NEWS of the LEPIDOPTERISTS' SOCIETY

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OPTICAL CONFIGURATIONS FOR CLOSE-UP AND MACROPHOTOGRAPHY OF LEPIDOPTERA

Lepidopterists, whether professional or amateur, may find it desirable to make photographic records in the course of their activities. The professional may require actual specimens *and* records of their characteristics in the natural habitat. The photographic records provide information that collected specimens cannot provide and vice versa. To the amateur, capturing specimens on film may supplement a collection *or* it may be an alternative, complete in itself. In "no collecting" restricted areas, photography may be essential for collecting detailed documentation. Drawings and paintings from visual data, while frequently quite beautiful, are not always able to command the scientific respect accorded photographs.

A wide variety of diverse types of close-up and macrophotography equipment can be applied to the photography of lepidoptera. Numerous different techniques may be used to achieve a given end goal. The myriad of possibilities, however, frequently confound professional as well as amateur photographers. It is difficult to understand what trade-offs exist and to evaluate the choices with respect to an individual's particular requirements. A key question rests on what use can be made of existing equipment. In addition, equipment may serve multiple needs.

This paper is a summary of the optical configurations that can be used to achieve close-up and macrophotography of lepidoptera. With modern photographic equipment (e.g., single-lens-reflex design, through-the-lens light meter, automatic iris diaphragm, and meter coupling to aperture) close-up and macrophotography have been enormously simplified (no exposure calculations, etc.). This type of photography is no longer the sole domain of specialists but is readily available to the amateur as well. All arrangements discussed here can be configured from commercial components (with no requirement for custom made parts).

The description of photographic equipment and its use is often plagued by confusing semantics, misunderstandings, and technical errors. In fact, however, a correct description of the optics of photography is achievable using only elementary optical principles.

Optical Parameters

The primary characterization parameter of a lens is its focal length, f. A photographic lens converges the light rays incident upon the lens to form an image of the object placed in front of the lens. If the object is a distance s (object distance) in front of the lens, an image is formed at a distance s′ (image distance) behind the lens. The relationship between s and s′ is given by the lens equations $(1/s) + (1/s') = (1/f)$. If the object is at infinity, the image is formed one focal length behind the lens (if $s = \text{inf}$ then $s' = f$). As the object distance is decreased the image distance (distance from lens to film) increases. If the object is only two focal lengths in front of the lens, then the image is formed two focal length behind the lens (if $s = 2f$ then $s' = 2f$).

The linear magnification, m, is defined as the ratio of the size of the image to the size of the object. Reproduction ratio is the reciprocal of the linear magnification. If a 20mm specimen has a size of 4mm as imaged on the film, then the magnification is 0.20 and the reproduction ratio is 5.0 (or 5 to 1). Close-up photography covers the range of magnifications from approximately $m = 0.1$ to $m = 1$. Macrophotography (or photomacrography) covers the range from about $m = 1$ to $m = 10$. For adult *Papilio glaucus* Linnaeus a magnification of only about $m = 0.1$ is needed. At the other extreme, ova, first instar larvae, and microlepidoptera require up to about $m = 5$. Therefore, virtually the entire range of magnifications of close-up and macrophotography are needed in the photography of lepidoptera. The linear magnification in terms of the object and image distances is given by $m = s'/s$. An object at infinity has zero magnification (if $s = \text{inf}$ then $m = 0$). As the object distance is decreased the magnification increases. If the object is two focal lengths in front of the lens, the magnification is unity (if $s = 2f$ then $s' = 2f$ and thus $m = 1$). If the object is closer than two focal lengths away, the magnification is greater than unity.

The f number of a lens (written as f-no. or f/no.) is the ratio of the focal length of the lens to the aperture diameter of the lens. Photographic lenses usually have an adjustable aperture iris built into the lens. This allows the aperture diameter to be varied to produce a large opening (small f-no.) or a small opening (large f-no.). The second characterization parameter of a lens is usually its largest working aperture given in terms of the corresponding f-no. Thus a 50mm f/2 lens means $f = 50\text{mm}$ and $\text{f-no.} = 2$.

The depth of focus of a photographic lens is the distance

over which the film can be moved (toward and away from lens) and the image still appear to be focused. This finite range of good focus occurs because of the limited resolving power of the human eye in viewing the final image. Thus the film position can be changed over a small range (depth of focus) and the human eye is unable to discern any difference in the resultant images. Of more practical significance is the depth of field, the range over which the object distance can be changed and good focusing maintained. The depth of field for the object on one side of the lens corresponds to the depth of focus for the image on the other side. The depth of field is a function of the magnification and the f-no. Mathematically, the depth of field, $\triangle$, is given by $\triangle = 2d(1+m)(\text{f-no.})/m^2$ where d is a constant equal to the diameter of the maximum tolerable blur spot (typically 0.1mm). The depth of field increases with increasing f-no. ($\triangle$ proportional to f-no.) and decreases with increasing magnification [$\triangle$ proportional to $(1+m)/m^2$]. These two parameters completely determine the depth of field. For the range of magnifications of close-up and macrophotography, the depth of field is unavoidably small. For m = 1.0 and f-no. = 4, the depth of field is $\triangle$ = 1.6mm using d = 0.1mm. Only by using a large f-no. (small aperture) can a workable depth of field be obtained. By changing to f-no. = 16, the depth of field becomes 6.4mm in this example. Because of the m^2 factor in the denominator of the expression for $\triangle$, the depth of field decreases extremely rapidly as higher magnifications are used. For example, with m = 2.0 and f-no. = 16, the depth of field is down to 2.4mm. In virtually all close-up and macrophotography, focusing is achieved by moving the entire camera forwards and backwards. The effect of backgrounds and foregrounds being out of focus may produce contributory as well as conflicting patterns in the resultant photograph. If the background and foreground are sufficiently removed from the specimen being photographed, it may be very desirable to have them totally blurred and completely lacking in detail so as not to detract from the specimen being photographed. The use of flash bulbs or an electronic strobe will produce a totally black background behind the insect if the background is sufficiently removed from the specimen. This eliminates all background distraction but may incorrectly give the impression of being a night photograph.

Photographic lenses are usually a combination of several simple lenses (typically 5 or 6) mounted together. The total lens, however, behaves quantitatively as though it were a single simple lens located at a point called the principal point. This effective position of the lens for a standard f = 50mm lens lies somewhere inside the lens structure, its location being specified in the manufacturer's literature. The object distance, s, is measured to this principal point. The actual distance from the object to the front of the lens is called the free working distance and is somewhat less than the object distance.

For a camera, the exposure is the amount of energy reaching the film. Quantitatively, (exposure) = (irradiance) x (aperture area) x (exposure time). Irradiance is the optical power per unit area incident upon the lens. The exposure time is merely the shutter time setting on the camera. To increase the exposure the aperture area may be increased (decrease f-no.) or the shutter time may be increased. Note that increasing the exposure by using a smaller f-no. also decreases the resulting depth of field. Natural lighting, flash bulbs, or electronic strobe may be used to illuminate a scene. Ambient lighting frequently provides adequate irradiance. A slight overcast sky is ideal in that it provides a soft, uniform, unvarying illumination. Direct sun light, on the other hand, produces harsh shadows and may vary rapidly as clouds drift past the sun. For close-up and macrophotography, auxiliary artificial illumination may be provided conveniently by a ring light electronic strobe that attaches as a ring around the end of the photographic lens (such as the Capro Model RL80 available from Ehrenreich Photo-Optical Industries, Garden City, NY 11530). This provides uniform, shadowless illumination. The high intensity of the strobe light also allows a very large f-no. setting to be used and thus an excellent depth of field is simultaneously achieved. In addition, somewhat of a "stop action" effect is obtained when using a strobe light since the flash duration is usually 1/200 sec. or shorter. This will stop antenna or slight wing movements that cause blurring in ambient light at exposure times of 1/30 sec. or longer. This flash duration, however, is much too slow to stop lepidoptera in flight. Surprisingly, most lepidoptera are not frightened by the strobe light and multiple pictures of the same specimen are usually possible. Quick movements of the photographer or the camera, on the other hand, usually do frighten lepidoptera.

Optical Configurations

The four basic categories of optical configurations used in close-up and macrophotography are close-up attachment lenses, extension techniques, lens reversal, and macro lenses. These are shown schematically in Fig. 1. These configurations as well as combinations of them represent essentially all possible close-up and macrophotography arrangements.

Close-up attachment lenses are attached directly to the front of the prime camera lens. The refractive power of the prime lens is increased by the addition of these attachment lens. The refractive power of a lens given in diopters is the reciprocal of the focal length of the lens given in meters. The refractive power of a combination of lenses is the sum of the refractive powers of the individual lenses. Thus, $(1/f') = (1/f_L) + (1/f_c)$ where f', f_L, and f_c are the focal lengths of the combination of lenses, the prime lens, and the close-up attachment lens respectively. Using an attachment lens produces a combination of lenses with a shorter focal length than the original prime lens. Since the distance to the film plane (image distance) is unchanged, the object distance is decreased (closer focusing) and thus higher magnification ($m = s'/s$) is obtained. Additional attachment lenses may be added to increase the magnification further.

Close-up attachment lenses have a number of advantages: 1) They are very small in size and thus very portable. 2) They are very simple and convenient to use. 3) They do not interfere with the operation of the camera's automatic iris diaphragm or the light meter coupling to the aperture setting. 4) They do not require any additional exposure. 5) They are inexpensive (about $12 each). The disadvantages of using close-up attachment lenses are: 1) Image quality is decreased from that of the prime lens alone. This is due to optical aberrations introduced by combining lenses and is especially apparent away from the center of the image. This undesirable effect becomes even more objectionable when multiple attachment lenses are used together. 2) Only relatively low magnifications (up to about m = 0.2) are achievable. 3) The depth of field is decreased compared to the prime lens alone (due to decreased focal length and thus decreased f-no.). 4) Attachment lenses are usually not "coated." This means that they lack the anti-reflection coating usually found on newer photographic lenses. This has a negligible effect on

the optical performance of the system. However, lepidoptera are frequently frightened when such a reflecting surface is brought near them. It dramatically advertises the camera's presence to the insect, making close approach difficult. For lepidoptera photography, only "coated" optics should be used.

Extension techniques simply involve moving the prime lens further from the film plane (increasing the image distance). Since the focal length of the lens is unchanged this allows closer focusing (object distance decreased) and thus higher magnifications. With the prime lens focus set at infinity focus, the amount of extension, d, needed to produce a given magnification, m, is given $d = mf$ where f is the focal length of the lens. Therefore as the desired magnification increases, so must the length of extension. As shown in Fig. 1, either rigid extension tube(s) or a variable bellows attachment may be placed between the lens and the camera to achieve extension. Extension techniques are commonly used with lenses having focal length of about 50mm (normal camera lens) and larger (including telephoto lenses). For a given magnification, the normal lens must be much closer to the lepidoptera than is necessary for the telephoto lens. Thus the free working distance (and the object distance) increase with increasing focal length. This emphasizes that the resultant magnification is not determined solely by how close the camera is to the subject (object distance) but also depends on the focal length of the lens. In fact, by combining the lens equation, $(1/s) + (1/s') = (1/f)$, and the magnification equation, $m = s'/s$, it is shown that $m = f/(s-f)$. Increasing the free working distance certainly lessens the chance of inadvertently frightening a specimen. However, severe difficulties are introduced when a telephoto lens is used with extension techniques. These are a) that a greatly increased exposure is required and b) that a tripod or other such mounting is required to hold the camera sufficiently steady so as to eliminate motion blurred images. The addition of a tripod is shown schematically in Fig. 1 for the use of extension techniques with telephoto lenses.

The advantages of rigid extension tubes are: 1) They are small in size. 2) They allow the prime lens to be used (with its minimum optical aberrations). 3) They can be used together in combinations to produce a variety of magnifications. 4) They are inexpensive (about $20 per set). The disadvantages of rigid extension tubes are: 1) They are cumbersome to change in the field. 2) They require an increased exposure to be used. 3) In some makes of equipment their use results in the loss of the camera's automatic iris diaphragm and/or the light meter coupling to the aperture setting. The advantages of a bellows attachment are: 1) It allows the prime lens to be used. 2) It is continuously adjustable and thus allows a continuous range of magnifications to be obtained. The disadvantages of a bellows are: 1) With its accompanying adjusting rails, it is somewhat large and a little awkward to handle. 2) It is somewhat expensive (about $100). 3) It requires an increase in exposure. 4) It results in the loss of the camera's automatic features.

Lens reversal is a commonly used technique in close-up and macrophotography. In addition to its application to normal lenses, it is also used with macro lenses and in combination with extension techniques. The principal point (apparent position of the lens) of most photographic lenses is located near the back (film plane side) of the lens. Therefore, when the lens is reversed by means of an adapter ring, the principal point is farther from the film plane and closer to the object. This increase in image distance and decrease in object distance results in a larger magnification ($m = s'/s$).

The advantages of lens reversal are: 1) The reversing adapter ring is very small in size and thus very portable. 2) The free working distance is increased in comparison to using the same lens with extension techniques. 3) The reversing adapter is very inexpensive (about $3). The disadvantages of lens reversal are: 1) Only one fixed magnification is obtained (about $m = 0.8$). 2) The manual focusing feature of the lens is lost. 3) The camera's automatic iris diaphragm feature and light meter coupling to aperture feature are lost.

Macro lenses are especially designed lenses that have minimum optical aberrations and thus the sharpest possible image (excellent flatness of field, color correction, resolution, and contrast) when they are used for close-up and

(Concluded on Page 5)

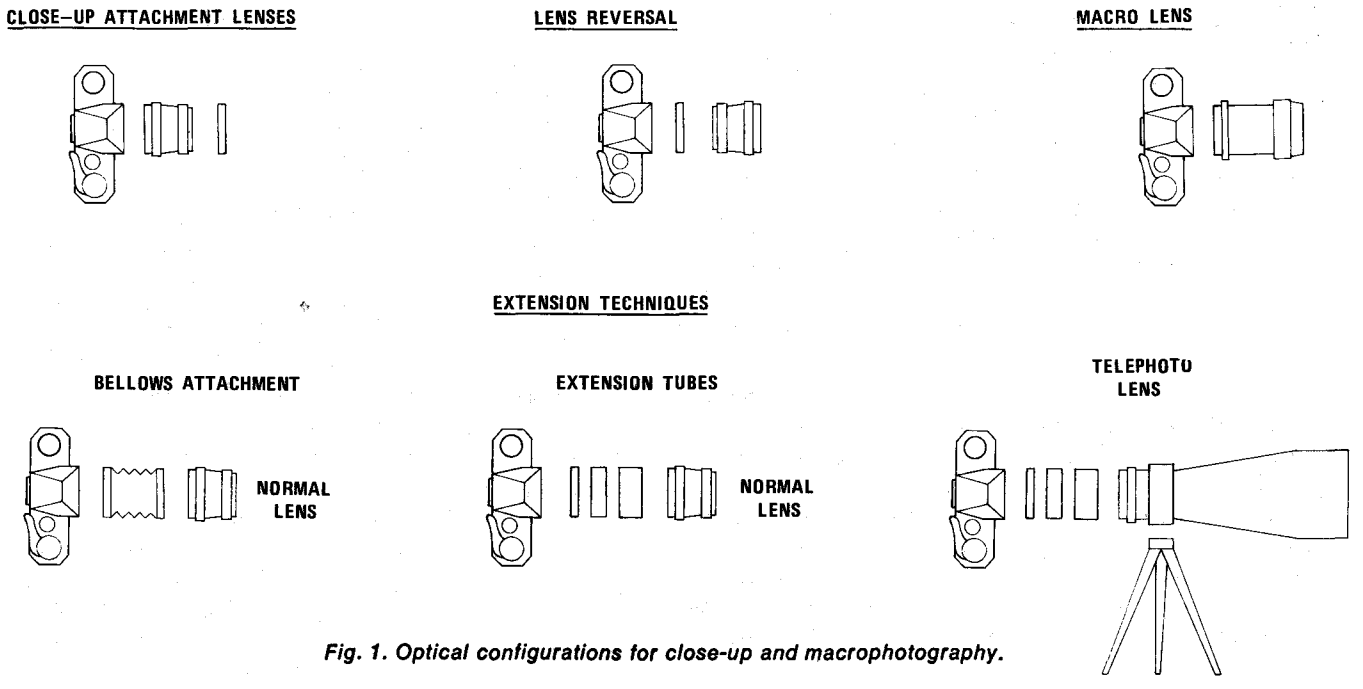

Fig. 1. Optical configurations for close-up and macrophotography.

THE SPREADING BOARD

By C. V. Covell, Jr.

Here's a NET REPAIR tip: Wrap a few turns of adhesive tape around the handle or ferrule of your insect net. If you get a bad tear while in the field, just unwind a sufficient amount to cover the rip. Remarkable how small a hole a butterfly can escape through!

J. E. Pilkington, 3125 Sandwich St., Windsor, Ontario, Canada writes: "On a trip through Northern Michigan last year in early June we set up our newly acquired UV light at a likely spot on a dirt road bordered by trees on both sides. This light is a single tube encased in clear plastic and for convenience we used the tripod legs to stand it upright on the car roof. The light operates off the car battery via the cigarette lighter.

After a chilly half hour of no activity around 10 p.m. we had decided to pack it in when we both heard a soft rustling sound 15 feet or so from the front of the car where the circle of light is so dull, visibility is much reduced. The intermittent sound was coming from the road surface and moved occasionally which added to our confusion. A couple of times I almost wrote it off as a cicada or some other "bug" so you can tell how surprised I was to come nose-to-nose with a Luna spread out on the road. Since it refused to flutter up I couldn't get it into the net but put a wide-mouth killing jar over it for a few minutes, then picked it up. Not a scale out of place despite the way it thrashed around on the gravel road.

During the next hour we took a single male *A. polyphemus* in exactly the same way, two more magnificent *lunas* on our knees on the road and a couple of sphinx moths *(S. cerisyi* and *S. gordius)* although I should add that there were also some moths taken in traditional manner right at the light. We even left one of the *lunas* fluttering in the grass by the side of the road to see if it would lift eventually but without success. Is this the result of the low temperature, probably in the low 40's? Or does UV light have this effect in some circumstances?

This tale has a moral for all collectors to make sure your captives are truly DEAD for after admiring the lunas back at the motel, we left them on the dresser as we slipped blissfully into the magic sleep of the successful hunter. Now imagine our faces next morning when we found our very-first-ever lunas were gone. Carried off by mice in the night? NO, but it took some searching to find them under the bed fully revived and not eager to be taken again.

In many hours of UV work back home around Essex County, Ontario, we have yet to attract another *luna* or large *saturniid* (plenty of *Io* moths) but this June will see us heading into Northern Ontario and any advice or tips would be most welcome."

ANS: Many moths will come near but not right to the light, and the heavier ones often thrash about in the vegetation. Some seem to have trouble taking off again because of large size and, to be sure, cooler temperatures. It is not unusual for large insects to come back to life when they have not been exposed long enough to the killing agent, or to the right type in the right concentration. In some cases, a cyanide jar won't do its duty because of age, or because the gas is prevented from getting into the chamber through the plaster barrier.

NOTICE TO ALL MEMBERS

This year, the ballots for the election of officers and the notice of 1977 membership dues will be sent out with the fourth issue of the JOURNAL OF THE LEPIDOPTERISTS' SOCIETY (Vol. 30, No. 4). There will be no separate mailing.

Any member whose dues have not been paid by March 1, 1977 will be dropped from membership in the Society on that date unless the member has notified the treasurer that he intends to continue his membership and will pay the dues at a later date.

The cost of Life Memberships has been increased to $250.00 as of the last Annual Meeting in June, 1976.

KENTUCKY LEPIDS HOLD JULY FIELD MEETING

Members of the Society of Kentucky Lepidopterists, most with families along, converged on July 23 at the farm of William R. Black Jr. outside Paducah, Ky. Most of the group camped in the pasture, and Nancy Black treated them to a cookout and two breakfasts. While moth collecting was exceptionally good (hot, humid nights and dark of the moon), the heat made butterfly collecting rather disappointing. Spots in McCracken Co. (Ky. Wildlife Management Area), Ballard Co. (Ballard Wildlife Management area), and Hickman Co. (the famed Murphy's Pond, cypress swamp considered the northern limit of the Cottonmouth Moccasin) were visited on July 24, and 32 butterfly species recorded in all. The best catch was *Lethe appalachia,* taken in wet, grassy woods surrounding Murphy's Pond. Another field weekend, focusing on *Hesperia leonardus,* is planned after Labor Day in Meade Co., Ky., and the Annual Meeting will be at the University of Louisville on Saturday, Nov. 20.

—C. V. Covell Jr.

POSTHUMOUS PROGENY FROM A DEAD PAPILIO THOAS

(Posthumous, according to Webster's Dictionary, applies to children born after the death of the father. I wonder if the term can be rightly applied in the present case). While experimenting, with negative results, to see if the larvae of *Papilio thoas* L. would feed on Avocado Tree *(Persea americana* Miller, Lauraceae), more than 50 females were captured and forced to oviposit during July, August and September 1975.

One of the females died on our way back from the fields. Still we extracted the eggs from the abdomen, some two hours after our arrival, and applied them to various Piperaceae (the normal foodplant in this country) plants in groups of 4 per leaf, with the fluids squeezed from the abdomen daubed on them. Of the 13 eggs so treated we obtained 8 larvae, two of which produced adults 45 days later. The rest of the eggs were destroyed by ants, and the other larvae died before pupation.

Alberto and Pierre Muyshondt
101 Ave. N. 322
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OPTICAL CONFIGURATIONS FOR CLOSE-UP AND MACROPHOTOGRAPHY OF LEPIDOPTERA

macrophotography. These lenses usually have a focal length in the range of 50mm to 200mm. Their magnification range is from m = 0 (infinity focus) to m = 1 or m = 2. Special mechanical design (extended helical focusing) provides the greater lens travel necessary to achieve this broad range of magnifications. A normal 50mm focal length lens focuses down to about 18 inches. A 50mm macro lens focuses down to about 9 inches. The maximum aperture of a macro lens is usually smaller (f-no. = 4) than that of normal lens (f-no. =2). However this is of minor concern in close-up and macrophotography since depth of field requirements dictate the use of small apertures. In general, the performance and convenience of use of macro lenses are excellent.

The advantages of macro lenses are: 1) They are specifically optically corrected to give optimum performance for close-up and macrophotography. 2) They are very versatile and are capable of a very wide range of magnifications. 3) No adapters are needed and usually (not always) the automatic features of the camera are retained. The disadvantages of macro lenses are: 1) They are expensive (about $200). 2) Their maximum aperture is small and this somewhat limits their use in ordinary photography.

Thomas K. Gaylord
School of Electrical Engineering
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THE EUROPEAN SKIPPER (T. LINEOLA)— A NEW MANITOBA BUTTERFLY

In routine insect collecting this past July a colony of *Thymelicus lineola* was found in downtown Winnipeg along the Red River. The species was locally abundant. The river is lined with elms, ash, and Manitoba Maple. Knee-deep grass and native plants also occurred here. A total of 117 *lineola* were taken in two days in early July.

T. lineola is new to Manitoba and is at its most northern range at present in North America. The Manitoba specimens are somewhat larger than a series from Chicago, Ill., and are also more brightly marked than European specimens. From the literature available, it seems that the species is moving with apparently invasive force. It may well supplant native skipper species occupying the niches of river side habitats.

T. lineola has a parallel history to this in England where it was first acknowledged a British species in January 1890. It has since spread in many parts of Essex, notably in habitats along the coast. In England eggs are laid in late summer in dried grass seed heads, and hatch the following April.

Walter Krivda

HOMOSEXUALITY IN MALE CITHERONIA REGALIS

On June 21, 1976, I enclosed 6 female and 7 male reared *Citheronia regalis* moths in a large screened walk-in trap at the marshy edge of my woods in Eldora, Cape May County, New Jersey. Wild males had the opportunity to enter through a narrow, inwardly-directed baffle, but the enclosed moths would have difficulty in escaping. The object of the exercise was to learn whether any of the moths would mate within the confines of the screened structure.

The next morning I found that 7 wild males had entered, while all the captive moths were still present. Four females had mated. Of these, three had settled close to one another on one of the screened panels. Directly opposite them, on the outside of the panel, I found a pair of wild males *in copula.* They were in the conventional mating position of *C. regalis,* with an end-to-end union, one moth facing upward and the other downward. Each one's right clasper was visible; in other words, each had grabbed the other's left clasper and had somehow found it a satisfactory object with which to attempt copulation.

I was able to transfer the moths to a twig and carry them to the house without their coming apart. They then remained *in copula* until nightfall, exactly as a heterosexual pair would have done.

One can readily conclude that the proximity of three females, all producing mating scent simultaneously, would overstimulate the two males and lead them to attempt to unite, each under the delusion that it had located a female. But that such a delusion could persist after their genitalia had effected a mutual closure that could not have been less than anatomically awkward and personally uncomfortable—this smacks of deviation. I submit that these moths represent the first instance of X-rated Lepidoptera.

C. Brooke Worth
R.D. Delmont, N. J. 08314
July 19, 1976

OCCURRENCE OF PAPILIO ORNYTHION IN NEW MEXICO

On August 27, 1975 I collected a single specimen of *Papilio ornythion* (Boisduval) 3 miles northeast of the New Mexico State University campus in Las Cruces, New Mexico. Due to the proximity of Las Cruces to the Rio Grande, it is probable that this is a stray migrant. This is a New Mexico state record and one of few U. S. records of this Central American species outside of Texas. In Texas, it is recorded from the central interior southward and more commonly in the Brownsville, McAllen, and Mission areas (Tyler 1975, The Swallowtail Butterflies of North America).

William H. Baltosser
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Las Cruces, New Mexico

BOOK NOTICES:

RHOPALOCERA DIRECTORY, by John R. Beattie. First volume of projected *Insecta Directory.* (See review elsewhere in last issue.) A computerized index to all generic and specific butterfly names in the *Zoo. Record* 1864-1971 and in *Ber. uber . . . Ent.* 1834-1863. Special supplemental sort for locating names misspelled in the literature. Offset or quality photo copy reproduction. Sturdy paperback, 169723 entries, 365 pages, 8½" x 11". $40.00 to libraries, $30.00 to individuals. Free 10-day examination without obligation: JB Indexes, 2377 Virginia Street, Berkeley, CA 94709, U.S.A.

BUTTERFLIES OF THE WORLD, H. L. Lewis, 1973, 320 pp., 208 color plates (with 6500 photographs), $14.95 delivered. The Lepidoptera Co. Ltd., 7316 S. Sacramento Ave., Chicago, ILL. 60629, USA

RESEARCH REQUESTS:

Need living material, preferably cocoons, of *Aglia tau*. Pupae are often just encased in moss, leaves, or plain dirt. Dr. B. G. Falk, P.O. Box 315, Belvedere, CALIF. 94920, USA

Wanted, for a project on the history of butterfly farming, any information (anecdotes, photographs, publications) on James Sinclair, from San Diego, who published in 1917 an instruction manual for collecting and preserving Lepidoptera. Jeannine Oppewall, 1021 C 20th St., Santa Monica, CALIF. 90403, USA

Need living material, prefer pupae, of *Pieris napi oleracea* and *venosa* for continuing experimental work on *Pieris* relationships. Please write beforehand. S.R.Bowden, 53 Crouch Hall Lane, Redbourn,Herts,ENGLAND

Want records of *Podosesia syringae* (Sesiidae). This clearwing, the Lilac or Ash Borer, is widely distributed east of the Rockies. Esp. interested in late summer and fall records. F. F. Purrington, Dept. of Entomology, OARDC, Wooster, OHIO 44691, U.S.A.

Want to borrow specimens of *Acroncosa* (Phycitinae) a small pyralid with white FW transversed by two orange lines. Found in SW U.S. Contact Dr. Carll Goodpasture, C/O Julian Donahue, Dept. of Entomology, L.A. County Museum, 900 Exposition Blvd., Los Angeles, CA. 90007, U.S.A.

NOTICES:

Members of the Lepidopterists' Society are invited to use this section free of charge to advertise their needs and offerings in Lepidoptera. We cannot guarantee any notices, but all are expected to be made in good faith. Please be brief, clear, and check spelling. Notices will be limited to 2 appearances. The Editor reserves the right to alter or reject unsuitable copy.

FOR SALE: Most species of butterflies (skippers special request only) of British Columbia, Yukon Terr., and Alaska. Also photos of living and dead specimens. Will collect on request. Price list and current stock list available now. C. S. Guppy, 4120 St. Georges Ave., North Vancouver, B.C. V7N 1W8, CANADA

FOR SALE: All Lepidoptera; new and used entomological books. 44 page color catalogue covers over 1000 species of Lepidoptera plus 10 supplementary lists each year for $6.00; catalogue only for $3.50. Your "want lists" invited. The Saruman Museum, Beckley, Rye, Sussex, ENGLAND TN31 6SB

FOR SALE: Large selection of West Malaysian butterflies and moths for collectors or art work. Also beetles, cicadas, scorpions, and many other exotic insects. B .L. Gooi, P. O. Box 9, Tanah Rata, Cameron Highlands, WEST MALAYSIA

FOR SALE: Large selection of worldwide butterflies, moths and beetles. Many rare exotic species. Free price list on request. Offers for exchange welcome. Desire to contact foreign collectors for specimens in quantity. Dan Capps, 231 Powers Ave., Madison, WISC. 53714, USA

WANTED: Overwintering eggs and pupae for Lepidoptera farming and release in nature displays at educational shows. Almost any species, esp. Papilionidae, Saturniidae, other large species. Please state quantities and prices; prompt reply to all offers. Robert Goodden, Worldwide Butterflies Ltd., Sherborne, Dorset, ENGLAND

FREE: Limited number of ova of *Hemileuca hera magnifica* to someone who wishes to describe the life history. *Artemisia* is probable foodplant. Richard Holland, 1625 Roma NE, Albuquerque, N.MEX. 87106, USA

FOR SALE OR TRADE: Living pupae of *Antherea pernyi* and *A. harti* (50¢ ea.), *Pachysp. occidentalis* (80¢ ea.). Ova of *Sat. walterorum,* others. Write for list. Bob Grossmann, 8340 Mono Lake Drive, San Diego, CALIF. 92119, USA

WANTED: Pages 233-350 of Trans. Amer. Ent. Society, Vol. 91 (entire volume if necessary). Please write with price. R. A. Rahn, 3214 W. Springdale Ave., Wausau, WISC. 54401, USA

FOR SALE: *Ornithoptera.* Write for price list and information. Donald Eff, 445 Theresa Dr., Boulder, COLO. 80303, USA

EXCHANGE: Do you need *Mitoura hesseli, Lyc. melissa samuelis, Eupt. areolata septentrionalis,* other U.S. species? Let's trade. Bill Wright, 18 Clinton Pl., Woodcliff Lake, N. J. 07675, USA

FOR SALE: S. American butterflies, many species, reasonable prices. Write for price list. Also N. American insects. Also one pair of *Ornith. victoria,* perfect condition. Will take best offer. Brett Barrett, P.O. Box 107, Alvaton, KENT. 42122, USA

FOR SALE: 50 different butterflies from Africa incl. *Papilio, Charaxes* ($25). *Goliathus meleagris* beetles (white), each $23, or 10 for $155. Includes airmail postage. Payment by $ cheque. Lists on requests of butterflies, moths, beetles from Africa, Paraguay, Malaysia, Philippines, Australia, Europe. Robert Keiser, Frederik van Eeden Plein 3, Box 34, B-2050 Antwerp, BELGIUM

EXCHANGE: Midwest U.S.butterflies with anyone anywhere. Newell Schwamberger, 9265 Airport Hwy., Monclove, OHIO 43542.

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