Boll. Zool. agr. Bachic.
Ser. II, 32 (2): 75-83

30 September 2000

R. NICOLI ALDINI

Morphological notes on the synanthropic psocid *Psoquilla marginepunctata* Hagen (first finding of the family Psoquillidae in Italy)

Abstract - Specimens of *Psoquilla marginepunctata* Hagen, 1865 (Psocoptera: Psoquillidae) were found in December 1994 in the railway station of Fidenza (province of Parma, Italy) on pallets bearing castor-oil plant seeds imported from Brazil. *P. marginepunctata* is a circumtropical species introduced into some temperate lands; in the Tropics it occurs primarily outdoors; in temperate countries in houses, warehouses and greenhouses. Taxonomical notes and drawings of the mouthparts, wings of the brachypterous form and terminalia of both sexes of this species are provided.

Riassunto - *Note morfologiche sullo Psocottero sinantropico* Psoquilla marginepunctata *Hagen (primo ritrovamento di Psoquillidae in Italia).*

Il primo ritrovamento dello Psocottero sinantropico *Psoquilla marginepunctata* Hagen, 1865 (Psoquillidae) in Italia è stato effettuato nel dicembre 1994 alla stazione ferroviaria di Fidenza (Parma), su bancali di supporto a una partita di semi di ricino proveniente dal Brasile. *P. marginepunctata* è specie circumtropicale e subcosmopolita, già citata per Europa centrale e Inghilterra; nelle regioni tropicali si trova soprattutto in luoghi aperti; nei paesi temperati in ambienti domestici, magazzini e serre. Si forniscono note tassonomiche e si illustrano le parti boccali, le ali della forma brachittera e i terminalia di entrambi i sessi di questa specie.

Key words: Psoquillidae, *Psoquilla marginepunctata*, incidental introduction, Italy, taxonomy.

INTRODUCTION

Psocids occurring in domestic situations can frequently be dispersed through human commerce, so they are sometimes carried a very considerable distance from their native places. Some of these species have a primary distribution pattern in tropical or subtropical areas, where they live mostly or exclusively outdoors, on plants or in ground litter. Their finding suitable life conditions in temperate climates, in the

human environment, is really a consequence of international-trade dispersal for these psocids, which settle permanently or are periodically re-introduced there (Lienhard, 1998).

Soa flaviterminata Enderlein (Lepidopsocidae), *Psoquilla marginepunctata* Hagen (Psoquillidae) and *Nanopsocus oceanicus* Pearman (Pachytroctidae) can be numbered among these species in the world, as well as some other Psocoptera whose distribution patterns and bio-ecological traits indicate the above recorded zoogeographic origin and introduction into temperate areas, mostly of North America and Europe (Mockford, 1991, 1993). As regards Italy, recently-introduced psocids include for instance *Ectopsocus maindroni* Badonnel (Ectopsocidae), which was found on imports from India in the early eighties (Locatelli, 1981), and a few years later *Dorypteryx domestica* (Smithers) (Psyllipsocidae), primarily known in Zimbabwe and found in the urban environment in Milan (Locatelli & Ottoboni, 1987).

Some observations on *P. marginepunctata* are here provided in order to integrate its first recording in Italy (Nicoli Aldini, 1998) and to illustrate distinctive morphological features.

FINDINGS

In December 1994, in the railway station of Fidenza (province of Parma), during a phytosanitary inspection of a stock of castor-oil plant seeds imported from Brazil, signs of current infestation by xylophagous beetles were noticed on the wooden pallets carrying the goods. This circumstance induced the cargo-receiver to consider whether he should send back the stock, after a proper check. Some insects and a portion of the infested wood, presenting emergence holes and covered by signs of nibbling and mould, were examined in the Institute of Entomology in Piacenza in order to identifying the xylophagous, which turned out to be bostrychids (Coleoptera Bostrychidae).

A few psocids were also observed on the sample: some live young nymphs and a dead adult of *P. marginepunctata* Hagen, 1865 (= *Heteropsocus dispar* Verrill, 1902), a circumtropical and widespread Psoquillidae (Hagen, 1865; Badonnel, 1943; Günther, 1974; New, 1974; Mockford, 1993; Lienhard, 1998) with characteristic, dark patterned colouring (Fig. 1). Using this material, a rearing was carried out in the laboratory, in a polyethylene container (at R.H. = 75±5%), in room with heating (23°C approx.) which was switched off for the last ten days of December and the first days of January (10°C approx.). In February 1995, besides the development of bostrychids producing dusty nibbling, some live adults of *P. marginepunctata* were observed. During the ensuing months, several dead adults of the psocid were found by sieving the abundant nibbling on the bottom of the container.

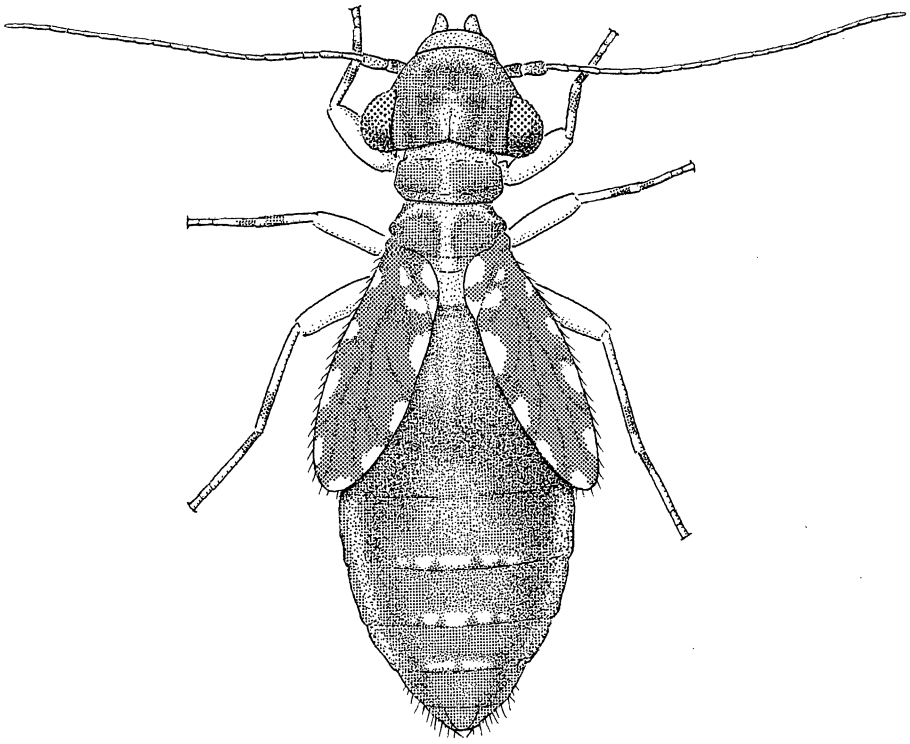


Fig. 1 – *Psoquilla marginepunctata*, brachypterous form.

SYSTEMATIC POSITION AND MORPHOLOGY

Psoquillidae, as belonging to the Subordo Trogiomorpha and to the Family Group Atropetae, present the following distinctive features (Smithers, 1972; Günther, 1974; Mockford, 1993; Lienhard, 1998): adult antennae generally with more than 18 flagellomeres; hypopharyngeal filaments (pair of thin and tubular sclerotized structures lying in the hypopharynx) separate, never joined on midline; labial palps 2-segmented, with minute basal segment and rounded apical segment; tarsi 3-segmented (features typical of Trogiomorpha). Spur sensillum present on second segment of maxillary palps; forewing, when fully developed, with postcubital vein Pcu [1] and anal vein An ending separately on wing margin. Ovipositor lacking ventral valvulae (V_1), formed by external valvulae (V_3) elongate and partially joined together on midline by a membrane, and sometimes formed also by small dorsal valvulae (V_2) (features peculiar to Atropetae).

(1) Interpretation of wing venation according to Lienhard (1998).

Within the groups above recorded, the species of the Family Psoquillidae are characterized by body and wings which are never covered with scales or dense setae; adult wings rounded at apex when fully developed, forewings even when much reduced with visible veins; vein Cu in forewing separating from R+M at about $^1/_4$ to $^1/_6$ length of the wing and not rejoining R+M; vein M_3 leaving from common Rs+M stem separately from M_{1+2}; coxal organ (presumably stridulatory structure on the medial side of the hind coxa) absent; pretarsal claws never with preapical tooth; phallosoma with parameres never fused at the front; spermathecal sac with two conspicuous 'accessory bodies' (spermathecal glands) at its opening.

The Genus *Psoquilla* is characterized by mostly dark-brown body colour, with wings very contrastingly marked dark brown and light and lacking closed cells. Principal recognition features of the brachypterous [(2)] adult of *P. marginepunctata* are as follows (Figs. 1-12) [(3)]:

Dimensions - Body length 1.1-1.8 mm approx.; length of forewing 0.65-0.80 mm.

Colour - Body largely dark or dark-brown dorsally and on sides, pale ventrally. Clypeus light brown, frons and vertex with clear and dark shaded pattern. Eyes black. Maxillary palps greyish, with darker second segment. Thorax with dorsal whitish midline and longitudinal dark band on both sides; ventrally whitish. Legs pale yellowish; tibiae brown-ringed near the apex; first tarsomere brown-ringed at the base. Forewing shining black-brown with marginal glassy-white, well-delimited areas between the veins, and some other light areas near the wing base; veins dark. Hindwing not uniformly light-brown, with more clear margin.

Morphology - Body almost glabrous; forewing with marginal setae and setae on the veins.

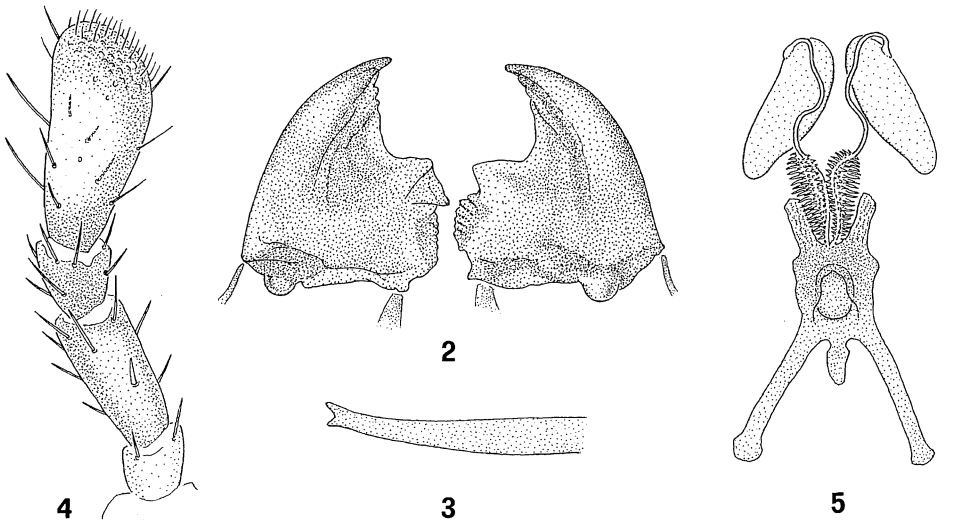
Head large with large and globose compound eyes. Vertex with coronal suture heavily impressed and posterior margin almost straight; frontal sutures indistinct. Antennae multiarticulate, with 20-21 flagellomeres. Mouthparts (Figs. 2-5): lacinial tip with two almost equal tines; maxillary palps with long and swollen apical segment.

Prothorax short, transverse, connected to the head by a broad membranous neck. Forewing (Fig. 6) shorter than the body, elliptical, with the following veins: at the base the trunk R+M+Cu, from which the cubitus Cu originates at about $^1/_6$ length of the wing; Cu is simple or forked (Cu_1, Cu_2) and reaches the posterior margin; more distad the radial vein R_1 comes off and reaches the anterior margin; near the middle

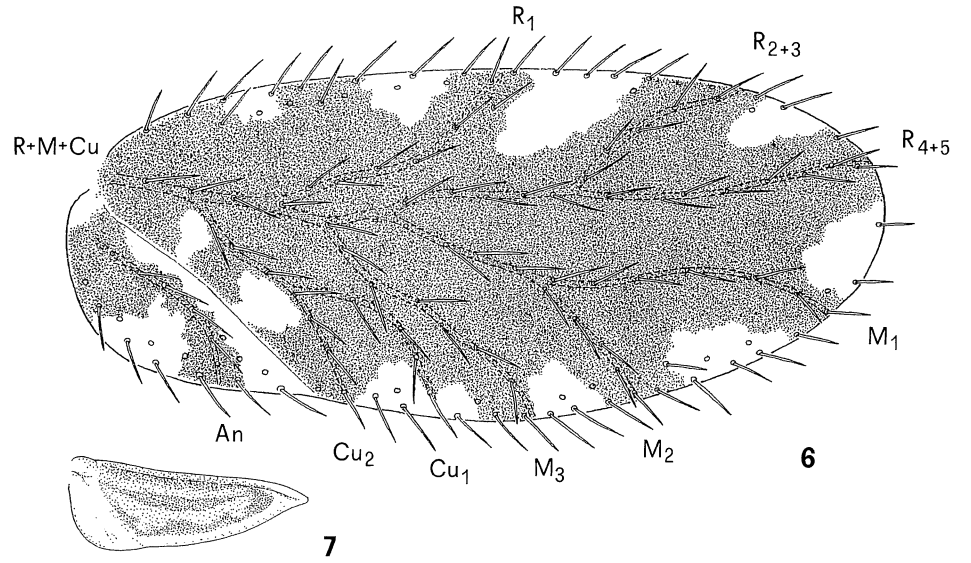
---

[(2)] *P. marginepunctata* is a dimorphic species with macropterous and brachypterous individuals in both sexes; this dimorphism depends on population density and food availability (Lee, 1987). The individuals examined in the present research (19 on the whole), on which the following notes are based, were brachypterous.

[(3)] The genus *Psoquilla* also includes *P. infuscata* Badonnel, 1949, described on macropterous females from West Africa (Ivory Coast). This species is distinguished from *P. marginepunctata* by the shape of the spermapore sclerite (ninth sternum) which is roundish instead of nearly quadrangular, the different number and conformation of the sensilla on the lateral side of the fourth segment of maxillary palps, the different length ratio between tibia and first tarsomere, as well as by some features in wing venation and pigmentation in comparison with those of the macropterous form of the latter species (Badonnel, 1949).



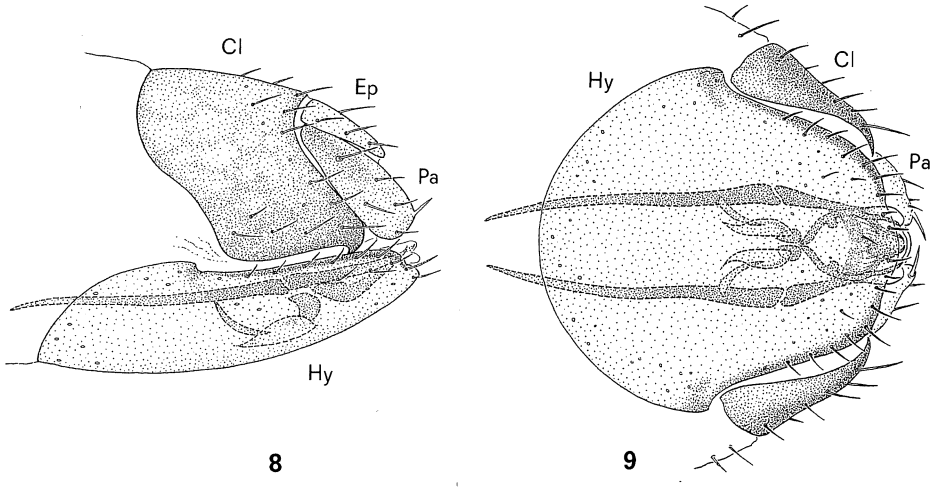
Figs. 2-5 – *Psoquilla marginepunctata*, adult mouthparts: mandibles (2), apical part of lacinia (3), maxillary palp (4), hypopharhynx (5).



Figs. 6-7 – *Psoquilla marginepunctata*, brachypterous form, forewing (6) and hindwing (7). (An = anal vein, Cu = cubitus, M = media, R = radius).

of the wing the trunk R+M forks again twice, at first in an M_3 vein reaching the posterior margin of the wing, and then in a radial branch Rs and in a medial branch Ms, each forking into two veins (R_{2+3} and R_{4+5}; M_1 and M_2) going to the margin; an anal vein An is also present. Hindwing (Fig. 7) extremely reduced and lacking veins. Femora slender. Tarsi 3-segmented, first tarsomere long, second and third tarsomeres short and of equal size. Pretarsal claws with basal seta and pulvillus, the latter somewhat broadened at tip.

Abdomen: phallosoma rather complex, with long parameres (Figs. 8-9). Ovipositor comprising large external valvulae (Fig. 10); spermapore sclerite nearly quadrangular, with two distal more or less sclerotized laminar lobes (Fig. 11). Spermathecal sac membranous with sclerotized beak supported by a sclerotized ring; spermathecal duct membranous; two conspicuous rounded, well-sclerotized accessory bodies (spermathecal glands) near the opening of the spermathecal sac (Fig. 12).

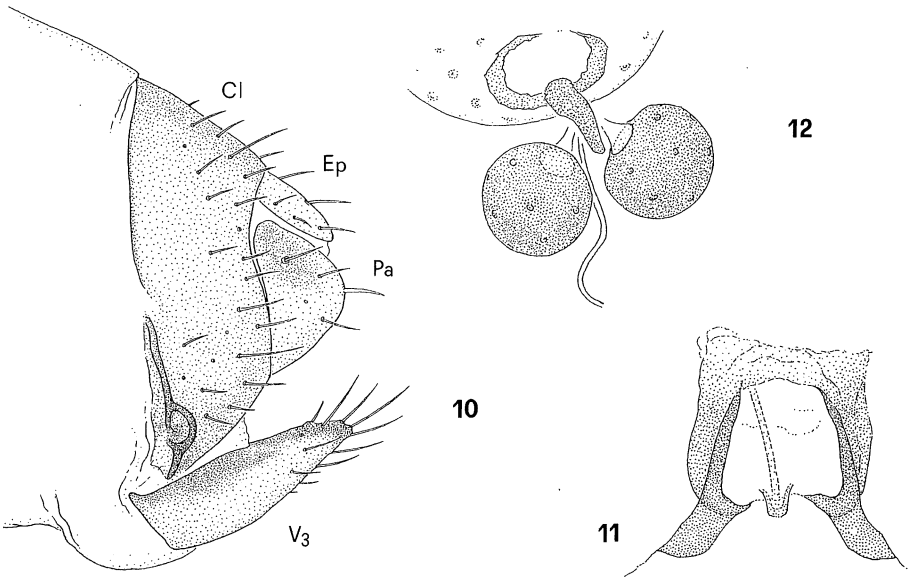


Figs. 8-9 – *Psoquilla marginepunctata* male, posterior part of the abdomen and phallosoma, in lateral view (8) and in ventral view (9). (Cl = clunium, Ep = epiproct, Hy = hypandrium, Pa = paraproct; phallosoma is dashed).

The young nymph is largely vitreous-whitish in colour, partially dark pigmented on vertex, nota and abdominal terga.

DISTRIBUTION, HABITAT, PEST STATUS

P. marginepunctata is known in tropical America, Africa and Asia, Bermuda, Hawaii, United States (Florida), Azores, central Europe and England (Mockford, 1993; Lienhard, 1998). In the Tropics it occurs primarily outdoors, on and under the bark



Figs. 10-12 – *Psoquilla marginepunctata* female, posterior part of the abdomen in lateral view (10); spermapore sclerite (11); accessory bodies and beak of spermatheca (12). (Cl = clunium, Ep = epiproct, Pa = paraproct, V_3 = external valvula).

of trees and in clefts of fruit and seeds; in West Africa this species is reported in stored foods; in temperate countries in houses, warehouses and greenhouses (Günther, 1974; Li, 1991; Mockford, 1991; García Aldrete & Gutiérrez Diaz, 1995). Its worldwide dispersal seems to be related mostly to the international trade of plants and seeds. *P. marginepunctata* can be noxious, as can other domestic psocids with which it may be associated (*Liposcelis* spp.), as a contaminant and value-reducing factor of stored foodstuffs and stored grains.

Neither this species before its finding in Fidenza, nor other Psoquillidae had ever been reported in Italy (Locatelli & Limonta, 1993; Schneider & Lienhard, 1994; Lienhard, 1998). Its settlement in the above locality or elsewhere in our country cannot be asserted on the basis of present knowledge; this record, nevertheless, is indicative of the recurrent dispersion of exotic species due to passive carriage by man, which facilitates their acclimatization in new regions, and it draws our attention to the importance of inspecting pallets and other packing and packaging as possible carriers of household and stored-product insects. Such dispersion is noted as increasing over the last few years, because of the higher speed of the means of conveyance, the increment of trade, the increase in international markets, as the rate of arrival of exotic insects to Italy, recently estimated at about four species a year, demonstrates (Tremblay, 1988; Arzone & Vidano, 1990; Pellizzari & Dalla Montà, 1997). It is very difficult for phytosanitary services to cope with this phenomenon in its present intensity.

ACKNOWLEDGEMENTS

I am very grateful to my Director, Prof. Piero Cravedi, and to Prof. Daria Patrizia Locatelli of the Institute of Agricultural Entomology, University of Milan, for critical reading and helpful suggestions on the manuscript. I sincerely thank the internal undergraduate Alberto Alberigi and Francesco Gallizia for their help in bibliographical research.

REFERENCES

ARZONE A., VIDANO C., 1990 - Insetti esotici di nuova introduzione in Italia e in Piemonte. - Inf.tore fitopat. 40 (7-8): 47-54.

BADONNEL A., 1943 - Psocoptères (Faune de France, n. 42). - Lechevalier, Paris, 164 pp.

BADONNEL A., 1949 - Psocoptères de la Côte d'Ivoire. Mission Paulian-Delamare (1945). - Rev. fr. Entom. 16 (1): 20-46.

GARCÍA ALDRETE A. N., GUTIÉRREZ DIAZ L. J., 1995 - Species of psocids (Psocoptera) associated with stored grains in Mexico. - Anales Inst. Biol., Ser. Zool., 66 (1): 47-55.

GÜNTHER K. K., 1974 - Staubläuse, Psocoptera (Die Tierwelt Deutschlands, 61. Teil). - G. Fischer, Jena, 314 pp.

HAGEN H. A., 1865 - Synopsis of the Psocina without ocelli. - Ent. mon. Mag. 2: 121-124.

LEE S. S., 1987 - Environmental factors inducing macroptery in the psocid *Psoquilla marginepunctata.* - Entomol. exp. appl. 44: 89-95.

LI F. S., 1991 - One new species from Guangdong province of China and notes on *Psoquilla* Hagen (Psocoptera). - Acta Agric. Univ. pekin. 17 (3): 97-101 (CAB abstract).

LIENHARD C., 1998 - Psocoptéres euro-méditerranéens (Faune de France et régions limitrophes, n. 83). - Fédération Française des Sociétés de Sciences Naturelles, Paris, XX + 517 pp.

LOCATELLI D. P., 1981 - *Ectopsocus maindroni* Badonnel (Psocoptera, Ectopsocidae) nuovo Psocottero introdotto in Italia. - Boll. Zool. agr. Bachic., ser. II, 16: 193-197.

LOCATELLI D. P., LIMONTA L., 1993 - Catture di Psocotteri mediante trappola a suzione e appunti per un catalogo delle specie italiane. - Boll. Zool. agr. Bachic., ser. II, 25 (2): 131-141.

LOCATELLI D. P., OTTOBONI F., 1987 - *Dolopteryx domestica* Smithers (Psocoptera Psyllipsocidae) nuovo Psocottero introdotto in Italia. - Boll. Zool. agr. Bachic., ser. II, 19 (1986-87): 13-21.

MOCKFORD E. L., 1991 - Psocids (Psocoptera). - In: GORHAM J. R. (ed.), Insect and mite pests in food. An illustrated key. U.S.D.A. Agriculture Handbook n. 655: 371-402.

MOCKFORD E. L., 1993 - North American Psocoptera (Insecta) (Flora & Fauna Handbook n. 10) - Sandhill Crane Press, Inc., Gainesville, XVIII + 455 pp.

NEW T. R., 1974 - Psocoptera (Handbooks for the identification of British Insects, vol. I, part 7). - Royal Entomological Society, London, 102 pp.

NICOLI ALDINI R., 1998 - Ritrovamento in Italia di *Psoquilla marginepunctata* Hagen, 1865 (Corrodentia Psoquillidae), psocottero sinantropico di origine tropicale. - Atti XVIII Congr. naz. ital. Entom., Maratea 21-26 giugno 1998, in: Atti Accad. naz. Entom. Rc. a. XLVI, suppl.: 49.

PELLIZZARI G., DALLA MONTÀ L., 1997 - Gli insetti fitofagi introdotti in Italia dal 1945 al 1995. - Inf.tore fitopat. 47 (10): 4-12.

SCHNEIDER N., LIENHARD C., 1994 - Psocoptera. - In: MINELLI A., RUFFO S. & LA POSTA S. (eds.), Checklist delle specie della fauna italiana, 38. - Calderini, Bologna, 6 pp.

SMITHERS C. N., 1972 - The classification and phylogeny of the Psocoptera. - Aust. Mus. Mem. 14, 349 pp.

TREMBLAY E., 1988 - Avversità delle colture di recente o temuta introduzione. Parassiti animali: insetti. - L'Italia agricola 125 (1):115-128.

DR. RINALDO NICOLI ALDINI - Istituto di Entomologia e Patologia vegetale, Università Cattolica del Sacro Cuore, Via Emilia Parmense, 84, I-29100 Piacenza. E-mail: rinaldo.nicolialdini@pc.unicatt.it.

Accepted 9 March 2000