SOME INTERESTING FUNGI OCCURRING ON AQUATIC WEEDS AND *STRIGA* SPP. IN INDIA*

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(Received for publication on December 23, 1968)

This paper describes additional fungi observed on various weeds in the course of the authors' work on plant pathogens attacking witch-weed (*Striga* spp.), water-hyacinth [*Eichhornia crassipes* (Mart.) Solms.] etc. Collections and/or cultures have been deposited in the Herbarium of the Commonwealth Mycological Institute, England (Herb. IMI) and in the Mycological Herbarium of C.I.B.C. (Herb. CIBC).

1. *Cercospora aymphaencea* Cooke and Ellis

in *Ann. Mycol.*, 1935, **33** : 46–71.

On living leaves of *Nymphoides indicum* (L.) O. Kze (= *Limnanthemum indicum* Thw.), December 25, 1964, Heserghatta (near Bangalore), Mysore State. K. M. Ponnappa, Herb. IMI 121517 ; Herb. CIBC 94.

The fungus infects leaves causing brown, circular to irregular leaf spots, 4–10 mm. in diameter with distinct margins. Often adjacent spots coalesce. The necrotic infected tissue may decay and drop out resulting in a 'shot-hole' appearance of the leaves. Fruiting of the fungus is epiphyllous, effuse, greyish-green in colour. Stroma sparsely developed or wanting, smoky-brown when present. Conidiophores arise in clusters of 5–10, simple, sparsely septate, sub-hyaline to pale brown, subgeniculate, 9·0–41·0 × 3·5–6·0 μ in size. Conidia hyaline, acerose with obconic or almost rounded base and sharply pointed or almost blunt apex, 3- to 8-septate, straight or slightly bent, 55·5–93·0 × 3·5 μ in size.

Damage caused to the plant was not severe. There has been no prior record of a *Cercospora* on this host.

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* This research has been financed in part by a grant made by the United States Department of Agriculture under PL-480.

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2. *Helicoceras nymphaearum* (Rand.) Linder

in *Ann. Mo. bot. Gdn.*, 1931, **18**: 1–7.

On living leaves of *Nymphaea pubescens* Willd., Novemker 14, 1965. Agia (Assam). E. Narayanan. Herb. IMI 121514; Herb. CIBC 88

The fungus inciting a leaf spot disease on the host was widely prevalent in different localities of Assam. Although this has been reported from India from isolates obtained from spotted paddy grains [Veeraraghavan and Padmanabhan, *J. Indian bot. Soc.*, 1963, **42** (1): 36], ours is the first record on its natural host.

The specimens, received from Assam in very good condition, contained spores as well as sclerotia. The fungus could be readily cultured on potato-dextrose agar in which it sporulated well and also produced abundant sclerotia. In infection trials, it was found to be pathogenic to *N. pubescens* and *N. stellata* Willd. In nature, though the infection spots were numerous, damage to the host was not very extensive.

3. *Macrophoma* sp.

On leaves and stems of *Striga lutea* Lour. September 29, 1965. Thirupathigudda (near Arsikere), Mysore State. T. R. Nag Raj. Herb. IMI 121513; Herb. CIBC 86.

This fungus was associated with extensive twig blights, and also occasionally with leaf blights, on the weed. Several twigs in a plant were found to be blighted over their entire length. Affected twigs turned yellow or yellowish-brown and dried up. The infection on the plants could be noticed at a short distance.

In the infected tissues, the hyphae were inter and intra cellular, closely septate, branched, pale brown to brown, often verrucose or tuberculate, up to 14 μ wide. Pycnidia appeared on the surface as minute black dots. They were scattered or gregarious and confluent, innate at first and then becoming erumpent, subepidermal, globose to subglobose or depressed-globose, carbonous, $71{\cdot}0–143{\cdot}0 \times 61{\cdot}5–176{\cdot}5$ μ in size with ostioles $9{\cdot}5–19{\cdot}0$ μ in diameter. The conidiophores are simple, short, hyaline, continuous, cylindrical bearing solitary acrogenous conidia. The conidia are hyaline to subhyaline, becoming brown with age, elliptic or obovate, occasionally naviculate, apical end rounded and broad, basal end truncate and narrow, unicellular, thin-walled, $9{\cdot}0–15{\cdot}0 \times 4{\cdot}0–5{\cdot}5$ μ in size.

The fungus could be easily cultured. It grew well on potato-dextrose agar with abundant cottony, aerial mycelium, greyish-white at first and finally turning olivaceous black. It sporulated sparsely on this medium after about 30 days from the initiation of the culture.

4. *Macrophomina phaseoli* (Maubl.) Ashby

in *Trans. Brit. mycol. Soc.*, 1927, **12** : 141–147.

(i) On leaves and stems of *Striga densiflora* Benth. October 13, 1965. Ranebennur (Mysore State). K. M. Ponnappa. Herb. IMI 121516; Herb. CIBC 91.

(ii) On living leaves of *Nymphaea stellata*. September 29, 1964. Shencottah (Kerala). K. M. Ponnappa. Herb. CIBC 65.

On *S. densiflora* infections resulted in leaf spots and twig blights. Entire branches were blighted and turned pale brown followed by desiccation. The affected twigs were studded on the surface with numerous black, subepidermal, ostiolate pycnidia, which in sections appeared globose or subglobose, ovate to obovate, 85·5–138·0 × 85·0–157·0 μ in size. The conidia were cylindrical, fusoid, often irregular, with rounded or subacute ends, hyaline, thin-walled, unicellular, borne on long conidiophores and 14·5–26·0 × 4·5–6·5 μ in size.

The fungus grew well on potato-dextrose agar producing numerous black, minute sclerotia, characteristic of the *Rhizoctonia bataticola* (Taub.) Butler phase of the fungus. Pycnidia did not develop in these cultures.

On *Nymphaea stellata* the fungus occurred as numerous scattered or gregarious and confluent, subepidermal, globose or subglobose, carbonous pycnidia bearing conidia similar in morphology and dimensions to those described above.

These are new host records for the fungus.

5. *Myrothecium roridum* Tode ex Fr.

in *Fungi Mecklenb.* I, 25 (1970) Tab. V.

On twigs of *Striga densiflora*, August 17, 1965. Bardoli (Gujarat). T. R. Nag Raj. Herb. CIBC 85.

This fungus was associated with blighted branches and twigs of the weed. This is a new record.

6. *Pestalotia nymphaeae* Maire

in *Bull. Soc. Mycol. Fr.*, 1930, **46** (3–4): 243 (as *Pestalozzia nymphaeae*)

On living leaves of *Nymphaea pubescens*. May 8, 1967. Heserghatta, Mysore State. K. M. Ponnappa. Herb. CIBC 108 *e*.

The fungus is associated with leaf spots which are oval irregular up to 10 mm. in diameter bearing a few acervuli of the fungus. Acervuli epiphyllous, subepidermal, innate-erumpent, subconic or globose,

brown to dark brown, 80·0–170·0 × 70·0–140·0 μ in size. Conidia are fusoid, 18·5–26·0 × 5·5–6·5 μ in size, 5-loculate, indistinctly constricted at septa, the first two of the median cells are brown and the third light brown. The two distal cells are hyaline and conoid and bear setae. Apical setae are two in number, somewhat recurved, 4·5–10·5 μ long, hyaline and somewhat stout. Basal appendage is absent or solitary, when present hyaline, 1–3 μ long.

The fungus grew and sporulated well on potato-dextrose agar. Spores formed in culture were essentially similar in morphology to those found in nature but varied in the number of apical appendages, 1–4 being found fairly frequently. The dimensions were: (i) spores: 16·5–26·0 × 5·5–7·5 μ, (ii) apical appendages: 7·5–22·5 μ; and (iii) basal appendage: 2·5–5·5 μ.

The fungus was first recorded on *Nymphaea alba* L. in Greece in 1906 (*l.c.*). This appears to be the first record from India.

7. *Pestlotia* sp. (Fig. 1).

On living leaves of *Ludwigia adscendens* (L.) Hara (= *Jussiaea repens* L.). May 8, 1967. Heserghatta, Mysore State. K. M. Ponnappa. Herb. CIBC 110.

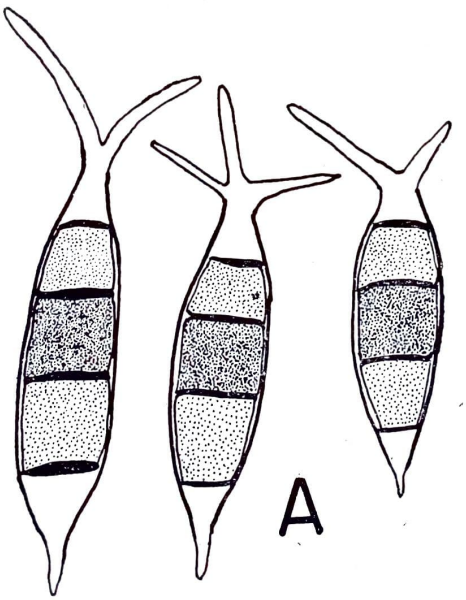

FIG. 1. *Pestlotia* sp. on *Ludwigia adscendens*. A, Conidia from host.

The fungus was found associated with leaf spots. Acervuli were globose to oval, dark brown or black, amphigenous, subepidermal, 75·0–186·0 × 74·0–148·0 μ. Conidia oblong, obclavate or fusoid-elliptic, 20·5–28·0 × 3·5–5·5 μ in size, 5-loculate, hardly constricted at septa, median cells brown and distal cells hyaline and conical. Apical appendages 2–3 in number, slender, filiform, 5·5–22·5 μ in size. Basal appendage solitary, hyaline, slender, 1·5–9·5 μ long.

8. *Phomopsis nymphaeae* sp. nov. (Fig. 2)

The fungus is associated with small leaf spots which are greyish-brown, circular to oval, sunken and studded with a few pycnidia which appear as minute brownish-black erumpent dots on the upper surface of the leaf. They are subepidermal, at first innate and then erumpent, globose to subglobose, light brown to dark brown, 152·0–200·0 × 142·0–214·5 μ in size, bearing unicellular hyaline, fusiform A-spores with acute ends, 7·5–10·5 × 1·5–3·0 μ in size. B-spores were not seen in the herbarium material.

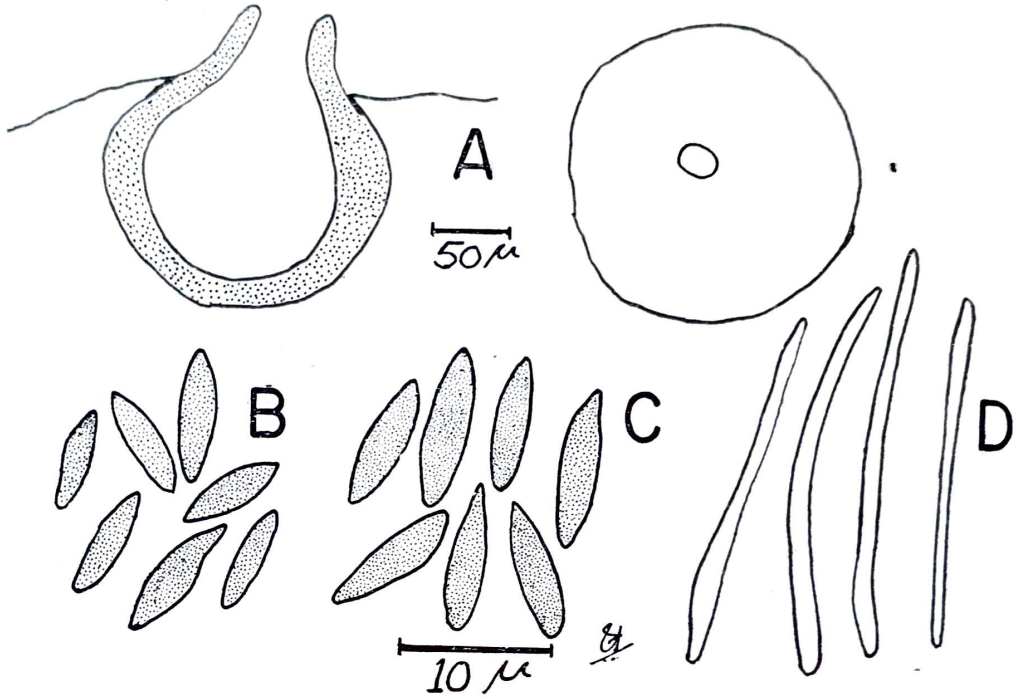

FIG. 2. *Phomopsis nymphaeae* sp. n. on *Nymphaea pubescens*. A, Pycnidia; B, A–spores from host; C, A-spores from culture; D, B-spores from culture.

The fungus could be readily grown in pure culture, on sterilised petioles of *N. pubescens* and on potato-dextrose agar. In 45-day old cultures on these two substrates, abundant hyaline, filiform, straight or curved and unicellular B-spores were observed. The dimensions of the structures were: (*a*) on sterilised petioles of *N. pubescens*: Pycnidia 119–238 × 142–333 μ; A-spores: 8·0–9·5 × 1·5–2·5 μ; B-spores: 27·5–46·5 × 1·5–2·5 μ. (*b*) on PDA: A-spores: 7·5–9·5×1·5–2·5μ; B-spores: 18·5–28·0 × 1·0–1·5 μ.

***Phomopsis nymphaeae* sp. nov.**

Foliicolous, spots small, greyish-brown, circular to oval, sunken. Pycnidia epiphyllous, subepidermal, innate-erumpent, globose to subglobose, light brown to dark brown, 152·0–200·0 × 142·0–214·5 μ. A-spores, hyaline, unicellular, fusoid with acute ends, 7·5–10·5 × 1·5–3·0 μ. B-spores absent in herbarium material, but developing in culture, hyaline, continuous, filiform, straight or flexuous, 18·5–28·0 × 1·0–1·5 μ in 45-day old cultures on PDA and 27·5–46·5 × 1·5–2·5 μ on 45-day old cultures on sterilised stem pieces of *N. pubescens*.

On living leaves of *Nymphaea pubescens*. May 8, 1967. Heserghatta, Mysore State. K. M. Ponnappa. Type in Herb. CIBC 108 *b*.

***Phomopsis nymphaeae* sp. nov.**

Foliicola, maculis parvis, griseo-brunneis, circularibus vel ovatis, depressis. Pycnidia epiphylla, subepidermalia, innato-erumpentia, globosa vel subglobosa, brunneola vel atro-brunnea, 152·0–200·0 × 142·0–214·5 μ. A-sporae hyalinae, unicellulares, fusoides, extremitatibus acutis, 7·5–10·5 × 1·5–3·0 μ. B-sporae in siccatis absentes, tamen in culturis evolutae, hyalinae, post 45 dies in culturis supra PDA, 18·5–28·0 × 1·0–1·5 μ sed in culturis supra caulem sterilisatum, *N. pubescentis*, 27·5–46·5 × 1·5–2·5 μ.

Typus in foliis viventibus *Nymphaeae pubescentis* die 8 *a* maii, 1967 ad Heserghatta, regionis Mysorensis a K.M. Ponnappa lectus et in herbario CIBC sub numero 108 *b* positus est.

9. *Phyllosticta* sp. (Fig. 3)

On living leaves of *Sagittaria guayanensis* H. B. K. June 10, 1967. Bangalore. K. M. Ponnappa. Herb. CIBC 109.

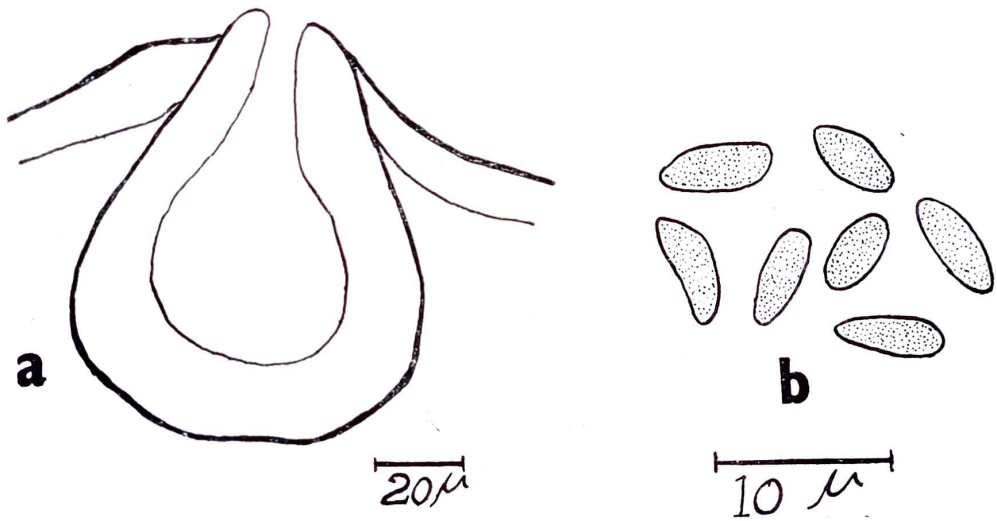

FIG. 3. *Phyllosticta* sp. on *Sagittaria guayanensis*. *a*, Pycnidium; *b*, Spores.

Foliicolous, inciting leaf spots which were confined to the margins of the leaf, mostly at the apex, at first yellow, then turning brown, irregular in shape and size. Pycnidia amphigenous, scattered, few in number, innate-erumpent, globose to subglobose, brown to dark brown, thick-walled and ostiolate, 57·0–133·5 × 47·5–95·5 μ. Spores hyaline, unicellular, oblong, a few globose, 4·5–6·5 × 2·5–3·0 μ in size.

In culture the fungus grew well, producing numerous mature pycnidia. The pycnidia and spores were similar in morphology to those found in nature. Their dimensions on a 105-day old culture

on sterilised petioles of *Sagittaria guayanensis* were: (*a*) Pycnidia: 95·0–190·5 × 89·0–181·0 μ (*b*) Spores: 4·5 6·5 × 2·0–3·0 μ.

10. *Robillarda sessilis* (Sacc.) Sacc.

in *Mich.*, 1880, **2**: 1–35.

On living leaves of *Ludwigia adscendens* L. October 8, 1966. Plassey (West Bengal). T. R. Nag Raj. Herb. CIBC 105.

Associated with leaf spots. Pycnidia amphigenous, subepidermal, solitary, occasionally gregarious and confluent, globose to subglobose, brown to dark brown, with well-defined circular ostioles that are 9·5–14·0 μ in diameter; wall pseudoparenchymatous, 47–120 × 47–130 μ. Conidia oblong or fusoid with truncate to rounded ends, septate, gently constricted at the septum in the basal part of the spore, subhyaline, becoming brown with age, 7·5–13·0 × 2·5–3·5 μ bearing apical appendages. Appendages hyaline, filiform with acute ends, 11–14 μ long, mostly three in number but occasionally two or four may also be found.

This is a new host record for the fungus.

11. *Sphaerotheca fuliginea* (Schlecht. ex. Fr.) Pollacci

in *R. Inst. Bot. Univ. Pavia* 2, 1905, **9**: 8.

On living plants of *Striga densiflora* and *S. lutea*. July 19, 1966. Bangalore. T. R. Nag Raj. Herb. IMI 121519; Herb. CIBC 98.

The fungus forms irregular white patches covering leaves and stems which later turn dirty white. The mycelium is hyaline, septate. Perithecia are gregarious or scattered, brown to dark brown, globose or subglobose, 80·0–91·5 × 81·5–121·0 μ; appendages are variable in number and length, hyphoid, flexuous, sparse, brown, septate, mostly simple, sometimes branched. Asci hyaline, single, rarely two, 7 to 8-spored, subglobose to broadly ovate, without a stalk, 68·5–84·0 × 52·0–68·0 μ; ascospores hyaline, unicellular, globose to oblong or rarely ellipsoidal, 11–17 × 11–15 μ.

This fungus has been known to occur on a wide range of hosts among which are included many members of the Scrophulariaceae [D. O. B. Saville, 1968, *Canad. J. Bot.*, **46** (4): 461–471]. To the best of our knowledge this is the first record on *Striga*.

12. *Sphaerulina ludwigiae* sp. nov. (Fig. 4)

Foliicolous, inciting leaf spots which are copper-coloured and irregular in shape and size. Perithecia epiphyllous, occasionally amphigenous, subepidermal, innate-erumpent, globose to subglobose, with thick pseudoparenchymatous wall, brown, ostiolate, aparaphysate, 58·00–136·0 × 43·00–141·00 μ. Asci clavate with a short stalk,

bitunicate, hyaline, 46·5–74·5 × 13·0–15·0 μ. Ascospores elliptic-fusiform with acute ends, pale brown to brown, 3-septate, 14·5–22·5 × 5·0–5·5 μ in size.

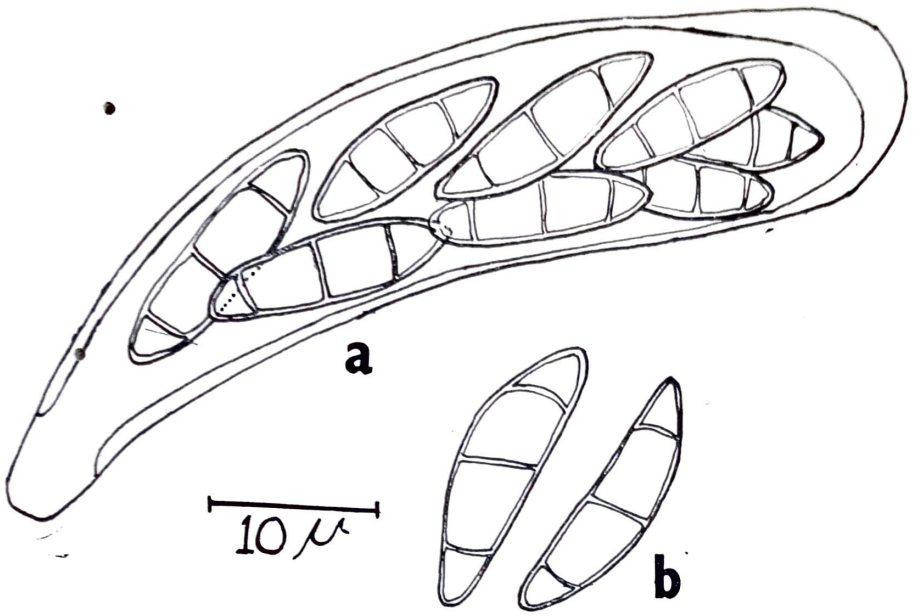

FIG. 4. *Sphaerulina ludwingiae* sp. n. on *Ludwigia adscendens*. *a*, Ascus, *b*, Ascospores.

On living leaves of *Ludwigia adscendens* (L.) Hara. August 28, 1965. Amingaon (Assam). K. M. Ponnappa. Type in Herb. IMI 121515; Isotype in Herb. CIBC 89.

Sphaerulina ludwigiae sp. nov.

Foliicola, incitans cupreas maculas forma staturaque irregulares. Perithecia epiphylla nonnumquam amphigena, subepidermalia, innato-erumpentia, globosa vel subglobosa, brunnea, ostiolata, aparaphysata, crassis subparenchymatisque parietibus, 58·25–136·0 × 43·75–140·75 μ. Asci clavati, breviter stipitati, bitunicati, hyalini, 46·5–74·5 × 13·0–15·0 μ Ascosporae elliptic-fusiformes, brunneolae vel brunneae, 3-septatae, extremitatibus acutis, 14·5–22·5 × 5·0–5·8 μ.

In foliis viventibus *Ludwigiae adscendentis* (L.) Hara ad Amingaon (Assam) die 28*a* augusti, 1965 a K. M. Ponnappa lecta. Typus in herbario IMI sub numero 121515; isotypus vero in herbario CIBC subnumero 89 positus est.

This paper records *Helicoceras nymphaearum* on *Nymphaea pubescens*; *Macrophoma* sp. on *Striga lutea*; *Pestalotia nymphaeae* on *N. pubescens*; *Pestalotia* sp. on *Ludwigia adscendens* and *Phyllosticta* sp. on *Sagittaria guayanensis* for the first time as additions to Indian mycoflora. It adds new host records for the following fungi: *Cercospora nymphaeacea*, *Macrophomina phaseoli*, *Myrothecium roridum*,

Robillarda sessilis and *Sphaerotheca fuliginea*. *Phomopsis nymphaeae* and *Sphaerulina ludwigiae* are described as new species.

The writers are grateful to Dr. V. P. Rao for his interest in these studies. They are indebted to the Director, Commonwealth Mycological Institute, England, for help in identifying some of the fungi mentioned in the paper and to Rev. Fr. C. Saldanha, S.J., St. Joseph's College, Bangalore, for preparing the Latin translation of the descriptions of the new species.