A NEW RACE OF *PAPILIO INDRA* FROM THE GRAND CANYON REGION

by DAVID L. BAUER

Until 1950 the occurence of *Papilio indra* Reakirt in Arizona was overlooked by lepidopterists; in that year the "Grand Canyon Natural History Association" published *Bulletin* No. 11, on the butterflies of the Grand Canyon, by JOHN S. GARTH. Under *Papilio indra minori* Cross, Dr. GARTH makes this statement: "The writer is indebted to Lloyd Martin of the Los Angeles Museum for pointing out the similarity of the under wing of this *Papilio* to *indra* rather than to *bairdi.*" This specimen has been examined by the writer; also all other specimens of the *Papilio machaon* group in the Grand Canyon Work Shop collection were studied. This search turned up two more *Papilio indra* specimens of the same type as the first. One of these specimens bore the label *"Papilio polyxenes auterius* Cram.", and was determined as such by J. F. GATES CLARK of the U. S. National Museum. This same specimen is listed as *Papilio ajax* L. by GARTH on page 10 of the above mentioned *Bulletin;* however, he also noted that it appeared to him to be identical with the specimen designated *Papilio indra minori* Cross. This last specimen labeled *"Papilio polyxenes asterius* Cram. female," has proved to be a male of the Grand Canyon race of *Papilio indra.* The other specimen found in the Work Shop collection was taken by Mr. ERNST CHRISTENSEN and was in the *Papilio bairdii* series. The examination of these specimens was made in 1952. The same year the writer captured a large male specimen near Ryan Ranger Station west of Jacob Lake, which at first was mistaken for a female *Papilio bairdii* Edwards. Since then the Park Naturalists at Grand Canyon have taken about forty additional specimens. These specimens have been examined and found to be consistently separable from all previously named species and races of the *Papilio machaon* Linné complex. The description of this previously unnamed race follows:

Papilio indra kaibabensis new subspecies

MALE. Upper suface of primaries: jet black, with a complete submarginal series of pale yellow spots; the post-median series of spots is composed of small, much clouded pale yellow spots; in the male type specimen there are only four such spots, those nearest the inner margin being completely obliterated by black over-scaling.

Upper surface of scondaries: jet black, with an incomplete series of small black-clouded submarginal yellow spots; the spot nearest the costal margin at the outer angle is obsolete as are also the two between the tail and the anal angle, leaving only three small submarginal spots; the row of blue spots is located in the usual position across the wing, and is composed of large, prominent, light blue spots; these spots shade gradually to black outwardly and are more prominent than those found in any othe *machaon*-group *Papilio.* The orange-red spot of the inner angle is largely filled by the central black spot, leaving only a thin cresent of orange; the post-median series of yellow spots is almost entirely obliterated by the black ground; the spot nearest the costal margin is the only one which is consistently present, but is reduced by black scaling to a narrow band; occasionally there is a trace of the next in line from the costal margin and of the yellow spot nearest the anal angle.

Under surface of primaries: black; submarginal series of spots considerably larger, paler, not clouded with black scaling, and six in number; the spots nearest the costal margin and the anal angle tinged with reddish orange; the series of blue spots reduced in area and prominence; the post-median series of pale yellow spots complete, seven in all; the orange-red spot of the inner angle larger and central black spot smaller, resulting in greater prominence of spot.

Palpi black. Antennæ black. Head black, with two yellow spots located dorsally at the posterior edge of each eye. Thorax black, dorsally two orange-yellow lines continuing posteriorly from the yellow spots on the head across the thorax to the base of the inner margin of the primaries. Abdomen black, usually with a small yellowish area on each side just cephalad of the claspers.

Forewing length base to apex of male TYPE 48 mm.; variation of length in type series 45-51 mm. Hindwing length of male TYPE 37 mm.; variation of length in type series 34-39 mm. Tail length of male TYPE 9 mm.; variation in type series 7-10 mm.

FEMALE: Upper surface of primaries: jet black; same markings as male, pale yellow submarginal and post-median spots reduced in size, and in number in post-median series.

Upper surface of secondaries: black; markings same as male.

Under surface of primaries and secondaries same as for male.

Palpi, head, thorax, and abdomen same as in male.

Forewing length of female ALLOTYPE 53 mm.; variation in type series 48-53 mm. Hindwing length of female ALLOTYPE 42 mm.; variation in type series 38-42 mm. Tail length of ALLOTYPE 10 mm.; variation of type series 8.5-10 mm.

As may be noted from the description above, the males and females are almost identical in appearance and most closely resemble female specimens of *Papilio bairdii* or *Papilio polyxenes* Fabricius. The lack of sexual dimorphism is characteristic of this race.

HOLOTYPE male: (expanse 76 mm.) Bright Angel Point, Grand Canyon, Coconino Co., Ariz., August 1953, leg. ERNST CHRISTENSEN.

ALLOTYPE female: (expanse 86 mm.) same locality and collector as HOLOTYPE, 14 August 1953.

PARATYPES: 9 males and 3 females. Data as follows (all but one male from the Grand Canyon National Park): 1 male, North Rim, 3 August 1938, leg. LOUIS SCHELLBACK; 1 male, Yavapai Point, South Rim, 22 August 1944, leg. LOUIS SCHELLBACK; 1 male, Bright Angel Point, North Rim, 13 August 1951, leg. ERNST CHRISTENSEN; 1 male, Bright Angel Point, North Rim, 7 August 1953, leg. ERNST CHRISTENSEN; 1 male, Roaring Springs, North Rim, 4 August 1953, leg. ERNST CHRISTENSEN; 1 male, near Ryan Ranger Station, Kaibab Plateau, Coconino Co., Ariz., 1 July 1952, leg. D. L. BAUER; 1 female, data same as for ALLOTYPE; 1 female, data same as for HOLOTYPE.

The HOLOTYPE and ALLOTYPE and four male PARATYPES will be returned to the Naturalist Work Shop Collection, Grand Canyon National Park; from there I believe the HOLOTYPE and ALLOTYPE will be sent to the U. S. National Museum. One male and one female PARATYPE will be returned to Dr. RODECK and the University of Colorado Collection, one male PARATYPE to the Yale Peabody Museum, and one male PARATYPE to the Los Angeles County Museum. The remainder are in the author's collection.

The type series of *Papilio indra kaibabensis* has been carefully compared with specimens of *P. indra* from northern California, Washington, and Colorado, *P. indra pergamus* from southern California, and P. *indra minori* from Colorado, and with other members of the *Papilio machaon* group. Following is a table of differences for the black Swallowtails of the West.

A. *P. polyxenes asterius* Stoll

This is widespread and the best known species of the group, so it will be used as a basis of comparison.

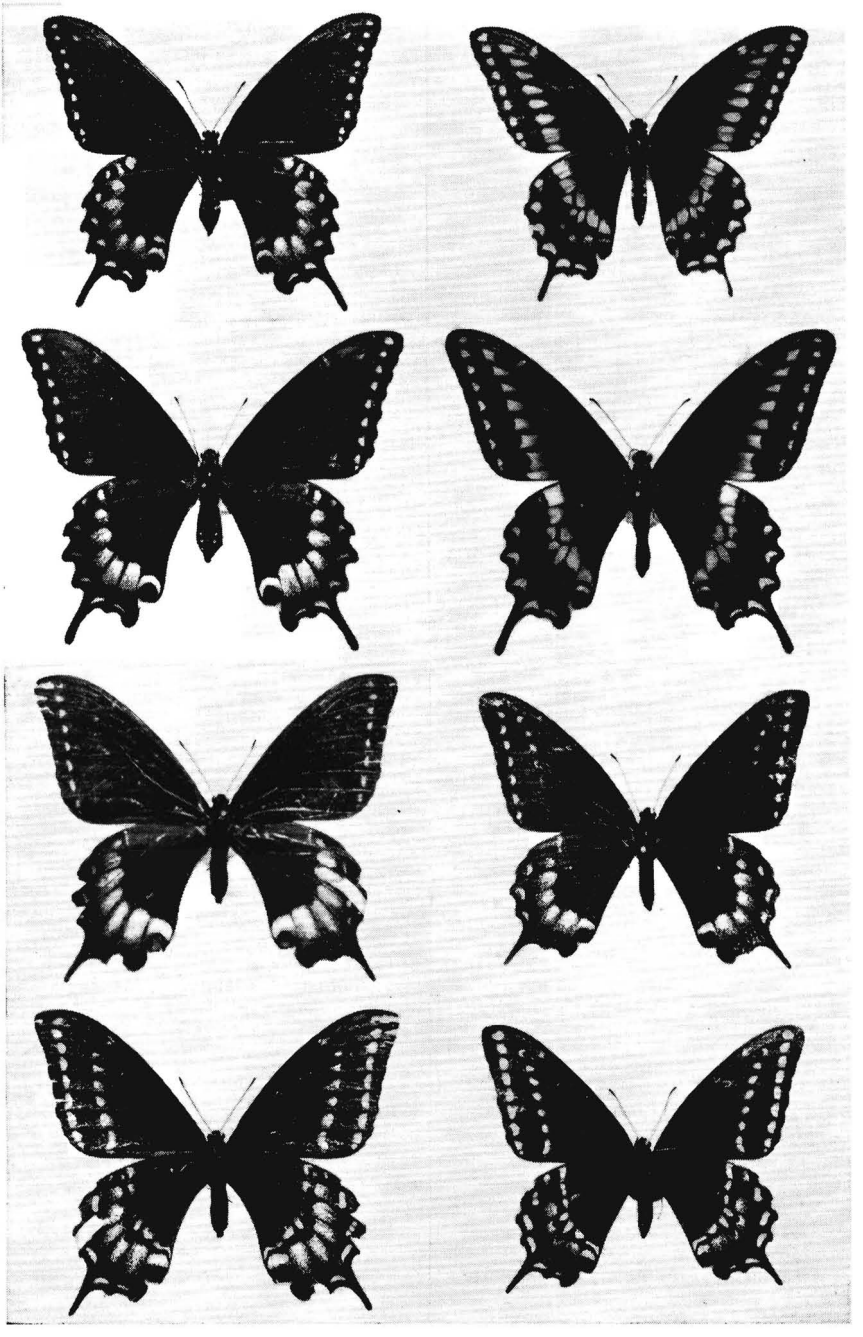
1. Wings: ground color black; pattern of markings shows marked sexual dimorphism and is composed of a complete submarginal series of yellow lunules and a complete series of yellow submedian spots in the male, variably obsolete in female; blue series of spots variable in prominence and number; anal orange spot pupiled with central black dot.
2. Tails long (8 - 10 mm.).
3. Palpi wholly black or partially yellow; antennæ and head black; two dorsal yellow spots posterior of eyes.
4. Thorax: the prothorax with two yellow dorsal spots; remainder of thorax and legs black; lappets or tegulæ black or only faintly yellowish.
5. Abdomen spotted in typical fashion with yellow.
6. Best distinguishing character: orange color of post-median and four submarginal lunules on underside of secondaries.

B. *P. rudkini* form "clarki" Chermock

1. Wings: ground color, pattern, and sexual dimorphism same as *P. polyxenes asterius;* post-median series of yellow spots of secondaries crosses wing differently and is wider near costal margin.
2. Tails long (7 - 10 mm.).
3. Palpi partially yellow; antennæ and head as in *P. polyxenes asterius.*
4. Thorax, legs, and lappets as in *P. polyxenes asterius.*
5. Abdomen spotted as in *P. polyxenes asterius.*
6. Best distinguishing character: smaller size and paler under surface, with considerably less orange in yellow spots.

C. *P. bairdii bairdii* Edwards

1. Wings: ground color and pattern same as in *P. polyxenes asterius;* sexual dimorphism more marked; male submarginal lunules and post-median series of spots normally larger, while in the female they are smaller; blue series of spots variable as in *P. polyxenes asterius;* anal orange spot has elongate black spot reaching to black along inner margin of wing.
2. Tails longer (8.5 - 12.0 mm.).
3. Palpi always yellow, sometimes tinged with black; antennæ black; head with considerable yellow all around the eyes.
4. Thorax: black with prominent yellow spots on prothorax dorsally and at base of forewings ventrally; lappets yellow or tinged with black; legs black.
5. Abdomen: spotted with yellow as in *P. polyxenes asterius,* but very variable, from very small nearly obsolete spots to large confluent spots; claspers black, partially yellow, or entirely yellow.
6. Best distinguishing characters: large size; much larger yellow submarginal and post-median spots on underside and very little orange except in post-median spots at end of cell of secondaries; also nature of anal orange spot and its black dot.



D. *P. indra indra* Reakirt

1. Wings: ground color and wing pattern typical of the group; wings more rounded; yellow spots very pale; post-median series of spots wider, forming a band on secondaries; blue series as in *P. polyxenes asterius* variable in number; anal orange spot and its central black dot as in *P. polyxenes asterius;* no notable sexual dimorphism.
2. Tails very short (1.5 - 4.0 mm.).
3. Palpi black; antennæ black; head black with two orange-yellow spots dorsally, as in *P. polyxenes asterius.*
4. Thorax as in *P. polyxenes asterius* except spots are orange-yellow; lappets pale orange-yellow; legs black.
5. Abdomen: black with one to three lateral yellow spots cephalad of claspers; claspers black.
6. Best distinguishing characters: more rounded wings; paleness of all yellow spots, which form band on secondaries; and very short tails.

E. *P. indra pergamus* Hy. Edwards

1. Wings: ground color and pattern of wing markings as in *P. indra indra,* but wings more angular; no notable sexual dimorphism.
2. Tails rather long (6.0 - 6.5 mm.).
3. Palpi, antennæ, and head as in *P. indra indra.*
4. Thorax as in *P. indra indra.*
5. Abdomen as in *P. indra indra.*
6. Best distinguishing characters: the more angular wings and longer tails separate it from typical *P. indra.*

F. *P. indra minori* Cross

1. Wings: ground color and pattern of wings as in *P. indra indra;* post-median band of spots much narrower and series of blue spots on secondaries more prominent; anal spot and black dot same; no marked sexual dimorphism.
2. Tails rather long (6 - 7 mm.).
3. Palpi, antennæ, and head black; head with the typical dorsal yellow spots.
4. Thorax as in *P. indra indra.*

EXPLANATION OF PLATE

Top: *Papilio polyxenes asterius*: left, *ex larva,* Cottonwood, 3500 ft., Yavapai Co., Ariz., 21 Aug. 1952; right, Sta. Catalina Mts., 3500 ft., Pima Co., Ariz., 17 Sept. 1948.

Second: *Papilio bairdii bairdii*: left, Mingus Mt., 6000 ft., Yavapai Co., Ariz., 18 Aug. 1952, *ex larva;* right, Grand Canyon Nat. Park, Ariz. (in G.C.N.P. collection). 1952.

Third: *Papilio indra kaibabensis,* upperside: allotype and holotype.

Bottom: *Papilio indra kaibabensis,* underside: allotype and holotype.

Females left, males right.

G. *P. indra kaibabensis* Bauer

1. Wings: ground color as *P. indra indra;* post-median band of spots greatly reduced on primaries, usually only partially represented, on the secondaries nearly always obsolete except for the spot nearest the costal margin; series of blue spots on secondaries more prominent than in any other of the black Swallowtails; no strong sexual dimorphism.
2. Tails long (7 - 10 mm.).
3. Palpi, antennæ, and head as in *P. indra minori.*
4. Thorax as in *P. indra minori.*
5. Abdomen as in *P. indra indra.*
6. Best distinguishing character: the very dark males, which closely resemble females of *P. polyxenes* and *P. bairdii.* The females can be separated readily from females of other species by the *indra*-marked abdomens and also other *indra*-type markings. Both males and females can be separated from other *P. indra*-group races by the larger size, longer tails, and darker coloring.

I wish to thank Dr. C. L. REMINGTON for his helpful counsel, Mr. DONALD EFF and Mr. W. C. MINOR for the loan of specimens of *P. indra minori,* and Professors MELVILLE H. HATCH and TREVOR KINCAID of the University of Washington for the photographs presented with this paper.

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RECORDS OF *BOLORIA TODDI* FROM MARYLAND

At higher elevations in the East, *Boloria toddi* (Holland) [=*Brenthis bellona* (Fabricius)] occurs as far south as North Carolina (Klots, 1951) and Tennessee (Clark, 1932). Along the Atlantic Costal Plain, however, the southern limit of this species is recorded as New Jersey (Klots, 1951).

During the past few years, this species has been taken independently by the writer and by J. H. FALES at several localities in eastern Maryland. These include Harford Co. (Bel Air, writer), Howard Co. (Dayton, writer), Prince Georges Co. (Beltsville, J. H. FALES; College Park, writer) and Montgomery Co. (Silver Spring, writer).

AUSTIN CLARK (Clark, 1932) mentioned the possible occurrence of *B. toddi* near Washington, D. C., although in spite of extensive collecting, he was unsuccessful in taking it in this area. In view of this, the records from Beltsville, College Park, and Silver Spring are especially interesting, as these locales are quite close to Washington, D. C., and are areas which were searched by Mr. CLARK. The recent occurrence of *B. toddi* in these areas may indicate a southward extension of the range of this butterfly subsequent to Mr. CLARK'S recording of its absence in 1932.

References

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