

HOST ASSOCIATIONS OF *SPECULARIUS IMPRESSITHORAX* (PIC) (INSECTA: COLEOPTERA: BRUCHIDAE) WITH SPECIES OF *ERYTHRINA* (FABALES: FABACEAE)¹

JOHN M. KINGSOLVER² AND JEAN E. DECELLE³

ABSTRACT

Seeds of species of *Erythrina* are seldom damaged by insects because toxic amino acids and alkaloids are present in the cotyledon. No seed beetles (Bruchidae) are known to attack seeds of *Erythrina* in the New World. The African bruchid, *Specularius impressithorax* (Pic), has been recorded in 7 species of *Erythrina* (including 2 species introduced into South Africa from the Neotropics) in Africa and India. Distribution of *S. impressithorax* and its host species are listed.

The beetle family Bruchidae (seed beetles) is widespread throughout the world, and species are especially numerous in tropical and subtropical regions. Larvae in this family without exception feed in seeds, but adults are pollenophagous, often feeding in flowers of plants other than the larval host plant. Eggs are deposited on the surface of the seed pod, or in some cases on the seed itself, and the newly hatched larva bores through the valve and/or seed wall into the cotyledon. All larval instars are spent in the cavity excavated by feeding activities, and the cavity in most cases is subsequently used as a pupal chamber. Following eclosion, the adult either chews an exit tunnel through the seed coat, or in some cases emerges through a tunnel excavated to the surface by the larva. Exit holes of bruchids are round and cleanly cut whereas those of other insects are ragged and irregular.

The majority of known host associations of bruchids are in the order Fabales. Many bruchids are host specific (a species of bruchid preferring only one host species), but the more prevalent relationship is a species of bruchid being associated with two or more species in a plant genus. Some bruchids are less discriminating and may be associated with species in several plant genera, or even several plant families.

Certain toxic compounds in seeds are effective deterrents to bruchid attack or development. A few legumes are entirely free of bruchid infestation, apparently due to the presence of toxins—e.g., *Gliricidia sepium* (Jacq.) Steud, *Gymnocladus dioica* (L.) Koch, and *Robinia pseudoacacia* L. (Janzen, 1969), but in others, e.g., *Abrus precatorius* L., *Dioclea megacarpa* Rolfe, *Oxytropis* spp., *Astragalus* spp., *Enterolobium cyclocarpum* (Jacq.) Griseb., certain species of *Erythrina*, one or more species of bruchids have either “developed” detoxification sys-

¹ We wish to thank the following workers for contributions of infested seeds: B. A. Krukoff, N.Y. Botanical Garden; I. Whitton, Durban, South Africa; T. Muller, Salisbury, Rhodesia; and P. H. Raven, Missouri Botanical Garden, St. Louis. We are grateful also to Dr. Krukoff for identifying seeds.

² Systematic Entomology Laboratory, IIBIII, Federal Research, Sci. & Educ. Admin., USDA. Mail address: c/o U.S. National Museum of Natural History, Washington, D.C. 20560.

³ Section d'Entomologie, Musée Royal de l'Afrique Centrale, Tervuren, Belgique.

tems in reaction to the specific toxin in the seed and are able to develop normally, or are in some other way unaffected by the toxin.

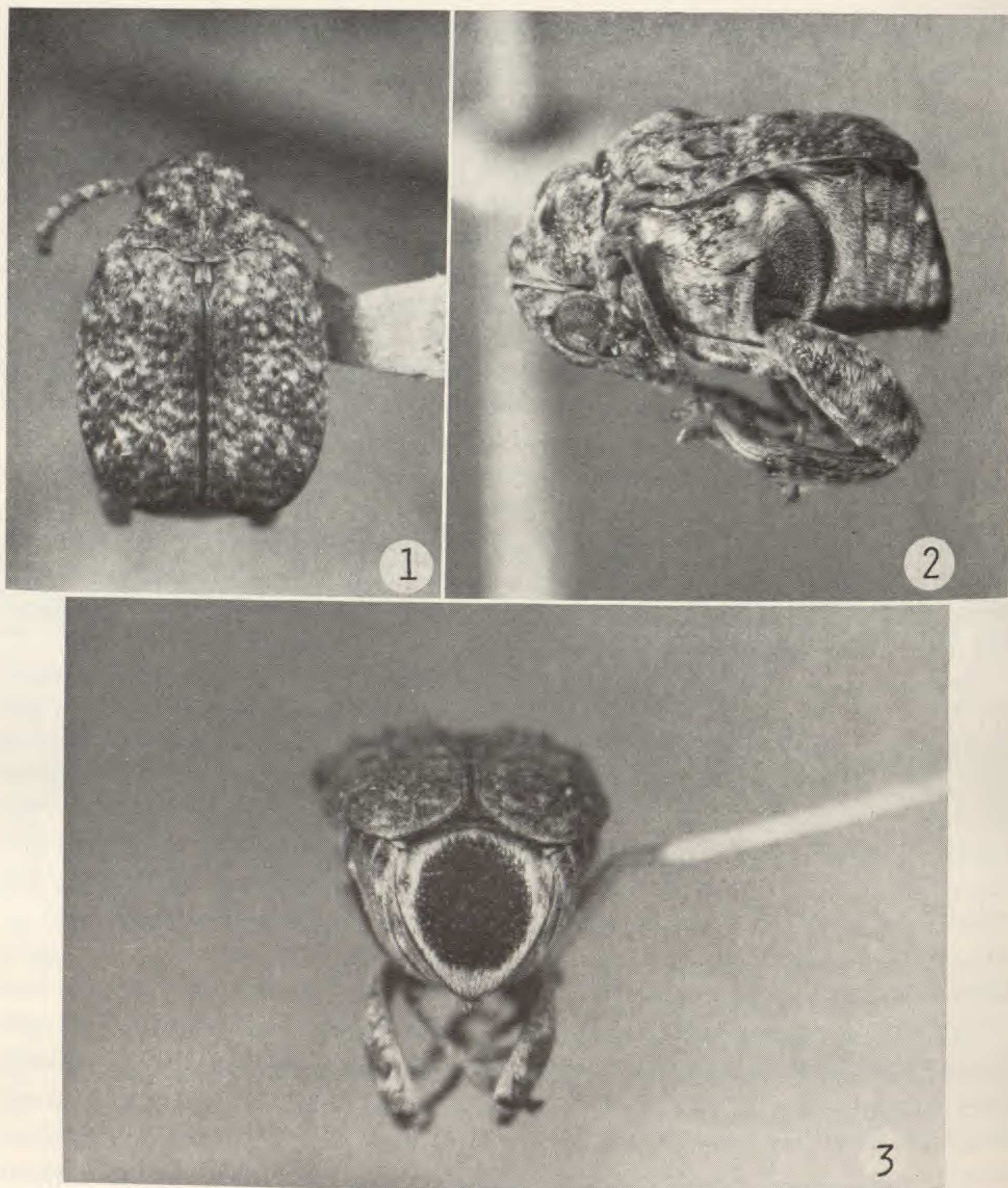
Erythrina is a widespread tropical and subtropical genus of 108 species of trees, shrubs, and herbs (Krukoff & Barneby, 1974) and is presently the subject of extensive and intensive studies being reported in this symposium. The seeds of most species in this genus contain relatively high amounts of alkaloids and amino acids which apparently are effective in thwarting attacks of most species of bruchids. No native species of *Erythrina* in the New World is known to be attacked by native bruchids. The report of *Mimosestes amicus* (Horn) found in pods of *Erythrina flabelliformis* Kearney in Arizona (Raven, 1974: 330) is apparently only an instance of the bruchid using the pod as a hibernaculum because it has not been subsequently repeated. The report of *Stator pruininus* (Horn) in *Erythrina* seeds in Hawaii (Bridwell, 1938: 71) is probably a similar situation.

In the Old World, the bruchid, *Specularius impressithorax* (Pic), is known to attack at least seven species of *Erythrina*. Raven (1974: 330) reports one additional species of *Erythrina* exhibiting apparent bruchid damage. Wherever infestations occur, however, they are usually quite heavy, indicating that toxic compounds have little effect in reducing populations of this species. The detoxification mechanism of *S. impressithorax* has not been investigated.

Specularius was described by Bridwell in 1938 for his new species *erythrinae* (p. 71), now a synonym of *impressithorax* (Pic) (Decelle, 1951: 177). The generic name refers to the glabrous, mirrorlike circular area on the pygidium in both sexes. Of the nine species and varieties assigned to this genus, only *impressithorax* (Pic) and *erythraeus* var. *speculifer* (Pic) possess this character. The females of most species of *Gibbobruchus* Pic, a New World genus, are in part also characterized by a speculate pygidium, but the relationships of *Specularius* and *Gibbobruchus* remain to be defined, although they superficially resemble one another. A taxonomic study of *Specularius* and its relationships is needed but is beyond the scope of this paper.

Specularius impressithorax is a small bruchid, 3.25 to 4.25 mm in length, yellowish brown with grayish flecks, and with prominent gibbositities marked with black on the pronotum and on the basal half of the elytra (Figs. 1–2). The antenna is serrate (Fig. 6). The hind femur is enlarged and carries a strong tooth on the inner margin (Fig. 7). The speculate pygidium is easily visible without magnification (Fig. 3). Although the species varies somewhat in size and extent of dark marks on the dorsal surface, we consider this normal variation. Male genitalia as in Figs. 4–5.

The range of the variety *minor* Zacher is widely separated from the principal range of the species and may represent a separate species, but study material is too limited to decide this question. This variety has been reared from *Erythrina senegalensis* A. DC. in Nigera (Zacher, 1952: 467) and Ghana (specimens in British Museum (N.H.), London), from *E. mildbraedii* Harms (reported as *altissima* Aug. Chevalier) in Nigeria (Zacher, 1952: 467) as well as from "*Strophostyles sarmentosa*" (sic) in Guinea Bissau. Without indication of host plants, this variety is also known from Senegal (Museum of Paris), Sierra Leone (British Mu-

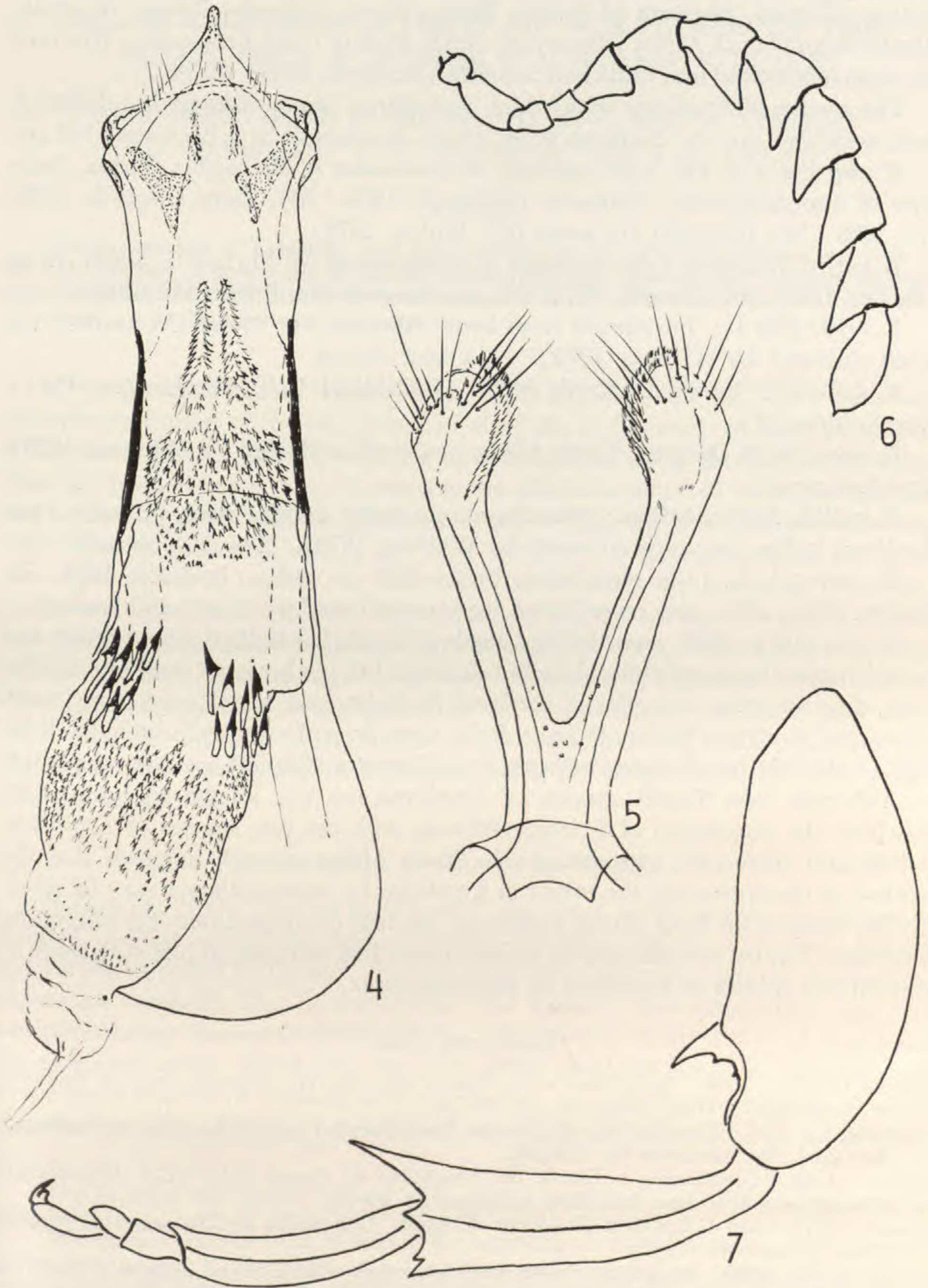


FIGURES 1-3. Morphology of *Specularius impressithorax* (Pic).—1. Dorsal aspect.—2. Lateral aspect.—3. Caudal aspect showing speculate pygidium.

seum), Zaire (in the central forest region, Museum of Tervuren), and Angola (British Museum).

A short series of specimens reared from *Erythrina mildbraedii* Harms in Nigeria may be still another species, but again study material is limited and no voucher seeds or plants are available.

Other species presently assigned to *Specularius* have been reared from species of *Psophocarpus* and *Rhynchosia*. *Specularius boviei* (Pic) was sampled on *Physostigma mesoponticum* Taub. in Angola, and this plant is likely the host of this bruchid (Decelle, 1975: 18).



FIGURES 4-7. Morphology of *Specularius impressithorax* (Pic).—4. Male genitalia, median lobe, ventral aspect.—5. Male genitalia, lateral lobes, ventral aspect.—6. Antenna.—7. Hind leg, lateral aspect.

The nominal form of *Specularius impressithorax* (Pic) was collected in Sudan, Eritrea (Cheran, Museum of Paris), Zaïre (Kivu), Uganda, Kenya, Tanzania, Rhodesia, and South Africa (Transvaal, Natal, East of Cape Province). This form has been introduced into India and Sumatra (Bridwell, 1938: 73–74).

The species of *Erythrina* with which *Specularius impressithorax* has definitely been associated and the countries where these associations have been reported are:

E. abyssinica A. DC. (also reported as *tomentosa* A. Richard): Sudan (holotype of *impressithorax*), Tanzania (Bridwell, 1938: 73), Zaire (Decelle, 1951: 177, 1958: 76), Rhodesia (ex seeds coll. Muller, 1976).

E. caffra Thunberg (also reported as *constantiana* M. Micheli): South Africa (Zacher, 1952: 467; Decelle, 1975: 17; specimens in the British Museum).

E. cristi-galli L.: introduced from South America into Natal (Westville) (ex seeds collected by Whitton, 1976). New host record.

E. humeana Sprengel: South Africa (USNMNH Coll., Washington, D.C.). New host record.

E. latissima E. Meyer: South Africa (ex seeds collected by Whitton, 1976). New host record.

E. pallida Britton & Rose: introduced into Natal, South Africa, probably from the West Indies (ex seeds collected by Whitton, 1976). New host record.

E. variegata L. (also reported as *indica* Lam.): India (Bridwell, 1938: 73; Zacher, 1952: 467); also reared from seeds contributed by Raven and Krukoff.

Raven (1974: 330) reported that seeds of *Erythrina livingstoniana* Baker and *E. milbraedii* Harms exhibited bruchid damage, but we have not seen any beetles from these samples. Samples of seeds of *E. lysistemon* Hutchinson from South Africa and *E. stricta* Roxburgh from India were free of attacked bruchids. Bridwell (1938: 74) lists *S. impressithorax* from Sumatra although no host was listed.

Although New World species of *Erythrina* are not known to host native bruchids, the association of *S. impressithorax* with the two species of *Erythrina*, *pallida* and *crista-galli*, introduced into South Africa, strongly suggests that the method of circumventing the toxins in *Erythrina* by *impressithorax* may be effective for many of the New World *Erythrina*, but that the opportunity for infestation is lacking. Future research should include controlled attempts at infesting seeds of non-African species of *Erythrina* by *impressithorax*.

LITERATURE CITED

- BRIDWELL, J. C. 1938. *Specularius erythrinae*, a new bruchid affecting seeds of *Erythrina* (Coleoptera). J. Wash. Acad. Sci. 28: 69–76.
- DECELLE, J. 1951. Contribution a l'étude des Bruchidae du Congo Belge (Col. Phytophaga). Rev. Zool. Bot. Africaines 45: 172–192.
- . 1958. Contribution a l'étude des Bruchidae du Congo Belge (Col. Phytophaga) (Deuxième note). Rev. Zool. Bot. Africaines 58: 75–84.
- . 1975. Les Coleopteres Bruchides d'Angola. Companhia de Diamantes de Angola, Publ. Culturais 89: 15–32.
- JANZEN, D. H. 1969. Seed-eaters versus seed size, number, toxicity and dispersal. Evolution 23: 1–27.
- KRUKOFF, B. A. & R. C. BARNEBY. 1974. Conspectus of species of the genus *Erythrina*. Lloydia 37: 332–459.
- RAVEN, P. H. 1974. *Erythrina* (Fabaceae): Achievements and opportunities. Lloydia 37: 321–331.
- ZACHER, F. 1952. Die Nährpflanzen der Samenkäfer. Z. Angew. Entomol. 33: 460–480.