

Late summer/early autumn records of fresh *Pontia chloridice* from Greece (Lepidoptera: Pieridae). Evidence of a third emergence per year

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Abstract. The occurrence of fresh specimens of *Pontia chloridice* (Hübner, 1813) flying in late August/early September is reported here for the first time for Greece. The butterfly was found to be common in two different localities, one situated in the central Rodhópi Mts., the other in the eastern part of the mountain range, and both in the vicinity of the Greek-Bulgarian border. The fresh condition of the majority of specimens implied that they could not possibly be remnants of the 2nd generation that normally flies from June to mid-July. This conjecture is supported by the fact that the HW underside greenish markings are often darker than in the summer brood individuals.

Samenvatting. Het voorkomen van verse exemplaren *Pontia chloridice* (Hübner, 1813) eind augustus/begin september wordt hier voor het eerst uit Griekenland gemeld. De soort was gewoon in twee vindplaatsen, de ene in het centraal Rhodopengebergte, de andere in het oostelijk deel van deze bergketen, telkens dichtbij de Bulgaarse grens. De versheid van alle exemplaren toonde aan dat het niet ging om overblijvers van de tweede generatie die normaal van juni tot midden juli vliegt. Bovendien was de groene tekening op de onderzijde van de achtervleugels donkerder dan in de zomerexemplaren.

Résumé. Des exemplaires frais de *Pontia chloridice* (Hübner, 1813) ont été observés pour la première fois en Grèce fin août/début septembre. L'espèce était commune dans deux localités, la première dans les Rhodopes centrales, et l'autre dans la partie orientale de la même montagne, toujours près de la frontière bulgare. La fraîcheur de tous les exemplaires montre qu'il ne s'agit pas d'exemplaires tardifs de la deuxième génération qui vole normalement de juin à mi-juillet. De plus, la couleur verdâtre des dessins en dessous des ailes postérieures était plus foncée que dans les exemplaires d'été.

Key words: Pieridae – *Pontia chloridice* – Greece – Thráki – Rodhópi – Voltinism.

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Introduction

Pontia chloridice (Hübner, 1813) is a butterfly with a very limited distribution in Europe, its colonies inhabiting only the Balkan Peninsula, where the species is generally considered rare and extremely local. In Greece it has been reported so far from three separate localities, all of

which are in the NE extremity of the country (Thráki region) (Fig. 1, black circles). Two of these localities lie in the Évros prefecture at an altitude of 100–200 m, and the third one in the Rodhópi prefecture (central Rodhópi Mts.) at an altitude of 600–700 m. The butterfly's habitat is invariably associated with dry river beds covered with white rounded rocks and pebbles.

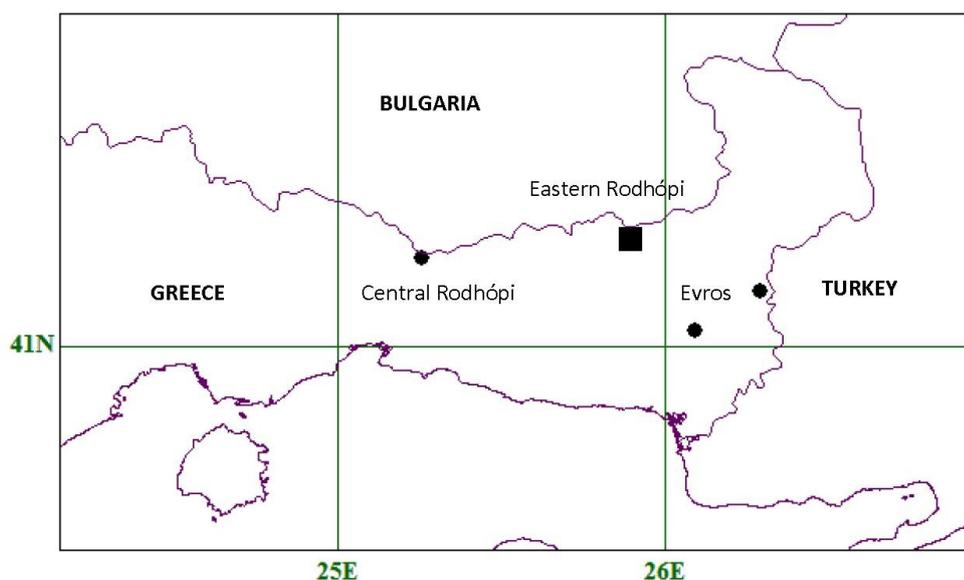


Fig. 1. Known geographic distribution of *Pontia chloridice* in Greece. Black circles correspond to already known colonies, black square to newly discovered location.

The Greek colonies of *P. chloridice* have been monitored by Greek lepidopterists for more than a decade, and it has been found that the butterfly's first generation normally flies from end March to mid-May

(depending on altitude), and its second one is on the wing from late June to late July. In both these generations the butterfly appears in small to fair

numbers, never giving the impression of being a common species.

Flight period and voltinism as recorded in literature

A lot of different views have been expressed in literature with respect to the number of broods per year for *P. chloridice*. These refer to populations ranging from the Balkans in Europe all the way to Mongolia. As, however, it has been shown in Coutsis (2014) that the population from Lake Balkhash, Kazakhstan actually is not *P. chloridice*, but instead the similar by wing characters *Pontia beckerii* (Edwards, 1871), it has been decided to exclude flight period and voltinism records for all geographic areas other than those for which the identity of *P. chloridice* has been established on the basis of its larval characters.

The following information already exists in literature regarding the flight period and voltinism of *P. chloridice*:

- Higgins & Riley (1980: p. 27) for Balkans: “April/May and June in two broods.”
- Abadjiev (1992: vol. 1, p. 41) for Bulgaria: “To my opinion *P. chloridice* is a trivoltine species. The first generation appears in March, the second in June, but it is very possible that a third brood (in September) will be discovered.”
- Hesselbarth *et al.* (1995: vol. 1, p. 433) for Turkey: “Die Falter treten je nach den klimatischen Verhältnissen des Biotops in zwei (Mai/Juni und Juli/August) oder in drei (März/April, Juni/Juli und August/September) Generationen auf, die sich mehr oder weniger überlappen.”
- Tolman & Lewington (1997: p. 42) for Balkans: “Bivoltine. Mid April/late May and June/July in prolonged emergence.”
- Tolman (2001: p. 17) for Balkans: “April – July in two prolonged overlapping broods.”
- Makris (2003: p. 110) for Cyprus: “The adult butterflies start to emerge in March and are on the wing until November in at least three generations.”
- Lafranchis (2004: p. 89) for Balkans: “Bivoltine: April – July.”
- Pamperis (2009: p. 96) for Greece: “From April to July, in two generations (third not observed).”
- Tshikolovets (2011: p. 120) for Balkans, Turkey, Cyprus: “multivoltine; from April to November according to altitude and locality, usually May – August.”

Although reports of a possible third generation are mentioned in some of the references above, actual pictures of specimens flying in autumn are shown only in Makris (2003). However, since the butterflies are displayed live, they are not useful for detailed description or comparison to earlier broods, because the insects are not set. Moreover, there is no clear evidence that broods are in fact chronologically distinct, as opposed to likely

prolonged, overlapping ones. The author claims that only the ‘...adults of the first generation have darker green colours and more extensive black markings than those of succeeding generations’, thus inferring that summer and autumn (if existent) broods do not differ morphologically. In any case, geographic and climatic conditions in Cyprus and Thráki are entirely different, meaning that direct parallelism could possibly be misleading.

Recent late summer / early autumn records of *P. chloridice* for Greece

On August 17, 2013 the first author visited an area in the Eastern Rodhópi Mts., NE of the city of Komotini (Fig. 1, black square), located at an altitude of 850 m. To his great astonishment, he collected three perfectly fresh specimens of *Pontia chloridice*, two of which were males and one a female. Their excellent condition clearly suggested that they were not remnants of the second brood, but instead representatives of a third emergence. This condition prompted the first author to also revisit the Central Rodhópi locality already previously visited on July 14, where the butterfly had been found in fresh condition and in typically small numbers. Indeed, on August 19, 2013, six very fresh males were captured there at 600-700 m. Moreover, on September 1 of the same year ten more males and two females were further collected, almost all of them in mint condition. The butterfly was unexpectedly very numerous, by far outnumbering any other syntopic species. Such a situation had never been observed in the past.

The HW underside greenish markings

These are complete and dark in first brood individuals (Figs. 2–5). In the second brood they are sometimes intermixed with yellow, especially along the veins, making them appear lighter greenish, and are often incomplete (Figs. 6–9) however there are a few individuals that resemble first brood ones. In the third emergence the situation is rather puzzling. On the average, the August/September specimens demonstrate intermediate characteristics, as shown in Figs. 10–17. Specifically, the green shade is quite as dark as in the first generation however the white areas are more extensive. A study of the complete series of captured material reveals that individual variation is quite broad, with extreme cases featuring characters almost overlapping morphologically with those of both earlier broods. For instance, the male specimen shown in Figs. 14, 15 is very scantily coloured on HW underside, whereas the male specimen shown in Figs. 16, 17 has its HW underside almost as dark as in the spring generation. Furthermore the HW underside of the female shown in Figs. 12, 13 is almost identical to that of first generation counterparts.



Figs. 2, 3. *Pontia chloridice* ♂, first generation. Greece, Évros river basin, 150 m, 29.iv.2007. 2. Upper side. 3. Underside. – Scale bar: 1 cm.

Figs. 4, 5. *Pontia chloridice* ♀, first generation. Greece, Évros river basin, 150 m, 29.iv.2007. 4. Upper side. 5. Underside. – Scale bar: 1 cm.

Figs. 6, 7. *Pontia chloridice* ♂, second generation. Greece, Central Rodhópi Mts., 500 m, 14.vii.2013. 6. Upper side. 7. Underside. – Scale bar: 1 cm.

Figs. 8, 9. *Pontia chloridice* ♀, Second generation. Greece, Central Rodhópi Mts., 650 m, 4.vii.1994. 8. Upper side. 9. Underside. – Scale bar: 1 cm.

Conclusions

Clearly all that has been said under the previous heading cannot be attributed to temperature conditions since, if this were the case, the dark HW underside form, usually associated with subjection of immature stages to low winter temperatures, would not have made its appearance in the second brood and the third emergence, both of which are not affected by such temperatures. All this leads to two possible hypotheses: either the HW underside greenish marking condition is affected by humidity factors of microclimatic origin rather than temperature, in which case the third emergence could very well be considered as representing a clear-cut third brood, or individuals with dark HW underside greenish markings, flying other than in spring, represent retarded emergences of butterflies whose immature stages have indeed been subjected to low winter temperatures. However, the synchronous

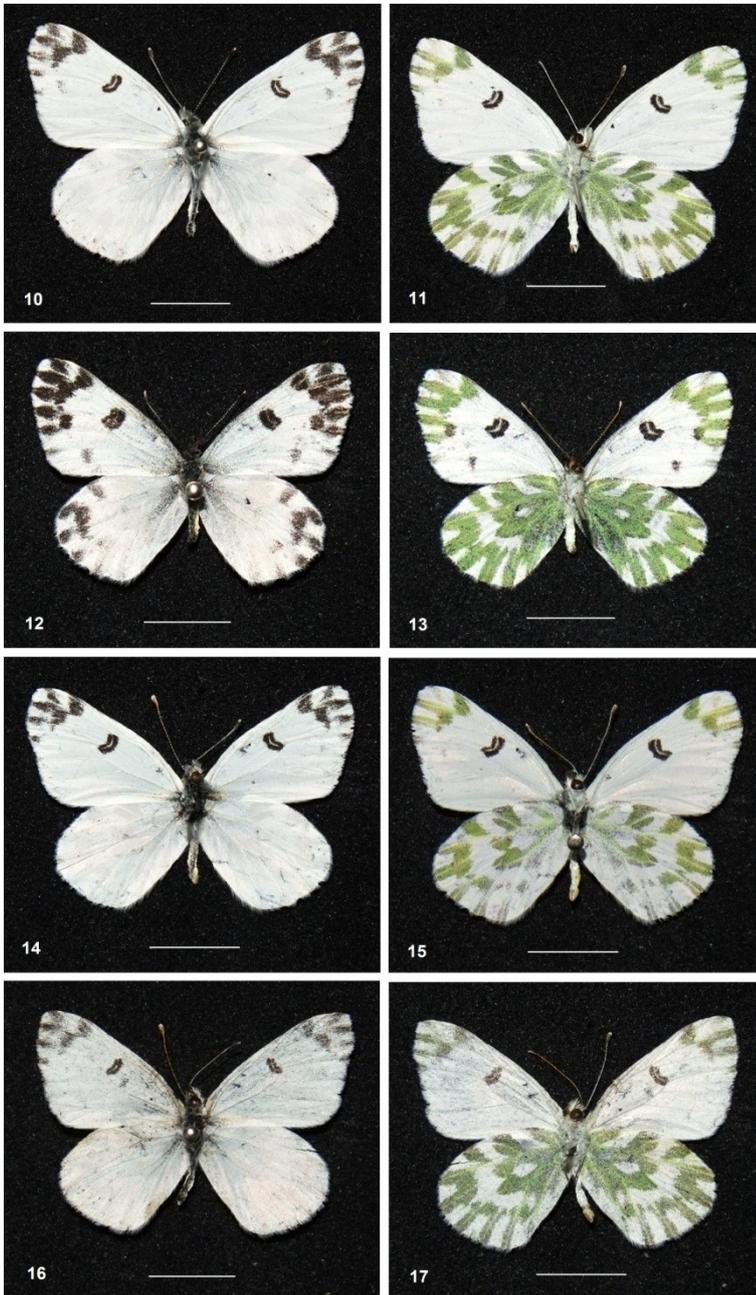
appearance of both HW underside morphs makes this hypothesis rather improbable.

It can only be hoped that future breeding experiments will eventually give a final answer about the true nature of the *P. chloridice* yearly third emergence.

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The map in Fig. 1 was created with DMAP for Windows, version 7.2. (<http://www.dmap.co.uk>)



Figs. 10, 11. *Pontia chloridice* ♂, third emergence. Greece, Central Rodhópi Mts., 600 m, 1.ix.2013. 10. Upper side. 11. Underside. – Scale bar: 1 cm.

Figs. 12, 13. *Pontia chloridice* ♀, third emergence. Greece, Central Rodhópi Mts., 600 m, 1.ix.2013. 12. Upper side. 13. Underside. – Scale bar: 1 cm.

Figs. 14, 15. *Pontia chloridice* ♂, third emergence. Greece, Central Rodhópi Mts., 500 m, 19.viii.2013. 14. Upper side. 15. Underside. – Scale bar: 1 cm.

Figs. 16, 17. *Pontia chloridice* ♂, third emergence. Greece, Central Rodhópi Mts., 500 m, 19.viii.2013. 16. Upper side. 17. Underside. – Scale bar: 1 cm.

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