
PEST ALERT

Insect Pests of Cycads¹

January 2006

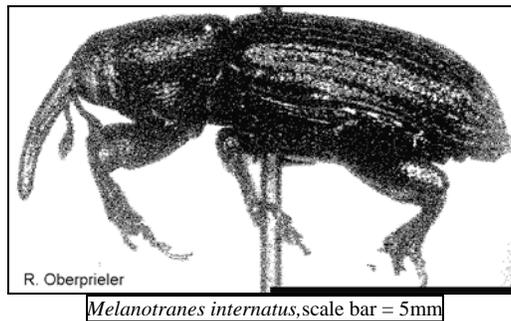
Compiled by
William Tang & Rolf Oberprieler

Introduction

The pest risk categorizations below are conducted for the IUCN Cycad Specialist Group (CSG). They are based on pest risk analyses using current knowledge and may change when more knowledge becomes available. These pest risk categorizations are not necessarily held or recognized by the institutions at which CSG members work. In evaluating a candidate pest, a risk analysis is conducted based on three variables: (1) the existence of a viable pathway for the spread of the pest, (2) the likelihood of transport to an *ex-situ* conservation collection or wild population, and (3) the destructiveness of the pest. In the pest threat ranking system used below, if the probability for each of these is high, then its threat is extreme. If only one or two of these factors can be ranked as high, then the pest's overall threat may only be ranked as high or moderate.

Call for Other Pests to be Considered for this List: Other possible candidates include the leopard moth (*Zerenopsis leopardina*), eumaeus butterflies (*Eumaeus* sp.), and liliocerid beetles (*Lilioceris* sp.). All these are feeders on young leaves. The frequency at which they are transported with plants in commerce does not appear to be high, however, so they have tentatively been placed in the MODERATE to LOW threat range and are not included in this list.

¹ **Note:** This Pest Alert document is separate from and supplementary to the one developed for cycad aulacaspis scale (CAS), *Aulacaspis yasumatsui* (released September 2005), which is currently the world's most serious and dangerous invasive insect pest of cycads. The CAS Pest Alert is available from the IUCN/SSC Cycad Specialist Group – Subgroup on Invasive Pests, located at the following URL: <http://www.iucn.org/themes/ssc/sgs/csg/publications/CAS/Cycad-Aulacaspis-Scale-Pest-Alert.pdf>



Species: *Melanotranes internatus* (Pascoe) and *M. roei* (Boheman) (Order: Coleoptera; family Curculionidae)

Common names: Melanotranes weevil

Threat Ranking: HIGH

Native range and hosts; artificial introductions: Native to Australia; living in the stems of *Macrozamia* sp. and *Lepidozamia* sp. Infestations outside of the natural range have been reported in collections in Europe and the U.S. (Lotusland in California); *Encephalartos* sp. are highly susceptible (Oberprieler 1995).

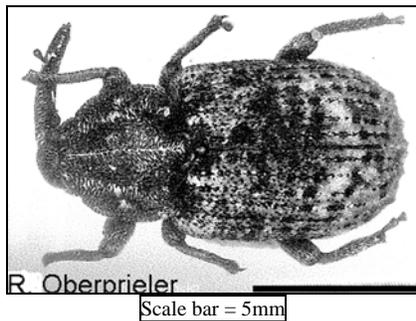
Mode of attack: These weevils live in the leaf bases of healthy *Macrozamia* and *Lepidozamia*, but will bore deep into the stems of stressed plants, usually causing death. Healthy plants of *Encephalartos* appear to be highly vulnerable in cultivation to stem attacks by these weevils.

Vulnerable regions: The export of large, wild-collected *Macrozamia moorei* and other *Macrozamia* species world-wide is currently of great concern. Large plants such as these cannot be effectively inspected for infestations prior to export, and their current sale into cycad regions such as Thailand pose a potential for the establishment of these stem borers into *ex-situ* cycad collections, such as Nong Nooch Tropical Garden, as well as wild populations of *Cycas* there. The susceptibility of Asian *Cycas* to this weevil is unknown. A second region of vulnerability is South Africa. The establishment of melanotranes weevils into cycad collections there may result in their spread into wild *Encephalartos* populations, which are known to be highly susceptible. Probable scenario: in a wild population of *Encephalartos*, all plants with large stems may be killed; melanotranes weevils persist in leaf bases of young plants with a continuing cycle of infestation and eventual extinction of that population.

Suggested control of spread: Large plants from infected areas should be prohibited for importation to vulnerable areas; in virgin areas, import of host genera should be restricted to small plants and seeds. USDA research indicates that fumigation with methyl bromide in a vacuum chamber is the only effective eradication measure for stem borers in cycads. Equipment large enough to accomplish this is not widely available in most countries.

Literature Cited:

Oberprieler, R. (1995) The weevils (Coleoptera: Curculionoidea) associated with cycads 1. Classification, relationships, and biology. Pp. 295-334 in P. Vorster (Ed.) *Proceedings of the Third International Conference on Cycad Biology*. Cycad Society of South Africa, Stellenbosch.



Species: *Demyrsus meleoides* Pascoe (Order: Coleoptera; family Curculionidae)

Common names: Macrozamia stem borer, demyrsus weevil

Threat Ranking: HIGH

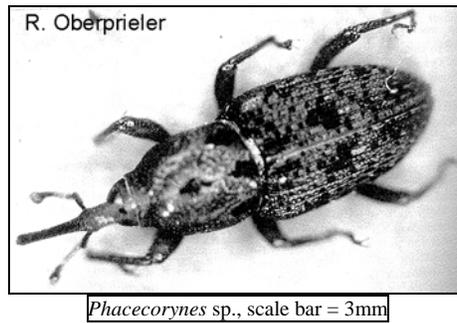
Native range and hosts; artificial introductions: Native to Australia; living in the stems of *Macrozamia* sp. This pest has been intercepted in imports of *Macrozamia* stems in Italy and in South Africa, where it escaped into the wild (specimen captured in KwaZulu-Natal in 1976), but appears not to have established. In Italy it has been found to attack *Encephalartos villosus* in cultivation; the larvae tunnel into the outer layers of the cycad trunk (Oberprieler 1995).

Vulnerable regions: The export of large wild-collected *Macrozamia moorei* and other *Macrozamia* species world-wide is currently of great concern. Large plants such as these cannot be effectively inspected for infestations prior to export, and their current sale into cycad regions such as Thailand pose a potential for the establishment of these stem borers into ex situ cycad collections, such as Nong Nooch Tropical Garden, as well as wild populations of *Cycas* there. The susceptibility of Asian *Cycas* to this weevil is unknown. A second region of vulnerability is South Africa. The establishment of tranes weevils into cycad collections there may result in their spread into wild *Encephalartos*, which are known to be susceptible.

Suggested control of spread: Large plants from infected areas should be prohibited for importation to vulnerable areas; in virgin areas, imports of host genera should be restricted to small plants and seeds. USDA research indicates that fumigation with methyl bromide in a vacuum chamber is the only effective eradication measure for stem borers in cycads. Equipment large enough to accomplish this is not widely available in most countries.

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Species: *Phacecorynes variegatus* (Fabricius), *P. sommeri* (Burmeister), and *P. sp.*
(Order: Coleoptera; family Curculionidae)

Common names: Encephalartos stem borer, phacecorynes weevil

Threat Ranking: HIGH

Native range and hosts; artificial introductions: Native to South Africa and Zimbabwe; at least three species are known, the two above plus one undescribed; they live inside the stems of *Encephalartos*, and the two described species have been transported in cycad stems to Europe since the 18th century, where they have caused some havoc in botanic gardens (R. Oberprieler 1995, and pers. comm.).

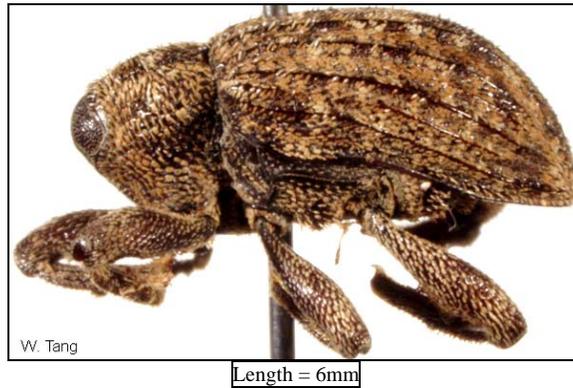
Mode of attack: These weevils burrow deep into the stems of *Encephalartos sp.*; infestations are usually fatal in stressed plants. *Macrozamia* and *Lepidozamia* are also likely to be susceptible.

Vulnerable regions: The export of large, wild-collected *Encephalartos* is the main pathway for the shipment of this pest outside of its native range. Infestations are difficult to detect on large stems. Vulnerable regions include areas with populations of *Encephalartos* in Central Africa as well as in southern Africa where these pests do not yet exist. Australia and *ex-situ* collections around the world are also locations of vulnerability.

Suggested control of spread: Large plants from infected areas should be prohibited for importation to vulnerable areas; in virgin areas, imports of *Encephalartos* should be restricted to small plants and seeds. USDA research indicates that fumigation with methyl bromide in a vacuum chamber is the only effective eradication measure for stem borers in cycads. Equipment large enough to accomplish this is not widely available in most countries.

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Species: *Eubulus* sp. (Order: Coleoptera; family Curculionidae)

Common names: Dioon borer, zamia borer

Threat Ranking: HIGH

Native range and hosts; artificial introductions: More than one species of *Eubulus* may feed on cycad stems in the New World. In the wild, they have been collected in the stems of dead/dying *Dioon angustifolia* (C. O'Brien pers. comm.). An imported species attacks stems of *Zamia* and possibly *Microcycas* cultivated in south Florida (Tang 2002).

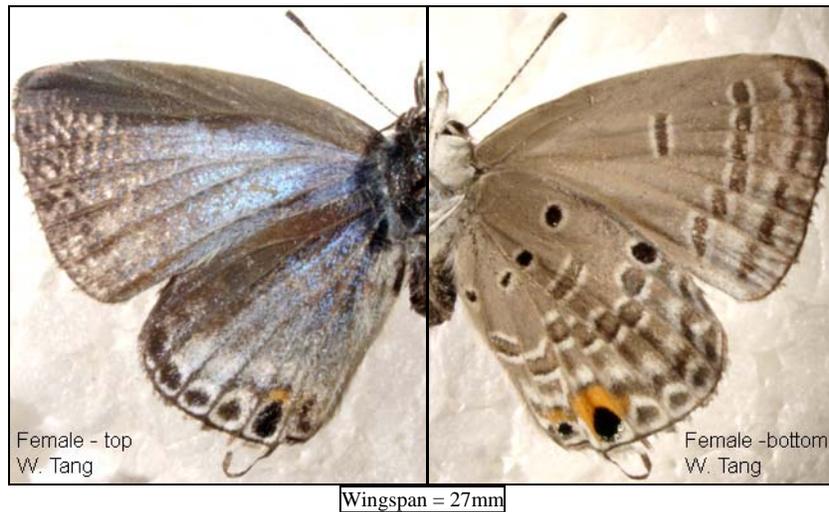
Mode of attack: Larvae of this weevil bore into the stem and roots of Caribbean cycads in cultivation. Pupae have also been found inside of stems, but pupation is likely to take place in surrounding soil as well. *Zamia* from the Greater Antilles and NE Florida are particularly vulnerable and the *ex-situ* collection of these plants at Montgomery Botanical Center (MBC) have been decimated by it. *Microcycas* also appears vulnerable.

Vulnerable regions: The spread of this pest in cultivation appears to be slow (in a human time frame), as the mobility of this weevil appears limited. Infestation has spread from Fairchild Tropical Garden (FTG) to MBC via the transport of infected landscape plants to the nursery for "recovery." Currently, the infestation of this pest appears limited to these two institutions and eradication may be feasible. The possibility exists that it lives in *Dioon* or other cycad genera without killing them, which would make eradication much more difficult. The spread of this pest into the Greater Antilles (*e.g.* Puerto Rico, Dominican Republic, Cuba) could cause widespread destruction in the extensive *Zamia* populations there as well as the endangered *Microcycas*.

Suggested control of spread: Large plants of *Dioon* and *Zamia* from infected areas (such as Mexico and Central America, and FTG and MBC) should be prohibited for importation to uninfected areas without proper treatment; otherwise trade should be restricted to seedlings and seeds. USDA research indicates that fumigation with methyl bromide in a vacuum chamber is the only effective eradication measure for stem borers in large cycad plants. Equipment large enough to accomplish this may not widely available in many countries.

Literature Cited:

Tang, W. (2002) Two new pests of *Zamia* in Florida. *Encephalartos* 69: 26-29.



Species: *Chilades pandava* (Horsfield) (Order: Lepidoptera; family Lycaenidae)

Common names: Cycas butterfly

Threat Ranking: HIGH

Native range and hosts; artificial introductions: Native to SE Asia including Thailand, Vietnam, China, and probably Burma, Cambodia and Laos; specializing on *Cycas*. This butterfly appears to be widespread in the *Cycas revoluta* farms in China and is intercepted by plant quarantine inspectors in the U.S. in commercial shipments of this cycad from China and Taiwan, suggesting that it is established on that island as well. Moore *et al.* (2005) report that this pest has been introduced to Saipan and Guam, where it is currently contributing to the population destruction of *Cycas micronesica*.

Mode of attack: The larvae of this butterfly feed on the young soft leaves of *Cycas*; heavy infestations will destroy a flush of leaves. Reproduction in some wild *Cycas* populations (e.g. *C. fairylakea* at Shenzhen) may be severely suppressed by infestations.

Vulnerable regions: Larvae and pupae of the cycas butterfly commonly accompany commercial shipments of *Cycas revoluta* from China and Taiwan. The volume of trade from these countries throughout the world is high, therefore a pathway for its introduction to many regions exists. The establishment of this pest in a receiving nursery is high. Any region outside of SE Asia where *Cycas* occurs native or is widely cultivated is at risk.

Suggested control of spread: Careful inspection of commercial shipments of *Cycas revoluta* (these are usually stems with most of the leaves and roots cut off) for newly emerged adults and for larvae is needed. Fumigation of Chinese and Taiwanese shipments of *C. revoluta* as a condition of entry should be considered.

Literature Cited

Moore, A., T. Marler, R.H. Miller & R. Muniappan (2005) Biological control of cycad aulacaspis scale on Guam. *Cycad Newsletter* 28(5):6-8.