

TWO NEW *PHYLLONORYCTER* SPECIES
(LEPIDOPTERA: GRACILLARIIDAE) FROM WEST AFRICA

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We present diagnoses and descriptions of two new species of *Phyllonorycter* discovered in the North Province of Cameroon: *P. gozmanyi* sp. n. and *P. farensis* sp. n. These are the first records of *Phyllonorycter* from this country. We provide images of adults and illustrations of the male and female genitalia. We briefly discuss the diagnostic differences within the *P. rhyngochosiae* (VÁRI) group and present a distribution map for both new species.

Key words: Lepidoptera, Gracillariidae, *Phyllonorycter gozmanyi*, *Phyllonorycter farensis*, new species, *Phyllonorycter*, Cameroon, morphology, Afrotropical.

INTRODUCTION

Since MEYRICK's *Exotic Microlepidoptera* series (MEYRICK 1912–1937), the Afrotropical Microlepidoptera have been only very scarcely and sporadically studied. The challenge taken by two Hungarian lepidopterists, L. VÁRI and L. A. GOZMÁNY, to tackle the taxonomy of some groups of African Microlepidoptera resulted in a series of outstanding classical monographs (VÁRI 1961, GOZMÁNY & VÁRI 1973, VÁRI *et al.* 2002) and their work cannot be underestimated by the lepidopterists dealing with the fauna of this region.

As currently understood, the genus *Phyllonorycter* includes 400 described species worldwide (DE PRINS & DE PRINS 2005) with the greatest species richness in the Palaearctic Region (258 species). The sub-Saharan *Phyllonorycter* fauna is represented by 20 recognized species only (VÁRI 1961, DALL'ASTA *et al.* 2001, DE PRINS 2002, TRIBERTI 2004, DE PRINS & DE PRINS 2005, DE PRINS & MOZTRAITIS 2006). For more than sixty years, only one species represented the *Phyllonorycter* fauna in western equatorial Africa (GHESQUIÈRE 1940). However, this *Lithocolletis urticicolella* (GHESQUIÈRE), reported from the Democratic Republic of Congo (=Zaire), was transferred to the family Tischeriidae (DE PRINS & DE PRINS 2005) and redescribed as *Tischeria urticicolella* (GHESQUIÈRE) (PUPLESIS & DIŠKUS 2005).

The great majority of species within *Phyllonorycter* are strictly monophagous (ROBINSON *et al.* 2001, 2002, 2004, DE PRINS & DE PRINS 2005, 2006). Due to

this most intimate relation with their host plants many *Phyllonorycter* species have been used to study insect-plant relationships (POWELL 1980, LOPEZ-VAAMONDE *et al.* 2003). The biology of African *Phyllonorycter* remains poorly studied. The unpublished notes by VÁRI on the biology of *Phyllonorycter* species in Southern Africa provide useful tips to find their leaf mines in Afrotropical areas. Although the Gracillariidae in general are considered easy to find in nature and easy to breed (NUSS 2005), and while all the preimaginal stages of the species assigned to the genus *Phyllonorycter* develop inside the same mine of their host plant (DAVIS & ROBINSON 1998), many known and unknown ecological factors can influence the feeding habits of larvae and the sexual activity of adults, especially in tropical areas.

Up to now no data are available regarding the phylogenetic relationships among African *Phyllonorycter* species based on morphology or DNA and only *P. loxozona* (MEYRICK, 1936) from Kenya has been hitherto sequenced (LOPEZ-VAAMONDE *et al.* 2003, 2006).

The aim of the present study is to describe, diagnose, and illustrate two newly discovered *Phyllonorycter* species from West Africa.

Abbreviations used in the text are as follows: ENT = entomology section; Gen. prep. = genitalia slide; HNHM = Hungarian Natural History Museum, Budapest, Hungary; ID = identification number; JDP = Jurate De Prins; MHNG = Muséum d'histoire naturelle, Genève, Switzerland; RMCA = Royal Museum for Central Africa, Tervuren, Belgium; TMSA = Transvaal Museum, Pretoria, Republic of South Africa.

MATERIAL AND METHODS

Adult specimens were examined externally using a Leica MZ12.5 stereomicroscope (maximum magnification 100×). All available specimens were dissected using the procedure explained by ROBINSON (1976). The genital morphology was examined using a Leica DMLB microscope under magnifications of 150×, 200×, and 400×. The drawings of the genitalia were made after photographing the slides with a 3CCD Toshiba Camera connected to a Leica DMLB light microscope and after processing the images with the Image-Pro Plus image analysing programme. The Auto-Montage Syncroscopy software was used to produce composite results from several separate photographs in planes of different depths. The distribution maps were prepared with the DMAP 7.2a programme (MORTON 2003) linked with the Faunistic Module of the World Gracillariidae Database of the RMCA (Microsoft Access 2002). The terminology of the anatomy follows VÁRI (1961), KLOTS (1970), DAVIS & DESCHKA (2001), and VARGAS & LANDRY (2005).

Phyllonorycter gozmanyi sp. n.

(Figs 1, 3, 5, 7, 9–11)

Holotype: ♂ CAMEROON, North Province, Faro riverside, 289 m, 08°22'N, 012°51'E, 29.XI.2003, leg. J. DE PRINS. Specimen ID: RMCA ENT 000002959. Gen. prep. 3635♂ De Prins (RMCA 00278), in RMCA.

Paratypes: 2 ♀, CAMEROON, North Province, Faro riverside, 289 m, 08°22'N, 012°51'E, 01.XII.2003, leg. J. DE PRINS. Specimen IDs: RMCA ENT 000002960. Gen. prep. 3636♀ De PRINS (RMCA 00280); RMCA ENT 000002961. Gen. prep. 3637♀ De PRINS (RMCA 00281), in RMCA.

Diagnosis – The species is comparable to *P. rhynchosiae* (VÁRI, 1961) known from South Africa (see VÁRI (1961): 216–217, pls. 23: 3, 65: 9, 112: 6). It is distinguishable by the following differences in wing pattern:

- Basal streak absent in *P. gozmanyi*, present in *P. rhynchosiae*;
- First fascia in *P. gozmanyi* at $\frac{1}{4}$ (can be interrupted); in *P. rhynchosiae* only the dorsal strigula is present;
- In *P. gozmanyi* the intensity of the coloration in the tornal sector of the forewing is stronger compared to that of *P. rhynchosiae*.

P. gozmanyi differs from *P. rhynchosiae* in male genitalia by the shape of the valva and the length and shape of the aedeagus and saccus:

- The valva of *P. gozmanyi* has two lobe-shaped projections; in *P. rhynchosiae* there is one short harp-like projection.
- The aedeagus in *P. rhynchosiae* is slender and straight; in *P. gozmanyi* it is 3× broader at its proximal part.



Figs 1–2. Forewing: 1 = *Phyllonorycter gozmanyi* sp. n. male, holotype (ID RMCA ENT 000002959), 2 = *P. farensis* sp. n. male holotype (ID RMCA ENT 000002948). Scale bar 1 mm

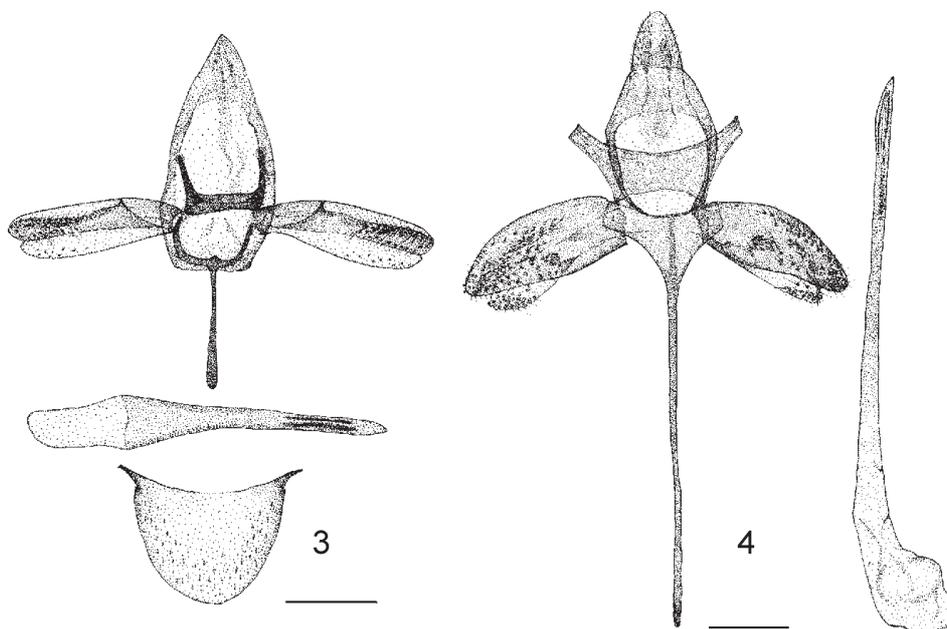
- The saccus in *P. rhynchosiae* is twice as long as the valva; the length of the saccus is 2/3 the length of the valva in *P. gozmanyi*.

P. gozmanyi differs from *P. rhynchosiae* in female genitalia by the shape of the papillae anales, the proportional length of the apophyses, and the shape of the antrum:

- Papillae anales as long as wide in *P. rhynchosiae*; twice as wide as long in *P. gozmanyi*.
- Posterior apophyses longer than anterior apophyses in *P. rhynchosiae*; posterior apophyses slightly shorter than anterior apophyses in *P. gozmanyi*.
- Antrum simple without special projections in *P. rhynchosiae*; strongly sclerotized on a boomerang-like, cuticular projection in *P. gozmanyi*.

Description – Male (Figs 1, 3, 5) (holotype). Forewing length: 3.1 mm.

Head: Vertex tufted with golden brown intermixed with white piliform scales; frons shining white with sparse piliform scales and smooth white scaling without shine below antennae. Antenna as long as forewing or slightly shorter; pedicel and flagellomeres golden brown above with dark ochreous suffusion, more intense in coloration distally; apical flagellomere bright golden brown;

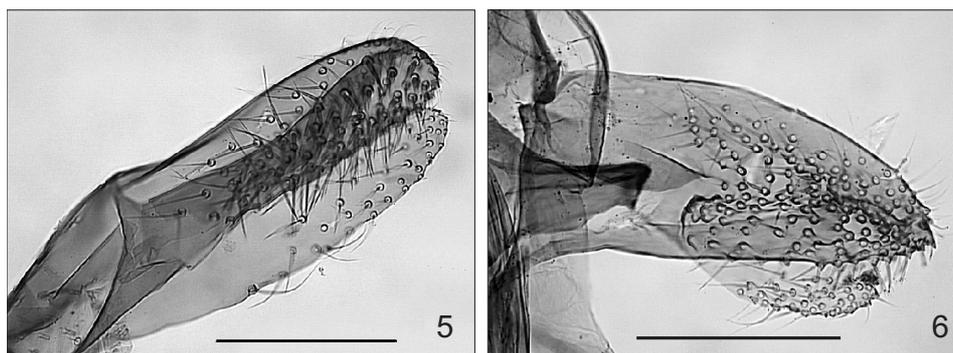


Figs 3–4. Male genitalia: 3 = *Phyllonorycter gozmanyi* sp. n., ventral view (drawing made from holotype slide No. 00278 in RMCA), with sternum VIII; 4 = *P. farensis* sp. n., ventral view (drawing made from holotype slide No. 00279 in RMCA). Scale bar 0.1 mm

scape golden brown, whitish along ventral margin; sparse pecten white, reaching 1.5× flagellomere length. Maxillary and labial palpi light beige. Labial palpus slightly longer than eye, with suffusion of brown scales outwardly, drooping, with ratio of segments from base 1:1:1.

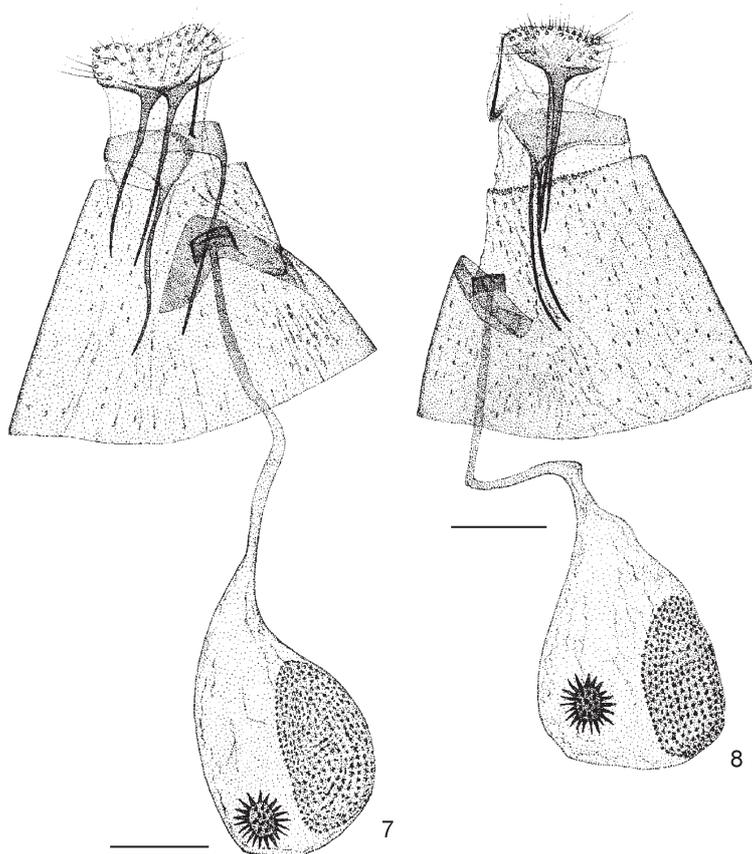
Thorax: Mesothorax golden brown with mixture of whitish scales, tegulae brown, darker at their bases with paler whitish scales apically; metathorax shining golden ochreous. Forewing (Fig. 1) elongate, ground colour golden ochreous brown with white markings consisting of two transverse fasciae, two costal and one dorsal strigulae; basal streak absent; 1st fascia at 1/5, angulated, irregular, broader at dorsum, reaching base of forewing and forming patch where white scales intermix with shining bronze scales; row of sparse black scales basally edging 1st fascia and reaching midline; 2nd fascia at 1/3, angulated, edged with row of black scales basally; 1st costal and 1st dorsal strigulae at 2/3, opposite each other, almost of equal size, narrow, comma-shaped, tapering towards apex, touching each other at midline; some black scales stretching irregularly from junction of costal and dorsal strigulae into apical sector; apical sector covered with greyish fuscous brown, intermixed with black and few dirty white scales; 2nd costal strigula at apex, dirty white, comma-shaped, without shine, bordered basally by small patch consisting of 6–8 black scales along costa; posteriorly with row of 4–5 black scales around apex, not reaching costa, and with patch of black scales at middle of apical sector; outer margin of apical sector edged with line of black scales; with second faint parallel line at tornus; fringe long, pale golden with slight shine, preceded by dirty ochreous shade. Hindwing pale fuscous, shining; fringe shining, pale golden to greyish. Forecoxa greyish fuscous; femur dark greyish fuscous; tibia and tarsomeres dark fuscous except pale grey bases of first two tarsomeres and apex of tarsomere V. Midleg femur white; tibia dirty white, with two rows of dark blackish brown scales preceded by ochreous brown and forming circular band at base, with two rows of dark blackish brown scales intermixed with ochreous and dark fuscous at 1/2 forming obscure band, and with irregular patch of dark blackish intermixed with fuscous subapically; tarsomeres I–III dirty white, clearly ringed with blackish brown subapically; tarsomere IV golden white; apex of terminal tarsomere pale golden. Hindleg femur pale beige; tibia dirty white becoming dark grey dorsally from 1/2 till apex and with row of 4–5 brown scales subbasally, tibial spurs white with slight intermixture of few darker scales, terminated with white hair-like scales reaching 2/3 of tarsomere I; apices of tarsomeres I–III marked with dark brown scales; terminal tarsomeres white.

Abdomen: Greyish brown dorsally, white ventrally; without conspicuous sex-scaling. Eighth sternum (Fig. 3) almost as long as saccus, slightly tapering to rounded apex.



Figs 5–6. Right valva: 5 = *Phyllonorycter gozmanyi* sp. n.; 6 = *P. farensis* sp. n. Scale bar 0.1 mm

Male genitalia (Figs. 3, 5). Tegumen lightly sclerotized, apex conical, tuba analis not protruding. Vinculum narrow, U-shaped, thickly sclerotized, especially laterally, slightly broadening caudally; saccus slender, as long as 2/3 of valva length, slightly broadening caudally. Transtilla well developed, U-shaped strongly sclerotized, as long as vinculum but slightly thicker with two lateral processes as long as horizontal bar of the H-shaped transtilla and attached to vinculum arms and aedoeagus. Valvae symmetrical, of moderate width, 1.5× longer than eighth sternum, gradually widening, 1.5× wider at apex than at basis, rounded apically; costal margin more thickly sclerotized, medially with sparse short setation from middle till apex; each valva medially with bilobed projections extending from base to apex; ventral projection gradually broadening at 2/3, tapering distally, with rounded apex; both projections forming 90° angle; dorsal (upper) projection broadening from very narrow basis, forming triangular pointed peak at 1/4 followed by slight depression, then until mid of valva, both margins of projection parallel and connecting with apex of valva (Fig. 5); both projections covered medially with sparse setae that become slightly thicker at apical sector of dorsal projection; dorsal projection slightly more thickly sclerotized than ventral one; median surface of valva and full



Figs 7–8. Female genitalia: 7 = *Phyllonorycter gozmanyi* sp. n. (from paratype slide No. 00281 in RMCA); 8 = *P. farensis* sp. n. (from paratype slide No. 00282 in RMCA). Scale bar 0.1 mm

surface of dorsal projection overlapping. Aedoeagus about twice as long as valva, bulging proximally, gradually tapering, becoming slender and straight near middle, parallel-sided distally; coecum about L total length of aedoeagus; vesica with two elongate, rod-like, thickly sclerotized cornuti on dorsal and ventral sides, about $1/5$ total length of aedoeagus.

Female ($n = 2$). Forewing length: 2.9–3.3 mm. Antennae as in male. Forewing less shining, more golden brown than golden ochreous. In both specimens first fascia interrupted and consisting of short comma-shaped costal strigula and long dorsal strigula reaching midline (ID 000002961) or $3/4$ (ID 000002960). Tarsomeres III–V of hindleg white without distinct markings, only with some ochreous scales on apices of tarsomeres I and II.

Female genitalia (Figs 7, 9). Papillae anales moderate, connected dorsally, $1.5\times$ wider than long, shaped like inverted triangles, weakly sclerotized except anterior margins, with few longer setae mostly basally, $1/2$ shorter setae along apical margin intermixed with small and thin microtrichiae; basal sclerotized bar rather wide ventrad from posterior apophyses, narrower dorsally; a slender needle-like weakly sclerotized projection going from basal bar of papillae anales and reaching middle of segment VIII. Posterior apophyses thickly sclerotized, about twice as long as width of papillae anales, with triangular bases, straight, of medium width on basal half, gently tapering from $1/2$ to apex, apically pointed. Segment VIII thickly sclerotized, connected ventrally with weak dorsal connection, about as long as papillae anales; anterior apophyses slightly longer than posterior ones, slender, gently tapering towards apices, almost parallel to each other, reaching anterior $1/3$ of segment VII. Antrum located in posterior $1/3$ rd of sternum VII, thickly sclerotized and shaped like

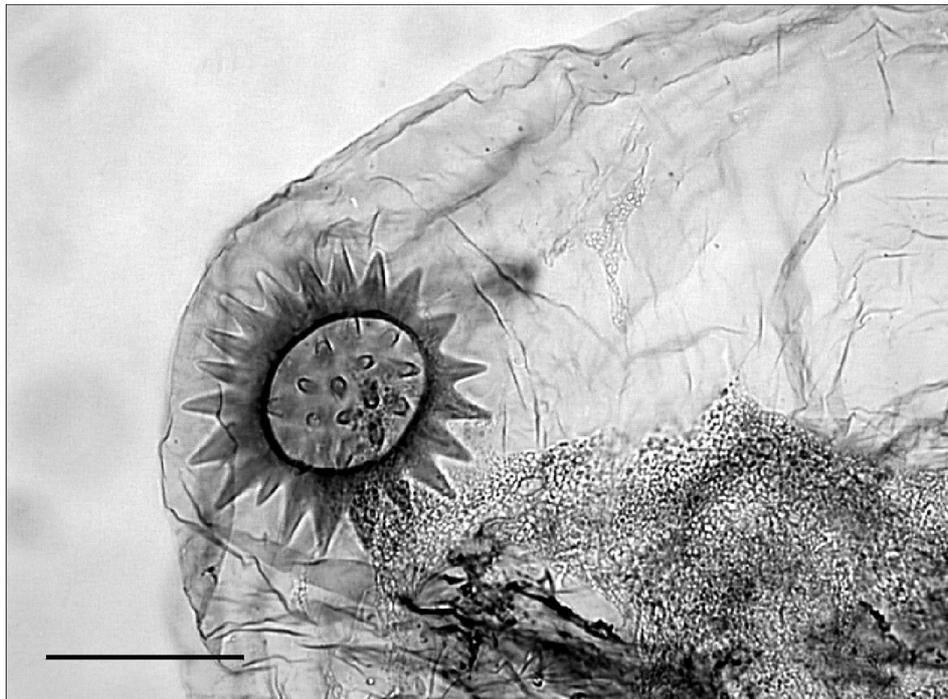


Fig. 9. Signum in bursa copulatrix of female paratype *Phyllonorycter gozmanyi* sp. n. (slide No. 00281 in RMCA). Scale bar 25 μ m

dorso-ventrally compressed, short and broad tube; cuticle posteriad and around antrum forming large sclerotized boomerang-like projection on which is ostium bursae. Ductus bursae almost twice as long as sternum VII, 1/3 thinner than antrum, with initial section more thickly sclerotized, as long as boomerang-like cuticular projection around antrum, followed by long unsclerotized section. Corpus bursae moderate, rounded, about half as long as ductus bursae, with large oval membranous area set with fine short spines, also with small, star-like circular signum set with 16 fine spines in middle and 21 broad, marginal, teeth-like rays (Fig. 9).

Etymology – The name of this species is derived from the family name of the late Hungarian lepidopterist LÁSZLÓ ANTAL GOZMÁNY who celebrated his 85th anniversary in 2006. He studied African Tineidae, among several other groups of Lepidoptera.

Biology – Unknown.

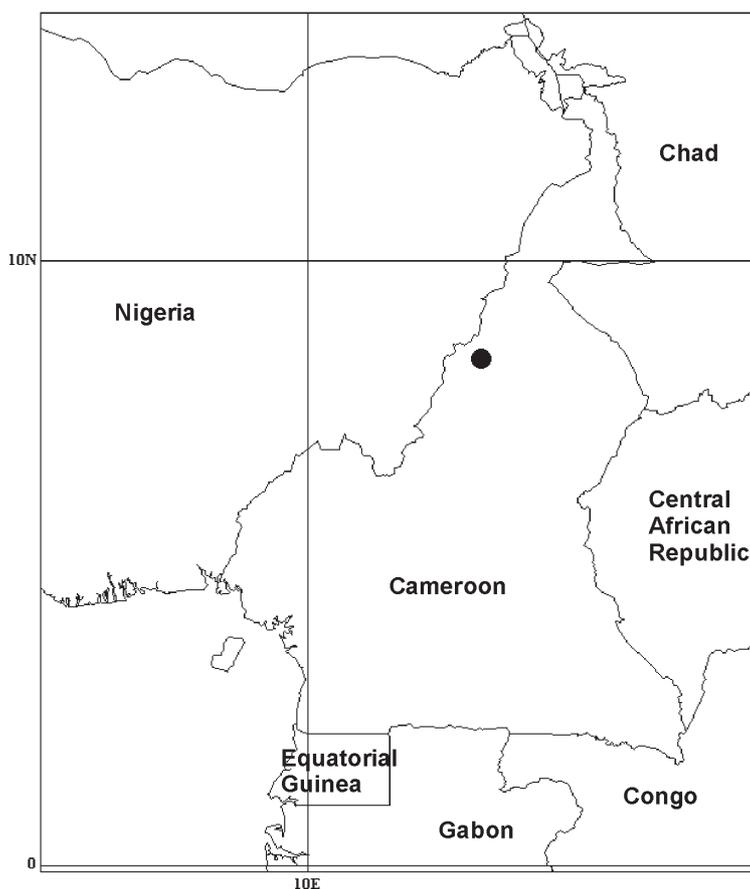


Fig. 10. Distribution map of *Phyllonorycter gozmanyi* sp. n. and *P. farensis* sp. n. The black spot indicates the type localities of the new species



Figs. 11–12. Type localities. 11 = Type locality of *Phyllonorycter gozmanyi* sp. n. on 2 December 2003. Faro River Reserve in the North Province of Cameroon; 12 = Type locality of *P. farensis* sp. n. on 24 November 2003. Faro River Reserve in the North Province of Cameroon (Photographs by JDP)

Flight period – Based upon the specimens available adults fly from late November till early December.

Distribution – So far this species is known only from the Faro River Reserve in the North Province of Cameroon (Figs 10–11).

Phyllonorycter farensis sp. n.

(Figs 2, 4, 6, 8, 10, 12)

Holotype: ♂ CAMEROON, North Province, Faro riverside, 289 m, 08°23'N, 012°49'E, 24.XI.2003, leg. J. DE PRINS. Specimen ID: RMCA ENT 000002948. Gen. prep. 3634♂ DE PRINS (RMCA 00279), in RMCA.

Paratype: 1 ♀ CAMEROON, North Province, Faro riverside, 289 m, 08°23'N, 012°49'E, 25.XI.2003, leg. J. DE PRINS. Specimen ID: RMCA ENT 000002962. Gen. prep. 3633♀ DE PRINS (RMCA 00282), in RMCA.

Diagnosis – In wing pattern the species is indistinguishable from *P. rhynchosiae*, known from South Africa (see VÁRI 1961: 216–217, pls 23: 3, 65: 9, 112: 6), and it resembles *P. gozmanyi* very closely. However, it differs from the latter by its brighter golden ochreous coloration without any fuscous greyish shading in the costal and tornal sectors of the forewing. In male genitalia *P. farensis* is distinguishable from *P. rhynchosiae* in the shape of the valva, the modified transtilla, the length of the saccus, and the aedoeagus.

- The ratio of valval length:width of *P. farensis* is 2:1; it is 4:1 in *P. rhynchosiae*. The valva in *P. farensis* is short and broad; it is prolonged and narrow in *P. rhynchosiae*;
- The projection of the valva in *P. farensis* is half ellipsoid in shape; it is harp-shaped in *P. rhynchosiae*;
- The transtilla of *P. farensis* is very modified, broad, occupying all the central part of the genitalia, covering the basal sector of the valva; it is well sclerotized but narrow in *P. rhynchosiae*;
- The saccus of *P. farensis* is twice as long as the valva; in *P. rhynchosiae* it is almost as long as the valva;
- The aedoeagus of *P. farensis* is 3× as long as the valva; it is 1.5× as long as the valva in *P. rhynchosiae*.

The main differences in male genitalia between *P. farensis* and *P. gozmanyi* are:

- The ratio of valval length:width of *P. farensis* is 2:1; it is 4:1 in *P. gozmanyi* (the valva in *P. farensis* is short and broad; it is elongate and narrow in *P. gozmanyi*);
- The valva of *P. farensis* possesses one projection; the valva of *P. gozmanyi* possesses two projections;

- The transtilla of *P. farensis* is modified and broad; it is narrow and H-shaped in *P. gozmanyi*;
- The aedoeagus of *P. farensis* is very long, 3× as long as the valva, and slender; it is 2× as long as the valva and bulging proximally in *P. gozmanyi*.

Description – Male (Figs 2, 4, 6) (holotype). Forewing length: 2.7 mm.

Head: Vertex tufted with golden brown scales; frons shining, white, with few intermixed brown filiform scales below antennae. Antenna as long as forewing or slightly shorter, pedicel whitish shining above and ochreous beneath; flagellomeres with dark ochreous suffusion of stripes above, apical flagellomere ochreous; antennal scape golden light beige, with pecten of few white scales as long as scape. Maxillary palpus as large as basal segment of labial palpus, drooping, light beige. Labial palpus slightly longer than eye, whitish beige with suffusion of sparse brown scales outwardly, with ratio of segments from base 1:2:1.

Thorax: Mesothorax golden brown with mixture of whitish scales, tegulae brown; metathorax with shining golden ochreous scales. Forewing (Fig. 2) elongate, ground colour golden ochreous brown with white markings consisting of one transverse fascia, two costal and two dorsal strigulae; basally in middle with suffusion of white scales not forming clearly defined streak; 1st dorsal strigula at 1/4, long, reaching 3/4 of width of forewing, oblique, tapering towards costa but not reaching it; 1st fascia at 1/3, angulated, edged with row of black scales basally, irregular, broader at dorsum, reaching base of forewing and forming patch; row of few black scales basally edging fascia and reaching midline; 1st costal and 2nd dorsal strigulae at 2/3, without clear shape, opposite each other, with few black scales interspersed irregularly between them, separating them; 2nd costal strigula at apex, indistinct, white, comma-shaped; with few black scales at tornus; outer margin of apical sector not edged with dark scales; fringe long, ochreous apically and dirty white dorsally. Hindwing pale fuscous, shining; fringe pale fuscous, shining. Forecoxa dark fuscous; femur dark brown with suffusion of black scales; tibia and tarsomeres dark brown, with beige apices; epiphysis ochreous. Midleg femur ochreous; tibia dirty white with suffusion of few dark ochreous scales; tarsomeres I–IV dirty white; apex of terminal tarsomere ochreous. Hindleg femur white basally and brown apically; tibia dirty white with some ochreous scales subapically, tibial spurs white, short; tarsomeres I–IV white; last tarsomere dirty white.

Abdomen: Greyish brown dorsally, white ventrally; without conspicuous sex-scaling. Eight sternum of male moderate, rounded caudally.

Male genitalia (Figs 4, 6). Tegumen lightly sclerotized, apex conical with thin sparse scobination from 1/2 to apex; tuba analis not protruding. Vinculum broad, U-shaped, thickly sclerotized, broadening caudally towards base of saccus; saccus very long and slender, twice as long as valva. Transtilla very strongly modified, broad, thin, covering basis of valva. Valvae symmetrical, of moderate width, costal margin running almost straight, ventral margin roundly tapering from broad basal part to smoothly pointed apex; basal sector wide, 1/2 as broad as length of valva; valva with short thick setae from 1/2, more densely set at apex; each valva from 1/2 to apex with rounded, elongate, weakly sclerotized, half-moon shaped projection; projection as broad as half of valva at basis, covered with abundant setae that become more dense, thicker, and shorter towards apex. Aedoeagus very long, about 3× as long as length of valva and 1.5× as long as saccus, slightly enlarged at coecum; vesica with four narrow needle-like cornuti parallel to one another along about 1/7 total length of aedoeagus; dorsal surface of distal 1/3 of aedoeagus covered with tiny scales (visible at 400×).

Female (paratype). Forewing length: 3.2 mm. Antennae, wing pattern, and colour as in male.

Female genitalia (Fig. 8). We were unable to detect any differences between these and those of *P. gozmanyi* except that the posterior apophyses, which are as long as the anterior ones in *P. farensis*, are slightly shorter than the anterior ones in *P. gozmanyi*.

Etymology – The name of this species is formed from the root of the type locality “Far-o”, and the Latin suffix *-ensis*, denoting place.

Biology – Unknown.

Flight period – Based upon the two specimens available adults fly in late November.

Distribution – So far this species is known only from the Faro River Reserve in the North Province of Cameroon (Figs 10, 12).

Remarks – According to their wing patterns, both *P. gozmanyi* and *P. farensis* can be associated with a number of similar species including *P. encaeria* (MEYRICK), *P. rhynchosiae* (VÁRI), *P. pavoniae* (VÁRI), *P. melhaniae* (VÁRI), *P. hibiscina* (VÁRI), and *P. brachylaenae* (VÁRI). Therefore, within this group, the main diagnostic characters are found in the morphology of the genital structures. Based on genital morphology, a group of related species possessing sclerotized projection(s) on the valvae can be recognized. Besides both new species from Cameroon, this group also includes *P. encaeria*, *P. pavoniae*, and *P. rhynchosiae*, known from South Africa.

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