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Marketing and Regulatory Programs

Animal and Plant Health Inspection Service

Field release of *Acythopeus burkhartorum* (Coleoptera:Curculionidae), a non-indigenous weevil for control of ivy gourd, *Coccinia grandis* (Cucurbitaceae), in Guam and Northern Mariana Islands

Environmental Assessment, August 2004

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Environmental Assessment, August 2004

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1. Purpose and Need for Proposed Action

1.1 The University of Guam and the Department of Land and Natural Resources of the Northern Marianas propose to release a non-indigenous weevil, *Acythopeus burkhartorum* O'Brien and Pakaluk (Coleoptera: Curculionidae: Baridinae), under permit from the USDA, Animal and Plant Health Inspection Service (APHIS), for the biological control of ivy gourd, *Coccinia grandis* (L.) Voigt (Cucurbitaceae) in Guam and the Northern Mariana Islands. Adult weevils feed on the leaves and larvae form galls on ivy gourd, *Coccinia grandis*, a noxious invasive weed in the plant family Cucurbitaceae.

Guam is located approximately 3,700 miles west-southwest of Honolulu, Hawaii. It belongs to a chain of islands located in the western Pacific Ocean called the Mariana Islands. The Northern Mariana Islands are a chain of islands extending northward from Guam (but not including the island of Guam). The three most populated islands in the Northern Marianas are Rota (50 miles north of Guam), Tinian (140 miles north of Guam), and Saipan (150 miles north of Guam). In 1898 Guam was ceded to the United States, following the Spanish defeat in the Spanish-American War. The Northern Mariana Islands became part of the U.S. Trust Territory of the Pacific after World War II.

The applicant's purpose for the proposed releases of *A. burkhartorum* is to reduce the severity and extent of infestation of ivy gourd on Guam and the Northern Mariana Islands. Native to Africa, Asia, Fiji, and northern (tropical) Australia (Jeffrey, 1967), ivy gourd (a member of the plant family Cucurbitaceae in the order Violales) is a rapidly growing, climbing or trailing vine. In its native habitat it is a common but not serious weed because it is kept in check by competing plants and natural enemies. However, in recent years, it has become an invasive weed in Hawaii, Guam, Saipan, and Rota by forming thick mats that overgrow vegetation, walls, fences, and utility poles (HDOA, 1994). Ivy gourd is also a host for most of the pests of the Cucurbitaceous crops, such as pumpkin caterpillar (*Diaphania indica*), red pumpkin beetle (*Aulacophora foveicollis*), melon fly (*Bactrocera cucurbitae*), melon aphid (*Aphis gossypii*), leafminers (*Liriomyza* spp.), black leaf footed bug (*Leptoglossus australis*), whiteflies (*Bemisia* spp.) and others. Suppression of this weed is a prerequisite to starting a melon fly eradication program in the Mariana Islands (McGregor and Vargas, 2002). Rapid spread of ivy gourd after introduction into a new area is attributable to vigorous growth, easy reproduction from stem fragments, and prolific seed production.

It has been estimated that over 15,000 acres in Saipan, 500 acres in Guam and 5 acres in Rota are now infested and infestations continue to spread. Successful control of this weed has occurred in the Hawaiian Islands by releasing *Acythopeus cocciniae* (Coleoptera: Curculionidae) and *Melittia oedipus* (Lepidoptera: Sessidae) in addition to *Acythopeus burkhartorum* (Ken Teramoto, pers. comm.). *A. cocciniae* has already been released in the Northern Mariana Islands (Horner, 2003).

Before a permit is issued for release of *A. burkhartorum*, APHIS needs to analyze the potential effects of the release of this agent into Guam and the Northern Mariana Islands.

1.2 APHIS must decide among the following options:
A. To deny permit applications (no action);
B. To issue permits as submitted;
C. To issue permits with management constraints or mitigation measures.

1.3 Questions of concern regarding the environmental release are:
A. Will *A. burkhartorum* attack non-target plants within and around the area infested with ivy gourd?
B. Will *A. burkhartorum* affect a federally listed threatened or endangered species?

1.4 The pending application for release of this biocontrol agent into the environment was submitted in accordance with the provisions of the Plant Protection Act (7 United States Code (U.S.C.) 7701 *et seq*.). This environmental assessment (EA) was prepared by APHIS in compliance with the National Environmental Policy Act (NEPA) (42 U.S.C. 4321 *et seq*.) as prescribed in implementing regulations adopted by the Council on Environmental Quality (40 Code of Federal Regulations (CFR) 1500–1509), by USDA (7 CFR 1b), and by APHIS (7 CFR 372).

2. Alternatives Including the Proposed Action

2.1 This chapter will explain the alternatives available for the control of ivy gourd, including no action, and summarize the potential environmental consequences of the alternatives. However, the alternatives listed under "no action" are not provided as alternatives for APHIS, and may continue whether or not a permit is issued for environmental release of *A. burkhartorum.* These are the methods presently being used to control ivy

gourd by public and private concerns and are presented to provide information to the reader.

2.2 Description of APHIS' alternatives.

2.2.1 Alternative 1 - No Action: Under this alternative, APHIS would not issue permits to any applicant for the release of *A. burkhartorum* for the control of ivy gourd on Guam and the Northern Mariana Islands. The release of the biological control agent would not take place.

2.2.2 Alternative 2 - Issue the Permit: Under this alternative, APHIS would issue permits to any applicant for the release of *A. burkhartorum* for the control of ivy gourd on Guam and the Northern Mariana Islands. These permits would contain no special provisions or requirements concerning release procedures or mitigating measures.

2.2.3 Alternative 3 - Issue the Permit with Specific Management Constraints and Mitigating Measures: Under this alternative, APHIS would issue permits to any applicant for the field release of *A. burkhartorum* for the control of ivy gourd on Guam and the Northern Mariana Islands. However, the permits would contain special provisions or requirements concerning release procedures or mitigating measures.

2.3 The following alternatives were considered but are not being evaluated except as consequence of the "no action" alternative. The following alternatives are not alternatives for decisions to be made by APHIS, but are presently being used to control ivy gourd by public and private concerns on Guam and the Northern Mariana Islands.

2.3.1 Chemical Control. The herbicide triclopyr (Garlon®) has been used to control ivy gourd in Saipan, Rota, and Hawaii by dipping cut stem ends, but the treatment is expensive and results are temporary. On Guam, spraying glyphosate (Roundup®) on ivy gourd foliage had no effect.

2.3.2 Mechanical Control. Bulldozing has been used in clearing an area of ivy gourd and is temporarily effective. Hand weeding and cutting of stems is done only in yards or farm hedges. Because the cut stems of ivy gourd readily root and sprout, disposal is a problem. Often, disposal of the cut stems in vacant lots or roadsides aids in spreading this weed.

2.3.3 Biological control. If *A. burkhartorum* becomes established on Guam and the Northern Mariana Islands, it will be the second agent to become established there for the control of ivy gourd. The first agent, a

weevil (*A. cocciniae*) was permitted for release in Guam and Saipan in 2003. Three biological control agents have been released on ivy gourd in Hawaii. A stem and root boring moth, *Melittia oedipus*, was released on the island of Oahu in 1996. In 1999, both weevils (*A. burkhartorum* and *A. cocciniae*) were released on Oahu. Successful control of ivy gourd has occurred in the Hawaiian Islands by these agents (Ken Teramoto, pers. comm.). It is expected that once *A. burkhartorum* is released in Guam and the Northern Mariana Islands, researchers will pursue approval for the release of the third agent, *M. oedipus.*

3. Affected Environment

3.1 Ivy gourd is a perennial vine native to East Africa (Murai *et al.* 1998) that thrives in warm, humid tropical regions. It is a common weed in its native habitat but is not a serious weed. However, in recent years, it has become an invasive weed in Hawaii, Guam, Saipan, and Rota by covering vegetation on roadsides, forests, house yards, pastures, gardens and natural reserves. Ivy gourd is dioecious plant (male and female plants grow separately). One variety of ivy gourd is cultivated as a vegetable by some people. It readily roots if nodes (the points on a stem from which the leaves arise) touch the soil. Often, slashed vines left in the ground result in re-growth. Vines form thick mats over trees and shrubs. The birds eat ripe fruits and spread the seeds. Ivy gourd is a host for most of the pests of the Cucurbitaceous crops, such as *Diaphania indica*, *Aulacophora foveicollis*, *Bactrocera cucurbitae*, *Aphis gossypii*, *Liriomyza* spp., *Leptoglossus australis*, *Bemisia* spp. and others. Ivy gourd harbors these pests and results in their population explosion.

3.2.1 *A. burkhartorum* is a petiole (leaf-stalk) and tendril (slender stemlike structure by which some twining plants attach themselves to an object for support) galling weevil. Adults live up to 23 months and feed on the leaves causing holes in leaves. Eggs are laid singly by inserting them in the young petioles or tendrils. Eggs hatch in about a week and larval development takes about three weeks. Pupation takes place within the gall and lasts for three to four months. Adult feeding on the leaves and larval galling of petioles and tendrils can cause drying of the leaves and eventual defoliation of the vines (Murai *et al.*, 1998).

Voucher specimens of *Acythopeus burkhartorum* have been deposited in the collections of the University of Guam and the U.S. National Museum, Washington, DC. Dr. Charles O'Brien of Florida A&M University and Dr. James Pakaluk of the USDA, Agricultural Research Service, Systematic

Entomology Laboratory, have described this weevil from specimens collected in Africa and introduced into Hawaii for biological control of ivy gourd.

Evidence of host specificity from laboratory tests:

Hawaii: "Choice" (test plant and *C. grandis* exposed to *A. burkhartorum*) "no-choice" (only the test plant exposed to *A. burkhartorum*) tests were conducted with 33 species of plants belonging to 15 families. These plants are listed in appendix 1. *A. burkhartorum* did not feed or develop galls on test plants in "choice" and "no choice" tests (Murai *et al.*, 1998). Based on these results, APHIS prepared an EA and issued a permit to release *A. burkhartorum* in the field in Hawaii (Broda-Hydorn,1999). In 1999, *A. burkhartorum* was released and has become established in Oahu and on other Hawaiian Islands.

Guam: In November 2003, a culture of *A. burkhartorum* was brought from the Hawaii Department of Agriculture to the Containment Laboratory at the University of Guam. In communication between the University of Guam, Department of Land and Natural Resources of the Northern Marianas, the U.S. Fish and Wildlife Service, and APHIS, the endemic plant species, *Zehnaria guamensis* (Cucurbitaceae), was selected for host specificity testing since it occurs within the same family as ivy gourd and is the only cucurbit species endemic to the region (Stone, 1979). Both "choice" and "no choice" tests were conducted. No feeding by adults or larval galling on *Z. guamensis* was observed in the "choice" and "no choice" tests. Adults in the *Z. guamensis* no-choice test died within two to seven days after the exposure.

3.2.2 Endangered and threatened species are a special concern under the Endangered Species Act. One endangered plant (*Serianthes nelsonii*, Fabaceae) and three plants proposed for endangered listing occur on Guam and the Northern Mariana Islands (*Tabernaemontana rotensis*, Apocynaceae, *Nesogenes rotensis*, Verbenaceae and *Osmoxylon mariannense*, Araliaceae). These plants are not related to ivy gourd.

3.3 No minority, low-income populations, or children should be negatively impacted due to the proposed action. Potential reduction in herbicide usage to control ivy gourd may even be beneficial to human populations.

4. Environmental Impacts of the Proposed Action and Alternatives

4.1 This chapter will analyze the potential environmental consequences of each alternative on the resources described in Chapter 3.

4.2 Effects of Alternative 1 - No Action

4.2.1 Effects on Non-Target Organisms: The continued use of chemical herbicides, mechanical controls, and biological control at current levels would be a result if the "no action" alternative is chosen. In the absence of successful control agents, ivy gourd will continue to expand its range, displacing native flora and increasing the pests of cucurbitaceous crops. Chemical control is expensive, temporary and often ineffective. It poses some environmental concerns, such as soil contamination, affecting non-target species and causing health hazards. Mechanical control is practiced only in house yards, fence lines and cropped lands. Often, slashing ends up increasing ivy gourd populations if the cut pieces are not properly disposed.

4.2.2 Effects on Threatened and Endangered: Impact on threatened and endangered species as a result of chemical and mechanical control would be similar to effects on non-target species and habitats described in section 4.2.1.

4.3 Effects of Altemative 2 - Issue Permits

4.3.1 Evidence indicates that *A. burkhartorum* is highly host-specific and will not have direct or indirect negative impacts on native plant species.

Evidence of host specificity from museum specimens:.

O'Brien and Pakaluk (1988), who described *A. burkhartorum*, reported that this insect occurs only on *C. grandis* and deposited specimens in museums in different parts of the world.

Evidence of host specificity from the scientific literature:.

The genus *Acythopeus* is of African and Asian distribution. Another related species, *A. curvirostris* Beheman, is an important pest of cultivated melons in Africa, in the Middle East, Iran and Southern India. *A. alcyoneus*

(Erichson) in southern Africa and *A. cucurbitae* (Marshall) in Kenya are also associated with cucurbits (O'Brien and Pakaluk, 1988).

Evidence of host specificity from testing in Hawaii and Guam:

In Hawaii, plants for host specificity testing were selected based on the centrifugal phylogenetic method advocated by Wapshere (1974). Under the protocol, all species commercially grown, naturalized, and endemic to Hawaii in the family Cucurbitaceae were tested. Additionally, plants belonging to the order Violales to which the family Cucurbitaceae belongs, as well as several plants in other orders were also tested (appendix 1). Adults of the gall weevil did not feed, survive, or deposit eggs on any plant other than ivy gourd.

Host specificity tests conducted in Guam on the endemic species *Z. guamensis* resulted in no feeding by adults or larval galling in the "choice" and "no choice" tests. Adults in the *Z. guamensis* no-choice test died within two to seven days after exposure. The environmental release of *A. burkhartorum* is not expected to have any negative effect on this plant.

4.3.2 Impact on Threatened and Endangered Species: Plants belonging to the families Fabaceae and Apocynaceae were tested in Hawaii and it was found that this weevil does not feed on them. Hence no negative effect is expected to occur on the endangered species *Serianthes nelsonii* (Fabaceae) and the proposed endangered species *Tabernaemontana rotensis* (Apocynaceae). Other species proposed for the endangered species list, *Nesogenes rotensis* (Verbanaceae) and *Osmoxylon mariannense* (Araliaceae) are outside the order Violales and do not occupy the same habitat as ivy gourd.

No listed endangered, threatened, proposed or candidate animals (including mammals, birds, insect, reptiles or snails) utilize ivy gourd and none will be adversely affected by the release of *A. burkhartorum*.

4.4 Effects of Alternative 3 - Issue the Permits with Specific Management Constraints and Mitigating Measures

4.4.1 Effects on Non-Target Organisms: No specific management constraints or mitigating measures have been recommended for this species. Therefore, under this alternative, impacts on non-target organisms would be identical to those described in 4.3.1.

4.4.2 Effects on Threatened and Endangered Species: No specific management constraints or mitigating measures have been recommended for

this species. Therefore, under this alternative, impacts on threatened and endangered organisms would be identical to those described in 4.3.2.

4.5 No disproportionate effects are expected for minority, low income populations, or children due to the release of *A. burkhartorum.*

4.6 An unavoidable effect of the proposed action would be the lack of complete control of the target weed. Should the proposed action be unsuccessful, the present chemical, biological, and mechanical control activities would continue.

4.7 Once a biological control agent such as *A. burkhartorum* is released into the environment and it becomes established, there is a slight possibility it could move from the target plant to non-target plants and itself become a pest. Host shifts by introduced weed biocontrol agents to unrelated plants are uncommon (Pemberton, 2000). However, if a host shift were to take place, the resulting effects could be environmental impacts that may not be easily reversed. Biological control agents such as *A. burkhartorum* generally spread even without the agency of man. In principle, therefore, release of these insects at even one site must be considered equivalent to release over the entire area in which potential host plants occur and in which the climate is suitable for reproduction and survival.

5. List of Preparers

This environmental assessment was written by Dr. Rangaswamy N. Muniappan, Professor Emeritus, University of Guam, and Dr. Tracy Horner, Entomologist, APHIS, Riverdale, MD.

6. List of Reviewers

This document was reviewed by Dr. Robert Flanders, Pest Permit Evaluation Branch Chief and Dr. Michael Firko, Assistant Director of Plant Health Programs, USDA-APHIS-Plant Protection and Quarantine, Riverdale, MD.

7. References Cited

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Appendix 1. Plants tested for host specificity of *Acythopeus burkhartorum* at the Hawaiian Department of Agriculture

Family	**Species**
Aristolochiaceae	*Aristolochia littoralis*
Asteraceae	*Helianthus annuus*
Begoniaceae	*Begonia hirtella*
Bromeliaceae	*Ananas comosus*
Caryophyllaceae	*Dianthus caryophyllus*
Portulacaceae	*Portulaca lutea*
Apocynaceae	*Alyxia oliviformis*
Convolvulaceae	*Ipomoea obscura*
Bixaceae	*Bixa orellana*
Caricaceae	*Carica papaya*
Cucurbitaceae	*Bebincasa hispida*
	Citrullus lanatus
	Coccinia grandis
	Lagenaria siceraria
	Luffa acutangula
	Luffa aegyptiaca
	Cucurbita moschata
	Cucurbita pepo
	Momordica charantia
	Cucumis dispsaceus
	Cucumis melo
	Cucumis sativus
	Sechium edule
	Sicyos hispidis
	Sicyos pachycarpus
	Sicyos waimanaloensis
	Trichosanthes anguina
Flacourtiaceae	*Xylosma hawaiiense*
Passifloraceae	*Passiflora edulis*
Violaceae	*Isodendrion laurifolium*
	Viola chamissoniana subsp. *tracheliifolia*
	Viola sp.
Turneraceae	*Turnera ulmifolia*

Decision and Finding of No Significant Impact
for
Field Release of Acythopeus burkhartorum (Coleoptera: Curculionidae), a Nonindigenous Weevil for Control of Ivy Gourd, Coccinia grandis (Cucurbitaceae), in Guam and Northern Mariana Islands
Environmental Assessment
August 2004

The U.S. Department of Agriculture (USDA), Animal and Plant Health Inspection Service (APHIS), is proposing to issue permits for release of a nonindigenous, leaf-mining weevil, Acythopeus burkhartorum O'Brien and Pakaluk (Coleoptera: Curculionidae). The agent would be used for the biological control of ivy gourd, Coccinia grandis (L.) Voight (Cucurbitaceae) in Guam and the Northern Mariana Islands.

The alternatives available to APHIS are No Action (no permits), Issue Permits, and Issue Permits with Management Constraints or Mitigating Measures. Because of the action being proposed by APHIS, the Issue Permit and the Issue Permit with Management Constraints or Mitigating Measures alternatives will result in the release of the biological control agent into the environment. APHIS has therefore analyzed the potential effects of the release of the agent into the environment. The No Action alternative, as described in the environmental assessment (EA), would likely result in the continued use at the current level of chemical and mechanical control methods for the management of ivy gourd. These control methods described are not alternatives for decisions to be made by APHIS, but are presently being used to control ivy gourd in Guam and the Northern Mariana Islands and may continue regardless of permit issuance for field release of A. burkhartorum.

I have decided to authorize the PPQ permit unit to issue permits for the field release of A. burkhartorum without management constraints or mitigating measures. I have also determined that none of the alternatives will have significant environmental impacts. The reasons for my decision are:

" This biological control agent is sufficiently host specific and poses little, if any, threat to the biological resources of Guam or the Northern Mariana Islands.

" This species will not disproportionately affect minority or low- income populations, nor will they disproportionately affect children or result in any environmental health risks or safety risks to children.

" A. burkhartorum poses no threat to the health of humans or wild or domestic animals.

" A. burkhartorum will have no effect on endangered or threatened species or their habitats.

" While there is not total assurance that the release of A. burkhartorum into the environment will be reversible, there is no evidence that this organism will cause any adverse environmental effects.

Based on the analysis found in the EA, I find that issuance of permits for the field release of A. burkhartorum without management constraints or mitigating measures will not have a significant impact on the quality of the human environment and that an environmental impact statement need not be prepared.

/s/
Michael J. Firko August 24, 2004
Assistant Director
APHIS Plant Health Programs
Plant Protection and Quarantine