss of arthropods that feed on these annuals."

Brooks (1995, 1999) found that the Desert Tortoise Research Natural Area, a fenced reserve in the western Mojave desert, contained significantly higher abundance and species richness of birds, lizards, and nocturnal rodents than outside the reserve, as well as greater aboveground live plant and seed biomass.

Any activities that result in the decline of general plant cover and the specific decline of their respective host plants would threaten the survival of rare endemic species with highly

restricted geographical ranges and highly specific habitat needs. Berry (1980) summarized a dozen studies of ORV effects on vegetation in various habitat types, including one study on sand dunes, and documented reduction in density of perennial plants, reductions in cover of perennial shrubs, reduction in diversity of perennials, reduction in biomass, and changes in annual plant production. The degree of impact is dependent on the amount and intensity of ORV use, vegetation type, and topography.

A study of the impacts of ORVs on vegetation in nine locations throughout California deserts concluded that the mean percentage of perennial vegetation density and cover was seriously reduced, particularly in areas of concentrated current or recent vehicle use (Lathrop 1983). For example, ground transects comparing shrub density and cover in disturbed and undisturbed plots at the Kelso Dunes show a reduction of density of 24 and 85 percent in the foredunes and desert floor, respectively, and a reduction in cover by 85 and 76 percent in the foredunes and desert floor, respectively (Kuhn 1974 as cited in Lathrop 1983). Bury et al. (1977) found that even moderate ORV use caused a 22 percent reduction in average plant biomass per plot in creosote scrublands in the Mojave desert, and concluded that ORV activity can eliminate plants in bloom and later scatter or destroy them after they have matured. Luckenbach and Bury's (1983) study comparing paired unused versus ORV-used plots in the Algodones Dunes found that areas with heavy ORV use had little or no vegetation, and control plots contained 2.5 times the number of plant species, 10 times the density, 10 times the cover, and 4 times the volume of shrubby perennials as compared with ORV-impacted plots. Recent research by Hess (in prep.) at the Algodones Dunes compared density of plants among three heavy, three moderate, and three little- to no-ORV use plots. Plant surveys were conducted in 2003 and 2004. The author documented an average of 11 individual plants per hectare in little- to no-use plots, 2.02 individuals per hectare in moderate-use plots, and 0.16 individual plants per hectare in heavy-use plots, indicating a drastic decline in plant cover due to ORVs even between moderately used and little- to zero-used sites.

In sum, in a comprehensive review of scientific literature regarding ORV impacts on desert flora and fauna, petitioners were unable to find a single study documenting positive or even neutral effects of ORVs. In fact, studies on the Algodones Dunes (Hardy and Andrews 1976, Luckenbach and Bury 1983) show that arthropods are significantly reduced in ORV-used areas (Figure 2). Research undertaken by Hardy and Andrews (1980) on *Pseudocotalpa andrewsi*, the subject of a previous listing petition, concluded that the species was "sensitive to activity in the areas where emergence and swarming take place, either remaining immobile in the sand and not emerging or rapidly decamping from the area of disturbance if already in flight." Unfortunately, the same sandy dunes that host these endemic insect species are also strongly favored by ORV enthusiasts. Hardy and Andrews (1980) found that most beetles spend the day buried at a depth of 5 to 8 cm. This depth is not sufficient to protect individuals from the shearing activity of dune buggy, sand rail, and other vehicle tires (Stebbins 1995).

Even for species whose adult emergence does not coincide with the most active times for off-roaders, such as *L. algodones* which emerges during the hot summer months, research on the effects of ORVs on plants the Algodones Dunes indicates that not just heavily impacted sites but moderately used areas experience declines in plant cover (Luckenbach and Bury 1983, Hess in prep.). Therefore, ORVs can significantly reduce the available habitat for rare endemic insect

species that depend on these plants for food and as breeding sites. Direct mortality of larvae can also result from impacts to plants. Wood, or stem, boring insect larvae developing within dying tissue or the woody root crown of a living plant will die if their host plant is killed by ORVs (Dr. Chuck Bellamy, California Department of Food and Agriculture, personal communication November 3, 2003)

The only insect species that has received any substantial attention by the BLM has been *Pseudocotalpa andrewsi*. This is due to concern voiced for the species as far back as the early 1970s. In recognition of the threats from ORVs, a flurry of activity around the Andrew's dune scarab beetle occurred during that decade: a proposal by the USFWS to list *P. andrewsi* in 1978 (43 FR 35636-43) and formal surveys for the species at the Algodones Dunes in 1977, 1978 and 1979 (Andrews et al. 1979, Hardy and Andrews 1980). All surveys indicated that the species was restricted to sandy areas of creosote and psammophytic scrub habitat in the Algodones Dunes. In addition, BLM proposed to conduct baseline and permanent monitoring studies for the Andrew's dune scarab beetle in a 1987 Wildlife Habitat Management Plan ("HMP") for the Algodones Dunes (BLM and CDFG 1987, pp. 21-22). However, the required biennial surveys apparently were never conducted, aside from one survey in the early 1990s by Scarabeus Associates. Petitioners have attempted to locate the survey report but have been unable to do so to date.

Despite concern for the Andrew's dune scarab beetle voiced in the 1970s and 1980s, use of ORVs continued unabated. The areas that held the most abundant colonies of the species (i.e. near Glamis and along the eastern dune margin) have been severely impacted over the past several decades. These areas are largely denuded of vegetation, and therefore the beetle is likely extirpated or severely reduced in those areas. Given known adverse impacts of ORVs on desert insects and on other fauna and flora, current and projected ORV use and lack of adequate management by the BLM threatens the continued existence of that species as well as other endemics of the Algodones Dunes.

As of December 2002, over 40,000 acres in the central portion of the Algodones Dunes are currently closed to ORVs to protect the Peirson's milk vetch (*Astragalus magdalenae* var. *peirsonii*). However, the proposed management plan (BLM 2002) would permit ORVs in an astounding 198,220 acres and protect only 27,695 acres, most of which are already designated "wilderness." The DEIS proposed this plan despite their knowledge of adverse impacts of ORVs on *P. andrewsi* and other endemic (and non-endemic) species that inhabit the dunes. Such a proposal indicates a serious failure of existing regulatory mechanisms to ensure the continued existence of the endemic insects and plants on the Algodones Dunes, and threatens individuals and their habitat with imminent destruction.

IV. CRITERIA FOR ENDANGERED SPECIES ACT LISTING

THE INSECT SPECIES ENDEMIC TO THE ALGODONES DUNES ARE ENDANGERED OR THREATENED UNDER THE ESA.

The Service is required to determine, substantiated solely on the basis of the best scientific and commercial data available, whether a species is endangered or threatened because of any of the following factors: (1) the present or threatened destruction, modification, or curtailment of its habitat or range; (2) the inadequacy of existing regulatory mechanisms; (3) overutilization for commercial, recreational, scientific or educational purposes; (4) disease or predation; or (5) other natural or manmade factors affecting its continued existence. 16 U.S.C. § 1533(a)(1) and 1533(b).

Petitioners believe that factors (1), (2), and (5) have played a significant role in endangering the continued existence of the rare endemic insect species of the Algodones Dunes. The most immediate threats to their existence are habitat specialization and highly restricted geographic ranges, as the species are known to occur only at the Algodones Dunes, and impending plans to open currently protected areas of the dune system to ORVs. These species are in dire need of the additional protections that only listing under the ESA can provide.

1. <u>The present or threatened destruction, modification, or curtailment of its habitat or range</u>.

As detailed above, published studies have documented the deleterious effects of ORVs on desert arthropods as well as on mammals, birds, amphibians, reptiles, and vegetation (Busack and Bury 1974, Hardy and Andrews 1976, Bury et al. 1977, Bury and Luckenbach 1983, Lathrop 1983, Luckenbach and Bury 1983, Brooks 1995, Stebbins 1995, Brooks 1999, Hess in prep.). No studies showed positive or even neutral impacts of ORVs on desert ecosystems.

The emergence and above-ground activity of species such as *Perdita algodones* Timberlake, *Anomala hardyorum* Potts, and all four subspecies of *Trigonoscuta rothi* Pierce during the most popular ORV season (approximately October through May) render these species vulnerable to direct destruction should a dune buggy traverse the area at the wrong time. In addition, species that are buried near the surface of the sand are vulnerable to mortality due to the shearing of tires.

While ORVs can directly kill individuals when they are burrowed in sand or flying at the surface during emergence, ORVs are also proven to adversely modify dune habitat, causing deleterious long-term impacts on the ability of a site to support a given species. Desert insects depend on their substrate for food, refuge from heat, and desiccation (Carpelan 1995). For example, *Euparagia* species are found on clumps of ephemeral flowers, but experiments have shown that even one or two tire tracks can significantly reduce cover and density of several annual plant species (Lathrop and Rowlands 1983; Pavlik 1979 as cited in USFWS 2003). Accumulations of vegetable matter collected in wind-made troughs probably serve as nurseries for the larval stages of numerous endemic insect species, including but not limited to *Microbembex elegans* Griswold, *Agrilus harenus* Nelson, *Lepismadora algodones* Velten,

Prasinalia imperialis (Barr), and *Anomala hardyorum* Potts. Obliteration by ORVs of accumulated vegetable matter in which larvae develop can eliminate entire generations (Carpelan 1995). Carpelan (1995) describes the mechanism by which dune buggies adversely modify important insect habitat:

> "Dunes become stabilized when the prevailing wind has blown the fine particles from the surface, leaving exposed material too heavy to be blown off. Disturbing this stabilized crust not only destabilizes the dune, but makes it difficult for the burrowers; and it may destroy the accumulations of organic matter – the food supply and the nursery. Dune buggies, then, are the agents of destruction of the plants, produced both on the dunes and adjacent to them, which are the limited food supply of the dune community."

Scientists have repeatedly warned that the loss of potential host plants such as *Larrea tridentata, Tiquila plicata, Eriogonum deserticola,* and *Croton wigginsii* due to even moderate ORV use reduces available larval nurseries for rare insects. Hardy and Andrews (1976) concluded that ORVs destroy plant growth within and near the Algodones Dunes, scatter or crush accumulations of organic matter likely used by larvae for nurseries, break up accumulations of dead vegetation on or near the surface of the sand and expose immature states to unnatural environmental conditions, disrupt layers of crust which stabilize the dunes and provide burrow-forming animals of suitable substrate, and upset reproduction of highly adapted species. Historical and current ORV use near Glamis and along the eastern dune margin has already eliminated some of the most abundant colonies of the Andrew's dune scarab beetle. Griswold (1996) noted that searches in areas of high vehicular use that are devoid of vegetation failed to yield *Microbembex elegans*. For wood, or stem, boring insect larvae, especially those that develop within dying tissue or the woody root crown of a living plant, if the host plant is killed by ORVs, the larva(e) will die (Dr. Chuck Bellamy, California Department of Food and Agriculture, personal communication November 3, 2003).

If currently protected areas of the Algodones Dunes are re-opened to ORVs and if other areas supporting rare endemic insects are not additionally protected, habitat for the 16 species discussed in this petition (as well as other, lesser-known endemics) will be modified or destroyed and their ranges within the dune system will be curtailed.

2. <u>Inadequacy of existing regulatory mechanisms</u>.

The BLM, the presiding land-management agency at the Algodones Dunes, has been well aware of concerns regarding the adverse impacts of ORVs on endemic insect species on the dunes for at least the past 30 years. Hardy and Andrews (1976) described just some of the deleterious effects of ORV activity on endemic insects on sand dune ecosystems, in their report to the Office of Endangered Species. While this report did not focus on the Algodones Dunes per se, the summary of ORV impacts on dune ecosystems is entirely relevant to that dune system. In the proceeding years, the USFWS (1978) and Hardy and Andrews (1979) proposed the Andrew's dune scarab beetle for listing under the Endangered Species Act in recognition of threats to the beetle wrought by unfettered ORV use at the dunes. In addition, the published, peer-reviewed scientific literature is replete with studies documenting the serious negative

impacts of ORVs in desert systems (e.g., Busack and Bury 1974, Bury et al. 1977, Berry 1980, Bury and Luckenbach 1983, Luckenbach and Bury 1983, Schultz 1988, Brooks 1995, Stebbins 1995, Brooks 1999). The BLM simply cannot claim ignorance of these issues, yet ORV use throughout the Algodones Dunes had continued unabated in sensitive habitat until the agency was sued by the Center for Biological Diversity and others in March 2000. After settlement with the plaintiffs, the BLM finally agreed to implement interim closures in 2000.

a. *Historic management failures*

Prior to the BLM's March 2002 "DEIS for a Proposed Recreation Area Management Plan and Amendment to the California Desert Conservation Area Plan: Imperial Sand Dunes Recreation Area," three planning documents for the Algodones Dunes Wildlife Habitat Area ("WHA") have addressed management for biological resources at the dunes (BLM and CDFG 1987), and are summarized below in chronological order.

1972 Recreation Management Plan

The Imperial Sand Dunes Recreation Management Plan called for the establishment of a Natural Area between Mammoth Wash and Highway 78. The Natural Area was closed to ORVs except for a vehicle access corridor, but the corridor was subsequently closed in 1977 because ORVs were negatively impacting plants and wildlife.

1980 California Desert Conservation Area Plan

In 1980 BLM developed the CDCA Plan for management of the entire California Desert. The CDCA Plan called for controlling ORV use and "protecting, stabilizing, and enhancing wildlife resource values." The CDCA Plan also designated use classes in the WHA, including Class C (suitable for wilderness), Class L (limited use), Class M (moderate use), and Class I (intensive use).

1987 Recreation Area Management Plan for the Imperial Sand Dunes

The 1987 is an amendment to and part of the CDCA Plan of 1980. The 1987 RAMP called for a reduction in the proposed level of recreation development and dispersal of intensive recreational use within Class I areas.

The 1987 RAMP included the Algodones Dunes Wildlife Habitat Management Plan (HMP), implemented under the authority of the Sikes Act (PL 93-452). The HMP mandated biennial surveys for the Andrew's dune scarab beetle: "Permanent plots will be evaluated biennially, and results will be compared to existing information to determine trend, until a satisfactory amount of data are gathered. Supplementary and monitoring studies will be through contract..." (p. 22). According to available documents, apparently only one set of surveys was ever conducted, although the survey reports could not be located by BLM, USFWS or petitioners

and the results are therefore unknown.[1] Apparently no further surveys have been conducted since that time.

The HMP also mandated that action be taken to determine distribution and status of other endemic invertebrates. BLM acknowledged that "[a] number of uniquely adapted invertebrates have been recorded in the WHA... One or more of these species may warrant consideration for special status designation by BLM, CDFG, and/or USFWS. More information on these species' distribution and status in the WHA is needed in order to make this determination," (BLM and CDFG 1987, p. 16). Implementation was to "conduct surveys and submit results to CDFG, including the California Natural Diversity Data Base and USFWS... If apparently unique forms are found, determine their taxonomic status... If unique taxa are present, add to BLM's Sensitive Species list...to ensure special management consideration," (BLM and CDFG 1987, p. 17). Most importantly, "the impacts to resources of special management concern resulting from implementation of [land use] decisions must be determined in order to ensure that no special status species' continued existence is jeopardized, and that impacts do not exceed those anticipated during the decision making process... Implementation [is to] conduct a monitoring program," (BLM and CDFG 1987, p. 18). Thus, permanent monitoring of endemic dunes insects was mandated in the HMP to determine special status and to ensure that management decisions do not jeopardize these species. Such surveys have never been conducted. The DEIS, released in March 2002, states that "[b]ecause of budgetary considerations and environmental factors, portions of the 1987 RAMP have not been implemented..."(Chapter 1-8). However, a lack of funding was not a valid reason to ignore mandatory requirements of the 1987 RAMP. Meanwhile, use of ORVs continued unabated throughout sensitive habitat until October 2000.

b. <u>Current management failures</u>.

A mere passing mention that unique endemic invertebrate species occur at the Algodones Dunes is not equivalent to developing and implementing real and effective protective measures. Regarding *P. andrewsi*, the DEIS states that "little is known about the biology of this beetle, [and] current information about the distribution and preferred habitat at the Plan Area is not available...No information about threats to this species is available" (Chapter 3-39). On the same page, the DEIS also provides two brief, cursory paragraphs regarding *Anomala carlsoni* Hardy and *A. hardyorum* Potts, respectively, and states again that no information about threats to these species is available. Assessments of these three beetle species is not just woefully inadequate, but completely inaccurate given all the information petitioners have presented above, particularly from several reports from the 1970s and 1980s by scientists Dr. Alan Hardy and Dr. Fred Andrews, and including information from the BLM itself. In addition, the HMP mandated collection of demographic and distributional information through surveys, which would have

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[1]Petitioners were only aware of the surveys based on a 1991 citation found in an "Annotated Bibliography of the Natural History of the Algodones Dunes," compiled by James Dice of the California Department of Fish and Game (CDFG; 23 May 2000), entitled "A study of Andrews' dune scarab beetle, a final report to the Bureau of Land Management on Contract B950RFP10008," conducted by Scarabaeus Associates. Petitioners' efforts to obtain the report proved fruitless, as no BLM, CDFG, or USFWS employee could locate the document.

provided additional data regarding population growth rates, survival, reproduction, and habitat use that would have been useful in developing this current management plan. Yet, required monitoring and management considerations for the unique endemics at the dunes was never conducted. No data were presented in the DEIS regarding distribution of endemic insect species in the Algodones Dunes, although such data are required before land-use decisions are made to ensure that these species are not jeopardized by federal management actions.

Astoundingly, the DEIS lists only five insect species as "known to occur or having the potential to occur" at the Algodones Dunes, and only three of the species are endemics or near-endemics (Andrew's dune scarab beetle, Carlson's dune beetle, and Hardy's dune beetle). The BLM has utterly ignored the nearly two dozen other endemic insects at the Algodones Dunes for which information has long been available in the scientific literature. Petitioners were able to locate information on these endemic species readily in published journals, reports to the agency, and via personal communication with entomologists familiar with the area.

In light of known deleterious impacts of ORVs on endemic desert insects, regulatory mechanisms to protect the species should necessarily include permanent protection of their habitats throughout the Algodones Dunes, including stringent enforcement of closures. Unfortunately, all four alternatives in the 2002 DEIS would result in relaxed conservation measures for natural resources from current levels of protection, including re-opening thousands of acres of currently protected habitat to ORV use. The DEIS specifically rejected an alternative that would maintain the interim closures because "interim closures (as stipulated in the settlement agreement) are not required for adequate protection of sensitive species...The results of the monitoring conducted since November 2000 and other data collected prior to November 2000 and assessed after the settlement agreement indicate that continuing the interim closures is not necessary to ensure adequate protection for the species of concern. For further support of the rationale for eliminating this alternative, see Appendix B" (Chapter 2-12). However, the Biological Assessment for the DEIS located in Appendix B, which supposedly provided "rationale" for their decision not to include an alternative that maintained interim closures, only included species accounts, analysis of threats, and mitigation for three species: the Peirson's milk-vetch, the desert tortoise (*Gopherus agassizii*), and flat-tailed horned lizard (*Phrynosoma mcallii*) (DEIS Appendix B). These species are all listed or proposed for listing under the federal Endangered Species Act. The DEIS does not even acknowledge the various endemic species, let alone ensure adequate protection for these species of concern.

The message rings loud and clear: in order to receive any consideration and protection by the BLM, a species occurring at the Algodones Dunes must be listed under the Endangered Species Act.

Three of the four alternatives in the DEIS would permit ORVs in an astounding 198,220 acres and protect only 27,695 acres which are already designated "wilderness." One alternative protects more acreage (roughly half the dune system) but without any consideration of the myriad rare endemic insects that are the subject of this petition. Table 1 below (from the DEIS, Chapter 4-12– 4-23) describes percentage and acreage of dune habitat types to be closed or open to ORV use in the four alternatives of the DEIS. It must be noted that wording in the table is erroneous because "controlled" areas are also "open" to ORVs. Therefore, petitioners included a

column presenting total percent of each habitat type open to ORVs, whether to intensive use or moderate use.

Table 1. Habitat Types by Estimated Areas within Closed, Controlled Access, and Open areas under the 4 DEIS Alternatives. From BLM (2002), Tables 4.2-1; 4.2-3;4.2-5; 4.2-7.

Habitat Type	Closed to OHV Use (Acres)	% Closed	Controlled Access (Acres)	% Controlled Access	Open to OHV Use (Acres)	% Open	Total % Open
ALTERNATIVE 1							
Creosote Bush Scrub	3,188	6	-	-	18,668	85	**85**
Psammo-phytic Scrub	16,956	16	-	-	91,177	84	**84**
Microphyll Woodland	7,551	12	-	-	29,833	80	**80**
ALTERNATIVE 2							
Creosote Bush Scrub	3,188	6	30,019	58	18,668	36	**94**
Psammo-phytic Scrub	16,956	16	24,726	23	66,976	61	**84**
Microphyll Woodland	7,551	12	37,749	58	20,082	30	**88**
ALTERNATIVE 3							
Creosote Bush Scrub	34,722	67	-	-	17,153	33	**33**
Psammo-phytic Scrub	48,678	45	-	-	59,980	55	**55**
Microphyll Woodland	48,403	74	-	-	16,979	26	**26**
ALTERNATIVE 4							
Creosote Bush Scrub	3,188	6	30,019	58	18,668	36	**94**
Psammo-phytic Scrub	16,956	16	24,726	23	66,976	61	**84**
Microphyll Woodland	7,551	12	37,749	58	20,082	30	**88**

The DEIS recognizes that "OHV activity tends to be concentrated within the psammophytic scrub. As a consequence, some special-status wildlife species such as the Colorado Desert fringe-toed lizard and endemic dune beetles occurring in these dunes would be killed or injured by OHV activity," (Chapter 4-15). However, three of the four alternatives in the DEIS would maintain as off-limits to ORVs only a relatively small (27,695 acre) portion of the Algodones Dunes, most of which is already designated as "wilderness." Figure 3 shows proposed land uses of the Algodones Dunes under the four alternatives. These alternative in the DEIS would allow 198,220 acres of the Algodones Dunes to be open to ORV use. The one "protective" alternative, Alternative 3, would still allow more than one-half the psammophytic scrub, one-third the creosote bush scrub, and one-fourth the microphyll woodland to be open to ORV use. In addition, the BLM reports that patterns of visitorship have apparently changed with the advent of GPS units and cell phones, which seem to embolden riders to use more remote areas (Notice of 12-month Finding for a Petition to Delist *Astragalus magdalenae var. peirsonii*; 69 FR 31523–31531). In combination with the projected 82 percent increase in visitorship by 2012–2013 above 1999–2000 levels, sensitive dune habitats will be increasingly impacted even in areas that in the past had experienced relatively low usage.

In 2003, a Final EIS and a Draft RAMP was released by BLM that adopted the preferred alternative of the DEIS (Alternative 2). Petitioners filed a formal protest of the FEIS and Draft RAMP and to date no Record of Decision implementing the RAMP has been issued.

In sum, administrative plans and legal requirements to specifically monitor and conserve the unique endemic insects at the Algodones Dunes have been systematically ignored, reneged, or abandoned by the BLM. Lack of enforcement of the law has resulted in no protection for the species until interim closures were implemented in 2000 – and only as a result of a lawsuit settlement. Current management plans include allowing ORVs in the vast majority of the habitat that supports the rare endemic insects at the dunes (94% of creosote scrub, 84% of psammophytic scrub, and 88% of microphyll woodland). Existing regulatory mechanisms are clearly inadequate to protect these Algodones Dunes endemics from extinction. Petitioners appeal to USFWS to immediately list these species as threatened or endangered under the ESA.

3. <u>Overutilization for commercial, recreational, scientific or educational purposes</u>.

No data are available.

4. <u>Disease or predation</u>.

Natural predation and disease, including fungal pathogens, affects populations but specific data are not available.

5. <u>Other natural or manmade factors affecting its continued existence</u>.

Pesticide use in the agricultural areas of the Imperial Valley may be having negative impacts on these species through pesticide drift into the Algodones Dunes. Spraying programs for the curly top leafhopper virus are also likely directly impacting the species.

V. CRITICAL HABITAT DESIGNATION RECOMMENDED

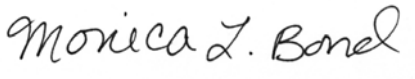
Petitioners strongly recommend the designation of critical habitat for all the species included in this petition, coincident with listing. The tenuous status of these species is clearly related to the historic and impending anthropogenic destruction of suitable habitat. In addition, the BLM has utterly ignored the existence of these rare endemics in all of its management plans, including the most recent RAMP, despite that fact that information is and has been readily available in the published literature and agency reports. Required monitoring has not been conducted, and current proposals would allow ORVs on the vast majority of the fragile dune habitat that supports these species. Critical habitat should be designated in all areas where these species currently occur and in key areas of suitable habitat where protection and restoration are necessary for the conservation of the species.

VI. CONCLUSION

The 16 rare endemic insect species of the Algodones Dunes that are discussed in this petition are facing the present and threatened destruction, modification, or curtailment of their habitat or range, inadequacy of existing regulatory mechanisms to protect them, and other natural or manmade factors affecting their continued existence. These factors are endangering the continued existence of these species. The most immediate threats to their existence are rarity, habitat specialization, and highly restricted geographic ranges, as the species are known to occur only at the Algodones Dunes, as well as impending plans to open currently protected areas of the dune system to ORVs. These species are in dire need of the additional protections that only listing under the ESA can provide.

In the past 30 years, ORV use at the Algodones Dunes has increased by an order of magnitude, resulting in direct mortality of individuals and loss of critical host plants. All measures BLM committed to taking in the 1987 management plan for the protection of these species were ignored or unimplemented. Today, even though the threats to the species have significantly increased, BLM proposes to do even less. BLM's management plan for the dunes will leave unprotected the vast majority of habitat. Until and unless BLM implements a management plan for the Algodones Dunes that acknowledges the existence of these species and adequately protects a significant portion of their habitat, *Microbembex elegans* Griswold, *Stictiella villegasi* Bohart, *Perdita algodones* Timberlake, *Perdita glamis* Timberlake, *Euparagia* n. sp., *Dasymutilla nocturna* Mickel, *Dasymutilla imperialis* Manley and Pitts, *Agrilus harenus* Nelson, *Lepismadora algodones* Velten, *Prasinalia imperialis* (Barr), *Anomala hardyorum* Potts, *Cyclocephala wandae*, *Trigonoscuta rothi rothi*, *Trigonoscuta rothi algodones*, *Trigonoscuta rothi imperialis*, and *Trigonoscuta rothi punctata* qualify for listing under the ESA. The USFWS must therefore take prompt action as required by law to process this petition and add these species to the list of threatened and endangered species.

Respectfully submitted,



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Monica Bond, Staff Biologist
Center for Biological Diversity
PO Box 493
Idyllwild, CA 92549
(909) 659-6053

Karen Schambach, California Director
Public Employees for Environmental Responsibility
PO Box 2368
Sacramento, CA 95812
(530) 333-2545

George Barnes
Sierra Club
960 Ilima Way
Palo Alto, CA 94306
(650) 494-8895

VII. LITERATURE CITED

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PERSONAL COMMUNICATION SOURCES

Dr. Chuck Bellamy, Plant Pest Diagnostics Center - Entomology Laboratory, California Department of Food and Agriculture.

Dr. James Carpenter, Curator of Invertebrate Zoology, American Museum of Natural History.

Dr. Terry Griswold, USDA-ARS Bee Biology and Systematics Lab, Utah State University.

Dr. Alan Hardy, Plant Pest Diagnostics Center - Entomology Laboratory, California Department of Food and Agriculture.

Dr. James Pitts, USDA-ARS Bee Biology and Systematics Lab, Utah State University.

Dr. Doug Yanega, Department of Entomology, University of California at Riverside.

Figure 1. Algodones Dunes and vicinity, Imperial County, California and northern Mexico. From Luckenbach and Bury (1983).

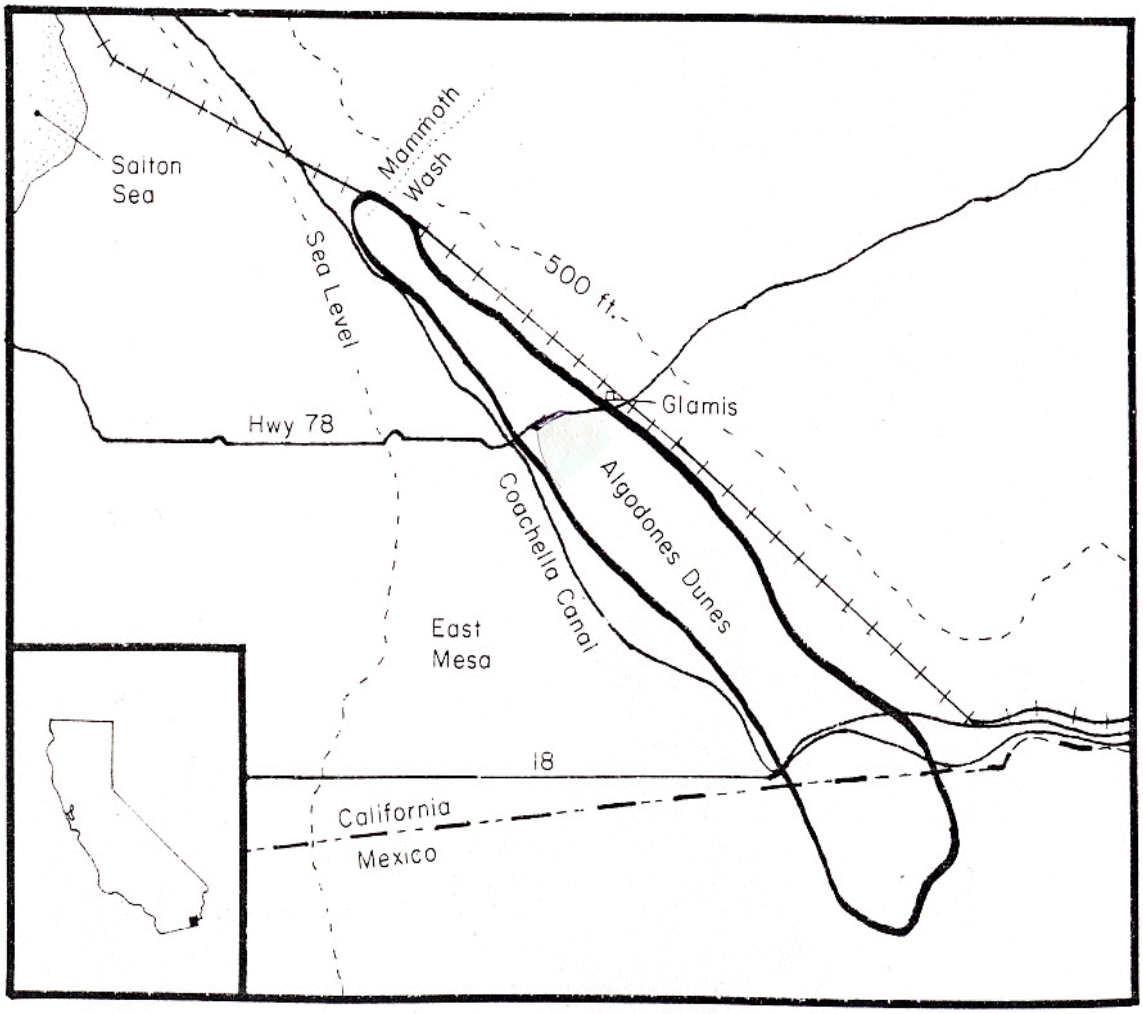

Figure 2. Comparison of beetle tracks between control and ORV-impacted areas recorded on 0.5 x 100 meter sand sweeps at the Algodones Dunes, 1977 and 1979. From Luckenback and Bury (1983).

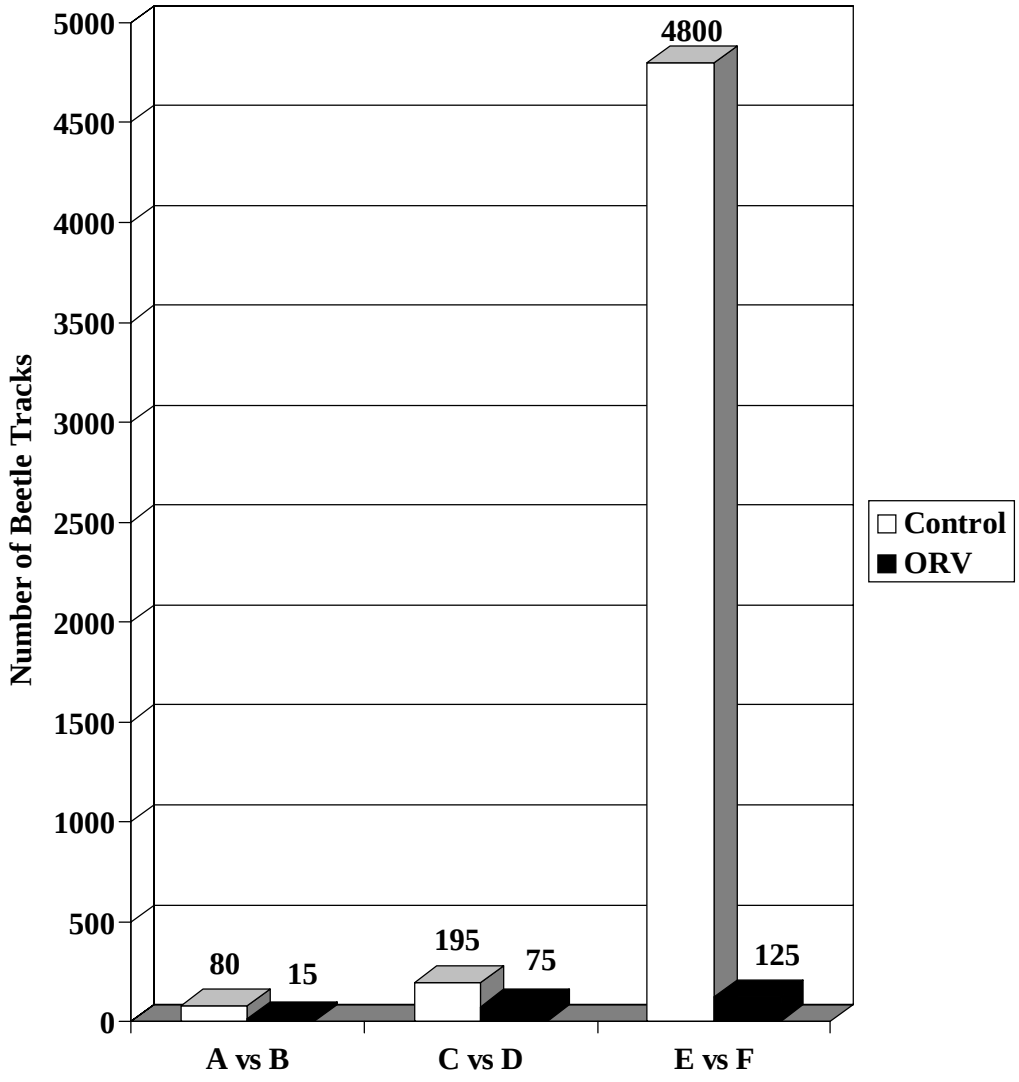

Figure 3. Proposed land-use classes in the Algodones Dunes, Imperial County, California. Figures 2-1 to 2-4 from BLM (2002).