

Taxonomic Studies and Status of the High Altitude Genus of Butterflies *Albulina* Tutt (Lepidoptera : Lycaenidae : Polyommatainae) from Indian Himalayas

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Abstract

The status of three species of genus *Albulina* Tutt from Indian Himalayas has been assessed and the species *A. omphisa* (Moore) has been found to be area whereas the species *A. metallica* (Felder & Felder) which is included in Schedule II Part II of Wildlife (Protection) Act of India has not been found to be quite rare in the area. The genitalia organs of both the species have been illustrated and described for the first time in details.

Key words : *Albulina*, Lycaenidae, Polyommatainae, Genitalia, Status.

Verity (1) pointed out that the taxon, *Papilio pheretes* Hubner on the basis of which Tutt (2) has proposed the genus *Albulina* is in fact, *Papilio orbitulus* Prunner. At the same time, the latter name had also been in use as type-species of another genus *Argiades* Hubner, which too was based on a misidentified species, which actually was *Papilio glandon* Prunner. To correct this disturbing nomenclatorial error, Hemming (3) moved an application and the I. C. Z. N. exercised its plenary powers, designated *Papilio glandon* Prunner as type-species of the genus *Argiades* Hubner (Opinion 270, 1954). With this action, *Papilio pheretes* Hubner also became a legitimate type-species of the genus *Albulina* Tutt. Prior to discovery of the latter genus, workers like Moore (4), de Niceville (5) and Bingham (6) have made use of the genus *Lycaena* Fabricius for the placement of various species, as has also been done afterwards by Champion and Riley (7). However, Evans (8) and Wynter-Blyth (9) have made use of another genus i.e., *Polyommatus* Latreille for these species. However, Cantlie (10) adopted the division of *Polyommatus* into thirteen genera including *Albulina* Tutt. Eliot (11) has also considered the genus *Albulina* in the *Polyommatus* section of the tribe Polyommataini.

According to Smart (12) and Bridges (13) the

genus contains six species viz., *omphisa* Moore, *galathea* Blanchard, *metallica* Felder & Felder, *Pheretes* Hübner, *youngusbandi* Elwes and *asiatica* Elwes and all these are duly represented in India. The former three species, collected from various North-West Himalayan localities between an altitude range from 2,680 to 4,050 m ASL have been dealt with in this compilation (Table 1). Keeping in view the altitude parameter, it is being inferred that all the three species appear to be restricted in the Greater and Trans-Himalayan regions, as no specimen could be collected in the Lesser Himalaya and Shivaliks. The male genitalia of all the three species i.e., *omphisa*, *galathea* and *metallica* and the female genitalia of the former two have been examined in detail during the present studies.

Results and Discussion

Genus Albulina Tutt

Tutt, 1909, Nat. Hist. Brit. Butts 3 (6) : 154 ; Stempffer, 1937, Bull. Soc. ent. Fr. : 217 ; Cantlie, 1963, Lyc. Butts. Revised : 54.

Type-species : *Papilio orbitulus* Prunner
 Prunner, 1798, Lep. Pedemont : 75.

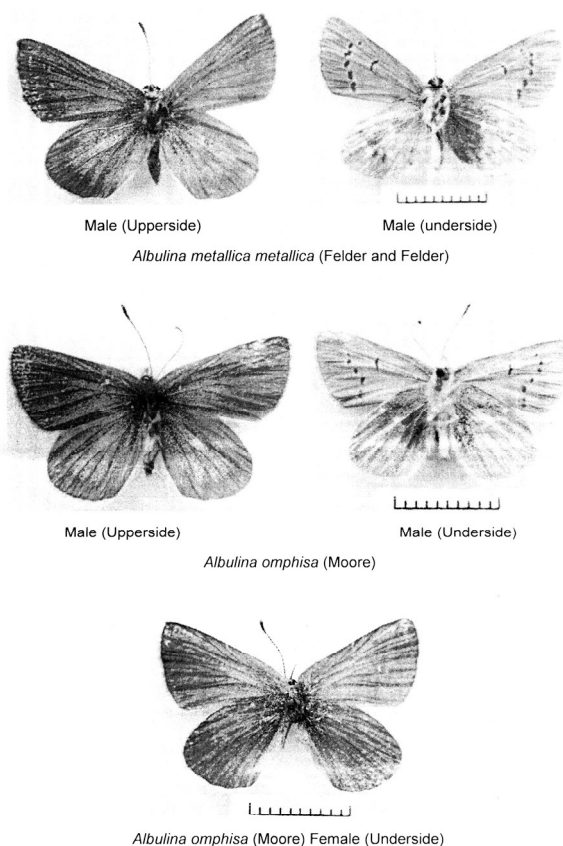


Figure 1. High altitude genus of butterflies.

Generic Diagnosis : Eyes hairy ; underside of forewing with markings black, edged white, underside of hindwing metallic green, all spots completely white, tailless ; forewing with 11 veins, veins Sc and R_1 free, the latter originating opposite to origin of vein R_1 ; male genitalia with uncus divided, each lobe narrowed apically, tip squarish, brachia robust, tegumen with suspensorium present, aedeagus short, completely straight, subzonal portion longer, ductus ejaculatorius entering cephalad.

Remarks : Followed by similar appearance (sibling species), the males of all the three species are exceptionally highly congeneric. Their male genitalia also conform to the type-species of the genus, *orbitulus* Prunner, figured by Stempffer (14) and, as such, these three species form a natural group. In this context, it may be mentioned that Eliot (11). too has also reported that in whole of the *Polyommatus* and *Euchrysops* sections, the valvae of the male genitalia

exhibit an unusual constancy. However, inspite of all similarities, especially in the male genitalia (uncus, vinculum, valvae, aedeagus and juxta), all the three species can be separated out, as per key given below. The two species i.e. *omphisa* and *galathea*, for which the female genitalia have been studied, differ from each other in respect of the genital plates. Such a significance of the female genitalia has also been highlighted by Hirowatari (15, 16) for separation of the species of the genus *Jamides* Hubner and *Nacaduba* Moore respectively. Moreover, small differences in the curves and shapes of different parts of the male genitalia which have been used presently for inter-specific discrimination of *omphisa*, *galathea* and *metallica* have also been successfully employed by workers such as Carbonell (17—20). Wakeham-Dawson and Spurdens (21) and Wakeham-Dawson (22) for the separation of different closely allied species of the allied genera such as *Polyommatus* Latreille

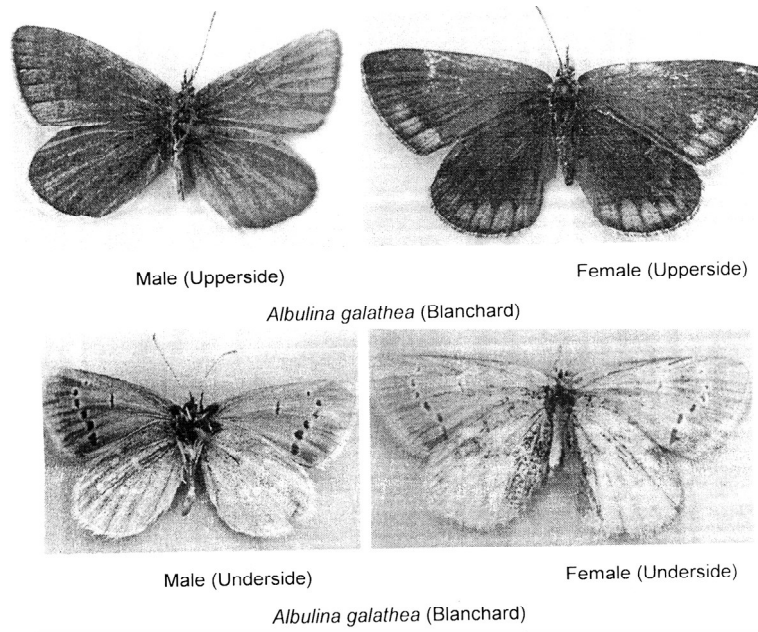


Figure 2. High altitude genus of butterflies.

and *Agrodiaetus* Herrich-Schaffer, which also exhibit unusual apparent similarity in their male genitalia.

arranged in a linear series : forewing with vein M_2 nearer to vein M_1 than vein M_3 ; male genitalia with lower portion of vinculum concave, each uncus lobe with apex swollen
....metallica Felder & Felder

Key to the species of the genus *Albulina* Tutt

1. Undersurface of forewing with discal spots

Undersurface of forewing with discal spots ar-

Table 1. Distribution of Genus *Albulina*.

Name of species	Names of subspecies	Indian region	Pangi	Lad-akh	Lah-aul & Spiti	Status as per evans (23)	Wild life (protection) act. 1972
<i>Omphisa</i>	–	Kashmir, Ladakh, Lahaul	P	P	P	Not rare	
<i>Galathea</i>	<i>g. galathea</i>	Kashmir - Kumaon	P		P	Not rare	
	<i>g. chitralica</i>	Chitral, Chilas	–	–	–	Not rare	
	<i>g. depreel</i>	Ladakh	–	P	–	Not rare	
<i>Metallica</i>	<i>m. metallica</i>	a) Kula, Koksar, Lahaul, Rupshu	P	–	P	Rare	Schedule II, Part II
	<i>m. chitralensis</i>	b) Chitral, Madaglasht, Shishi, Warsangol	–	–	–	Not rare	
	<i>M. gilgitica</i>	c) Chitral, Shandur, Baroghil, Gilgid, Astor, Chilas	–	–	–	Not rare	
<i>Pheretes</i>	<i>p. lehana</i>	a) Chitral to Kumaon (over 3,657 m)	–	–	–	Not rare	
	<i>p. pharis</i>	b) Sikkim, chumbi	–	–	–	Not rare	
<i>Younghusbandi</i>	–	Sikkim, Chumbi	–	–	–	Rare	Schedule II, Part II
<i>Asiatica</i>	–	Sikkim (over 3, 657 m)	–	–	–	Rare	

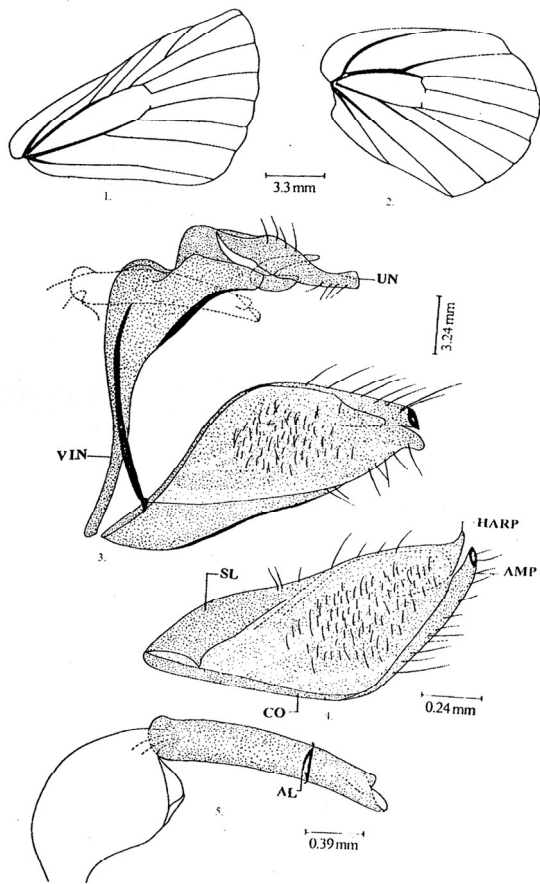


Figure 3. *Albulina metallica metallica* (Felder & Felder). (1) Venation of forewing, (2) Venation of hindwing, (3) Male genitalia (lateral view), (4) Left valva (inner view), (5) Aedeagus (lateral view). 1A+2A, Vein representing fused first and second anal vein, 3A, Third anal vein; AMP, Ampulla; APO, ANT, Apophysis anterioris; APO. PO, Apophysis posterioris; BR, Brachium; BU. EJ, Bulbus ejaculatorius; CO, Costa; CORP. BU, Corpus bursae; Cu_{1a}, First cubital vein; Cu_{1b}, Second cubital vein; DU.BU, Ductus bursae; DU.EJ, Ductus ejaculatorius; DU.SEM, Ductus seminalis; G. P., Genital plate; HARP, Harpe; JX, Juxta; LDX, Lodix; M₁, First medial vein; M₂, Second medial vein; M₃, Third medial vein; O.B., Ostium bursae; O. P., Ostium pouch; P. A., Papilla analis; R₁, First radial vein; R₂, Second radial vein; R₃, Third radial vein; R₅, Fifth radial vein; Sc, Subcosta; SUS, Suspensorium; TEG, Tegumen; UN, Uncus; VES, Vesica; VIN, Vinculum; VLV, Valva.

ranged in a wavy series; forewing with vein M₂ in middle of veins M₁ and M₃; male genitalia with lower portion of vinculum straight, each uncus lobe gradually narrowed towards apex 2

2. In male, uppersurface of wings with ill defined

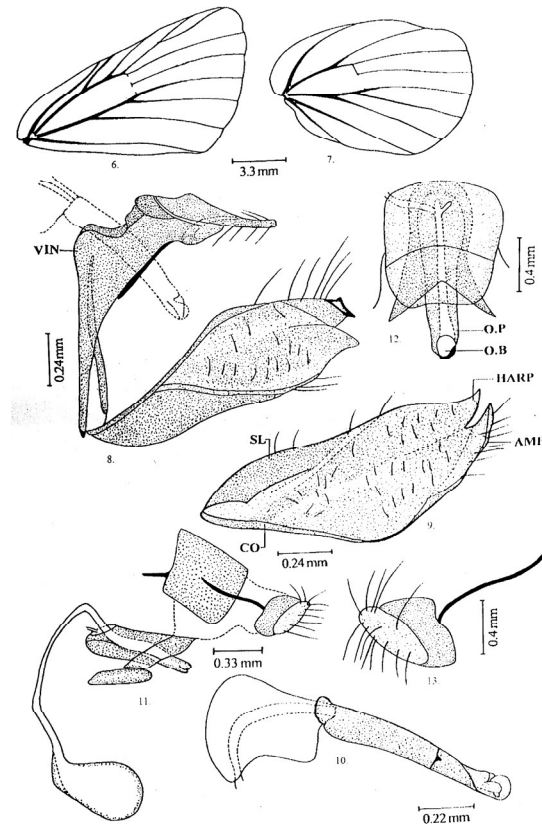


Figure 4. *Albulina omphisa* (Moore). (6) Venation of forewing, (7) Venation of hindwing, (8) Male genitalia (lateral view), (9) Left valva (inner view), (10) Aedeagus (lateral view), (11) Female genitalia (lateral view), (12) Genital plate, (13) Papilla analis.

broad borders, the latter fading towards the base; female without orange submarginal spots; male genitalia with vinculum produced and notched behind at upper anterior angle, aedeagus with subzone apically bifid on dorsal side; female genitalia with ostium pouch extending well beyond genital plate, the latter with lamella antevaginalis notched posteriorly *omphisa* Moore

In male, uppersurface of wings with well defined thread-like borders, female with orange submarginal spots; male genitalia with vinculum not produced, rounded at upper anterior angle, aedeagus with subzone apically undivided; female genitalia with ostium pouch not extending beyond genital plate, the

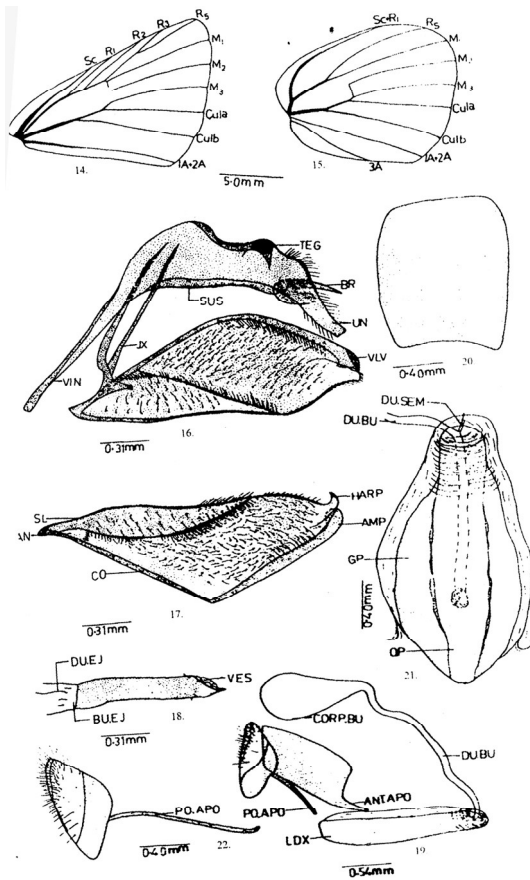


Figure 5. *Albulina galathea* (Blanchard). (14) Venation of forewing, (15) Venation of hindwing, (16) Male genitalia (lateral view), (17) Left valva (inner view), (18) Aedeagus (lateral view), (19) Female genitalia (lateral view), (20) Lodix, (21) Genital plate, (22) Papilla analis.

latter with lamella antevaginalis not differentiated

.....*galathea* Blanchard

***Albulina metallica*
(Felder & Felder)**

Common name : The Small Green Underwing
Felder & Felder, 1865, Reise Novara (2) : 283 (*Lycaena*) ; de Niceville, 1890. Butts India Burmah Ceylon 3 : 83 (*Lycaena*) ; Evans, 1932, Ident. Indian Butts (2nd ed.) : 229 (*Polyommatus*) ; Stempffer, 1937, Bull. Soc. ent. Fr. : 217 (*Albulina*) ; Cantlie, 1963, Lyc. Butts Revised : 56 (*Albulina*).

Albulina metallica metallica
(Felder & Felder)

Felder & Felder, 1865, Reise Novara (2) : 283 (*Lycaena*).

Venation : Forewing with discal cell slightly more than half of the wing length, vein Sc and vein R₁ slightly approximating, vein R₄ wanting, vein R₃ arising before middle of vein R₅, stalk of veins R₃ + R₅ and vein M₁ well separated at base, vein M₂ nearer to vein M₁ than vein M₃, upper discocellular complete, arcuate, lower discocellular incomplete, origin of vein Cu_{1a} well before end cell ; hindwing with discal cell shorter than half of the wing length, vein M₂ at base nearer to vein M₁ than vein M₃, upper discocellular complete, lower incomplete, vein Cu_{1a} arising shortly before end cell.

Male Genitalia : Symmetrical, large, well sclerotized ; uncus divided by a U-shaped posterior emargination along distal margin, each lobe elongated, finger-shaped, with a broad base, narrowed to blunt swollen apex, pilose : brachia short, sharply incurved, bases broad with narrow, slender arms gradually tapering to slightly hooked acute apices ; tegumen dorsally reduced to a crescent-shaped band ; lateral windows narrow, elongated ; vinculum with upper portion much broader and produced into an elongated caudal extension, lower portion narrower and concave ; saccus absent ; each valva large, broader in middle, costa narrow, diagonal, sacculus broad with acute inner angle, ampulla flattened with broad blade-shaped incurved apex, harpe downcurved, with apex pointed, valva densely pilose on inner side and sparsely pilose on dorsal and ventral edges ; juxta V-shaped, with elongated slender arms tapering to narrow apices ; aedeagus very short, straight, slender with subzone longer than suprazone, apex narrow, vesica without cornuti, subzone apically bifid on dorsal side, bulbus ejaculatorius large, membranous, ductus ejaculatorius enters dorsad.

Female Genitalia : Not examined.

Material Examined :

Himachal Pradesh : 3 male, 26. VI.1995, Losar, 4079 m ASL, Lahaul & Spiti ; 2 male, 25. VII. 2009 Sural, 3234 m ASL, Pangi.

Range : 3234—4079 m ASL.

Old distribution : Lahaul, Ladak, Chitral, Warsangol, Gilgit, Kullu, Koksar, Rupshu.

Larval food plant : Not known.

Remarks : Besides nominotype, the species, under reference, is represented by two more subspe-

cies viz., *gilgiltika* Tytler and *chitralensis* Tytler in the North-West Himalaya. The species, identified as *metallica* Felder & Felder has either been reported under the genus *Lycaena* Fabricius (5, 6) or *Polyommatus* Latreille (9, 23) or *Albulina* Tutt (10, 24, 25) by respective workers. As explained under the remarks of the genus above, the correct nomenclature of the taxon is *Albulina metallica* (Felder & Felder). In view of distribution, it is reported as *A. m. metallica* Felder & Felder and its male genitalia is being reported for the first time. The collection of this taxon from Losar (Lahaul & Spiti) in the Greater Himalaya is its new distribution record from this locality. Further, it has been either regarded as rare (10, 23) or endangered (10, 25) and has been included in part II of schedule II of the Wildlife (Protection) Act, 1972. The present surveys reveal that though the species is restricted in distribution, yet it is not rare at above mentioned locality. However, the female population seems to be rather quite scarce and warrant ex-situ conservation measures.

***Albulina omphisa* (Moore)**

Common name : The Dusky
Green Underwing

Moore, [1875], Proc. zool. Soc. Lond. 1874 (4) : 573 (*Polyommatus*); de Niceville, 1890, Butts India Burmah Ceylon 3 : 84 (*Lycaena*); Evans. 1932. Ident Indian Butts (2nd ed.) : 229 (*Polyommatus*); Cantlie, 1963, Lyc. Butts Revised : 56 (*Albulina*).

Venation : Forewing with discal cell equal to half of the wing length, vein Sc and vein R₁ free, subparallel, vein R₄ wanting, vein R₃ arising before middle of vein R₅, stalk of veins R₃ + R₅ and vein M₁ closely separated at base, vein M₂ almost equidistant between vein M₁ and vein M₃, discocellulars obsolete, only end fragments present, vein Cu_a well before end cell, all veins thicker in basal area; hindwing with discal cell shorter than half of the wing length, vein M₂ closer to vein M₁ than vein M₃, upper discocellular thin, oblique, lower discocellular absent, vein Cu_a from before end cell.

Male Genitalia : Symmetrical, well sclerotized, large sized; uncus divided by a U-shaped emargination along distal margin, each lobe slightly broader at base, elongated, gradually narrowed towards apex, with broad squarish apex, pilose; brachia short, with

broad incurved bases, arms narrow, slender, gradually tapering to acute spines; tegumen dorsally narrow, crescent-shaped transverse band with pointed ends; lateral windows narrow, lanceolate; vinculum broader in upper portion, produced and notched behind at upper anterior angle, an elongated narrow projection along distal margin, lower half of vinculum straight; saccus absent; each valva large, well sclerotized, longer than broader, laterally subtriangular, costa narrow, elongated and arched, sacculus broad, somewhat triangular, ampulla flat with broad, rounded incurved blade-like apex, harpe narrow apically, downcurved, inner surface of valva more densely pilose than dorsal and ventral edges; juxta V-shaped, with very long, narrow, slender arms; aedeagus very short, straight, slender, with subzone longer than suprazone, the latter tapers to a narrow apex on ventral side, opening of vesica terminal, subzone apically bifid on dorsal side, bulbus ejaculatorius large and membranous, ductus ejaculatorius enters cephalad.

Female Genitalia : Lodix large, squarish with rounded ends; genital plate sac-like, with elongated sclerotized patches on ventral wall, lamella antevaginalis broad, band-shaped, sharply notched posteriorly; ductus seminalis enters ductus bursae just above genital plate; ductus bursae long, narrow, slender and membranous, opens exteriorly through elongated ostium porch, the latter extending well beyond genital plate; corpus bursae oblong, shorter than ductus bursae, well marked, signum elongated and hook-shaped, present in middle on dorsal surface; apophyses anteriores long, straight, tapering to blunt ends; apophyses posteriores elongated, thick, slender, curved rods with pointed arrow-like apices; papilla analis triangular, with proximal margin notched in middle, pilose.

Material Examined :

Himachal Pradesh : 6 male, 2 female, 26. VI. 1995, Losar, 4079 m ASL, Lahaul & Spiti; 1 male, 24. VII. 2009, Sural, 3234 m ASL, Pangi.

Jammu and Kashmir : Leh, Ganglas, 3 male, 11. VII. 2008. 3209 MASL.

Range : 3234—4079 m ASL.

Old distribution : Kashmir, Ladak, Lahaul.

Larval food plant : Not known.

Remarks : A phenon comprising eight individu-

als (six males and two females) has been identified as *Lycaena omphisa* (Moore) from de Niceville (1890), who has referred that it is a distinct species. While justifying its position in the genus *Albulina* Tutt, Stempffer (14) has furnished an outline of the male genitalia of this species, without giving description of any of the parts. Accordingly, an illustrated account of both the male and female genitalia has been provided for the first time. During the process of examination of the material, it has been observed that all the spots on undersurface of the hindwing have been found to be quite obscure in one of the male individuals, whereas, in other two males, the spot in the space R_s is wanting. The conspecificity of these variable males has been confirmed by dissecting them. The genitalia have been found to be identical in all the cases. The reporting of this species from Losar (4,079 m ASL) in HP in the North-West Himalaya is the first distribution record from the said locality. It may also be mentioned that the specific name has been incorrectly spelled as *omphissa* Moore by Kirby (26), de Niceville (5) and Evans (23). In view of works by Bingham (6), Evans (23), Stempffer (14), Leslie and Evans (27), Cantlie (10) and Bridges (13), the current spelling of the species is as *omphisa* and the same has been followed presently.

***Albulina galathea* (Blanchard)**

Common name : The Large
Green Underwing

Blanchard, 1884, In Jacquemon, Voy. Ind. 4 (Zool); 21 (*Lycaena*); Moore, 1874, Proc. zool. Soc. Lond. (*Polyommatus*); Cantlie, 1963, Lyc. Butts Revised : 56 (*Albulina*).

Male Genitalia : Uncus bifid, each lobe elongated with squarish apex; brachia slender, curved outwards, apices pointed; tegument narrow, suspensorium present; vinculum much broader in upper half; saccus absent; valva large, triangular, costa diagonal, narrow, sacculus ridge-like, ampulla flattened, apex rounded, separated from harpe, the latter curved downwards with pointed apex, innersurface of valve densely and margins sparsely pilose; juxta v-shaped, with fairly long, narrow, pointed arms; aedeagus very short, subzone much larger than suprazone, the latter flattened, spatula-like, ductus ejaculatorius entering cephalad.

Female Genitalia : Lodix oblong; genital plate fusiform, sac-like, well developed; ductus seminalis entering into ductus bursae just above genital plate; ductus bursae long, wavy, slender, sclerotized at basal end; corpus bursae oval; apophysis anterioris long, thick, broad; apophysis posterioris long, stout, slender; papilla analis triangular, pilose.

Material Examined :

Himachal Pradesh : 1 male, 2 female, VII, 1948, Pangi (10,000 ft.) ZS1, Kolkata collections; 1 male, 16. VII.1992, Kukumsheri, Lahaul Spiti; 1 male, 20.VII.1992, Dharwas, Pangi; 1 male, 16.VI.1996, Sangla, 2680 m ASL, Kinnaur; 1 male, 16.VI.1996, Rakcham, 2900 m ASL, Kinnaur; 1 male, 16. VII.2009, Tindi, Lahaul Spiti; 1 male, 24.VII.2009; 1 female, 20.VII.2009, 2805 m ASL, Pangi; 3 male, 2 female, 25.VII.2009, Sural, 3234 m ASL, Pangi.

Jammu and Kashmir : Leh, Ganglas, 3 male, 11.VII.2008, 3209 M ASL.

Range : 2680—3234 m ASL.

Old Distribution : Chitral, Gilgit, Pangi, Kashmir, (2100—3600 m ASL), Ladak, Kullu, Narkanda, Tehri Garhwal, Nepal (2790—3900 m ASL).

Larval food plant : Not known.

Remarks : Evans (23), Wynter-Blyth (9) and Cantlie (10) have reported the species, *Albulina galathea* (Blanchard) as not rare. However, in view of present surveys, it is being inferred that it is getting rarer and more so has restricted distribution in the North-West Himalaya. Only two males, one each from Kukumsheri (Lahaul and Spiti) and Dharwas (Chamba) in the North-West Himalaya could be collected. Further, the collection of this species from Sangla Valley (Himachal Pradesh) is the first distribution record from this locality. Since *Albulina galathea* is highly sibling to *A omphisa* (Moore), their male genitalia have been dissected and critically compared with each other. Interestingly, though the genitalia too are greatly similar to each other yet the characters such as the vinculum and aedeagus in male genitalia and the genital plate in the female genitalia (lamella antevaginalis) have been found to be truly useful in their discrimination.

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