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***Pachycrepoideus vindemmiae* (Rondani) (Hymenoptera Pteromalidae) on *Megaselia scalaris* (Loew) (Diptera Phoridae), new host recorded in Italy**

Abstract - The recovery of the parasitoid *Pachycrepoideus vindemmiae* (Rondani) (Hymenoptera Pteromalidae) on *Piophilidae* *casei* L. (Diptera Piophilidae) and on the new host *Megaselia scalaris* (Loew) (Diptera Phoridae) in Italian dairies is reported. Notes on diagnostic features, biology, distribution and economic relevance of the parasitoid are given.

Riassunto - *Pachycrepoideus vindemmiae* (Rondani) (Hymenoptera Pteromalidae) su *Megaselia scalaris* (Diptera Phoridae) (Loew), nuovo ospite segnalato in Italia.

Si riporta il ritrovamento del parassitoide *Pachycrepoideus vindemmiae* (Rondani) (Hymenoptera Pteromalidae) su *Piophilidae* *casei* L. (Diptera Piophilidae) e sul nuovo ospite *Megaselia scalaris* (Loew) (Diptera Phoridae) in caseifici italiani. Vengono forniti alcuni dati sui caratteri diagnostici, sulla biologia, sulla distribuzione e sull'importanza economica del parassitoide.

Key words: filth flies, pteromalid parasitoid, dairy, *Pachycrepoideus vindemmiae*, *Megaselia scalaris*.

The cheese fly *Piophilidae* *casei* L. (Diptera Piophilidae) is a cosmopolitan and notorious pest in households and food processing industries (Zuska, 1973); the cheese skippers attack cured hams and cheese producing relevant economic damages (Fulton, 1953). Among piophilids, *P. casei* is the best known species in the world for rates of damages (Belcari & Antonelli, 1994). Moreover, *P. casei* is a vector of several micropathogens, such as the human and animal parasite *Listeria monocytogenes* (Domenichini, 1991).

Megaselia scalaris (Loew) (Diptera Phoridae) is a cosmopolitan species of tropical and subtropical origin. Its larvae, usually considered saprophagous, are capable of developing on a wide variety of substrates, as animal feces, culture media, milk, fresh and decaying animal and vegetal material (Disney, 1994). The ability of adults to live on different types of substrates and their rapid development increase the risk of contamination of human food (Santini, 1998).

In June-September 2002, during a cheese fly monitoring carried out in dairies of South-Eastern Sicily, *P. casei* and *M. scalaris* puparia have been collected. The only parasitoid

emerged from these puparia was an hymenopterous Pteromalidae identified as males and females of *Pachycrepoideus vindemmiae* (Rondani) (Hymenoptera Pteromalidae).

This report is the first record of *P. vindemmiae* on *P. casei* in Italy, while *M. scalaris* represents a new host.

In this paper, notes about diagnostic features, biology, distribution and economic relevance of *P. vindemmiae* are reported.

Pachycrepoideus vindemmiae (Rondani, 1875)

Pteromalus vindemmiae Rondani, 1875: 148; synonymised with *Pachycrepoideus vindemmiae* by Delucchi (1955) (as *vindemmiae*; emendation);

Pachycrepoideus dubius Ashmead, 1904: 329; syn. with *vindemmiae* by Delucchi (1955) (as *vindemmiae*; emendation);

Toxeumopsis nigra Girault, 1915 [239]: 196; syn. with *vindemmiae* by Bouček (1988);

Toxeumella dissimilis Dodd & Girault, in Girault, 1915 [239]: 196; syn. with *vindemmiae* by Bouček (1988);

Pterosemoidea drosophilae Dodd, 1917: 350-351; syn. with *vindemmiae* by Bouček (1988);

Anisopteromalina crassinervis Bouček, 1954: 57-60; syn. with *vindemmiae* by Bouček (1957);

Pachycrepoideus elongata Delucchi, 1955: 141; syn. with *vindemmiae* by Graham (1969).

Pachycrepoideus vindemmiae (Rondani, 1875) is the original spelling, not *vindemiae*.

P. vindemmiae belongs to the family Pteromalidae (Hymenoptera Chalcidoidea), subfamily Pteromalinae, tribe Pteromalini (Bouček, 1988).

DESCRIPTION

Female (fig. 1a) in general blackish, black with slight aeneous reflections, submetallic but in bright sunlight metallic dark-greenish; the abdomen smooth and shiny, the head and thorax closely reticulated.

Head sub-circular, slightly wider than long; ocelli in a flat triangle in the centre of the vertex, distant from the margin of the eyes. Mandibles 3- (left) and 4-dentate (right) (fig. 1f): in the first case, the inner mesal tooth truncate and the shortest, the two others acute, the lateral tooth the longest; in the latter case, the three inner teeth small, obtuse and subequal, the lateral outer tooth much longer, obtusely conic.

Antennae (fig. 1b) usually fuscous, but not metallic. They are inserted about two thirds down the face, slightly below a line drawn between the ventral ends of the eyes. Scape longer than half the length of the flagellum; pedicel equal in length to 3rd anellus and 1st funicular segment together; flagellum with 5 distinct funicular segments before clava and with 3 basal segments anelliform and without longitudinal sensilla (fig. 1e); 3rd anellus longer than the other two; 1st segment is the longest of the funicular segments; 1st and 2nd funicular segments slightly longer than wide, while 4th and 5th subquadrate and subequal; club 3-segmented.

Pronotum distinct, about 1/4 of mesonotum length; notauli incomplete, not clearly traceable to posterior margin of mesoscutum, at most indicated only by slight difference in meshes of reticulation.

Forewing hyaline (fig. 1d); submarginal vein narrow and over 3 times longer than marginal

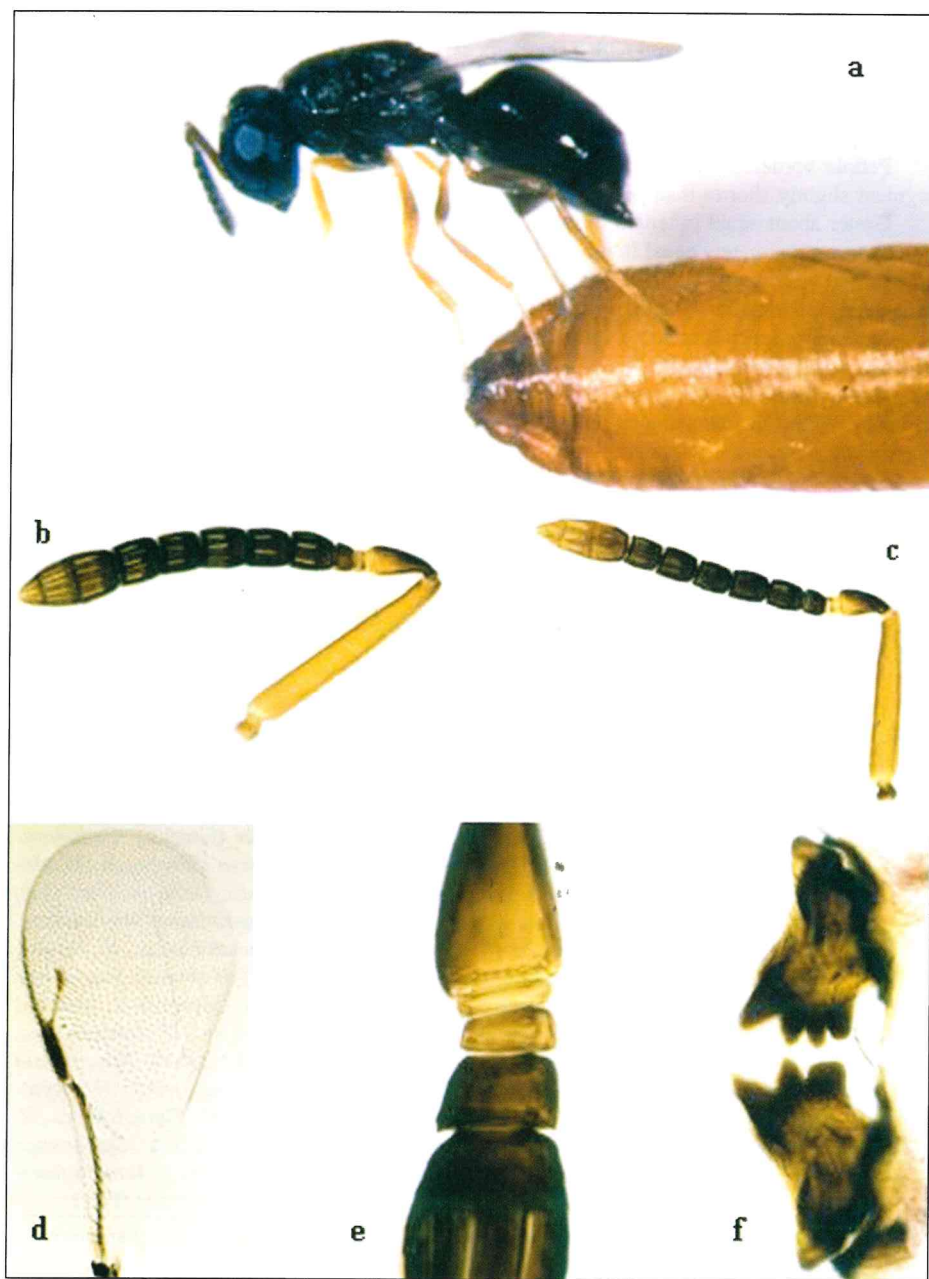


Fig. 1 - *P. vindemmiae*: a) female ovipositing into *Piophilidae* puparia; b) female antenna; c) male antenna; d) female forewing; e) female antenna, particular; f) female mandibles.

vein; marginal vein same thickness along entire length; stigmal vein shorter than the postmarginal vein, straight, clavate and with a small uncus; postmarginal vein long and slender, uniform in width, distinctly longer than marginal vein.

Coxae nigroaeneous, legs variable, uniformly brownish to yellow.

Propodeum with spiracle much nearer to the anterior margin than to the posterior one.

Petiole bordered on either side by flange: the flange formed by extension of 1st gastral segment slightly shorter than petiole.

Gaster about equal in length to the thorax; rarely compressed and conic-ovate, 1st and 2nd segments approximately equal in length, large, unite forming about half the length of the gaster; in air-dried specimens, 1st and 2nd together covering most of the gaster; 4th and 5th segments subequal, much smaller. The tip of the ovipositor slightly exerted; ventral valves inconspicuous.

Male more aeneous metallic, more slender. Antennae (fig. 1c) as in female, but more slender and hairy; flagellum cylindrical.

Gaster more distinctly petiolate and depressed.

Keys to the Nearctic Chalcidoidea (Gibson *et al.*, 1997) have been used to identify *Pachycrepoideus* Ashmead. A detailed description of the genus and of the species (as *P. dubius*) was made by Girault and Sanders (1910).

HOSTS

P. vindemmiae is a generalist idiobiont parasitoid and facultative hyperparasitoid of Diptera and Hymenoptera (Noyes, 2001) (tab. 1).

Table 1 - *Pachycrepoideus vindemmiae* (Rondani) hosts.

Diptera	<i>Anastrepha</i> sp., <i>A. fratercula</i> (Wiedemann), <i>A. ludens</i> (Loew), <i>A. obliqua</i> (Macquart), <i>A. suspensa</i> (Loew), <i>Bactrocera cucurbitae</i> (Coquillett), <i>B. dorsalis</i> (Hendel), <i>B. passiflorae</i> (Froggatt), <i>B. oleae</i> (Gmelin), <i>Calliphora</i> sp., <i>Ceratitis</i> sp., <i>C. capitata</i> (Wiedemann), <i>Chrysomya chloropyga</i> (Wiedemann), <i>Dacus ciliatus</i> Loew, <i>Delia antiqua</i> (Meigen), <i>Delia radicum</i> (L.), <i>Drosophila</i> sp., <i>D. melanogaster</i> (Meigen), <i>Exorista sorbillans</i> (Wiedemann), <i>Fannia</i> sp., <i>F. canicularis</i> (L.), <i>F. scalaris</i> (F.), <i>Haematobia</i> sp., <i>H. irritans</i> (L.), <i>H. irritans exigua</i> Meijere, <i>Hermetia illucens</i> (L.), <i>Hydrotaea leucostoma</i> (Wiedemann), <i>Hylemya</i> sp., <i>Lucilia</i> sp., <i>L. illustris</i> (Meigen), <i>L. sericata</i> (Meigen), <i>Metagonistylum minense</i> Townsend, <i>Musca</i> sp., <i>M. domestica</i> L., <i>Muscina stabulans</i> (Fallèn), <i>Orseolia oryzae</i> (Wood-Mason), <i>Paratheresia brasiliensis</i> (Townsend), <i>P. claripalpis</i> (Wulp), <i>Phormia regina</i> (Meigen), <i>Piophilha</i> sp., <i>Piophilha casei</i> L., <i>Pterandrus rosa</i> (Karsch), <i>Rhagoletis</i> sp., <i>R. cingulata</i> (Loew), <i>R. indifferens</i> Curran, <i>R. fausta</i> (Osten Sacken), <i>Sarcophaga</i> sp., <i>Silba virescens</i> Macquart, <i>Stomoxys</i> sp., <i>S. calcitrans</i> (L.), <i>Terellia fuscicornis</i> (Loew), <i>Tricharaea occidua</i> (Fab.), <i>Trichopoda pennipes</i> (Fab.)
Hymenoptera	<i>Asobara tabida</i> (Nees), <i>Coptera silvestrii</i> (Kieffer), <i>Diachasmimorpha fullawayi</i> Silvestri, <i>D. tryoni</i> (Cameron), <i>Encyrtus</i> sp., <i>Leptopilina heterotoma</i> (Thomson), <i>Muscidifurax raptor</i> Girault & Sanders, <i>Psytalia humilis</i> (Silvestri), <i>Tetrastacus giffardianus</i> Silvestri

BIOLOGY

In laboratory conditions, the incubation period of the eggs varies from 12 to 20 hours. The length of the larval period is 9 days on the average. The duration of the pupal stage varies from 6 to 9 days; besides, the pupal stage of the male is shorter than the female one (Crandell, 1939).

Sex ratio is female-biased (Nadel & Luck, 1992).

Male and female are sexually mature since their emergence; fertilized female refuses any other copulation (Crandell, 1939; Nadel & Luck, 1992).

Females hostfeed from the same hosts into which they oviposit and this enables them to mature additional eggs (Phillips, 1993).

Females detect and kill with their ovipositor the eggs laid on the same host by congenere females in order to control competition for resources (Goubalt, 2000).

DISTRIBUTION

P. vindemmiae has a cosmopolitan distribution. It was reported in Afrotropical, Australasian, Nearctic, Neotropical, Oriental and Palearctic regions (Noyes, 2001).

ECONOMIC RELEVANCE

Several studies, carried out to evaluate the efficacy of *P.vindemmiae* as pupal parasitoid of some filth flies in poultry farms, livestock manure and pig farms (Morgan & Patterson, 1975; Rutz & Scoles, 1989; Rueda *et al.*, 1997), have shown that the pteromalid, in particular in swine barns, is one of the most important parasitoid of muscoid flies (Morgan & Patterson, 1975; Rueda *et al.*, 1997).

In U.S.A. *P. vindemmiae* has been used to increase biological control of flies, particularly *Musca domestica* L. and *Stomoxys calcitrans* (L.) (Diptera Muscidae) and *Fannia* spp. (Diptera Fanniidae) associated with livestock manure (Pickens *et al.*, 1975; Pickens, 1981). In Argentina the parasitoid has been successfully introduced and released in field, together with *Diachasmimorpha longicaudata* (Ashmead) (Hymenoptera Braconidae) and *Aceratoneuromyia indica* (Silvestri) (Hymenoptera Eulophidae), as biological control agent of *Ceratitis capitata* (Wiedemann) (Diptera Tephritidae) in fruit orchards (Turica *et al.*, 1971). In 1973-77 *P. vindemmiae* has been released in Tucuman province (Argentina) and again, in 1986, it has been used for biological control of the tephritid together with *A. indica* (Ovruski *et al.*, 2002).

Therefore, the employment of *P.vindemmiae*, also thanks to the use of strains reared in vitro with artificial diets (Thompson, 1983), could really decrease filth flies populations to no damage levels in relation to the biocontrol methodology of these important pests in food industry.

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