

Maurizio BOLLINO & Giovanni SALA

Synopsis
of
Papilio alexanor
Esper, 1799.

(An updated revue of its taxonomy and biology)

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Maurizio BOLLINO & Giovanni SALA : Synopsis of *Papilio alexanor* Esper, 1799.

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FOREWORD

Revising the nomenclature and bibliography of *Papilio alexanor*, Esper, we found that some invalid names were still currently used, and high confusion was also found in modern faunistic works, especially about its eastern populations. The confusion is surely due to some mistakes by early authors, which are still in use. To put such situation in order we decided to write this paper, hoping to collect and to reorganise all the available information reported in previous papers about this species and add new unpublished data from our own experience or from that of our colleagues. These people very sensitively responded to our insistent requests of news about the biology of the species, or kindly sent us their material to compare with our reference collection. Thus, we succeeded in examining a significant number of specimens (nearly 1200) belonging to many different populations of *P. alexanor*. Such material enabled us to clarify some systematic doubts and to locate the dark sides of the biology and systematics of the species. Although our work is as updated as possible, we do not claim to have done the ultimate set-up about our knowledge of the species, but we consider it as the stimulus for the reader to undertake more studies in order to solve the unresolved questions.

SYSTEMATIC SECTION

Papilio alexanor, during its taxonomic history, has always been, but for a short period, considered as belonging to the genus *Papilio* Linnaeus. Argumentations by Verity about its ascription to genus *Pterourus* Scopoli are in contrast with the biogeographical and phylogenetic results of the authors who worked on phylogeny of Papilionidae (Munroe, [1961]; Hancock, 1982; Miller, 1987). Asia Minor was one of the most important dispersal centres, and *Papilio alexanor* most probably originated in such area (see zoogeographical chapter). As underlined by Hancock (1982) "*P. alexanor* is somewhat distinct [from *Papilio machaon* group] and may prove to belong to a relict genus, predating the *Papilio-Princeps* split". Morphology of male clasper, of early stages (caterpillars and pupa), their heliotropism and adaptation to a flower-feeding diet are divergent characters from most species of genus *Papilio* (s.str.). Here we do not state if such characters are primitive or derived, but surely they need much investigation to control Hancock's hypothesis. Further phylogenetic researches (Caterino & Sperling, 1999) on mitochondrial cytochrome oxidase I and II genes partly confirmed Hancock's hypothesis, excluding *P. alexanor* from the *machaon* group which is strongly monophyletic. In any case, Caterino & Sperling (1999) state: "The actual affinities of *alexanor* remain unclear. We suggest a close relationship to the [*Pterourus*] *troilus* group". Waiting for further information, we provisionally consider *Papilio alexanor* as belonging to genus *Papilio* Linnaeus (s.str.).

***Papilio alexanor* Esper, 1799**

Original description: Die Schmetterlingen in Abbildungen nach der Natur mit Beschreibungen. 1(2): 89, pl 110, f. 1

"*Alis caudatis, subconcoloribus flavis; superioribus falciis quinque transversis, intermediis duabus abbreviatis nigris; inferioribus, fascia intermedia nigra, postica latiore, atomis caeruleis adspersa.*"

Typical material: type material lost.

Type locality: Nice, Provence (loc. typ. of *P. polidamas* De Prunner)

Synonymy:

Papilio polidamas Prunier, L. De, 1798 - Lepidoptera Pedemontana illustrata. Augusta Taurinorum excudebat Mathaeus Guaita, 8,1:pp. 52+125

Papilio polychaon Loche, F.M. De, 1801 - Papillons du Piémont nouvellement connus [sic!]. avec 3 pl.col. *Memorie Accad. Sci. Torino*, 6(2):139-150

Papilio alexanor ab. *couleti* Oberthür, C., 1909 - Notes pour servir a etabli la Faune Française et Algérienne des Lépidoptères. *Etud. Lepid. Comp.*, 3:101-106, pls. XXIII-XXIV

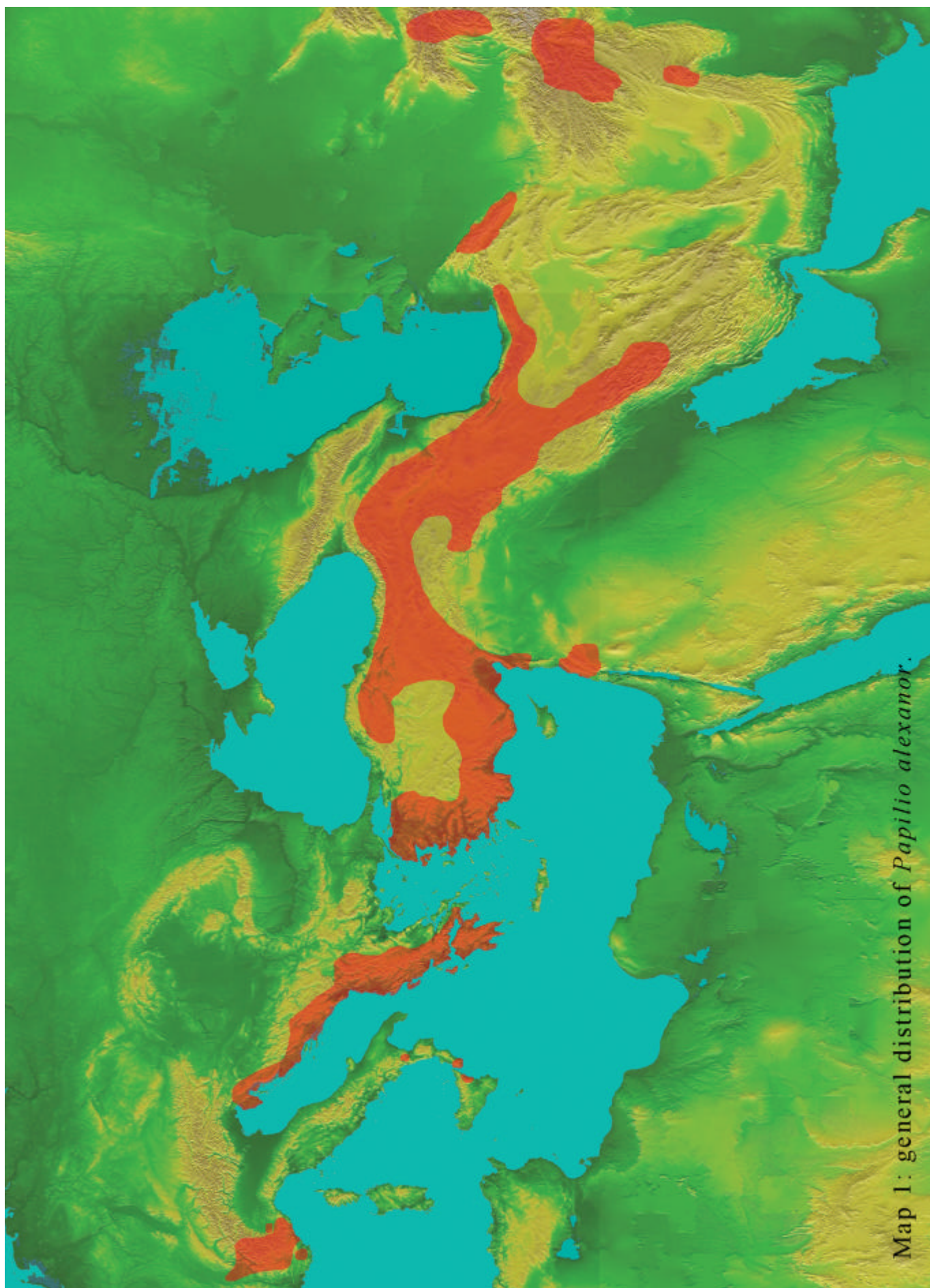
Papilio alexanor ab. *augustinus* Oberthür, C., 1909 - Notes pour servir a etabli la Faune Française et Algérienne des Lépidoptères. *Etud. Lepid. Comp.*, 3:101-106, pls. XXIII-XXIV

General distribution of the species: south-eastern France, Italy (Maritime Alps, Calabria and Sicily), former Yugoslavia, Roumania (?), Albania, Greece, Turkey, Russian Armenia, Lebanon, Israel, Jordan, Syria (?), Iraq, Iran, Afghanistan, Turkmenistan, Uzbekistan, Pakistan (Baluchistan), Pamir (?). Map 1.

Description of the species.

Male: Head: frons medially black, yellow laterally, palps yellow. Antennae: black, except for yellow distal third of club. Prothorax and metathorax dorsally black, laterally bordered with yellow, laterally and ventrally yellow. Abdomen dorsally and ventrally black, laterally yellow. Valvae black. Wings: ground colour yellow, more or less deep depending of the population. Six black vertical bands on forewing, of which marginal, submarginal, postbasal and basal running from costal to anal margins, while discal and postdiscal ones limited to the discal area. Hindwing with a submarginal black band curved outward, a black discal band running from costal to anal margin and another along anal margin. A black discal spot at the apex of the cell, or near it. A double-coloured anal spot, the proximal portion being black with blue suffusion, while the distal portion being red-orange, with different proportion of both colours depending of localities. Versus of wings with same pattern, but less deep yellow ground colour.

Female: there is not any sexual dimorphism in the species. Females are on average a little larger than males, and with a slightly less deep ground colour. Differentiation of sexes is possible with the analysis of anal tip of abdomen.



Map 1: general distribution of *Papilio alexanor*.

Variability: although constant in general pattern all over its distribution, the species shows local and individual variations of size and minor characters. Just because of this apparent uniformity, the morphological analysis of limited series or single specimens from different localities rarely helps in spotting subspecific differentiations. Only when long series from many localities are available, can one single out constant local characters to establish that *alexanor* flying in one area is phenotypically different from other populations. Size, ground colour of wings, width and shape of black and yellow bands are useful parameters to distinguish a subspecies from another. To further complicate the situation, specimens diverging in pattern are not rare in each population, and are especially frequent in transitional populations, like in Maritime Alps, southern Turkey, eastern Iran or southern Uzbekistan. In such populations it is frequently very difficult to attribute some specimens to one subspecies rather than another, as in the case of southern Turkey, where two different subspecies (*eitschbergeri* and *orientalis*) converge.

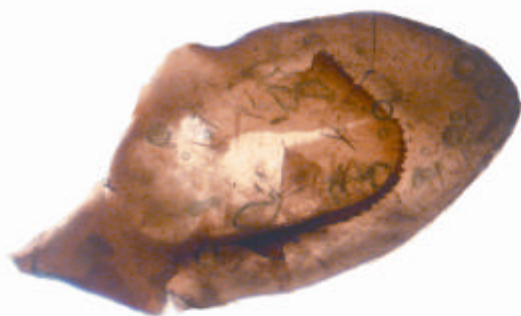
Genitalia: "Supra-uncus blunt, downturned; valve small, harpe expanded into a wide curve and serrated all round; penis short, curved to a right-angle; furca short and wide" (Higgins, 1975). Examination of male genitalia from nearly all areas (except for Jordan, Afghanistan and Pakistan, due to lack of material available for dissection) does not show any significant variation of morphology. Some variations were observed only in shape of valve and more or less serrated harpe, but with no geographical constant pattern. (see figs. 1a-1h).

Chromosome number: *Papilio alexanor* was firstly studied in this respect by Lorkovic (1941), who gave an haploid number of 30, stated studying testes' cells in meiotic division of spermatocytes, using specimens coming from France, and belonging to nominate subspecies.

Size: size of imagoes is highly variable. While males of western European populations have a normal FW length of 34-37mm and females 37-41 mm, Greek specimens are larger, with an average wing length of 36-40 mm in males and 42-44 mm in females. About the same size is observed in Turkish and Iranian populations, but the largest size is attained in western Turkish and especially in Samos populations, where it is not unusual to find very large females with forewings 47 mm long and males with a FW length of about 45 mm. Further eastward, the size returns smaller again, and the medium length of FW of Uzbekistan populations is 35-36 mm in males and 38-40 mm in females. A female from Baluchistan (being one of only very few specimens known to us from this locality) has a FW length of 33 mm. It is possible to find larger and smaller individuals within the same population. We suppose that size variations have to be related only to food-plant availability, as the late caterpillars find probably plants which become drier and drier every day and are thus induced to pupate earlier, giving smaller individuals at emergence, the so-called "hungry-form".

Phenology: *Papilio alexanor* is typically a single brooded species, with an emergence period, depending on local climatic conditions, that ranges from late March, April or early May to late July. For further details, see single sections and biological notes.

- 1a: *Papilio alexanor alexanor*: France, Briançon (right male valva, ventral view)
- 1b: *Papilio alexanor radighierii*: Italy, Valdieri (right male valva, ventral view)
- 1c: *Papilio alexanor atticus*: Greece, Delphi (right male valva, ventral view)
- 1d: *Papilio alexanor eitschbergeri*: Greece, Samos (right male valva, ventral view)
- 1e: *Papilio alexanor eitschbergeri*: Turkey, Izmir (right male valva, ventral view)
- 1f: *Papilio alexanor orientalis*: Turkey: Sarikamis (right male valva, ventral view)
- 1g: *Papilio alexanor orientalis*: Armenia: Eriwan (right male valva, ventral view)
- 1h: *Papilio alexanor orientalis*: Uzbekistan: Taskent (right male valva, ventral view)



1a



1b



1c



1d



1e



1f



1g



1h

1) *Papilio alexanor alexanor* Esper, 1799

plate 1: figs. 1-7; plate 2: figs. 1-2

Distribution: Southeastern France (Drôme, Vaucluse, Alpes-de-Haute-Provence, Alpes-Maritimes, Haute-Alpes, northern Var), Northwestern Italy (Liguria). Map 2.

Localities:

France

Hautes-Alpes: Saint-Crépin; la Bessée; Gap; Briançon; Veynes; Gorges d'Agneilles; La-Haute-Beaume.

Drôme: Nyons; Montagne de Chamouse; Sainte-Euphémie-sur-Ouvèze; Propiac; Saint-May; Dieulefit; Gorges de Gas; La Charce; Col de Cabre; Col de Menée; Abbaye de Valcroissant; Benevise; Chatillon; Les Nonières; Grimone; Aucejon; Pradelle; Brette; Col de Limouche; Beaurières; Chamaloc; St.-Nazaire-le-Désert; Pont de Espenel; Plan de Baix; Saillans; Les Auberts; La Motte-Chalançon; Peyrus; Bezaudun; Saint-Pantaléon; Col de Bacchus; Saint-Benoit-en-Diois; Col de Pennes.

Isère: Bourg-d'Oisans.

Savoie: Termignon.

Ardèche: Celles-les-Bains.

Vaucluse: Lubéron; Mont Ventoux.

Alpes-de-Haute-Provence: Barcelonnette; Col d'Allos.

Alpes-Maritimes: Isola-sur-Tinée; Venanson; Berthemont-les-Bains; Belvédère; Saint-Vallier; Bouyon; Gourdon; Saint-Martin Vesubie; Madonne de Fenestre; Moulinet-sur-Menton; Col de Braus; la Bollène-Vesubie; Col de Vence; La Blache; Saint-Etienne-de-Tinée; La Turbie; Tourrette-s.-Loup; Col di Tenda; Digne; Chabrières; Col de Valferrière.

Var: Mont Lachens; Bargemon; Sainte-Baume.

Italy

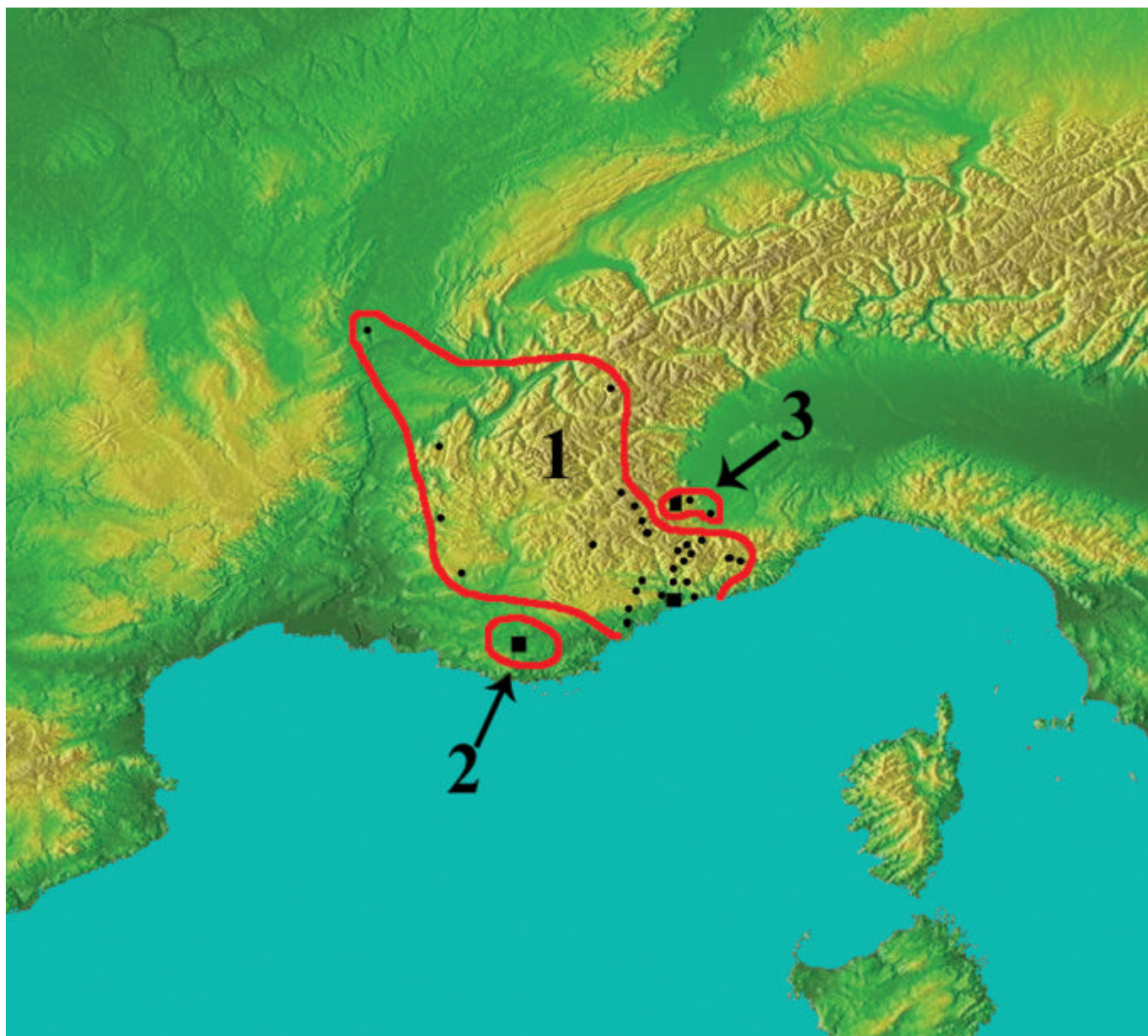
Imperia Prov.: Molini di Trioria; Colla Melosa; Mt. Gouta

Cuneo Prov.: after Vernante, on way to Col de Tende; Ormea.

Flight period: the nominal subspecies has an emergence period covering the whole of June and the first half of July. The best period to meet with the species is surely the last third of June.

Description: specimens of the nominate subspecies are small in size with pale yellow ground colour. Submarginal and postmedian yellow bands usually wider than in *a. destelensis* and *a. radighierii*. Black bands narrower than in nearby subspecies, especially submarginal and basal ones. HWs with black postmedian band more retreated than in *a. destelensis* and *a. radighierii*. Anal spot ochre as in *a. radighierii*.

Material examined: 15 males, 10 females (France: Briançon, Venanson, Digne, Lubéron, Vallouise, Pallon) in coll. Bollino (Lecce, Italy); 2 males, 3 females (France: Digne, Saint-Etienne) in coll. Crnjar (Cagliari, Italy); 27 males, 16 females (France: Le Gard de Apt, Laure, Guillestre, Briançon, Sète, Digne, Peille, Madonne de Fènestre, Nice, Montagne de Lure, Saint-Etienne, Col de Braus, Bouyon, Banon) in coll. Sala (Salò, Italy); 21 males, 17 females (France: Digne, Vaucluse, Cannes, Drôme, Montagne de Lure, Saint-Etienne, Var) in coll. EMEM; 33 males, 14 females (France: Simiane, Col St.Jean, Digne, Nizza, Montagne de Lure, Saint Christol, Palon, Venançon, Col de Tènde) in coll. Floriani (Milano, Italy); 3 males, 9 females (France: Digne, Valle de la Pia, Castellane, Clues de Barles, Mont Ventoux) in coll. Rose (Mainz, Germany); 1 female (France: Digne), ex coll. Verity, in coll. Museo Zoologico La Specola (Firenze, Italy); 1 male, 1 females France) in Museo Zoologico (Torino, Italy); 1 male (Italy: Mt Gouta) in coll. Forte (Torino, Italy); 4 males, 3 females (France: Briançon) in coll. Caimi (Saronno, Italy); 1 male (France: Col de Tènde) in coll. Clerici (Lomazzo, Italy); 1 female (France: Digne) in coll. Museo Civ. St. Nat. Verona; 2 males, 3 females (France: Madonne de Fènestre) ex coll. Della Beffa and 5 males, 2 females (France: Col de Braus) ex coll. Rocca in coll. Museo Civico Storia Naturale (Verona, Italy); 5 males, 4 females (France: St.Chental, Venanson, St.Martin de Queyrieres, Luberon, Digne) in coll. D'Alessandro (Napoli, Italy); 13 males, 14 females (France: Vitrolles, Luberon, Monieux, Gorges de la Nesque, St.Crepin, Digne, Briançon, La Bessée, Mt. Lur) in coll. Racheli (Rome-Italy); 36 males, 20 females (France: various localities) in Forschungsinstitut Senckerberg (Frankfurt am Main- Germany); 8 males, 6 females (France), 26 males, 4 females (France: Digne); 3 males, 1 female (France: Haute Provence, Montagne de Lure), 1 female (France: Provence, Le Mees), 1 male, 1 female (France: Nizza), 1 male, 1 female (France: Maritime Alps, Pigna), 1 female (Italy: Ormea), in Senckenberg Staatsammlung (Munich-Germany).



Map 2

1: *Papilio alexanor alexanor*; 2: *Papilio alexanor destelensis*; 3: *Papilio alexanor radighierii*
 ■ : type locality

Plate 1

1: *Papilio alexanor alexanor* HT: Original image by Esper

2: *Papilio alexanor alexanor* f. *couleti* HT: [France], Digne, Aug.[uste], Coulet, 1905, BMNH, Type collection (reproduced by kind permission of the Trustees of the Natural History Museum, London)

3: *Papilio alexanor alexanor* f. *augustinus* HT: [France], Digne, Aug.[uste], Coulet, 1905, BMNH, Type collection (reproduced by kind permission of the Trustees of the Natural History Museum, London)

4: *Papilio alexanor alexanor* male: Francia, Valle di Freissinaire, Pallon, m. 1200, VII.1989, coll. Bollino

5: *Papilio alexanor alexanor* female: France, Nice, [no further data], coll. Bollino

6: *Papilio alexanor alexanor* male: France, Haute Alpes, Vallouise, m. 1330, 30.VI.1984, ex. Coll. Charmeux, coll. Bollino

7: *Papilio alexanor alexanor* male: [France], Col di Tenda, 1/5/96, coll. Sala

Note: specimens 2-7 are life-sized.



Plate 1

Plate 2

1: *Papilio alexanor alexanor* female: [France], Col di Tenda, m. 700, 26/7/94, coll. Sala

2: *Papilio alexanor alexanor* female: France, Vaucluse, Montagne de Luberon, m. 800, 6.VI.87, lg. Bertaccini, coll. Bollino

3: *Papilio alexanor radighierii* HT male: Piemonte, Valdieri (CN), 24.VI.1989, 600-800 m., coll. Sala

4: *Papilio alexanor radighierii* PT female: Piemonte, Val Gesso (CN), Valdieri, coll. Bollino

5: *Papilio alexanor radighierii* male form: Piemonte, Val Gesso (CN), 15/6/99, coll. Sala

Note: all specimens are life-sized.



Plate 2

2) *Papilio alexanor destelensis* Nel & Chauliac, 1983

plate 3, figs. 1-3

Original description: Une nouvelle sous-espèce de *Papilio alexanor* Esper isolée dans la Provence méridionale. *Alexanor*, 13(1): 16-20

Type material: Holotype male and allotype at Muséum national d'Histoire naturelle de Paris (France). Paratypes: 28 males and 12 females in collections Nel, Chauliac, Bigot, Willien and Hébrard.

Type locality: Sainte-Anne-d'Evenos, Var Prov., France

Distribution: its authors, to avoid any danger due to overcollecting did not indicate the exact distribution of the subspecies. Apparently it exists in three well-established populations at least, in southern Var, around Toulon. Map 2.

Localities:

France

Var: Sainte-Anne-d'Evenos.

Flight period: as reported by Nel & Chauliac, the subspecies flies from 10th of May until 10th of June.

Description: the subspecies has a larger size than typical *alexanor*, and a deeper yellow ground colour, especially in males. Anal spot of hindwings more orange, instead of red ochre like in *a. alexanor* and *a. radighierii*. Black bands of both fore and hindwings larger than in *a. alexanor*, especially the basal band of Fws at vein 1B.

Material examined: photographs of holotype male and allotype female (France: Var, Sainte-Anne-d'Evenos) in Mus. Nat. Hist. Nat., Paris (France); 2 males (France: Var, environs de Toulon) in coll. Bollino (Lecce, Italy); 5 males, 1 female (France: Var, Le Broussen, Gourдум A.M, Bouyon A.M.) in coll. Sala (Salò, Italy).

3) *Papilio alexanor radighierii* Sala & Bollino, 1991

plate 2, figs. 3-5

Original description: *Papilio alexanor* Esper from Italian Maritime Alps: a new subspecies. *Atalanta*, 22(2-4): 75-79, plates XVII-XVIII

Type material: Holotype male in coll. Sala, Salò (BS), Italy. Paratypes: 51 males and 34 females in collections Sala, Bollino, De Castro, Cortese, Forte, Crnjar and Giacomazzo.

Type locality: Val Gesso (Cuneo Prov.), Piedmont, Italy.

Distribution: restricted to the eastern slopes of Italian Maritime Alps (Val Gesso, Val Stura). Map 2.

Cuneo Prov.: Val Gesso, S. Giacomo di Entracque; Val Gesso, Valdieri; Val Stura, Vinadio; Entracque.

Flight period: normally in the second half of June and first half of July.

Description: *Papilio alexanor radighierii* shows a highly melanic pattern, very similar to the balcanic populations. It is larger in size both than typical *alexanor* and *alexanor destelensis*. The yellow ground colour is much deeper than in *a. alexanor*, and deeper too than in *a. destelensis*. Black bands very wide. "Distinctive characters of *radighierii*: Forewings with very broad marginal and submarginal black bands, the latter always beginning before R4-R5 branching off. A constant and typical feature in nearly all *radighierii* specimens is the thin design of the yellow postmedian band that is comma shaped in ce R3 and ce R5....The three cellular black bands are wider than in nominal subspecies....Hindwings almost always (95% of our specimens) lacking the yellow submarginal lunule in ce SC+R1, on the contrary of nominal subspecies and *a. destelensis*. Moreover the yellow submarginal band is so separated from the margin that the resulting black space is twice wider than in French subspecies" (Sala & Bollino, 1992).

Material examined: type material, including 10 males, 4 females in coll. Bollino (Lecce-Italy), 14 males, 7 females in coll. Sala (Salò-Italy), 3 males, 3 females in coll. De Castro (Como-Italy), 19 males, 16 females in coll. Cortese (Cuneo-Italy), 1 male in coll. Crnjar (Cagliari-Italy), 4 males, 4 females in coll. Forte (Torino-Italy), 1 male in coll. Giacomazzo (Venezia-Italy). Further material not included in the type series: 5 males, 2 females (Piemonte: Cuneo Prov., Entracque, Limone Piemonte) in coll. Sala (Salò-Italy); 1 male, 1 female (Val Gesso- Valdieri) in coll. EMEM (Marktleuten- Germany); 1 male, 1 female (idem) coll. Rose (Mainz- Germany); 2 males (idem) in coll. Vitale (Lecce- Italy); 2 males (Piemonte: Cuneo Prov., Limonetto), ex coll. Pozzi-Montandon, in coll. Museo St. Nat. (Milano-Italy); 1 male (Piemonte: Cuneo Prov., Entracque) ex coll. Baldizzone in coll. Museo Civ. St. Nat. Verona; 1 male, 1 female (Val Gesso-Valdieri) in coll. D'Alessandro (Napoli-Italy); 3 males, 2 females (Piemonte: Cuneo Prov., Entracque) in coll. Sala (Salò).

4) *Papilio alexanor* ssp.

plate 3, figs. 4-6

Papilio alexanor from southern Italy is known on the basis of only a few specimens, collected during a period of about seventy years! The most recent capture of a male was done in 1980 by Henriksen near Linguaglossa, and a second male was observed on the same occasion. No other specimens are known from S.Luca d'Aspromonte. Recently an exciting capture was done near Morano (Cosenza Prov.) by Mr G. Gulli in June 1985. He reports that he collected a worn female while it was laying eggs on a small yellow-flowered Umbellifera. He also succeeded in breeding a small series of specimens from the wild collected eggs. The locality, placed on the southern slopes of Monte Pollino, was visited by the authors repeatedly for four years, to confirm the relevant report, but in vain! Surely the biotope is reminiscent of those favoured by *alexanor*, but we were not able to capture or see any specimen. From a biogeographical point of view, the presence of *Papilio alexanor* in other southern Italian localities (in addition to the known ones in eastern Sicily and southern Calabria) is highly expected, as the species surely arrived to the present localities from just along the mountain ranges of Basilicata and Calabria. For unknown reasons the southern Italian populations are exceedingly rare, and their poorly known distribution is to be linked to their scarcity. Their direct derivation from Greek and Albanian populations is evident from the analysis of the few available specimens, although some morphological features suggest a local subspecific differentiation. Affinities between Balkan and southern Italian faunas are commonly observed in various groups of insects. If we consider, for example, local populations of *Carabus* (s.l.) sp. (Coleoptera, Carabidae), some species with a trans-adriatic or trans-ionic distribution will be found. This is the case of *C. (Oreocarabus) preslii* Dejean, with the nominate subspecies present in Peloponnesus and subspecies *neumoeyeri* Schaum widespread both in Albania, Western Greece and southern Italy (Basilicata and Calabria); or *C. (Chaetocarabus) lefebvrei* Dejean, usually considered as having more affinities with Greek species of the same subgenus than with central European *C. (Chaetocarabus) intricatus* Linnaeus (Casale, Sturani e Vigna Taglianti, 1982).

Localities:

Italy

Cosenza Prov.: Mt Pollino, above Morano

Catania Prov.: Nizza di Sicilia; Linguaglossa; Taormina.

Reggio Calabria Prov.: S.Luca

Distribution: southern Italy: Calabria, Sicily. Map 3

Flight period: Henriksen found his fresh specimen at the end of May, while Turati received one worn specimen from S. Luca (Calabria), collected at the end of May, and Stauder found one more worn specimen in the same area at the end of June. Gulli found the flown female on Mt Pollino on 11th of June.

Material examined: 1male from Mt. Etna, ex coll. Henriksen, 1 female from Morano, in coll. Bollino (Lecce - Italy) and 1 female from Morano, ex ovo, in coll. Sala (Salò - Italy).



Map 3
Papilio alexanor ssp.

Plate 3

- 1: *Papilio alexanor destelensis* HT: [France], Var, Ste. Anne d'Evenos, 314 m., 24.05.1980, lg. Nel Jacques (reproduced by kind permission of the Trustees of the National Natural History Museum, Paris)
- 2: *Papilio alexanor destelensis* AT: [France], Var, Ste. Anne d'Evenos, 314 m., 31.05.1980, lg. Nel Jacques (reproduced by kind permission of the Trustees of the National Natural History Museum, Paris)
- 3: *Papilio alexanor destelensis* male: France, Var, env. Toulon, 25/V/88, coll. Bollino
- 4: *Papilio alexanor* ssp. male: Italien, Etna, 21.5.1980, lg. Henriksen, ex coll. Henriksen, in coll. Bollino
- 5: *Papilio alexanor* ssp. female: Calabria, Cosenza, Mt. Pollino, above Morano, m. 800, 15.VI.86, ex ovo, bred by Gulli, coll. Sala
- 6: *Papilio alexanor* ssp. female: Calabria, Cosenza, Mt. Pollino, above Morano, m. 800, 11.VI.86, ex ovo, bred by Gulli, coll. Bollino

Note: all specimens are life-sized.



1



2



3



4



5



6

Plate 3

5) *Papilio alexanor atticus* Verity, 1911

plate 4, figs. 1-6; plate 5, figs. 1-5

Original description: *Rhopalocera Palaearctica*, Suppl.:294

Type material: Syntype male in coll. Museo Zool. La Specola, Firenze (Italy)

Type locality: Graecia, Attika.

Synonymy:

magna Verity, R., [1911]-*Rhopalocera Palaearctica*: 294, pl.LII, fig.1

adriatica Schawerda, K., 1913- Zwei herzegowinische Lokalrassen. *Jb. ent. Ver. Wien*, 23(1913): 211-212

graecus Schmidt, E., 1989- Eine neue Subspecies von *Papilio alexanor*. *Ent.Z.*, 99(20):300 -302

Distribution: along the Yugoslavian coastal areas from Istria and Dalmatia south to Montenegro, Albania, Yugoslavian Macedonia, western and southern continental Greece, Corfu and Cefalonia Islands, Peloponnesos. Map 4

Localities:

Croatia

Pisino; Istria, Krk Island.

Dalmatia

Gravosa; Castelveccchio; Riviera sette Castelli; Traù I.

Hercegovina-Montenegro

Gacko; Vucija bara; Spalato; Biokovo Massiv; Boljevici; Skutari Sea;Cettinje.

Macedonia

Treska Matka; Titov Veles.

Albania

Skutari Sea; Kacinjeti; Korce; Vijosë-south of Berat; Berat; Valona; Saranda; Butrint; Stillo.

Greece :

Macedonia: Mt. Askion; Mt.Gramos; Koridallós

Epirus: Mt.Gamilla; Mts. Agrafta; road Ioannina-Katara Pass; Mt. Smolikas; Parga; Pyrsogianni; Kapakli; Asfaka; Gourpiani

Central Greece and Euboea: Delphi; Mt. Parnassus; Arachova; Mt. Hymettus; Mt. Parnis; Acrocorintho; Mt. Iti; Acarnanien; Mt. Tymphristos; région de Corinthe; Valimi; Mt.Pateras; Mt.Pendeli

Thessaly: Rapsani; Skala; Olympos, Pinios Valley

Ionian Islands: Kephallonia: Argostoli, Ag. Irini, Ag.Giorgiou; Corfu: Mt.Pantokrator

Peloponnesos: Chelmos; Megaspileion; Kalavryta; Olympia; Mycènes; Mistrà; Mt. Taygetos; Epidauros; Gythion; "Ostkuste Peloponnesos"; Klitoria; Tripolis; Sparti; Vouraikos; Mt. Panachaiko; Mt. Oligirtos; Lafka.

Roumania

Floreasca Sea (?).

Flight period: usually the subspecies flies during May, but early males can be seen in April (and exceptionally in March) and females are easily on the wing in June-July. This happens especially on Pindus Mt., where fresh specimens were collected at the beginning of July. In any case, the best period to encounter the species is the second half of May.

Description: specimens belonging to this subspecies are normally easily identifiable by their melanic appearance. Wings show highly wide black bands, deep yellow ground colour and usually thin anal red spots of HWs. Marginal black bands of FWs are especially wide, as are the postmedian and marginal black ones of HWs. Submarginal yellow bands of both wings with black marked veins.

Material examined: 1 male (syntype of ssp. *attica*, Verity) (Graecia: Attica [illegible]), 1 female (syntype of ssp. *magna*, Verity) [Yugoslavia] (Dalmatia: Gravosa), 1 female (Greece: Olympos), ex coll. Verity, in coll. Museo Zoologico La Specola (Firenze-Italy); 1 male, 3 females (Yugoslavia: Melfi, Gacko, Krk I.), 12 males, 3 females (Albania: Saranda, Valona), 35 males, 24 females (Greece: Parga, Pindus, Chelmos, Mistra, Taygetos, Palaeoepidauro) in coll. Bollino (Lecce-Italy); 2 males, 1 female (Yugoslavia: Dalmatia); 24 males, 9 females (Greece: Parga, Koridallos, Epirus, Delphi, Sparta, Mistra, Taygetos, Kalavryta, Palaeoepidauro, Parnassos, Pinios Valley); 1 male, 1 female (Albania: Valona) in coll. Sala (Salò-Italy); 1 female (Yugoslavia: Gravosa); 11 males, 9 females (Greece: Epidauros, Taygetos, Chelmos, Delphi, Kalavryta, Arachova) in coll. EMEM (Marktleuthen-Germany); 13 males, 16 females (Albania: Valona, Stillo, Butrint) in coll. Museum Nat. Hist. (Tirane-Albania); 1 female (Greece: Gourpiani) in coll. Floriani (Milano-Italy); 5 males, 3 females (Greece: Delfi, Chelmos); 1 male (Yugoslavia: Treska) in coll. Rose (Mainz-Germany); 5 males, 3 females (Greece: Saloniki, Attica; Dalmatien, Gravosa) in coll. Racheli (Rome-Italy); 2 males, 4 females (Greece: Theben; Dalmatien: Gravosa) in Forschungsinstitut Senckenberg (Frankfurt am Main - Germany); 2 males, 2 females (Dalmatia), 1 female (Dalmatia: Zara), 3 males, 4 females (Dalmatia: Gravosa), 1 male, 2 females (Dalmatia: Melfi), 1 male (Dalmatia: Ragusa), 1 male (Dalmatia: Cattaro), 1 female (Dalmatia: Lusa), 1 male (Macedonia: Treska Matka), 2 males, 2 females (Macedonia: Veles), 5 males, 2 females (Greece: Zachlorou), 5 males, 1 female (Greece), 1 male ([Greece]: Sparta), 1 male, 1 female ([Greece]: Kalavryta) in Senckenberg Staatsammlung (Munich-Germany).



Map 4
Papilio alexanor atticus; ■: type locality

Plate 4

1: *Papilio alexanor atticus* ST male: Graecia, Attika, coll. Verity (reproduced by kind permission of the Trustees of the Natural History Museum, Florence)

2: *Papilio alexanor magna* ST female: Dalmatia, Gravosa, coll. Verity (reproduced by kind permission of the Trustees of the Natural History Museum, Florence)

3: *Papilio alexanor atticus* male: [Yugoslavia], Dalmatia, Melfi, VI/69, coll. Bollino

4: *Papilio alexanor atticus* female: [Yugoslavia], Dalmatien, Malfi, VI.1969, ex coll. Krrüger, coll. Bollino

5: *Papilio alexanor atticus* male: Albania, Vlorë Prov., Jonufër, m.20, 21.05.93, lg. & coll. Bollino

6: *Papilio alexanor atticus* female: Albania, Vlorë Prov., Jonufër, m.20, 21.05.93, lg. & coll. Bollino

Note: all specimens are life-sized.

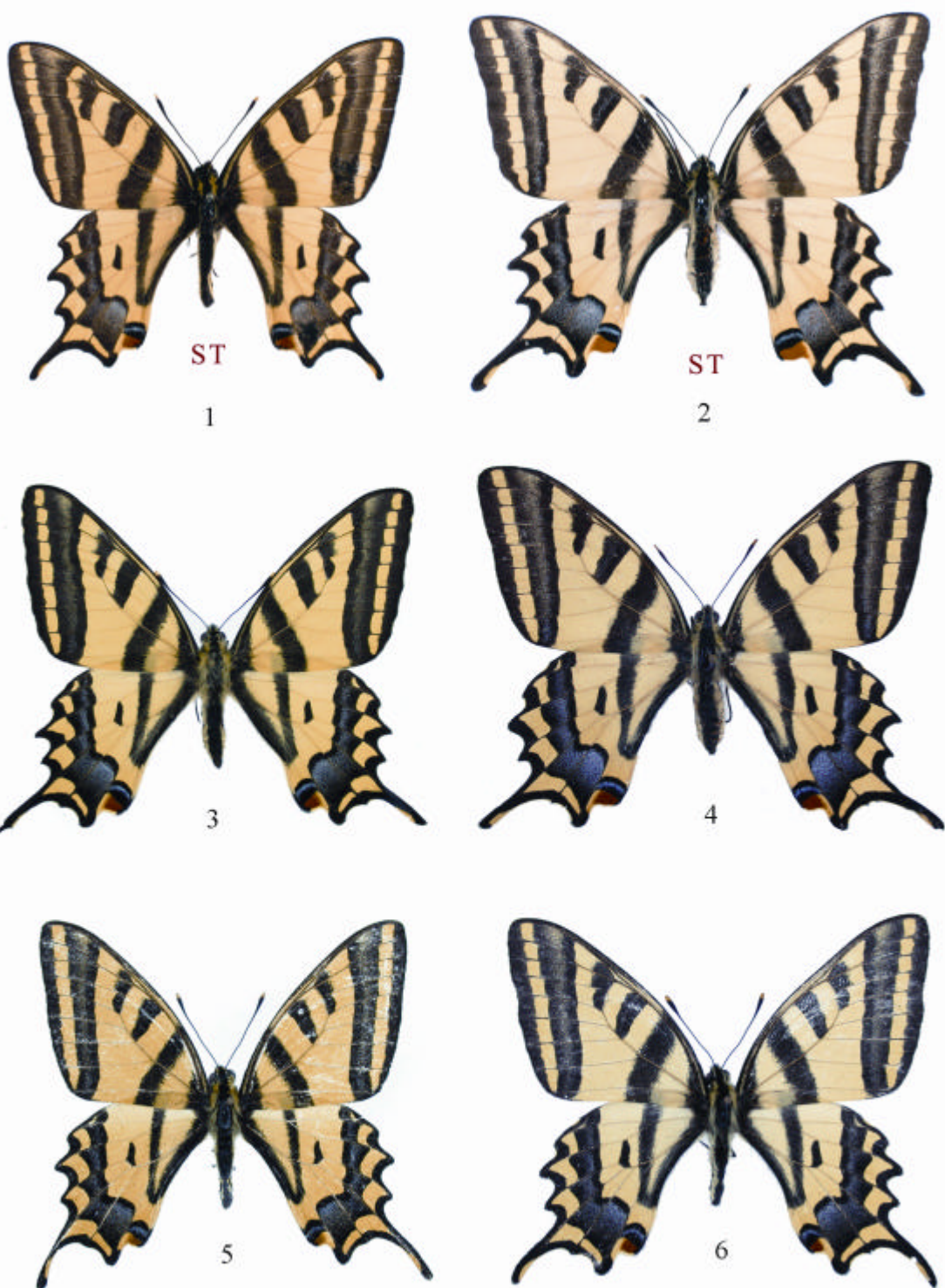


Plate 4

Plate 5

- 1: *Papilio alexanor atticus* male: Greece, Preveza, near Parga, m. 185, 29/IV/90, legit & coll. Bollino
- 2: *Papilio alexanor atticus* female: Greece, Preveza, near Parga, t.50, 26.V.87, legit Huber, coll. Bollino
- 3: *Papilio alexanor atticus* male form: Greece, Mt. Olimpo, NE slope, 26/V/90, coll. Sala
- 4: *Papilio alexanor atticus* male: Greece, Peloponnesos, Ano Diakoftò, Chelmos, m. 700, 25/V/90, legit & coll. Bollino
- 5: *Papilio alexanor atticus* female: Greece, Peloponnesos, near Sparta, Mistrà, mt.400, 25.V.85, legit & coll. Bollino

Note: all specimens are life-sized.

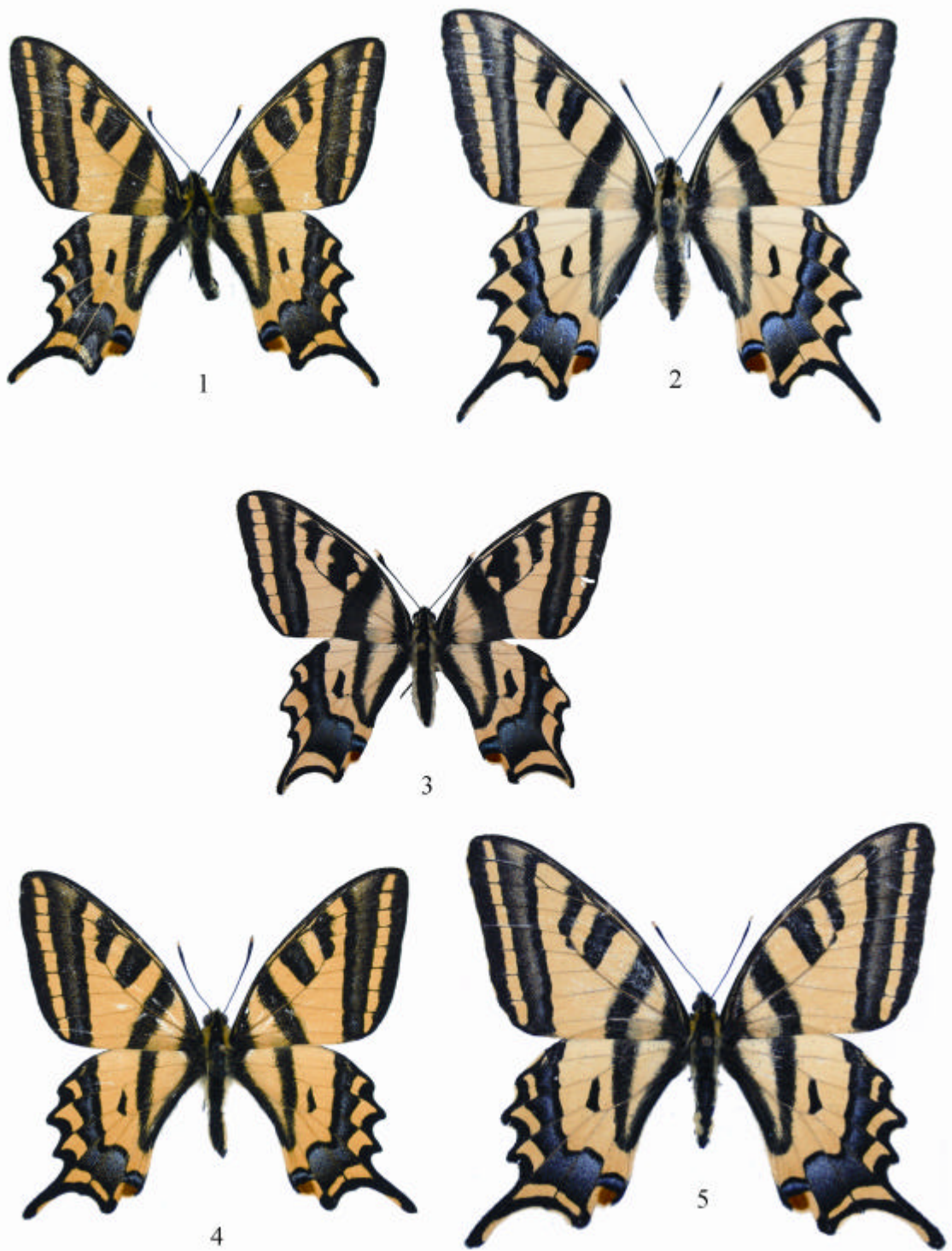


Plate 5

6) *Papilio alexanor eitschbergeri* Bollino & Sala 1992

plate 6, figs. 1-4

Original description: *Papilio alexanor eitschbergeri*, a new subspecies from Samos Island (Greece) and Western Turkey. *Atalanta*, 23(1/2):127-131, pl. VII

Type material: Holotype male in coll. Bollino, Lecce (Italy). Paratypes: 76 males and 71 females in collections Sala, Bollino, Wagener, Eitschberger, Huber and Garrevoet.

Type locality: Samos Island, Manolates (Greece)

Distribution: Samos Island and Lesbos I. (Greece), western Turkey (from southern coast of Marmara Sea to Bafa Lake in the South). Map 5

Localities:

Greece

Egean Islands: Samos Island; Samos: Pythagorion, Pandrosson, Pirgos, Kastania, Ag. Zoni, Iraion, Marathocampus; Lesbos I.; Nysiros I.: Mandraki.

Turkey

Canakkale Prov.: 3 Km W of Kucükküyu.

Balikesir Prov.: 4 Km SSE Bigadiç.

Bursa Prov.: Brussa; Bursa Prov.; Bozbürün Kaplakli.

Izmir Prov.: Izmir Sud; Serinse; Selçuk; Camlik bei Selçuk.

Flight period: usually the last third of May, with earliest specimens at the end of April and worn females in mid June.

Description: "*Papilio alexanor eitschbergeri* is surely that population, where the biggest sizes are attained..... The..subspecies is moreover the lightest in colour. It can be separated from the nearby *alexanor judaeus* on the basis of some quite constant characters: black bands of FWs with few blue scaling, whereas in *judaus* the blue scales are usually abundant; black FWs' postmedian band always separated from R4-R5 branching off, whereas in *judaus* black scales reach that area; yellow submedian band with well marked veins, especially in the tornal area; black marginal lunules of HWs much wider than in *judaus*" (Bollino & Sala, 1992). We provisionally consider as belonging to this subspecies also the only known specimen from Lesbos Island, not checked by us, given the very close position of such isle to the Western Turkish coast, and appearing very unlikely that a different population could arise on such area.

Material examined: type material, including 15 males, 13 females in coll. Bollino (Lecce - Italy), 3 females in coll. Wagener (Bocholt-Germany), 1 male, 6 females in coll. Sala (Salò-Italy), 59 males, 47 females in coll. EMEM (Markt-leuten-Germany), 1 male, 1 female in coll. Garrevoet (Antwerpen-Belgium), 1 male, 1 female in coll. Huber (Scharten-Austria). Further material not included in the type series: 8 males, 5 females (Turkey: Bafa Golu, Kucükküyu) in coll. Bollino; 2 males, 1 female (Greece: Samos Island) in coll. Rose (Mainz-Germany); 34 males, 22 females (Greece: Samos) in coll. EMEM; 1 male (Greece: Samos) in coll. D'Alessandro (Napoli-Italy).

7) *Papilio alexanor judaeus* Staudinger, 1893

plate 6, figs. 5-7

Original description: Ueber Namens-Aenderungen. Deut.Ent.Zeit. (Iris), 6: 368-369

Type material: holotype male in Museum für Naturkunde, Berlin (Germany)

Type locality: Umgebung Jerusalem.

Synonymy:

maccabaeus Staudinger, O., 1891 - Neue Arten und Varietäten von Lepidopteren des palaarktischen Faunengebietes. Dt. Ent. Z. Iris, 4(2): 224-339 [1892]

Distribution: Lebanon, Israel, Jordan, and Syria (?). Map 5

Localities:

Lebanon

Ain Zhalta; Faitroun; Falougha; Jisr el Qadi.

Israel

Mount Carmel; Mount Gilboa; Judean Mts.; near Sea of Galilee; West Side of Genezareth Sea; Mount Hermon.

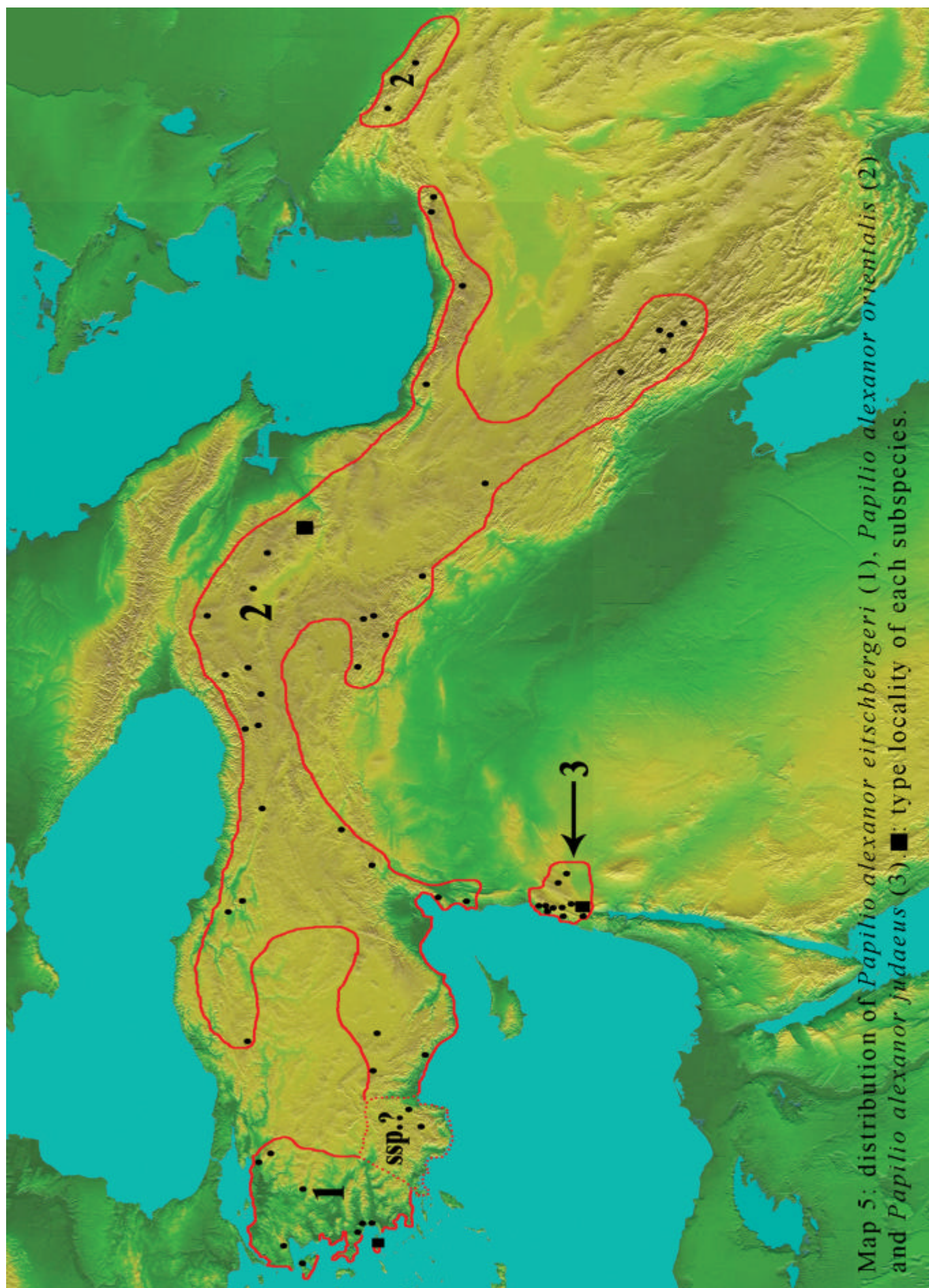
Jordan

Ain Sinia; Nebi Samwil; Jerusalem, Joseph's Cave; West Jordan, Wadi Kufrinja; East Jordan, Wadi Kafringi and Wadi Zerqa.

Flight period: this subspecies has surely the most differing periods, depending on the flight locality. While in Lebanon it can be seen during May-June, with a main period in the second half of May and first half of June, in Israel and Jordan specimens are on the wing at the end of March - beginning of April. Daniele Baiocchi (pers. comm.) collected only worn specimens on April 1st on Hare Gilboa and Bozano (1990) netted a very worn female at Wadi Kufrinja (Western Jordan) on 21st of March. Finally, Westphal (pers. comm.) collected worn specimens in Israel at the end of March.

Description: De Freina (1983) supposedly shows differences between *alexanor orientalis* and *alexanor judaeus*, but he apparently considered, as *judaus* material, specimens coming from western Turkey now described as *alexanor eitschbergeri*, thus confirming, about nine years before the original description, the validity of a western Turkish subspecies. Significant series of typical *judaus* from Israel and *orientalis* from Armenia show that main differences can be found in submarginal black bands of FWs, that of *judaus* being narrower than in *orientalis* and with parallel edges, while in the latter, usually, the external edge is straight, and the inner one is convex between cubital and median band. Profile of FWs is slender in *orientalis*, while in *judaus* is somewhat squat, showing a modification of costal bending approximately at the inner edge of submarginal black band. Moreover margins of HWs are highly festooned in both subspecies, but in *orientalis* are more sickle-shaped and with a rounded apex, especially in females, while in *judaus* each "festoon" has more straight margins and a sharp apex.

Material examined: photographs of holotype male and 1 paratype male ([Palestine]: Jerusalem) ex coll. Staudinger in Museum für Naturkunde, Berlin; 4 males, 3 females (Israel: Hare Gilboa) in coll. Bollino (Lecce, Italy); 1 female (West Jordan: Wadi Kufrinja) in coll. Bozano (Milano, Italy); 1 male, 2 females (Israel: Palestine, Hare Gilboa, El Quinteyra) in coll. Sala (Salò, Italy); 1 female (Lebanon: Beyrouth) in coll. EMEM (Marktleuthen, Germany); 1 male (Jordan: Gerasalemme), ex coll. Verity, in coll. Museo Zoologico La Specola (Firenze, Italy); 1 male, 1 female (Lebanon: Beyrouth) in coll. Gambusera (Como, Italy); 2 male, 1 female (Israel: Jerusalem) in coll. Racheli (Rome-Italy); 2 male, 3 female (Israel: Jerusalem) in Forschungsinstitut Senckerberg (Frankfurt am Main- Germany); 5 males, 1 female (Palestine), 1 female (without data) in Senckenberg Staatsammlung (Munich-Germany).



8) *Papilio alexanor orientalis* Romanoff, 1884

plate 7, figs. 1-7; plate 8, figs. 1-6

Original description: Les Lepidopteres de la Transcaucasie. Premiere partie. *Mem. Lep.*, 1:1-92

Type material: holotype female in Zoological Institute of Russian Academy of Sciences, St. Petersburg (Russia)

Type locality: Ordub.[ad], [Nachitschewan, Azerbaijan]

Synonymy:

voldemar Kreuzberg, A.V.A., 1989 - New subspecies of Papilionids and Whites (Lepidoptera, Papilionidae, Pieridae). *Vstn. zool.*, 1989(6):31-41 (in Russian) **syn.nov.**

Distribution: from northern-central Turkey to Turkish Armenia, South to Kurdistan and north-eastern Iraq, East to Russian Armenia, western and northern Iran, western Turkmenistan (Kopet Dag), Uzbekistan, West Tyan-Shan Mts, Pamir (?). Maps 5-6

Localities:

Turkey

Ankara Prov.: Ankara; Kizilçahamam; Cal Dagı.

Isparta Prov.: Davraz Dag

Amasya Prov.: vic. Amasya; Amasya Prov.

Tokat Prov.: Turhal.

Erzincan Prov.: Kizil Dag, vic. Akarsu.

Antalya Prov.: Döşemeatlı, Cubuk Bogazi; Alanya; Akseki, Dikmen Köyü,

Konya Prov.: Akschehir; Sultan Dag.

Adana Prov.: Aolugh bei Chanziri.

Içel Prov.: Gülek; Yeniyuruk.

Malatya Prov.: 30 km W Malatya.

Maras Prov.: West Marash; vic. Agabeyli; Maras Prov.

Nigde Prov.: Ala Dag

Hatay Prov.: Das Dag bei Alexandrette; vic. Belen, Belen Geçidi.

Bayburt Prov.: Kopdagi Gecidi.

Erzurum Prov.: Soganlı Dag, Ovit Geçidi; Çairözü; Çoruh-Tal; 3 km W Yesildere; 35° km road Erzurum-Tortum; Cobandede.

Iğdir Prov.: Ak Bulak.

Artvin Prov.: Kaçkar Dagları, Umgebung Heveg.

Kars Prov.: vic. Sarikamis; 30 km ENE Horasan.

Ardahan Prov.: Göle.

Van Prov.: various places ENE Çatak; Kurubas Gecidi.

Hakkâri Prov.: Hakkâri Dagları; near Hakkâri; 10 km E Geçitli; Zap-Tal, 10-18 km SW Hakkari; Tah-Tal.

Sirnak Prov.: Tanintanin Gecidi; Süvarihalil Gecidi.

Russia

Caucasus: Mt Aragaz; Mt Aragac, Amberd River Valley; Mt. Aragac, Biurakan Village; Mt Daralages; Mt Zangezur; env. d'Ordubad; Jerevan; Armenia: Arzni.

Iraq

Kurdistan: Rayat.

High Mountains [no further data]

Iran

Azerbaijan: Azerbaijan

Kermanshah: Jallalyvand Spring

Mazandaran: Elburs; Marzanabad; Schahrud; Hadschyabad; Gorgan, Golestan National Park.

Fars: Fars; Ardekan; Shiraz; road Shiraz-Ardekan; Kuh-e-Barfi & Kuh-e-Bamu

Zanjan: Zereshk, 20 km North of Quazvin

Turkmenistan

Central Kopet Dag: Ashkhabad; Western Kopet Dag: Syunt -Khasardagsky Reserve, Ioldere Gorge, Saparklytsch Gorge and Aidere Gorge; Kopet Dag.

Kazakhstan

Karatau Mts., Karabastau Pass; idem, Kentau Pass and Bayzhansay.

Uzbekistan

Karzhantau Mts.: Kardzantau Ridge; idem: Aktash and Alytshek - Kurgan Pass; Tshatkal Mts.: Yangikurgan Pass; idem: Tschatkalskij; idem: Tshimgan, Shabrez Gorge, Masarssaj Pass, Akssak-ata Pass; Kuraminsky Mts.: Kuraminski; idem: springs of Angren River; Ugam Mts.: Ugamskij; idem: Anaulgan Pass and Khumsan village; Turkestan Mts.: Turkestanskij; idem: Kanigut Mts.; Pskemskij; Karykurt Ridge, Kokbel Pass; Kotsuysky Mts.: Brytshnulla village; Nuratau Mts.:Khayatsay.

Western China

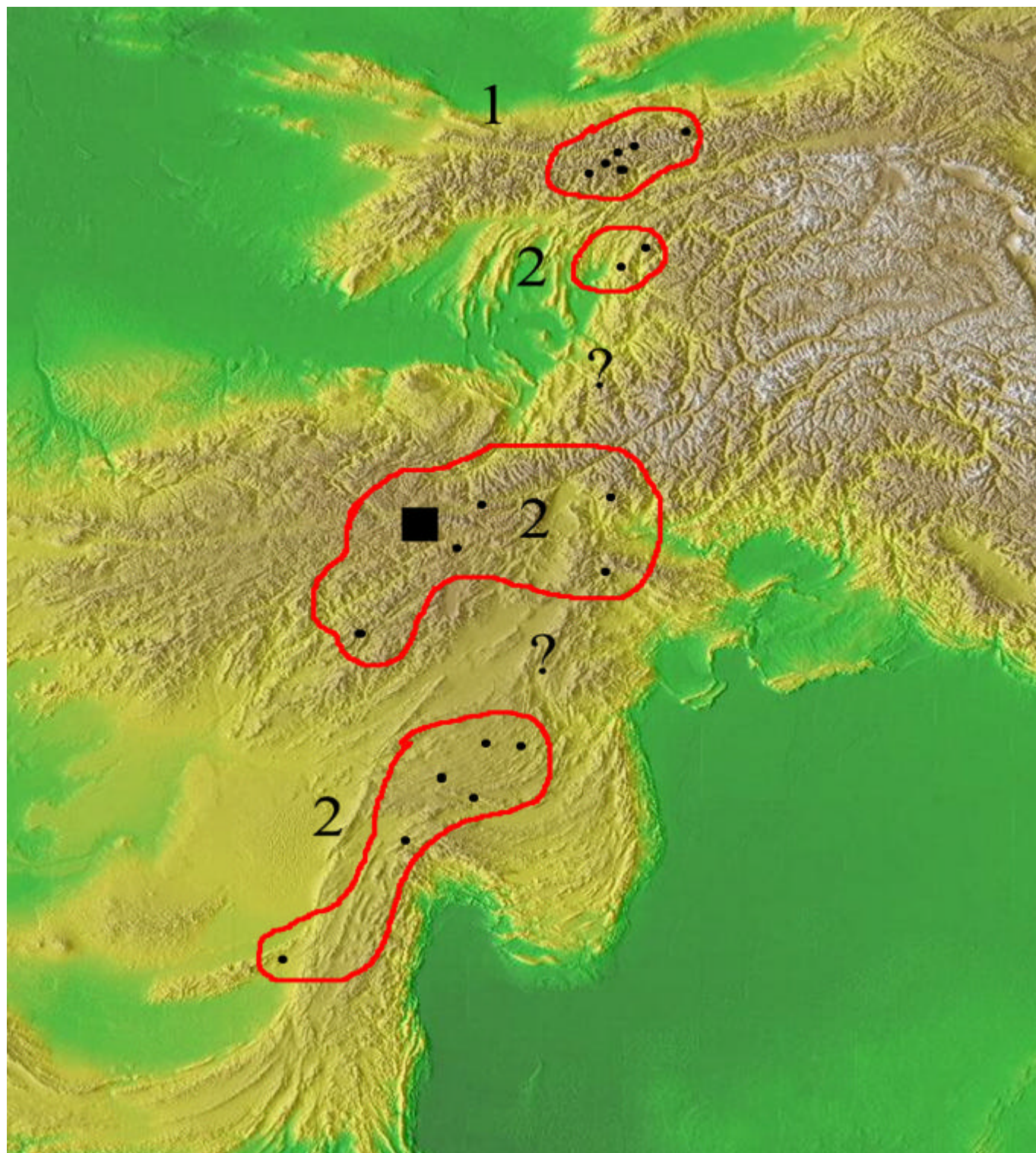
Alpheraky (1910) reports *P. alexanor* from Talkin Valley, between Kuldja and Sayram-Noor. Apparently he only saw one specimen, but did not catch it. Lukhtanov (in litt.) retains this observation very uncertain. If confirmed, this locality will probably represent the easternmost population of the species, very isolated from the range of ssp. *orientalis*.

Flight period:the best period to find the species in north-eastern Turkey is the first week of July, but in the same biotope is possible to find both freshly emerged and worn specimens. In south-eastern Turkey and Northern Iran (Kermanchahan, Azerbaijan, Mazanderan) the species flies about two weeks earlier, while in Southern Turkish coastal biotopes and Fars (South-western Iran), probably due to the climate, the species is on the wing at the end of May. Wiltshire reports his specimen from Rayat as collected on 24th June. Tshikolovets (in litt.) gives dates of material from Turkmenistan (Kopet Dag) in his own collection, ranging from 30th of April to 20th of May. We have few field data on Uzbekistan populations. From the available material, literature and personal communications (Tshikolovets, in litt.) we can assume that it flies during all of June, with the earliest specimens at the end of May and the worn ones at the beginning of July.

Description: ground colour light yellow, with well contrasted black bands. Like in other eastern subspecies, black bands are highly suffused with blue scales and median cellular black band is wide and almost rectangular. We provisionally consider as *P. alexanor orientalis* also specimens coming from Southern Turkey (Antalya, Konya, Maras and Antakya Provinces), also if they show a divergent pattern from nearby populations of the same subspecies. In particular the yellow ground colour is darker and the black bands of forewings wider. Populations from Western Uzbekistan were recently described as a new subspecies by Kreuzberg (1989). We compared material from this area with significant series from Turkey, Iran, Russian Armenia and Turkmenistan not finding any constant character to discriminate the new subspecies. We observed a cline ranging from Central Turkey to Uzbekistan, with specimens having a clearer ground-colour and black bands less extended and less contrasting in eastern populations. Blue scaling on black bands is not so evident in specimens from Uzbekistan like in typical *alexanor orientalis* from Turkey or Armenia. Recently received specimens from Turkmenistan (Kopet Dag) show a perfectly intermediate pattern between turkish-iranian and uzbekian populations, so we decided to consider *Papilio alexanor voldemar* Kreuzberg as primary subjective synonym of *Papilio alexanor orientalis* Romanoff.

Material examined: photograph of holotype female of *Papilio alexanor orientalis* Romanoff: (Ordub.[ad]) in coll. Zool. Inst. Russian Acad. Science, St. Petersburg Russia); photograph of holotype male of *Papilio alexanor voldemar* Kreuzberg (Uzbekistan: Karshatau-Gebirge, Aktash) in coll. Zool. Inst. Russian Acad. Science, St.Petersburg (Russia); 15 males, 11 females (Turkey: Kizil Dag, Ispir, Sarikamis, Termessos, Ala Dag, Alanya, road Erzurum- Tortum, Yenyiyuruk); 2 males, 1 female (Caucasus: Eriwan); 15 males, 6 females (Iran: Kermanchahan, Quazvin, Mazanderan); 5 males, 5 females (Uzbekistan:Taskent, Chimgan, Chatkalskij, Pskemskij); 5 males, 1 female (Turkmenistan: Kopet Dag, Kara-Kala and Aidere) in coll. Bollino (Lecce -Italy); 1 male, 1 female (Turkey:Suvarihalil Geçidi) in coll. Huber (Scharthen- Austria); 7 males, 1 female (Turkey: Antalya, Alanya, Termessos);1 female (Iran: Mazanderan) in coll. Rose (Mainz-Germany); 2 males, 4 female (Turkey: Ankara, Alanya, Termessos, Sarikamis, Tortum); 2 males, 1 female (Caucasus: Eriwan); 4 males, 7 female (Uzbekistan: Chimgan, Aktash, Beldersai River); 1 male, 1 female (Turkmenistan: Kopet Dag, Kara-Kala) in coll. Sala (Salò-Italy);; 1 male, 2 females (Turkey: Termessos); 1 male (Turkmenistan: Kopet Dag) in coll. EMEM (Marktleuthen -Germany); 1 male (Turkey: road Erzurum-Tortum); 1 male (Caucasus: Dervesh Mt) in coll. Floriani (Milano- Italy); 2 male

(Turkey: Akscheir, Davraz Dag), ex coll. Pozzi-Montandon, in coll. Museo di Storia Naturale (Milano-Italy); 3 males, 1 female (Turkey: Akscheir), ex coll. Verity, in coll. Museo Zoologico La Specola (Firenze-Italy); 1 female (Südiran: gebiet 10 km nordoestl. Ardekan), 1 female (Nordiran: Elbursgebirge, unterhalb Dizin bei Gachsar) in coll. Hofmann (Limesheim-Germany); 2 female (Turkey: Tunceli, 30 km. S Pulumur), 1 male (Iran: Elburs, Kendevan Pass), 2 males (Armenia: Erivan, Dahrvesh Valley) in coll. Racheli (Rome-Italy); 1 male, 3 female (Turkey: Ankara; Armenia: Alages Mt.) in Forschungsinstitut Senckerberg (Frankfurt am Main- Germany); 1 female (Armenia: Kars), 3 females (Kaukasus), 1 female (Syria: Aleppo), 2 male, 3 females (Syria: Taurus, Marasch), 3 male, 1 female (Akschir) in Senckenberg Staatsammlung (Munich-Germany).



Map 6

1: *Papilio alexanor orientalis* (= *voldemar*); 2: *Papilio alexanor hazarajatica*

■: type locality

Plate 6

1: *Papilio alexanor eitschbergeri* HT male: Greece, Samos Island, Manolates, 22.V.1986, mt.700, legit H.J.Henricksen, coll. Bollino

2: *Papilio alexanor eitschbergeri* PT female: Graecia, Insel Samos, Pyrgos, 1.V-12.VI.1984, lg. Gamehn, coll. Bollino

3: *Papilio alexanor* intermediate male: Turkey, Boz Dag, 28/V/65, coll. Sala

4: *Papilio alexanor* intermediate male: SüdTurkey, Prov. Antalya, Termessos, 500 m., 20-23.05.1991, lg. Rose, coll. Bollino

5: *Papilio alexanor judaeus* HT male: Jerusalem [no more data] (reproduced by kind permission of the Trustees of the Museum für Naturkunde der Humboldt-Universität, Berlin)

6: *Papilio alexanor judaeus* female: Israel, Hare Gilboa, m. 200/400, 2/IV/71, coll. Sala

7: *Papilio alexanor judaeus* female: Jordan, Wadi Kufrinja, 300 m., 21.III.89, lg. & coll. Bozano

Note: all specimens are life-sized.



Plate 6

Plate 7

1: *Papilio alexanor orientalis* HT female: Ordub.[ad], 3.6.[18]81, [Nachitschewan, Azerbaijan], [lg.] Chr[istoph] (reproduced by kind permission of the Trustees of the Institute of Russian Academy of Sciences, St.Petersburg)

2: *Papilio alexanor orientalis* male: Turkey, Kars Prov., 10 km. South of Sarikamis, 1900-2100, 9-11.VII.1990, legit & coll. Bollino

3: *Papilio alexanor orientalis* female: Turkey, Kars Prov., 10 km. South of Sarikamis, 1900-2100, 9-11.VII.1990, legit & coll. Bollino

4: *Papilio alexanor orientalis* male: Iran, Bakhtaran, Kermanchahan, Jalalvand springs, m. 1000, 5-10.6.1992, coll. Bollino

5: *Papilio alexanor orientalis* female: Iran, Zereschk, 20 km. N. Quazvin, 150 km. E Tehran, 6 June '84, coll. Bollino

6: *Papilio alexanor orientalis* female: Iran, Yasuj region, Kuh-E-Dinar Mts., Meinmand, m. 2450, 31/5/2000, coll. Sala

7: *Papilio alexanor orientalis* male: U.d.S.S.R., Caucasus, Eriwan, 10.06.86, ex. coll. Schulte, coll. Bollino

Note: all specimens are life-sized.

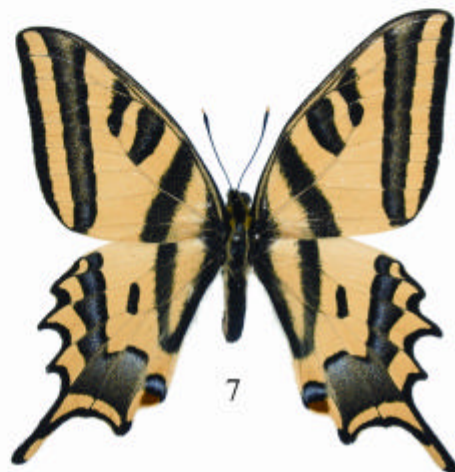


Plate 7

Plate 8

1: *Papilio alexanor voldemar* HT male: Uzbekistan, Karshatan Range, Aktash, lg. V. Kreuzberg (reproduced by kind permission of the Trustees of the Institute of Russian Academy of Sciences, St.Petersburg)

2: *Papilio alexanor orientalis* female: Turkey, Erzurum Prov., Ispir, 16-18.VII.88, lg. Charmeux, ex. Coll. Charmeux, coll. Bollino

3: *Papilio alexanor orientalis* male: Turkmenia, S.W. Kopet-Dag, vic. Kara-Kala, 600 m., 26.04.1991, coll. Bollino

4: *Papilio alexanor orientalis* female: Turkmenia, S.W. Kopet-Dag, vic. Aidere, 1000 m., 1.05.1991, coll. Bollino

5: *Papilio alexanor orientalis* male: Uzbekistan, Pskemskiy Range, Chimgan, m.1850, 25.6.87, coll. Bollino

6: *Papilio alexanor orientalis* female: Uzbekistan, Pskemskiy Range, Chimgan, m. 2200, 16.6.88, coll. Bollino

Note: all specimens are life-sized.

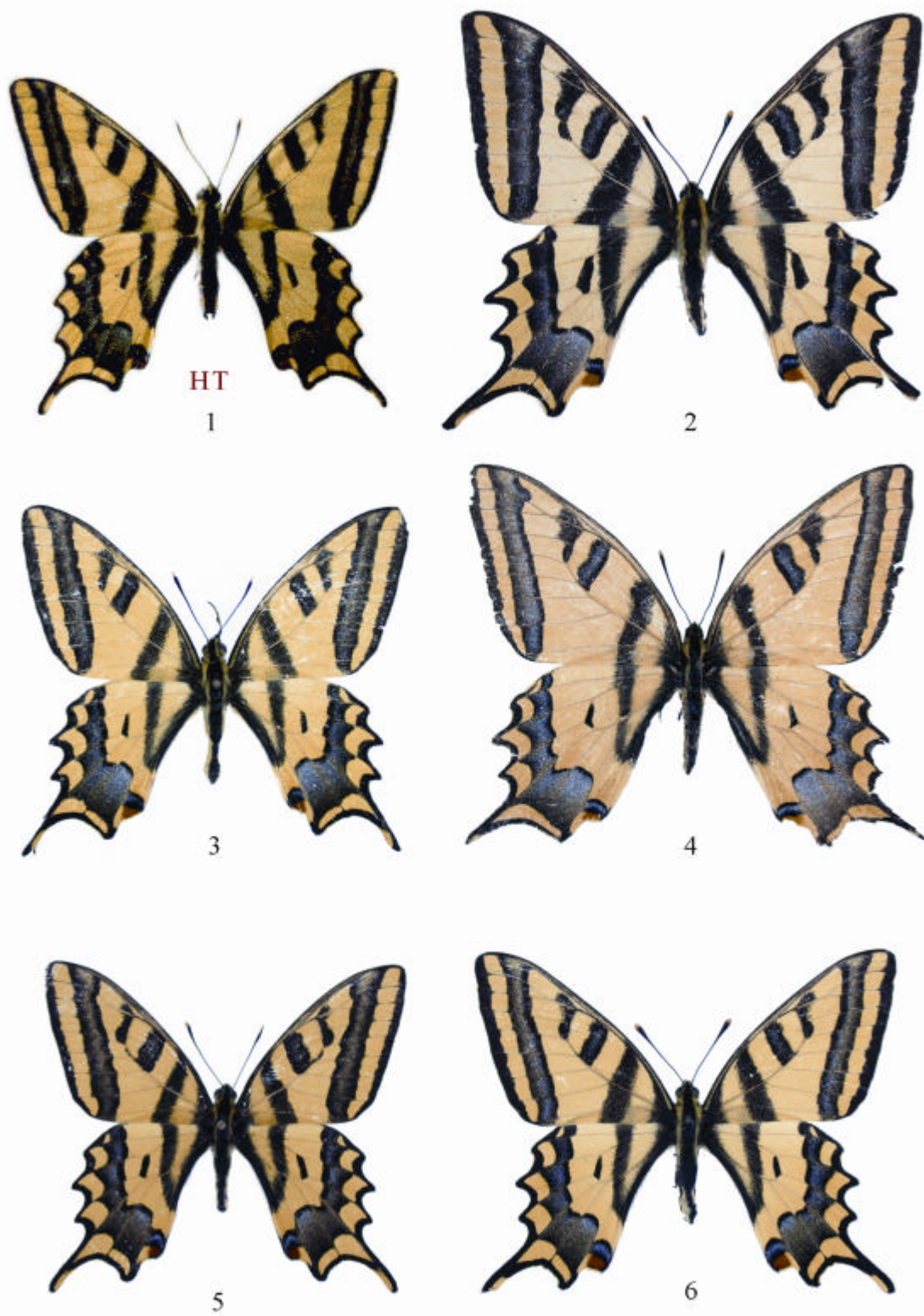


Plate 8

9) *Papilio alexanor hazarajatica* Wyatt, 1961

plate 9, figs. 1-6

Original description: Additions to the Rhopalocera of Afghanistan with description of new species and subspecies. *J. Lep. Soc.*, 15(1):1-18, 3 pls., 1 fig.

Type material: holotype male in Staatliches Museum für Naturkunde, Karlsruhe (Germany)

Type locality: Joshanak Valley, S. of Band-i-Amir, W. Koh-i-Baba Mts., 9500 ft., Afghanistan

Distribution: central and north-eastern Afghanistan, southern Uzbekistan, Tadzhikistan, Pakistan (Baluchistan). Map 6

Localities:

Tadzhikistan

Gissar Mts: Gissar Range; idem: Marguzar; Mts. Peter the Great: Darai-Nasarak Gorge; Farab and Padrud villages; Magian River; Maykhura River; Kondara River.

Alai Mts.: Tandykul

Uzbekistan

Zeravshan Mts.: Sazagan, Aman-Kutan Pass, Zenak village.

Afghanistan

Joshanak, W. Koh-i-Baba; Panjshir Valley; Panjaw; Darunta; Jalalabad; Alingar River.

Pakistan

Baluchistan: Quetta; Zernow Valley.

Flight period: we have very few field information about this subspecies, hence we could establish an emergence period mostly by looking at the dates given in bibliography. In Uzbekistan and Tadzhikistan the species is reported as flying in May-July, and probably has its peak in mid June. In Afghanistan it was mainly collected in the second half of June, but it flies in May at low altitude localities. Eckweiler collected fresh females near Quetta (Baluchistan) in mid May, while Giovanoli saw a specimen flying at about 3.600 mt in Zernow Valley (Pakistan) at the end of July.

Description: the subspecies is distinguishable from nearby populations for the smaller size, the submarginal black band of FW "much wider near the base than at the apex, the exact opposite to the normal, with a large inward bulge between M1 and M3, heavily powered with yellow scales" (Wyatt, 1961). Tails shorter than in other populations.

Material examined: photographs of the type plus 2 males (Uzbekistan: Gissar Range) in coll. Bollino (Lecce-Italy); 1 female (Pakistan: Baluchistan-Quetta) in coll. Rose (Mainz-Germany); 1 female (Pakistan: Baluchistan - Quetta) in coll. Hofmann (Limesheim, Germany); photographs of 1 male (Afghanistan: Alingar River, Laghman) and 1 female (Afghanistan: Panjaw, Koh-i-Baba Mts) in Sakai (1981).

Plate 9

1: *Papilio alexanor hazarajatica* HT male: Afghanistan, Joshanak Valley, W. Koh-i-Baba Mts., 9500 ft., 14.VI.1960, [lg.] Colin Wyatt (reproduced by kind permission of the Trustees of the National museum for natural history, Karlsruhe)

2: *Papilio alexanor hazarajatica* AT female: Afghanistan, Panjao, W. Koh-i-Baba Mts., 93-10500 ft., 26-30.VI.1963, [lg.] Colin Wyatt (reproduced by kind permission of the Trustees of the National museum for natural history, Karlsruhe)

3: *Papilio alexanor hazarajatica* male: Uzbekistan, Gissar Range, m. 2300, 18.VI.1991, coll. Bollino

4: *Papilio alexanor hazarajatica* female: Pakistan, Baluchistan, Quetta Urak, m. 2400-2700, 10-14.V.83, lg. Eckweiler, coll. Hofmann

5: *Papilio alexanor hazarajatica* female: [Pakistan], Baluchistan, Quetta-Kach, 14.4.[19]28, BMNH (reproduced by kind permission of the Trustees of the Natural History Museum, London)

6: *Papilio alexanor hazarajatica* female: Pakistan, Baluchistan, Quetta Urak, m. 2400-2700, 24-26.V.88, coll. Rose. Note: all specimens are life-sized.



HT

1



AT

2



3



4



5



6

Plate 9

ZOOGEOGRAPHY

Papilio alexanor is a typical Ponto-Mediterranean species (sensu De Lattin, 1967) which had its dispersal centre in central and southern Anatolia. From here, during the Tertiary, it expanded its areal to the East, following the irano-turanic Ridges, and to the South and West, following the coastal Taurus Mountains. To the West, through "Inferior Egeid", it reached the Peloponnesos and continental Greece. Inferior Egeid, in various periods of the Tertiary, represented a very important connection between Anatolia and Peloponnesos, through the Egean Islands, from Samos to Crete. Leestmans & Arheilger (1988) underline a total lack, in Crete, of many Lepidopterous species which probably used this itinerary, but nobody can support this absence with some evidence. *P. alexanor* too has not yet been found in Crete, probably being not at all present in the island, its absence in the Island being probably justified as result of extinction. The species is only present on Samos, which is an emerged remnant part of Inferior Egeid. The species follows the distribution pattern of other xeromontane species (sensu Varga, 1975; idem, 1977), like *Colias aurorina*, *Thersamonia thetis*, *Kretania eury pylus* etc. The apparent absence of *P. alexanor* in the Eastern greek regions would testify for the use of Inferior Egeid as direction of expansion to the European regions. *P. alexanor*, once arrived to continental Greece, would have expanded its areal to the West, reaching southern Italy (where we find relict populations in Calabria and Sicily) through a trans-adriatic or trans-ionian way, and to the North, along the Balkan coastal massifs. From Istria it would have finally reached Provence and southern France along Venetian, Lombard and Piedmontese Prealps. Würmian glaciations interrupted the continuous range of the species, extinguishing Italian prealpine populations, thus producing the present discontinuous distribution.

Other Ponto-Mediterranean species probably followed most of the same route, like *Anthocharis damone*, *Pieris ergane* etc. If we compare their European ranges, we find an high degree of correspondence both in their chorology and ecological requirements.

The Pontic origin of *P. alexanor* is also confirmed by the analysis of the botanical species used as host plants at the larval stages. Eastern regions are shared by similar ecosystems, characterized by botanical associations of Irano-turanic type. There, *P. alexanor* only uses, as host plants, many species of the genus *Ferula* or the related genus *Heptaptera*. *Ferula* sp. had its differentiation and dispersal centre in south-western and central Asia. Moreover, the early stages of *P. alexanor* specialized for an exclusively floreal feeding habit and high adaptation to *Ferula*. This lead Nakamura & Ae (1977) to conclude that these *Umbellifera* represent the only original host plant for the species. During its westward diffusion as it colonized biogeographical different areas, *P. alexanor* later modified its own feeding selection switching to other Umbelliferous plants such as *Trinia* sp., *Ptychotis* sp. and *Opopanax* sp. Because of its highly adaptative plasticity, *alexanor* could thus colonize biotopes with different botanical components, reaching Southern France and North-western Italy.

BIOLOGY, ECOLOGY AND ETHOLOGY

(Plates 10-17)

Papilio alexanor is usually found in dry areas, at elevations variable from sea-level (like in Sicily, some Greek and Turkish populations) up to 3000 m in Uzbekistan. Its flight period depends on the altitude and consequent climatic conditions, as we find low-altitude populations flying in mid May or earlier, whilst the Iranian medium - altitude populations usually fly in the middle of June and the Turkish and Russian high-altitude populations are usually found on the wing in July. All the populations are highly localized and territorially limited to the areas where the local foodplant grows. Only few wandering worn specimens are found out of the habitat. At Sarikamis (Kars Province-East Turkey) the local *alexanor* population is restricted to one slope only of a deep canyon where *Ferula* species near *oopoda* grows, and no specimens are seen only few hundreds meters away from that small area. The preference for rocky slopes is surely influenced by the ecological needs of the food-plants, which frequently are colonizer species preferring eroded and poor soils. The males are much more active than the females, being seen patrolling the area in search of females and hilltopping, but without any territorial behaviour. Females are more frequently seen in early morning and late afternoon, searching for the host-plant and egg-laying, whereas they are rarely encountered during the hottest hours. European populations show high preference for the purple flowers of thistle and *Centrantus*, whereas Turkish *alexanor* is rarely seen feeding on flowers. Personal observations indicate that also other Turkish Papilionidae (especially *Parnassius apollo* and *Papilio machaon*) are rarely seen on flowers, at least not so frequently as in Europe, where *P. apollo* and *P. machaon* often visit thistles. The species is usually reported as uncommon to rare, but we know at least some moderately abundant populations, as near Sparta (southern Peloponnesos), Delphi (central Greece), Samos Island (Greece), Sarikamis (Eastern Turkey) and Valona (Albania). On the contrary, other very scarce populations are reported, like the topotypical one of ssp. *radighieriii*, the southern Italian and Macedonian ones. As reported above, the female lays eggs mainly in the early morning and afternoon. No more than two or three eggs are normally laid on each plant, and only on flowers, but if enough tall food-plant is available, up to 8-10 caterpillars can be seen on each plant. After 7-10 days the egg hatches and the caterpillar starts eating only the flowers of the plant. During the development, the highly heliotropic caterpillar remains on a flower stem, rarely abandoning it, except to take shelter and shade in the sheaths present along the stems of *Ferula* sp. during the hottest periods (Nakamura & Ae, 1977; De Freina, 1983). This behaviour was observed only in eastern populations feeding on *Ferula* sp., as western subspecies feed on plant unprovided of any sheath. At later instars the caterpillar also feeds on fruits and stems of the inflorescence (the leaves only in some populations, like typical subspecies feeding on *Ptychotis saxifraga*). Last instars, if not enough food is available, can erode stems' rid, too. Just before pupation, the caterpillar abandons the plant and usually pupate near the ground, indicating a negative phototaxis (Nakamura & Ae, 1977). We do not know where pupation take place in nature, and it is only possible to speculate that larvae pupate near or under stones. Pupae never show colour variations with adaptation to support's colour like in *P. machaon* L., but always have the same light-brown or brown colour, so suggesting they do not need any chromatic camouflage, probably because they are protected by their stony support. As underlined by Nel (1991), each population of *Papilio alexanor* shows a selected trophic preference for one species only of Umbellifera, and any additional host-plant only represents a local adaptation, as it happens in France where some caterpillars are reported as feeding on *Pastinaca sativa* (Nel, 1991). Local use of different food-plant was observed (pers. obs.) in Central Greece (at Delphi, for example), where local population of *P. alexanor* use at least three different food-plant species: *Pimpinella* sp., *Opopanax chironium*, *Ferulago* sp. These plants have different blooming periods, *Pimpinella* having the earlier and *Ferulago* the later one. The use of different food-plants with echeloned blooming represents a very important adaptation for a species with prolonged emergence period, offering same opportunities of reproductive success both to early and late emerged specimens. Use of different food-plant, with echeloned blooming, was also reported by Nakamura & Ae (1977) for *P. a. judaeus*.

A further situation, expressive of the ecological plasticity of the species, was observed at Bouyon Les Ferres and Courmes (France - Alpes-Maritimes), where populations of *Papilio alexanor* are present on opposite slopes of the same hill. Specimens flying near Bouyon, on northern side, feed as caterpillars on *Opopanax chironium*, while early stages of the species near Courmes and Col de Braus, located on southern slopes, use as host-plant *Ptychotis saxifraga* (Lux, in litt.). Presence of different food-plants depends of particular soil structure, as *Opopanax* grows better on wet, calcareous soils, while *Ptychotis* is found on dry siliceous ground.

The emergence period is strictly related to altitude and the flowering period of the local food-plant. So *P. a. alexanor* begins emerging at the end of May, with a maximum of emergence at the middle of June, when *Ptychotis saxifraga* is flowering, while *P. a. destelensis*, whose early stages feed on *Opopanax chironium* which blooms earlier, also emerges about 15 days earlier. *P. a. atticus*, feeding on three

different food-plants with different blooming period (as underlined above), begins its emergences at the end of April, but continues with freshly emerged specimens until July. Nakamura & Ae (1977) revealed an additional aspect of the association between *P. alexanor* and its larval host-plant. They worked on *P. alexanor judaeus* from Palestine, breeding *alexanor* from eggs and caterpillars obtained in the wild. They found that local food-plants shoot up a stem and bloom only in years of sufficient rain. In dry years most of the plants only produce leaves. "*Ferula* may be an indispensable yet highly risky food source for a butterfly with flower-feeding larvae, and may require a special protection". And in fact they show that *Papilio alexanor* pupae can remain in diapause up to 3 years, and that at least 50% of the pupae usually remained in diapause after the first year. The advantage of such adaptation is obvious for this species. At the moment of their work the authors did not know if "*Papilio alexanor* retains the same ability elsewhere". We have observed that, at least in Greek and Turkish populations, the species shows the same adaptation, with many pupae remaining in diapause for 1-2 years. In a stock of 24 pupae obtained from last instar wild collected caterpillars of *P. alexanor atticus* from Central Greece and preserved in stressed, dry conditions, 3 died during first winter, only 1 male emerged the next spring, 2 more died during second winter, 12 emerged during second spring, 6 hibernated the third time, with six perfect specimens emerging the following third spring after pupation. Of such six last emerged specimens, 5 were large sized ones, and 1 was a small specimen, emerged from a pupa obtained from a caterpillar bred in restricted feeding conditions, due to lack of enough fresh food-plant. This phenomenon has also been reported in *P. saharae* Oberthür (Pittaway et al., 1994)

Early stages: we prefer to avoid a long and tedious description of early stages of the species, preferring to replace many words with few colour plates giving immediate idea of them. We observed that colour pattern of last stages differs in localities far from each other, but being quite constant on wide areas. Both the extension of black marks and the colour of usually orange spots changes, varying from yellow to red, in different localities, but we can not refer a colour pattern of early stages to a given subspecies, nor to a locally preferred food-plant. On the other side such possibilities can not be discarded "*a priori*" without any experimental evidence.

Food-plants: early stages of *Papilio alexanor* are typically linked to Umbelliferae of different genera, depending on different populations. Relations between early stages and their host-plants were discussed in biogeography and biological sections. Here we only present a scheme of all foodplant species known over the area of distribution of *Papilio alexanor*. We indicate only surely classified food-plants, avoiding generalized reports as "Umbelliferae". Botanical systematics and nomenclature created confusion about food-plants usually reported in bibliography, as it happened, for example, with French populations. Botanic species like *Trinia* Dc., *Seseli montanum*, *Seseli* L., *Ptychotis heterophylla*, *Ptychotis* Koch. were in the past indicated as local food-plant of nominotypical subspecies. Nel (1991) asserts that all reports of different plants, except for *Ptychotis saxifraga* (L.) only, were due to botanical confusions and synonymy. Further confusion was given also in the past by authors who frequently referred *Papilio alexanor* as feeding on "*Ferula*", as underlined and discussed by Bollino & Sala (1995). Now we know that most of such reference, at least for Western populations, have to be shifted to *Opopanax* sp. (see table 1).

Table 1-Food-plants of different populations of *Papilio alexanor*

Subspecies	Food-plant	Locality
<i>alexanor</i>	<i>Ptychotis saxifraga</i>	France
	<i>Pastinaca sativa</i>	"
	<i>Opopanax chironium</i>	France
		(Var:Draguignan; Alpes-Maritimes: Grasse)
<i>destelensis</i>	<i>Opopanax chironium</i>	France-Var
<i>radighierii</i>	<i>Trinia glauca</i>	Italy-Val Gesso
	<i>Ptychotis saxifraga</i>	"
<i>atticus</i>	<i>Opopanax chironium</i>	Greece
	<i>Ferulago</i> sp.	Continental Greece
	<i>Pimpinella</i> sp.	Greece
	<i>Opopanax hispidus</i>	Peloponnesos
	<i>Seseli montanum</i> *	Central Greece

*Probably a misidentification with *Pimpinella* sp.

Subspecies	Food-plant	Locality
<i>eitschbergeri</i>	<i>Ferula communis</i> (?)	Greece-Samos I.
	<i>Pastinaca sativa</i> (?)	"
	<i>Opopanax chironium</i>	"
	<i>Opopanax hispidus</i> (?)	West Turkey
<i>judaeus</i>	<i>Ferula tingitana</i>	Israel
	<i>Heptaptera anisoptera</i>	"
<i>orientalis</i>	<i>Heptaptera anisoptera</i> (?)	Southern Turkey
	<i>Ferula tingitana</i>	" "
	<i>Ferula oopoda</i>	Armenia
	<i>Ferula</i> sp. (<i>oopoda</i> ?)	East Turkey
	<i>Ferula ugamica</i>	West Tian Shan
	<i>Ferula angreni</i>	Mts. Kuraminskyi
	<i>Ferula oopoda</i>	Kopet Dag
	<i>Ferula ovina</i>	"
<i>hazarajatica</i>	<i>Ferula karategina</i>	Mts.Peter the Great
	information not available	

Parasitism

Papilio alexanor's parasitism is rarely reported in bibliography, as far as we know. Hanisch (1993) reports a rate of 0% of parasitized wild-collected caterpillars of the species, Hesselbarth et al. (1995) underline that the species is only rarely parasitized, while, on the contrary, David & Sanetra (1994) report a rate of 90% of wild-collected caterpillars from a french locality inhabited by the nominate subspecies, as parasitized by Ichneumonidae belonging to the genus *Hyposoter*. Surely, the early stages of the species are rarely subject to parasitism, at least in comparison with other *Papilionidae* like *Papilio machaon* or *Zerynthia polyxena*. This is confirmed by observations of Forte (pers.comm.) who advised us that wild collected *Papilio alexanor* caterpillars were never parasitized, while early stages of *P. machaon*, collected on the same plant of *Trinia glauca*, were so (Sala & Bollino, 1991). Our own experience confirms the reports by Hanisch (1993) and Hesselbarth et al. (1995), having not observed any parasitism in a sample of about 50 pupae obtained in different years from wild collected caterpillars at last instar from various localities of Central Greece. As resulted from our field observation and experience, only once we observed a wild collected caterpillar of ssp. *atticus* parasitized by *Exorista larvarum* (L.), which emerged few days after the full grown caterpillar pupated. Recently we received two specimens of an Ichneumonid which parasitises uzbekian populations of *P. alexanor orientalis*. Unfortunately we did not obtained any further information either on parasites or on rate of parasitism. From the same area (?) the Ichneumonidae *Trogus lapidator* Fabricius is reported as parasiting local populations (Krasnaja Kniga USSR, 1985). Observation of such low pressure by parasits is quite unusual, especially if we think to high heliotropismus of *alexanor* early stages. We can suppose a protection factor of a chemical nature goes to defend caterpillars.

Conservation status

The species is listed under Appendix II of Convention on the conservation of European wildlife and natural habitats, signed in Berne on 19.IX.1979. Also if Heath (1981) listed the species as Vulnerable in Europe, and Endangered in the Balkan Peninsula and Italy, Collins & Morris (1985) do not list *Papilio alexanor* among the Swallowtails species in need of protection, and Kudrna (1986) considers *P. alexanor* at medium Vulnerability index.

Our aim is to underline where the species needs really urgent protection. In recent years on the basis of our field observations and continous requests of data on the species, we also collected direct or indirect information about its conservation status. As a species, *P.alexanor* is not at all an endangered taxon, and some of the populations are well established in nature. Its ecological preference for areas of scarce economical or agricultural interest offers a great opportunity for its survival. On the other hand, by analyzing in detail its distribution and local conditions, we have located some regions where its protection is urgently needed.

In France, where the species is normally abundant and widespread, the species is protected by law, and in restricted areas, like near Briançon, the capture of any specimen is totally forbidden, while in Var, in spite

of any restriction, we were informed that the topotypical population of subspecies *destelensis* is actually extinct, due to overcollecting (Charmeux, in litt.).

Italian populations are normally low density ones, especially in southern Italy, and all but one have their areal not included in any protected area. Only the supposed present population near Morano, Mt. Pollino (Calabria) falls within the boundaries of the recently founded Parco Nazionale del Pollino. On the contrary, the topotypical population of subspecies *radighieri* is seriously endangered due to its location just around a gravel quarry. In recent years, moreover, irresponsible caterpillar overcollecting (up to 150 caterpillars during 1994 season only!) is contributing to deplete the natural stocks of the subspecies, which needs urgent total protection.

Collins & Morris (1985) stated that Balcan populations are extinct. We have not any evidence of such situation, also because the species is surely much more widespread than we know in that area. Moreover the subspecies *atticus* is well represented both in Greece and Albania with many strong populations, the species actually being much more widespread and less rare than reputed in the past. Finally the Greek Law protects *Papilio alexanor*, ensuring, at least on paper, its survival in the Balkan area. The only objective danger for the species is the easy capture of its early stages, being heliophilus and rapidly locatable on the food-plant, especially at the last instar, even on the road side from a car!

Middle-East populations. As from reported observations and our own, the species is far from being rare in Anatolia, even though it is probably not represented by contiguous populations as in Greece. Some local populations are known to be exceptionally abundant, like in Samos (Greece), Sarikamis (Turkey) or Hare Gilboa (Israel). The low level of urbanization and the relatively difficult access to many of the known populations represent the best present protection of the species in such areas. In Iran the species is less rare than supposed earlier (Nazary, in litt.), and some populations fall within virtually protected areas (Mazanderan Prov: Golestan Park; Fars Prov.: Kuh-e-Bamu National Park).

A different situation is found in the former U.S.S.R., where the species, for its decline due to degradation of alpine meadows, was included in the U.S.S.R. Red Data Book as Vulnerable. Unfortunately, recently there has been no accessible report on the status of the species in that area, except for Dabrowski (1981), who reports the species as rapidly declining both in Caucasus and west Tyan-Shan for cultivation and sheep-grazing.

Finally, we have no reports at all about the conservation status of *Papilio alexanor* in Afghanistan and Pakistan. Specimens from those countries are regarded as great rarities, but surely their scarcity is mostly due to lack of well experienced collectors in such areas and rare opportunities, for European collectors, to visit these regions. In the light of our field experience with this wonderful insect, we are sure that *Papilio alexanor* is much more common and widespread there than supposed, and its political and geographical isolation is, after all, its best defence!



P. alexanor alexanor biotope: France, Hautes-Alpes, near St. Crepin, Briançon, m. 900, 8.VII.1989, photo by Sala



P. alexanor radighieri biotope: Italy, Cuneo Prov., Valdieri, m. 800, 25.VI.1989, photo by Sala

Plate 10



P. alexanor atticus biotope: Greece, Attica, Delphi, m. 600, 9.V.1990, photo by Bollino



P. alexanor orientalis biotope: Turkey, Kars Prov., 10 km. South of Sarikamis, 1900-2100, 10.VII.1990, photo by Bollino

Plate 11

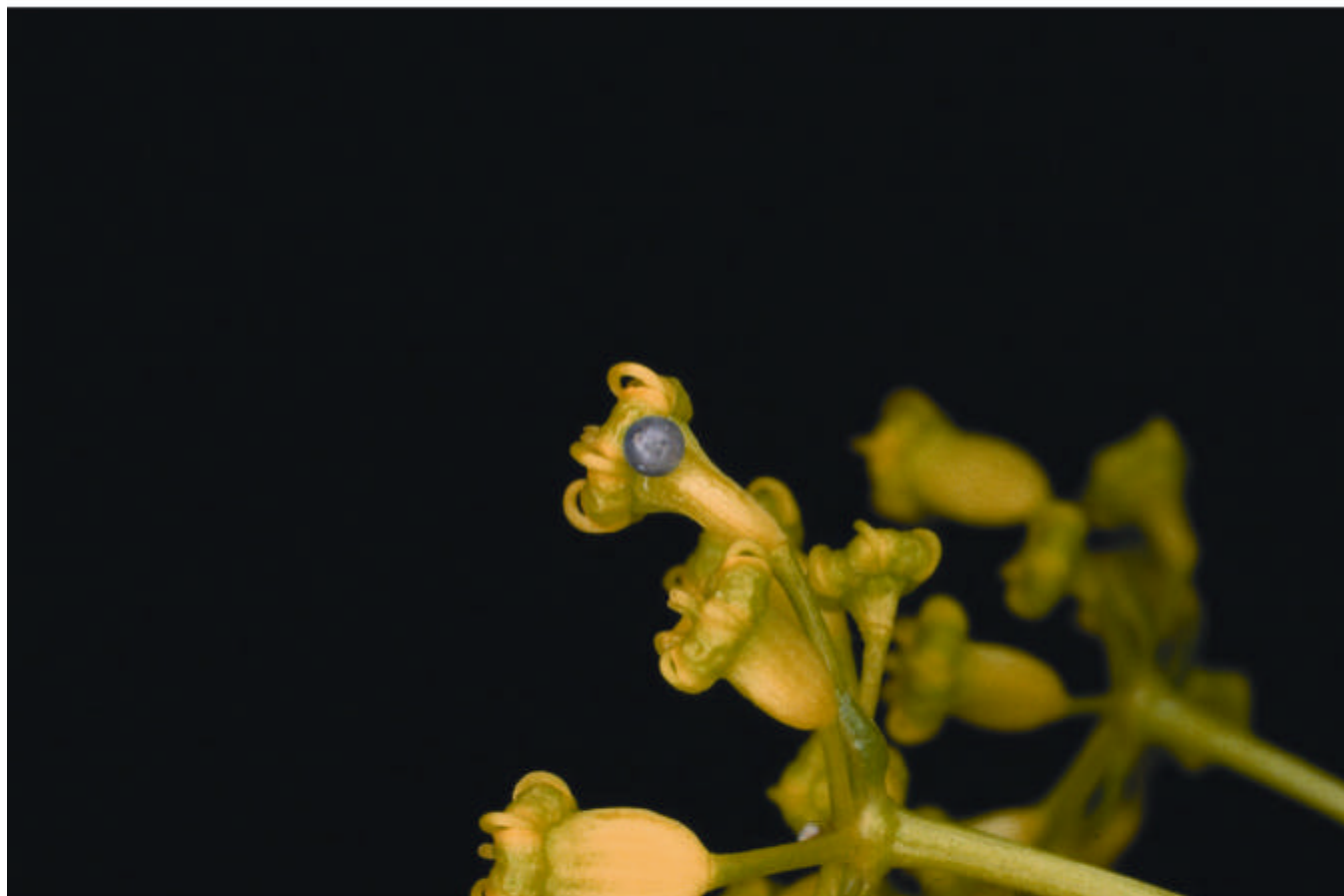


P. alexanor orientalis biotope: Uzbekistan, Zeravshan Mts., m. 1500, VI.1988, photo by Tschikolovets.
 Foreground: *Ferula* sp., local food-plant of *alexanor*.



P. alexanor orientalis biotope: Uzbekistan, no more data, photo by Tschikolovets.
 Foreground: *Ferula* sp., local food-plant of *alexanor*.

Plate 12



Papilio alexanor atticus: egg on blossom of *Opopanax* sp. Photo by D. Reggianti



Papilio alexanor radighierii: second instar on *Ptychotis saxifraga*. Photo by Sala

Plate 13



Papilio alexanor radighieri: second instar on *Ptychotis saxifraga*. Photo by Sala



Papilio alexanor atticus: third instar on *Opopanax chironium*. Photo by Bollino

Plate 14



Papilio alexanor radighierii: fourth instar. Photo by M. Marini



Papilio alexanor radighierii: last instar. Photo by M. Marini

Plate 15



Papilio alexanor atticus: last instar. Photo by Bollino



Papilio alexanor atticus: pupa. Photo by P. Mazzei

Plate 16



Papilio alexanor atticus: last instar caterpillars on *Opopanax chironium*. Greece, Pindus, June 1995.
Photo by Bollino

Plate 17

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