ODONATOLOGICAL ABSTRACTS

1972

(2666) LANDA, H.H., 1972. Die Libellen des Entensees. Ber. Offenbach. Ver. Naturk. 77: 26. — (*Author's address unknown*).
18 common spp. are listed from a pool in the city of Offenbach nr. Frankfurt, German Federal Republic.

1975

(2667) NORBERG, A., 1975. Hovering flight of the dragonfly Aeschna juncea L., kinematics and aerodynamics. *In*: T.Y.-T. Wu, C.J. Brokaw & C. Brennen, Swimming and flying in nature, Vol. 2, pp. 763-781. Plenum, New York. — (*Dept. Zool., Univ. Göteborg, S-400 33 Göteborg*).
The kinematics of free unimpeded hovering flight of A. juncea was analysed from films taken in the field with 80 frames sec^{-1}, and from still pictures taken with a motorized camera. — The body is held almost horizontal, and the wing stroke plane is titled 60° relative to the horizontal. In these respects the dragonfly differs strongly from most other hovering animals. The wing beats essentially in the same plane on the downstroke and upstroke. All wings are strongly supinated (pitched-up) during the upstroke. The stroke angle is ca. 60° and the wing beat frequency ca. 36 Hz. — Average, minimum force coefficients were calculated with use of steady-state aerodynamic theory. Calculations were made under several alternative assumptions and gave lift coefficients of 3.5 to 6.1, which are all far too large to be explainable with steady-state aerodynamics. At least 60% of the force generated in hovering flight are due to non-steady-state aerodynamics. The pitching rotations of the wings at top and bottom of the stroke are believed to contribute much force, although the exact mechanism is not clear. — At the leading edge of the wing of dragonflies there is a unique morphological arrangement, the node. It permits elastic tension of the leading edge and seems to be an adaptation permitting strong wing twistings. The node may also function as a shock absorber. (Author).

1976

(2668) AKRE, B.G., 1976. The effect of alternate prey presence on the functional response by larval damselflies to changes in cladoceran prey density. V+132 pp. M.A. thesis, Rice Univ., Houston, Texas. — (Correspondence to: *Dr. D.M. Johnson, Dept. Biol., East Tennessee St. Univ., Johnson City, Tenn. 37601, USA*).
The effect of alternate prey availability on the functional response by larval Anomalagrion hastatum to change in the density of a cladoceran prey was measured in large-volume simulated weedbed systems with low (natural) prey densities. A study of predator selectivity, a key to functional responses for single prey within a multiple-prey system, was included in the experimental design. — The dragonflies exhibited hyperbolic (destabilizing) functional responses for single prey, but sigmoid (poten-

tially stabilizing) responses for both spp. in a complementary density two-prey system. Deviations of two-prey response data from "constant preference" predictions suggested that variable selectivity may have been the source of the observed regulatory potential. — Presented with varying relative abundances of the two prey, predators increased their selectivity for the more abundant spp. i.e., they switched. Therefore, predator switching may be the source of regulatory potential in the functional response. The larval tendency toward switching, and their selectivity for Daphnia magna at equal densities of prey, increased with increasing predator hunger. Increasing total prey density also increased equal density selectivity for D. magna. These changes in predator selectivity are discussed with reference to optimization theory. — A behavioral hypothesis explaining switching and the potentially stabilizing functional responses (reward reinforcement of selective search modes) is proposed. Relationships between switching and regulatory potential in functional responses for two competing prey, and for prey within multiple-prey systems, are discussed. Theoretical and documented effects of alternate prey availability lead to the conclusion that relative prey abundance and predator selectivity may be more important determinants of field functional responses than absolute prey dentisy or predator hunger level. (Cf. also *OA* No. 2617).

(2669) GLAUS, H., 1976. Ansprache von dr. Hans Glaus, Prädisent der naturwissenschaftlichen Gesellschaft Thun, anlässlich der Vernissage zur Fotoausstellung von Otto R. Strub und Irene Siegenthaler, Galerie Zur Heubühne, Oberdiessbach, 26. September bis 10. Oktober 1976. II + 3 pp. Filmstudio 2 S Thun, Thun. (Text in Swiss German). — (Author's address: *Sonneckweg 6, CH-3600 Thun*; — Publishers' address: *Filmstudio 2 S Thun, Seestr. 26 J, CH-3600 Thun*).
Address delivered at the opening of the Dragonfly Photograph Exhibit by Mr. O.R. Strub and Miss I.E. Siegenthaler, Thun, Switzerland, in Oberdiessbach, Switzerland. (Cf. *OA* No. 1768).

1977

(2670) COMPTE, A., 1977. Nueva cita de Diplacodes lefebvrei (Ramb.) en España (Odonata, Libellulidae). Graellsia 33: 229-236. — (*Inst. Esp. Entomol., José Gutierrez Abascal 2, Madrid-6, Spain*).
The Iberian distribution of D. lefebvrei is reviewed and the ecology of the sp. is briefly outlined.

(2671) GROSSNIKLAUS, H.P., 1977. Ansprache von H.P. Grossniklaus, Biologielehrer Lehramt Bern, anlässlich zur Fotoausstellung Otto R. Strub und Irene Siegenthaler, Schulwarte Bern, 6. Mai bis 4. Juni 1977. II+5 pp. Filmstudio 2 S Thun, Thun. (Text in Swiss German). — (Author's address: *Höhenweg 6, CH-3700 Spiez*; — Publishers' address: *Filmstudio 2 S Thun, Seestr. 26 J, CH-3600 Thun*).
Address delivered at the opening of the Dragonfly Photograph Exhibit by Mr. O.R. Strub and Miss I.E. Siegenthaler, Thun, Switzerland, in Berne, Switzerland. (Cf. *OA* No. 1793).

(2672) MÜLLER, J., 1977. Nachweise von Sympetrum pedemontanum (Allioni) (Odonata) im Bezirk Magdeburg. Abh. Ber. Naturk. Vorgesch. Magdeburg 12 (1): 11-12. (*Pablo-Neruda-Str. 9, DDR-3018 Magdeburg, GDR*).
7 records (1975-1977) of S. pedemontanum from the Magdeburg area, German Democratic Republic, are listed and discussed. (Cf. also *OA* Nos. 992, 2701).

(2673) NEWMAN, B.G., S.B. SAVAGE & D. SCHOUELLA, 1977. Model tests on a wing section of an Aeschna dragonfly. *In*: T.J. Pedley, [Ed.], Scale effects in animal locomotion, pp. 445-477. Academic Press, New York. — (*Dept. Mechanical Eng., 817 Sherbrooke Str. West, Montreal, Que., H3A 2K6 CA*).
The chord Reynolds number of a dragonfly

wing flying at high speed is of the order of 10^4. It is well known that aerofoils at moderate incidence experience an increase of drag coefficient and a decrease of lift coefficient as the Reynolds number is reduced below a critical value of about 5 x 10^4 and that this is associated with complete separation of the laminar boundary layer. — The aerofoil section of the dragonfly is unusual, as indicated by Fig. 1a which is a sketch of a photograph of the section just inboard of the nodus on the wing of Aeshna eremita. — Attention is drawn to the minute saw-teeth on ech web of the T section which forms the leading edge (costa), and the spurs on both sides of the matrix which supports the rear membrane. The saw-teeth very likely act as turbulators to promote transition in the separated shear layer and subsequent reattachment of the boundary layer in a turbulent state. Smoke tunnel studies of the wing section support this hypothesis. Trapped vortices are observed in the V sections at low incidence, and at high incidence (about 10°) the flow is observed to reattach to the rear cambered membrane; the leading-edge separation bubble is then greater than half a chord in length. The purpose of the spurs which are roughly the height of the viscous sub-layer for the reattached flow, is less obvious. — The average flapping frequency in forward flight (about 10 m s^{-1}) is roughly 25 Hz (Nachtigall) so that in one cycle the wing moves forward about 40 chord lengths. It is therefore postulated that the aerodynamics may be usefully studied, at least initially, on a static wing in steady flow. — Indoor free-flight tests have been made on two sizes of model glider with a similar wing section. Under stroboscopic illumination flights have been photographed using a long time exposure. With reflectors placed on the model and above the horizontal floor the flight altitude, flight-path angle and speed have been measured in steady flights for various trim conditions. From this data the lift coefficients and drag coefficients as a function of angle of attack and Reynolds number may be estimated. The results show the dragonfly wing section to be very efficient and comparable to a very-high-performance, low-Reynolds-number aerofoil, fitted with an artificial turbulator. (Authors).

(2674) TUZET, O., 1977. La spermatogenèse. *In*: J. Carayon, P.P. Grassé, P. Joly, R. Martoja, Ch. Pérez & O. Tuzet, [Eds.], Traité de Zoologie 8 (V/4): 139-276. — (*Dep. Zool., Univ. Sci. Techn. du Languedoc, F-34060 Montpellier*).
This is a useful review of the subject in the well-known comprehensive handbook. The odon. chapter ("Paléoptères") appears on pp. 149-154, 266 (references). The account is based on selected literature published up to and inclusive 1966.

1978

(2675) BALL, E. & J. GLUCKSMAN, 1978. Limnological studies of Lake Wisdom, a large New Guinea caldera lake with a simple fauna. Freshw. Biol. 8 (5): 455-468. — (*Dept. Neurobiol., Res. Sch. Biol. Sci., Australian Natn. Univ., P.O.B. 475, Canberra, A.C.T. 6001, AU*).
The lake has a nearly circular shape and fills the central caldera of Long Island, Papua New Guinea. It is of interest because of its large size (95 km^2), great depth (360 m), the presence of O_2 throughout, and because of the surprising lacunae in its biota. Among the few insect spp., Odon. are also represented.

(2676) BECHTEL, H., 1978. Das Münsterland in Farbe. Ein Reiseführer für Naturfreunde mit 120 Farbfotos. 72 pp., 120 col. figs. incl. Franck, Stuttgart. — Price: DM 8.80. — Author's address: *Siegfriedstr. 26, D-4 Düsseldorf-Ok, GFR*).
This is a general nat.-hist. guide to the country around the city of Münster, Westfalia, German Federal Republic. On p. 36, a colour photograph of Lestes virens is given along with a few general notes on the sp.

(2677) COWIE, B., A.J. CONNER & L.N. CONNER, 1978. A survey of the benthic inverte-

brates from the Freshwater Valley, Stewart Island. Mauri Ora 6: 27-32. — (*Dept. Zool., Univ. Canterbury, Christchurch-1, NZ*).
The benthic invertebrates, collected from Freshwater Valley, Stewart Island, New Zealand, are listed and their relative abundance noted. The taxa discussed include also Odon.

(2678) LAVOIE, J., J.-G. PILON & M.A. ALI, 1978. Etude histologique et morphométrique de la croissance de la partie photosensible de l'oeil composé d'Enallagma boreale Selys (Odonata: Coenagrionidae). Biol. Vestn. 26 (2): 141-151. (With Slovene s.). — (*Dép. Sci. biol., Univ. Montréal, C.P. 6128 Montreal, Que., H3C 3J7, CA*).
During the postembryonic development of the compound eye the number of retinulae is increasing. The increase is particularly pronounced at the transition from the aquatic to the aereal life. The structural organisation of the retinulae, however, remains unchanged during the growth processes, and is described and illustrated in detail. The larval retina is characterized by the presence of a field of protective pigment. In the adults, in this area the tracheal system is particularly well developed. Statistical analysis has shown that neither in the larval nor in the adult stage there are any morphological distinctions between the dorsal and the ventral retinulae, while the photosensitive parts of the compound eyes of adults and larvae are significantly distinct.

(2679) RETTIG, K., 1978. Zum Vorkommen einiger Insektenarten in Ostfriesland. 11 pp., 42 figs. excl. Emden, privately published. — Price: DM 6.—. — (*Danziger Str. 11, D-279 Emden, GFR*).
Annotations are given on 12 common odon. spp. from Eastern Frisia, German Federal Republic; for 6 of these, (badly reproduced) photographs are also provided. — (*Abstracter's note*: It is likely that Gomphus vulgatissimus was erroneously identified, and that the sp., which is said to be common, is referable to G. pulchellus. For another booklet by the same author cf. *OA* No. 2731. Both booklets are available from the author only).

(2680) RYŠHAVÝ, B. & L. VOJTKOVÁ, 1978. Zur Kenntnis der Larven der Art Tatria decacantha Fuhrmann, 1913 in der ČSSR. Scr. Fac. Sci. nat. Ujep brunensis (Biol.) 2: 81-89. (With Russ. s.). — (*Lehrst. Parasitol. & Hydrobiol., KU, Praha, Czechoslovakia*).
The larval stages of the cestode T. decacantha are described and illustrated on the basis of material recovered from Lestes sponsa and Libellula quadrimaculata in southern Bohemia, Czechoslovakia. The latter has not been previously known as the intermediate host of this sp. A review of the intermediate hosts (1 copepode, 15 odon. spp.) of 4 Tatria spp. is presented, and the "Tatria sp." described in the paper listed in *OA* No. 173 is identified as pertaining to T. acanthorhyncha Wedl.

(2681) TOVORNIK, D., 1978. Preliminarna laboratorijska opazovanja bioloških sovražnikov komarskih larv. (Preliminary laboratory observations of biological enemies of the mosquito larvae). Biol. Vestn. 26 (2): 193-198. (Slovene, with Engl. s.). — (*Oddelek za virologijo, Zavod SRS za zdravstveno varstvo, Bohoričeva 15, YU-61000 Ljubljana*).
Laboratory observations are described on a number of mosquito larvae predators, incl. the Odon. It is concluded that the predatory efficiency of Odon. and Notonecta glauca (Heteroptera), as revealed in laboratory experiments, clearly indicates the control potential of these organisms in natural populations as well.

(2682) TYAGI, B.K., 1978. Studies on the chromosomes of Odonata of Dun Valley (Dehradun, India). PhD thesis Univ. Garhwal (submitted Jan. 13, 1979), Srinagar (Garhwal). VIII+285 pp., 17 tabs., 335 figs. excl. — (*Dept. Zool., D.A.V. Coll., Dehradun-248001, India*).
The comprehensive volume is based on ori-

ginal observations on 45 spp. (the main cytotaxonomic data on 13 of which were subsequently published elsewhere [cf. *OA* No. 2465], leaving as new Anisopleura lestoides [n=13, *m*] only) and on a thorough literature study. It is organized into 13 chapters, incl. a comprehensive bibliography and a synopsis of the chromosome numbers recorded in the Order up to 1977, and presents several novelties for the regional and/or Indian fauna (cf. also *OA* No. 2542). The book was not issued commercially, but a substantial abstract is available from the author (cf. *OA* No. 2683). — (*Abstracter's note*: The author should be congratulated on the production of this work, which has been carried out under often hard personal circumstances and under a great financial stress).

(2683) TYAGI, B.K., 1978. Studies on the chromosomes of Odonata of Dun Valley (Dehradun, India). Abstract PhD thesis Univ. Garhwal (submitted Jan. 13, 1979), Srinagar (Garhwal). IV+15 pp., 2 figs excl. — (*Dept. Zool., D.A.V. Coll., Dehradun-248001, India*).
This is a substantial abstract of the volume listed in *OA* No. 2682. A limited number of copies are available from the author, xerox copies are available from the Editors of Odonatologica.

(2684) VATS, L.K. & J.S. SINGH, 1978. Population, biomass and secondary net production of aboveground insects in a tropical grassland. Trop. Ecol. 19 (1): 51-64. (With Fr. s.). — (*Dept. Zool., Kurukshetra Univ., Kurukshetra-132119, India*).
91 spp. of 9 orders were recorded at the study area in the Kurukshetra Univ. Campus, India (Aug. 20-Dec. 3, 1975). In terms of numbers and biomass Acrididae (Orthopt.) were dominant. The assessment of secondary net production was calculated by 4 different methods from time-series field data. Out of the 8 (partly unidentified) Odon. Neurothemis intermedia and Orthetrum sabina were the most abundant spp. The odon. biomass (mg/m^2) was approx. 10 times lower than that of Acrididae.

(2685) ZISER, S.W., 1978. Seasonal variations in water chemistry and diversity of the phytophilic macroinvertebrates of three swamp communities in southeastern Louisiana. SWest. Nat. 23 (4): 545-562. — (*Dept. Biol., Univ. New Mexico, Albuquerque, N.M. 87131, USA*).
3 habitats of the McElroy Swamp, Ascension Parish, Lousiana, USA, were sampled. The 3 stations were distinct in terms of physico-chemical features and faunal characteristics. The permanent waters of the cypress swamp have the richest odon. fauna.

1979

(2686) (Anonymous), 1979. Das Libellenjahr — eine Fotoausstellung von Otto R. Strub und Irene Siegenthaler. Amts-Anzeiger, Lichtensteig 94 (48): 2. (Issue of Nov. 30).
An informative article, in a local newspaper, on the traveling dragonfly photographs exhibit by Mr. O.R. Strub and Miss I.E. Siegenthaler (Thun, Switzerland), entitled "The Dragonfly Year" (after their 1976 book of the same name; cf. *OA* No. 1563), on the occasion of the exposition in the city of Lichtensteig, Switzerland (Nov. 19 - Dec. 21, 1979). For more information on the subject cf. *OA* No. 2547; for an identic article elsewhere cf. *OA* No. 2687. The (Swiss) stations and periods of the exhibit are (scheduled) as follows: 1979: Rapperswil (Apr.-May), Zürich (June-July), Luzern (Sept.-Oct.), Lichtensteig (Nov.-Dec.); — 1980: Arbon (Febr.), Brugg and Aarau (March-Apr.), Brig and Sion (May-June), Lausanne or Freiburg (July-Aug.), Geneva (Sept.-Oct.), Lugano (Nov.-Dec.); — 1981: Freiburg or Lausanne (Jan.-Febr.). — (*Abstracter's note*: Articles on this traveling exhibit are appearing regularly in the local press, but the monitoring is extremely difficult, therefore the coverage in the *OA* cannot be claimed to be complete).

(2687) (Anonymous), 1979. Das Libellenjahr — eine Fotoausstellung von Otto R. Strub und

Irene Siegenthaler. Der Toggenburger 39 (182): 4. (Issue of Nov. 23).
Text identic to that of the article listed in *OA* No. 2686. For further bibliographic references cf. there.

(2688) (Anonymous), 1979. Symposium sur les insectes. La Voix des Mille-Îles, Ste-Thérèse, Quebec, issue of Aug. 1, 1 p.
Local daily's announcement of the Fifth International Symposium of Odonatology, held Aug. 5-11, 1979 at the CÉGEP Lionel Groulx College, Ste-Thérèse, Montreal, Quebec, Canada. — (For other literature concerning the Symposium cf. *OA* Nos. 2549, 2739).

(2689) ABUSHAMA, F.T. & J.L. CLOUDSLEY-THOMPSON, 1979. Desert arthropods of Kuwait and their distribution. Ent. mon. Mag. 114 (1368-1371) [1978]: 149-151. — (First author: *Dept. Zool., Univ. Khartoum, P.O.B. 321, Khartoum, Sudan*; — Second author: *Dept. Zool., Birkbeck Coll., Univ. London, Malet Str., London, WC1E 7HX, UK*).
This is a preliminary report on the fauna collected 1974-1978 at 5 localities in Kuwait. For the Kuwait City "a few" not further identified "dragonflies" are mentioned. A more exhaustive account is in preparation.

(2690) ALCOCK, J., 1979. Multiple mating in Calopteryx maculata (Odonata: Calopterygidae) and the advantage of non-contact guarding by males. J. nat. Hist. 13 (4): 439-446. — (*Dept. Zool., Arizona St. Univ., Tempe, Arizona 85281, USA*).
Both ♂♂ and ♀♀ in a population of C. maculata mated more than once in the course of a single afternoon. The possibility that ♀♀ might mate with an intruder or with a neighbouring territory owner may have favoured the evolution of guarding behaviour by ♂♂. Territorial ♂♂ employed non-contact guarding of their mates. They perched on vegetation overlooking the oviposition site and repelled intruder ♂♂ from the area. — Territory owners were able to discriminate between the ♀♀ they have already mated and new arrivals. When previous mates left the oviposition site temporarily they usually were readmitted promptly by the resident ♂ when they returned. New arrivals were usually courted, pursued and sometimes successfully mated, even if this meant briefly leaving an ovipositing mate unguarded in the territory. — Non-contact guarding is interrupted as an adaption to permit a territorial ♂ to acquire new mates even while guarding previous ones. Comparisons with other Odon. and with a bee are presented in support of the hypothesis that non-contact guarding evolves when receptive ♀♀ are relatively abundant and multiple mating by some ♂♂ a regular possibility. When receptive ♀♀ are consistently scarce, ♂♂ may evolve contact guarding to protect their mates as effectively as possible against takeovers even though this means they cannot mate again while guarding a previous mate. (Author).

(2691) ANDRIES, J.C., 1979. Induction expérimentale de la morphogenèse et de la dégénérescence mésentérique chez Aeshna cyanea (Insecte, odonate). Gen. comp. Endocrinol. 39: 174-191. (With Engl s.). — (*Lab. Biol. anim., Univ. Sci. Techn. Lille I, B.P. 36, F-59655 Villeneuve d'Ascq-Cedex*).
Midgut metamorphosis of A. cyanea is characterized by the genesis of a transient tissue, the reticulated tissue which, some days later, degenerates and with the larval epithelium, is rejected in the intestinal lumen, after the imaginal epithelium genesis. By means of injections of different doses, at different times of the last instar of either a juvenile hormone (JHI) or a JH mimetic (the farnesyl methyl ether, EMF), of either ecdysone or ecdysterone, the different manifestations of this metamorphosis can be perturbed. The results can be summarized as follows. (1) The reticulated tissue and imaginal epithelium commitment seems to occur at the end of the first half of the last intermolt and, remaining under juvenile hormone rate control, requires the presence of ecdysone (ecdysterone). (2) Ecdysterone is more active than ecdysone in the imaginal epithelium differentiation. (3) It is possible

to inhibit both the reticulated tissue and the imaginal epithelium genesis (in the case of supernumerary larvae obtained after early injections of EMF or after relatively high doses of JHI during the first half of the instar) or solely and almost exclusively the reticulated tissue formation (in the case of injections of ecdysone or ecdysterone done at Day 1) or only the imaginal epithelium (in the case of low doses of JHI at the beginning of the instar). (4) The reticulated tissue is more inhibited by ecdysterone than by ecdysone injections which give results close to the controls. (5) The cell death in the larval epithelium is more or less pronounced and depends on the experimental conditions (amount and time of the ecdysone or ecdysterone injection). (Author).

(2692) ANDRIES, J.C., 1979. Junctional structures in the metamorphosing midgut of Aeshna cyanea (Insecta, Odonata). Cell Tissue Res. 202: 9-15. — (*Lab. Biol. anim., Univ. Sci. Techn. Lille I, B.P. 36, F-59655 Villeneuve d'Ascq-Cedex*).
The metamorphosing midgut of A. cyanea is characterized by the successive development of two tissues: the reticulated tissue and the imaginal epithelium. These tissues supply information concerning contacts between cells diverging in their developmental pathways although arising from the same stem cell population. In addition to small desmosomes, which bind reticulated to imaginal cells, the reticulated cells form invaginations into the apex of imaginal epithelial cells. The projections of the reticulated cells have enlarged tips, and numerous microfilaments run longitudinally along the length of these processes. It is suggested that the anchoring projections of these cells delay the casting off of the reticulated tissue into the lumen, and thus allow the development of the imaginal microvilli. These project into the dilated intercellular space filled with a glycoprotein material that separates imaginal and reticulated cells. (Author).

(2693) ASAHINA, S., 1979. Notes on Chinese Odonata, VIII. Three small collections in the U.S. National Museum of Natural History. Kontyû 47 (3): 328-334. — (*Takadanobaba 4-4-24, Shinjuku-ku, Tokyo, 160, JA*).
The 3 collections include material from the provinces of Shenshi, Fukien and Kiangsu (brought together resp. by E. Suenson, Tso-Hsien Chen and C.H.F. Loomis). Taxonomic notes are provided on Prodasineura autumnalis (Fraser) (= "Indoneura dolorosa Needham"), Philosina buchi Ris and Neurobasis anderssoni Sjöst. (For the earlier parts in this series cf. *OA* No. 2282).

(2694) BAUER, H.J., R. BROCKSIEPER, M. WOIKE, H. BEYER, H. GREVEN & R. KIKILLUS, 1979. Rote Liste in Nordrhein-Westfalen gefährdeter Libellen (Odonata). SchrReihe Landesanst. Ökol. Nordrhein-Westf. 4: 73-75. — (*Postfach 906, D-435 Recklinghausen, GFR*).
The 37 endangered odon. spp. in Northrhine-Westfalia, German Federal Republic, are classed into 4 categories. Colour photographs of Coenagrion lunulatum and Cordulegaster bidentatus are added.

(2695) BHADURI, A.S., 1979. Dragonflies. J. Bombay nat. Hist. Soc. 75 (2) [1978]: 505. — (c/o *Bagchi Transport Co., 44 Chittaranjan Ave., Calcutta-700012, India*).
A note on an incidental observation of dragonfly predation (sp. unidentified) on a danaid butterfly, noticed in Oct., at Maniadih nr. Dhanbad, Bihar, India.

(2696) CHARPENTIER, R., 1979. A nonoccluded virus in nymphs of the dragonfly Leucorrhinia dubia (Odonata, Anisoptera). J. invert. Pathol. 34 (1): 95-98. — (*Lab. Ins. Pathol., Inst. Zool., Univ. Lund, Helgonav. 3, S-223 62 Lund*).
A sp. of the insect-associated Densovirus (Parvoviridae) was encountered in larval L. dubia from Kolmarden, Östergötland, Sweden. The clinical picture of the disease is described along with the description and electron micrographs of the negative-stained, purified virus particles, measuring 19-21 nm. They have no envelope, and the surface

of the capsid has a hexagonal outline. Although the type of the nucleic acid has not been identified, the taxonomic identification of the virus is based on the supposition that it is DNA.

(2697) CUMMINS, K.W. & M.J. KLUG, 1979. Feeding ecology of stream invertebrates. Ann. Rev. Ecol. Syst. 10: 147-172. — (*Dept. Fish. & Wildl., Oregon St. Univ., Corvallis, Oregon 97331, USA*).
The review is organised around the concept of functional feeding groups, and the literature coverage is restricted to the last decade. The considerations on the Odon. are based on the paper by D.M. Johnson (1973, Ecology 54: 251-268), cf. *OA* No. 585.

(2698) DE MARMELS, J., 1979. Libellen (Odonata) aus der Zentral- und Ostschweiz. Mitt. schweiz. ent. Ges. 52 (4): 395-408. (With Engl. s.). — (For reprints contact *Mr. H. Schiess, Brüglenstr. 1, CH-8344 Adetswil*).
A review is given of 53 spp. known to occur in Eastern and Central Switzerland. It is based on unpublished museum material and on own collections (1976-1978), and supplemented with literature records.

(2699) DEACON, K.J., 1979. The seasonality of four Odonata species from Mid Canterbury, South Island, New Zealand. PhD thesis Univ. Canterbury, Christchurch. XI+209 pp. — Unbound offset copies available through the Editors of Odonatologica at US $ 10.—. (Author's address: c/o *the Editors of Odonatologica, Dept. Anim. Cytogenet. & Cytotaxon., Univ. Utrecht, Padualaan 8, Utrecht, NL*).
Odon. seasonality is determined at Isaac's Pond (43°28'S; 172°32'E) 30 m amsl at 2 sites at Lake Sarah (43°03'S; 171°47'E) 579 m amsl in New Zealand. The means by which seasonality is attained and the effects that altitudinal differences have on the pattern of seasonality are examined in field and laboratory studies. — Xanthocnemis zelandica (Coenagrionidae) has a 2-yr life cycle at Isaac's Pond, but a 3-yr life cycle at Lake Sarah-tb (Typha-bed site). Emergence starts earlier at Isaac's Pond, but ends by approximately the same date at all 3 sites. Emergence is trimodal at Isaac's Pond and bimodal at Lake Sarah. Embryonic development is direct; hatching occurs only the summer that eggs are laid. Later instar larvae cease development at about 7-9°C. Diapause, possibly cued by rate of change of daylength and temperature, occurs during the summer in the F-2 to F instar larvae. — Austrolestes colensonis (Lestidae) has a 2-yr life cycle at Lake Sarah-tb. Emergence starts earlier at Isaac's Pond, but ends by approximately the same date and is bimodal at all three sites. Embryonic development usually is direct, although some delayed hatching occurs. Some eggs hatch the summer that they are laid, but others overwinter and hatch the following spring. Supplementary moulting ocurs in F-2 instar larvae during the summer. — Procordulia smithii (Corduliidae) has a 4-yr life cycle and a bimodal emergence pattern at Lake Sarah-tb. Embryonic development is direct above approximately 19°C, but greatly prolonged below this temperature; therefore, most eggs overwinter. Results from larval laboratory studies are tentative. — Procordulia grayi (Corduliidae) is examined only briefly at Lake Sarah-ls (Lake shore site). — In general larval growth restrictions occur during the late summer that effectively prevent emergence during the autumn when successful reproduction is unlikely. (Author).

(2700) DESHEFY, G.S., 1979. Percent unsuccessful eclosion in dragonflies. Fla Ent. 62 (4): 412. — (*Dept. Zool., Clemson Univ., Clemson, South Carol. 29631, USA*).
Percentage mortality from incomplete eclosion of emerging Odon. was determined at 3 habitats in South Carolina and in Connecticut, USA, and was ranging between 2.44-4.82%. Unsuccessful eclosions appeared related to physiological failures rather than predation.

(2701) DONATH, H., 1979. Die gebänderte Heide-Libelle (Sympetrum pedemontanum (Allioni) 1766). Biol. Stud. Kreis Luckau 8:

32-36. — (*Jahnstr. 6, DDR-7960 Luckau, GDR*).
All known records of S. pedemontanum in the German Democratic Republic are listed along with the evidence on the flight periods and the habitat types. It is argued that in the past decades the number of populations of this sp. has increased. (Cf. also *OA* Nos. 992, 2672).

(2702) DRÖSCHER, V.B., 1979. Numerus clausus für Heiratslustige: die Libellen. Landwirtschaftl. Wochenbl., Münster 136 (33): 24. — (Publishers's address: *Landwirtschaftsverlag, Marktallee 89, D-44 Münster, GFR*).
A general narrative on life history and behaviour of dragonflies.

(2703) EDA, S., 1979. [Dragonflies]. *In*: N. Koyama, [Ed.], [Insect iconography of the Nagano Prefecture], Vol. 2, pp. 7-92. (Japanese). Shinanomaichi Press, Nagano. — Price: Y 2000.—. — (*Dept. Oral Pathol., Matsumoto Dental Coll., 1780 Gobara, Hirooka, Shiojiri-shi 399-07, JA*).
The booklet (300 p., pocket size, plastic cover) contains close to 300 photographs of the insects more or less common in the Nagano Prefecture, Japan. The photographs were taken in the natural environment (mostly by T. Gyoda and K. Hori), the odon. chapter was contributed by the well-known Japanese odonatologist and photographer, Dr. S. Eda. Most of the illustrations are of exceptional quality and they are accompanied by extensive captions. — (For a handbook on the odon. fauna of Nagano cf. *OA* No. 2072).

(2704) FERRERAS ROMERO, M. & A.G. SOLER ANDRÉS, 1979. Odonatos de las marismas del Bajo Guadalquivir. Aspectos faunisticos. Bol. Asoc. esp. Ent. 3: 213-218. (With Engl. s.). — (*Cátedra de Zool., Fac. Cienc., Univ. Córdoba, Córdoba, Spain*).
A list is given of 18 spp. recorded (1975-1977) in the saltmarshes of lower Guadalquivir, Spain. 5 of these are said to be new for the area. (Cf. also *OA* No. 2111).

(2705) GARDINER, C.J., 1979 Insects in the Ardennes, September 1978. Bull. Amat. ent. Soc. 38 (325): 188-190. — (*18 Chesterton, Hall Crescent, Cambridge, UK*).
Calopteryx splendens (p. 190) is the only odon. sp. recorded in the article (Joigny, Ardennes, France).

(2706) GRACILE (Newsletter of Odonatology). Published by the Kansai Research Group of Odonatology, Osaka, No. 25 (July 1979), No. 26 (Nov. 1979). (Japanese, with Engl. translation of the titles). — Annual subscription: Y 1500.—. — (c/o *Mr. K. Inoue, 5-9, Fuminosato 4-chome, Abeno-ku, Osaka, 545, JA*).
(No. 25): *Obana, S.* (Kinryo-cho 3-4-10, Sakai, Osaka Pref., 590, JA): A hopping trip to the Southwestern islands (1-5); — *Obana, S., S. Tsuda, K. Inoue, Y. Fujiwara & S. Shimura*: List of collection of "A hopping trip to the Southwestern Islands" with some notes of observations and larval breedings (5-9); — *Tsuda, S.* (Habikigaoka 7-17-9, Habikino, Osaka Pref., 583, JA): Let's use Grid Square Code in the collection data (9-11); — *Fujiwara, Y.* (Takatsuki Sky Heights, Kosobe-cho 2-10-10-507, Takatsuki, 569, JA): Successful cases of getting laid eggs of Odonata (12-14).
(No. 26): *Obana, S.*: A tentative clue to the Mnais polymorphism problem (1-8); — *Tsuda, S.*: Check list of Japanese Odonata (9-18); — Notes on the names of some Japanese dragonflies, I (18-20); — *Anaze, N. & T. Takamatsu* (Takara 529, Yukawa-cho, Gobo, Wakayama Pref., 644, JA): A survey trip for Mnais pruinosa at Fudodani River, a branch of Kinokawa (Wakayama Pref.) (21-22); — *Inoue, K*: (5-9, Fuminosato 4-chome, Abeno-ku, Osaka, 545, JA): Dr. and Mrs. Kiauta visited us (23-28); — *Inoue, K.*: Overseas odonatologists hitherto visited (29-32); — (*Anonymous*): Corrigenda Gracile No. 24 (32) [Cf. *OA* No. 2473].

(2707) GREEN, J., A.I. EL MOGHRABY & O.M. M. ALI, 1979. Biological observations on the crater lakes of Jebel Marra, Sudan. J. Zool., Lond. 189 (4): 493-502. — (*Zool.*

Dept., Westfield Coll., Univ. London, Hampstead, London NW3 1ST, UK). 2 lakes lie in a caldera at the top of Jebel Marra, and are known under the name, Dariba lakes; alt. 2200 m approx. Both are saline, but the smaller less than the larger one. The 2 lakes differ markedly in their chemistry and biology. Dragonflies occur only in the Small Dariba Lake (Ischnura senegalensis, Hemianax ephippiger, aeshnid larvae).

(2708) GREEN, L.F.B., 1979. Organization and fine structure of the hindgut of the nymph of Uropetala carovei (White) (Odonata: Petaluridae). Int. J. Insect Morphol. & Embryol. 8 (5/6): 311-323. — (*Dept. Zool., Univ. Oxford, Oxford, OX1 3PS, UK*).
The hindgut is divided into 2 regions, the anterior colon and the rectum. The rectum itself is divided into a large anterior branchial chamber, housing the heavily tracheated respiratory gill lamellae, and a short posterior vestibule. The gills of the branchial chamber are arranged in 6 rows, each row comprising a series of paired gill lamellae that arise from the luminal tips of the rectal pads, that are formed from 6 longitudinal rows of thickened epithelial cells. Each pad encloses a medulla of fat body cells. Most of the branchial chamber is lined with a thin layer of epithelial cells, underlying a thin layer of cuticle. Ultrastructural features of the Malpighian tubules, the colon, the 3 regions of the anterior rectum and the posterior rectum are described. The epithelial cells of the basal pads exhibit features characteristic of transporting epithelia and the fine structure of the gill lamellae is typical of respiratory epithelia. The role of the hindgut in both respiration and ionic regulation is discussed. (Author).

(2709) HAYASHI, K., H. SUZUKI, Y. MAKINO & S. ASAHINA, 1979. Notes on the transoceanic insects captured on East China Sea in 1976, 1977 and 1978. Trop. Med. 21 (1): 1-10. (Japanese, with Engl. s.). — (*Dept. Virol., Inst. Trop. Med., Nagasaki Univ., Nagasaki, JA*).
In the period, mid June - early July, of the 3 yrs, 3738 specimens, referable to 60 spp. of 9 orders were collected. The list includes 3 odon. spp., viz. Anax guttatus, Tholymis tillarga and Pantala flavescens, all of which are habitual transoceanic taxa. (Cf. also *OA* No. 2452).

(2710) JACOB, J. & H.-P. HANSSEN, 1979. The chemical composition of cuticular lipids from dragonflies (Odonata). Z. Naturforsch. (C) 34: 498-502. — (*Biochem. Inst. f. Umweltcarcinogene, Sieker Landstr. 19, D-2070 Ahrensburg/Holst, GFR*).
The cuticular lipids Aeshna grandis, A. mixta, Sympetrum sanguineum, S. danae have been analysed. Alkanes, triglycerides, and free fatty acids predominate and minor amounts of monoester waxes have been detected. Among the hydrocarbons unbranched odd-numbered (55-66%) predominate, followed by monomethyl-alkanes with the branch in the middle of the molecule (11-19%), 3-methylalkanes (7-15%), and 2-methylalkanes (1-13%). Moreover, alkanes (1-12%) were detected. The composition of triglycerides and free fatty acids were very similar with 14:0, 16:0, 18:0, 16:1, 18:1 and 18:2 being main constituents. Ester waxes were composed of unbranched and predominantly even-numbered fatty acids and alcohols with chain lengths C_{14}-C_{30}. The results are discussed from a chemotaxonomic viewpoint. Similarities of the integumental lipids from Odonata and Plecoptera were found. (Authors).

(2711) KALLAPUR, V.L., A.V. NARASUBHAI & C.J. GEORGE, 1979. Diglyceride as principal energy source during flight in the dragonfly Pantala flavescens. Ind. J. exp. Biol. 17: 426-428. — (*Dept. Zool., Karnatak Univ., Dharwar-580003, India*).
The analysis of the neutral lipid of the flight muscles after a forced flight period of 120 min indicated a highly significant reduction in 1,2 and 1,3 diglycerides. The free fatty acid content of the flight muscles on the other hand was found to be increased considerably. This increase in free fatty acid level in the flight muscles is interpreted as

being the result of hydrolysis of diglyceride in the flight muscles, since the lipase activity in the muscles, with diglyceride as substrate, was as much as four and half times more than with triglyceride as substrate. (Authors).

(2712) KOMNICK, H. & U. ACHENBACH, 1979. Comparative biochemical, histochemical and autoradiographic studies of Na^+/K^+-ATPase in the rectum of dragonfly larvae (Odonata, Aeshnidae). Europ. J. Cell Biol. 20: 92-100. — (*Inst. Cytol., Univ. Bonn, Ulrich-Haberland-Str. 61a, D-5300 Bonn-1, GFR*).
Na^+/K^+-ATPase localization in the rectal wall of larval Aeshna cyanea was studied with histochemical precipitation techniques and ^3H-ouabain autoradiography in conjunction with biochemical measurements of enzyme activities and radiospectrometry of ^3H-ouabain binding, respectively. The NPP-strontium and ATP-lead methods led to complete inhibition of Na^+/K^+-ATPase in this organ and hence to unreliable histochemical results. The ^3H-ouabain binding technique revealed sodium pump sites at the basolateral plasma membranes of the absorptive rectal chloride epithelia. (Authors).

(2713) KUMAR, A. & V. KHANNA, 1979. Taxonomy and ecology of Odonata larvae in India. *In*: V.K. Gupta, [Ed.], Workshop on advances in insect taxonomy in India & Orient, Manali (H.P.), October 9-12, 1979, pp. 42-43. Ass. Study Oriental Ins., New Delhi. — (*Zool. Surv. India, 13 Subhash Rd., Dehradun-248001, India*).
This is an abstract of the paper presented at the Workshop organized by Prof. Dr. V.K. Gupta (Dept. Zool., Univ. Delhi, Delhi-110007, India). — [Verbatim text]: So far, no comprehensive account on these interesting and important aspects of Indian Odon. was available. The present contribution reviews the literature available on the larval taxonomy and biology of Indian dragonflies. A list of known larvae of about 90 Indian species, with key to the generic identification has been provided. Methods of collecting eggs, larvae and adults and rearing techniques of larvae in the laboratory have been described. Terminology of larval taxonomy has been discussed and illustrated, and larval ecology has been briefly reviewed.

(2714) LAHIRI, A.R., 1979. Odonata (Insecta) from different states of North Eastern India. Oriental Insects 13 (1/2): 119-132. — (*Eastern Reg. Stn, Zool. Surv. India, Fruit Garden, Risa Colony, Shillong-793003, Meghalaya, India*).
The results of a study of the odon. collections accumulated in the Eastern Regional Station, Zool. Surv. India, Shillong, from a number of surveys conducted during 1972-1976, in the states of Assam, Arunachal Pradesh, Manipur and Mizoram (all northeastern India) are presented. In all, 33 taxa are listed along with the taxonomic notes on some of them. Megalestes lieftincki sp. n (♂ holotype: Tahlia, Arunachal Pradesh; 20-XI-1975) and the hitherto unknown isochromatic ♀ of Neurothemis t. tullia (Dr.) are described and illustrated (type material in the National Zoological Collection, Zool. Surv. India, Calcutta). The taxa listed from Arunachal Pradesh and Mizoram are new to the fauna of these states, while numerous new distributional records are supplied also for other regions of northeastern India.

(2715) LE PELLEY, R.H., 1979. [Report on the status of Calopteryx virgo and Pyrrhosoma nymphula on the Channel Island of Guernsey]. Rep. Trans. Soc. Guernesiaise 1978: 307-308. — (c/o *the Editor, La Houguette, Castel, Guernsey, UK*).
Measures will be taken, as suggested by Dr. J. Belle (Onder de Beumkes 35, 6883 HC Velp, the Netherlands), to protect the island habitats of C. virgo (Talbot Valley) and P. nymphula (La Mare de Carteret). (Cf. also Selysia 8 [2]: 3).

(2716) LEGRAND, J., 1979. Palpopleura albifrons n.sp., nouveau Diastatopidinae de la forêt gabonaise (Odonata Libellulidae). Revue fr. Ent. (N.S.) 1 (4): 179-181. (With Engl. s.). —

(*Lab. Ent., Mus. natn. Hist. nat., 45 rue Buffon, F-75005 Paris*).
The new sp. is described and illustrated on the basis of a single ♂ taken in Apr. 1979 at the forest of the Institut de Recherche d'Ecologie Tropicale, nr. Makokou, Gabon. The type is in the Paris Mus. The sp. differs from all other Palpopleura taxa by the presence of a cream-white frontal patch, by reduction of the wing black patches, and by its habitat, i.e. the dense forest, whereas all other members of the genus live in the open areas.

(2717) MACFARLANE, R.P., 1979. Notes on insects of the Chatham Islands. N.Z. Ent. 7 (1): 64-70. — (*Ent. Div., DSIR, Private Bag, Auckland, NZ*).
92 insect spp. recorded from the islands (800 km E of New Zealand) during Jan. 1976 are listed. The only odon. spp. collected are Austrolestes colensonis, Xanthocnemis zelandica and Procordulia smithii. All were taken on the main island and also occur in New Zealand.

(2718) MATHAVAN, S., 1979. Effect of running water on predatory behaviour of the dragonfly nymph Pantala flavescens (Odonata). Entomon 4 (2): 117-119. — (*Sch. Biol. Sci., Madurai Kamaraj Univ., Madurai-625021, Tamilnadu, India*).
Predatory efficiency was studied at 6 different water flow rates (0.0, 2.0, 4.0, 6.0, 8.0 and 10.0 l/min. The smallest nymph (125mg) tested predated 15 Culex larvae at the rate of flow of 0.0 l/min, and the predatory capacity decreased to 3 larvae when the flow rate was increased to 10 l/min. The predatory capacity of the nymph weighing 350 mg decreased from 20 larvae to 6 larvae when the water current was increased from a flow rate of 0 to 10 l/min. The same trend resulted when the data were calculated considering the weight of the larvae consumed. (Author).

(2719) MATHAVAN, S. & C.P. JAYA GOPAL, 1979. Effects of volume and depth of water on predatory behaviour of a tropical dragonfly nymph. Comp. Physiol. Ecol. 4 (2): 56-58. — (*Sch. Biol. Sci., Maduraj Kamaraj Univ., Madurai-625021, Tamilnadu, India*).
Changes in the volume and depth of water in the aquarium considerably influenced the predatory behaviour of Mesogomphus lineatus. With increased volume of water, the number of Culex fatigans larvae predated by the dragonfly nymph increased from about 11 in 35 ml of water to about 18 in 350 ml and subsequently decreased to 14 in the maximum volume tested (4400 ml). With increasing aquarium depth, the number of larvae predated by the nymph increased from 13 in the shallowest aquarium (4 cm depth) to about 20 larvae in 16 cm aquarium depth and subsequently deceased to about 14 larvae in the deepest tested (28 cm depth). (Authors).

(2720) MAY, M.L., 1979. Energy metabolism of dragonflies (Odonata: Anisoptera) at rest and during endothermic warm-up J. exp. Biol. 83: 79-94. — (*Dept. Ent. & Econ. Zool., Cook Coll., Rutgers Univ., New Brunswick, New Jersey 08903, USA*).
Energy metabolism at rest and during preflight warm-up was measured in a variety of anisopteran dragonflies. Resting oxygen consumption was similar in its relation to body temperature (*Tb*) and body mass to that of other insects. At 30°C, $\log M = 0.91 \log m + 0.44$, where M is metabolism (W) and m is body mass (kg). Metabolism during warm-up was calculated both from measurements of *Tb* and from oxygen consumption. By the former method, $\log M = 1.01 \log m + 2.22$ at the maximum *Tb* attained during warm-up, and $\log M = 0.90 \log m + 1.87$ at *Tb* + 30°C. Oxygen consumption measurements mostly gave values of M about 15% higher. Total energy cost of warm-up is directly related to mass, thermal conductance and *Tb* at takeoff, and inversely related to warm-up rate. (Author).

(2721) McCAFFERTY, W.P., 1979. Swarm-feeding by the damselfly Hetaerina americana (Odonata: Calopterygidae) on mayfly hatches. Aquatic Insects 1 (3): 149-151. — (*Dept.*

Ent., Purdue Univ., West Lafayette, Indiana 47907, USA).
Large numbers of H. americana were observed feeding on hatches of subimaginal Isonychia and Baetis over riffle areas of the White River, Indiana, USA. The phenomenon of swarm-feeding in Odon. is reviewed and delineated. The behaviour of H. americana differs considerably from previously recorded patterns.

(2722) MIELEWCZYK, S., 1979. Badania nad entomofauną (Ephemeroptera, Odonata, Heteroptera) jeziora Zbechy i kanału Rogaczewem. [An inquiry into the insect fauna (Ephemeroptera, Odonata, Heteroptera) of the Zbechy Lake and the Rogaczew Canal]. Streszczenia Komunikatów 9 Zjazd. Hydrobiol. Pol. [Abstr. Pap. 9th Symp. Polish Hydrobiol.], Łódź, pp. 93-94. (Polish). — (*Dept. Agrobiol., Polish Acad. Sci., ul. Swierczewskiego 19, PO-60-809 Poznań*).
As far as the Odon. are concerned, the larvae of Ischnura elegans were dominating in the lake (1977, 1978): 44 individuals per m^2 were recorded on the sandy bottom, while the concentration in the Phragmitetum zone varied between 30.8 (in 1978) and 149.2 (in 1977) individuals per m^2.

(2723) NIELSEN, P., 1979. Lestes barbarus (Fabricius) fundet i Danmark (Odonata: Lestidae). (Lestes barbarus (Fabricius) found in Denmark (Odonata, Lestidae)). Ent. Meddr 47 (2): 96. (Danish, with Engl. s.). — (Ent. *Dept., Mus. Zool., Universitetsparken 15, DK-2100 København-Ø*).
L. barbarus is recorded from western Denmark. It is assumed that the sp. is not autochthonous there, but the actual breeding sites are unknown.

(2724) OLESEN, J., 1979. Prey capture in dragonfly nymphs (Odonata, Insecta): labial protraction by means of a multi-purpose abdominal pump. Vidensk. Meddr dansk naturh. Foren. 141: 81-96. — (*Inst. Biol., Odense Univ., Campusvej 55, DK-5230 Odense-M*).
Libelluloid larvae use the same neuro-muscular apparatus for labial protraction (prey capture) and jet propulsion. An anatomical study shows that the labium cannot be protracted by its own muscles, and it is shown that large (50-100 cm H_2O) rises in the intra-thoracic pressure accompany both labial protraction and jet propulsion. A pressure pulse produced by the abdominal muscles will produce labial protraction if the labium is released by its locking mechanism (probably involving the maxillae). A similar pressure pulse will produce jet propulsion if the larva opens its rectum. There are small differences between the abdominal muscle activity during labial protraction and jet propulsion suggesting differences between the central inputs to the abdominal motor neurones during the two acts. It has been suggested by other authors that a giant fibre system in the ventral nerve cord is responsible for activating the abdominal muscles to produce a pressure pulse. In contrast to this hypothesis, the present author could activate giant fibres and abdominal muscles independently of each other by electrical stimulation of the ventral nerve cord. (Author).

(2725) PINHEY, E., 1979. Rediscovery of an elusive S.W. Cape dragonfly (Odonata). Arnoldia, Rhod. 8 (32): 1-3. — (*Natn. Mus., P.O.B. 240, Bulawayo, Rhodesia*).
Adult ♂ and ♀ of Orthetrum rubens Barnard (Du Toits Kloof, Cape, Republic of South Africa) are redescribed. The brown wing suffusion appears to be of a fatty nature.

(2726) PINHEY, E., 1979. The status of a few well-known African anisopterous dragonflies (Odonata). Arnoldia, Rhod. 8 (36): 1-7. — (*Natn. Mus., P.O.B. 240, Bulawayo, Rhodesia*).
It is shown that Anax mauritianus Ramb. should be regarded as the Afrotropical ssp. of A. imperator Leach, and Crocothemis erythraea (Brullé) as a ssp. of C. servilia (Drury). Prophalline differences between C.s.erythraea and C. sanguinolenta are much more reliable than the superfacial characters normally used to separate these taxa. — In reconsidering the relationship of

Orthetrum brachiale (P. de Beauv.) to kalai Longf. it has been shown that these 2 can be specifically separated but, in considering the insular fauna, it is also found necessary to synonymize kalai to the Mauritian-described stemmale (Burm.). The Seychelles ssp. O.s.wrightii Sel. remains a valid taxon. (Author).

(2727) PINHEY, E., 1979. Examples of anisopteran swarms (Odonata). Arnoldia, Rhod. 8 (37): 1-2. — (*Natn. Mus., P.O.B. 240, Bulawayo, Rhodesia*).
Observations are recorded of a migrating swarm of Hemianax ephippiger and Pantala flavescens (Lake Kariba, Zambezi River; Dec. 1975), and of an aggregate of large numbers of Zygonyx natalensis, Z. torrida, Pantala flavescens and a few Tramea basilaris, flying or hovering around one of the so-called "Rain trees", on a hill-top nr. Umtali, Rhodesia (Nov. 1958).

(2728) PINHEY, E., 1979. Additions and corrections to the 1966 checklist of dragonflies (Odonata) from Malawi. Arnoldia, Rhod. 8 (38): 1-14. — (*Natn. Mus., P.O.B. 240, Bulawayo, Rhodesia*).
E. Pinhey's checklist (1966, Arnoldia, Rhod. 2 [33]: 1-24) is expanded, and the nomenclature corrected and brought up to date. Spp. of the 1966 paper not discussed are listed in appendix.

(2729) PINHEY, E., 1979. Falcon College Expedition to Soutpansberg, December 1978: Entomology: Odonata and Lepidoptera. Falcon, Rhod. 6 (4): 119-123. — (*Natn. Mus., P.O.B. 240, Bulawayo, Rhodesia*).
A brief summary of the odon. material collected (37 spp., but a list of these is omitted).

(2730) PRESTIDGE, R.A., 1979. Ingestion and assimilation efficiency of Aeshna brevistyla and Hemicordulia australiae larvae (Odonata). N.Z.Jl mar. Freshw. Res. 13 (1): 193-199. — (*Dept. Zool. & Appl. Ent., Imperial Coll., Univ. London, London, SW7 2AZ, UK*).
In the laboratory study of the ingestion and assimilation efficiency of larvae of the 2 spp., ingestion was determined using Cerenkov radiation techniques and assimilation efficiency by a double-labelled isotope technique. Of each prey item (Daphnia carinata), 30% was not ingested but lost as body fluids and as material within the alimentary canal of the prey. Assimilation efficiency was greater than 70% for both dragonfly species, which appears to be typical for most other invertebrate predators. The efficiency with which 12th-15th-instar Aeshna assimilated ^{14}C did not increase with feeding rate, but Hemicordulia increased its efficiency through instars 12-14. When dragonfly larvae were pre-fed before experimentation, assimilation efficiency decreased in both species. (Author).

(2731) RETTIG, K., 1979. Zum Vorkommen einiger Insektenarten in Ostfriesland. Teil II. 8 pp., 22 figs excl. Emden, privately published. — Price: DM 3.50. — (*Danzinger Str. 11, D-297 Emden, GFR*).
This is a supplement to the volume listed in *OA* No. 2679. It contains annotations on 14 odon. spp., and photographs of 4 spp. Among these, Libellula fulva is of some interest.

(2732) RUDOLPH, R., 1979. Das Naturschutzgebiet "Zwillbrocker Venn" als Exkursionsziel. Natur- u. Landschaftsk. Westf. 15 (3): 89-96. — (*Landesmus. Naturk., Himmelreichallee 50, D-44 Münster, GFR*).
This is a general article on the natural history of the Nature Reserve, 'Zwillbrocker Venn', Westfalia, German Federal Republic. It includes a brief note on Odon., while for further reading reference is made to the faunistic list by M. Becker (1969, Natur u. Heimat 21: 79-82). (Cf. also R. Rudolph, 1978, Notul odonatol. 1:30).

(2733) SAVAGES, S.B., B.G. NEWMAN & D.T.-M. WONG, 1979. The role of vortices and unsteady effects during the hovering flight of dragonflies. J. exp. Biol. 83: 59-77, 7 pls. excl. — (*Dept. Civil Engineering & Appl.*

Mechanics, McGill Univ., Montreal, H3A 2K6, Que., CA).
T. Weis-Fogh (1973, J. exp. Biol. 59: 169-230) and R.A. Norberg (1975, *in*: Swimming and flying in nature, vol. 2, pp. 763-781, Plenum, New York) concluded that steady-state aerodynamics is incapable of explaining how the dragonfly supports its weight during hovering. Norberg also concluded that the wing kinematics of Aeshna juncea L., as determined photographically, are incompatible with those proposed by Weis-Fogh for his Flip mechanism. The present paper has proposed an alternative lift-generating mechanism, various aspects of which are novel from the standpoint of animal flight. Flow visualization tests performed in water established the flow field during a complete cycle of the idealized wing motion. Using this information and unsteady inviscid flow theory the forces were analysed. A plausible balance of horizontal forces and more than sufficient lift were obtained. A physical explanation of the theory is provided for those who do not wish to study the mathematical details. (Authors).

(2734) SQUIRES, R., 1979. Middle Pliocene dragonfly nymphs, Ridge Basin, Transverse Ranges, California. J. Paleontol. 53 (2): 446-452. — (*Dept. Geosci., California St. Univ., Northridge, Calif. 91330, USA*).
Previously undescribed odon. larvae occur as impressions in Middle Pliocene lacustrine shale beds from Ridge Basin, California, USA. One well preserved specimen is similar to the modern Hagenius brevistylus, and another is similar to Ladona deplanata. Locally, 3 thin shale beds with varve-like laminations contain numerous larvae, mostly incomplete, and plant and fish remains. Paleoenvironmental interpretation of the shale beds and consideration of the modern ecology of lake-dwelling larvae indicate that these shoreline-dwelling larvae drifted a short distance out into the lake and then were rapidly buried.

(2735) STANGE, G. & J. HOWARD, 1979. An ocellar dorsal light response in a dragonfly. J. exp. Biol. 83: 351-355. — (*Dept. Neurobiol., Res. Sch. Biol. Sci., Australian Natn. Univ., P.O.B. 475, Canberra, A.C.T. 2601, AU*).
The visual component of equilibrium control in dragonflies consists of inputs of a dual system, involving both compound eyes and ocelli. The former provide the fine resolution needed to define the actual position of the horizon, while the latter monitor rapid changes of that position, allowing fast corrections of attitude which are vital for the maintenance of flight stability.

(2736) STICHMANN, W., 1979. Gutachten über schutzwürdige Biotope in zoologischer Sicht im Lippegebiet zwischen Stockum bei Werne und Alstedde bei Lünen. X + 148 pp., numerous tabs. and 2 maps incl. Oberkreisdirektor Kreis Unna, Unna. — (Author's address: *Am Zuckerberg, D-4773 Möhnesee-Körbecke, GFR*).
This is a report on the fauna and hydrobiology of some back-waters and other water bodies of the Lippe Riv. system, Westfalia, German Federal Republic. From among 11 odon. spp. listed, Erythromma viridulum is of particular interest and has not been recorded from Westfalia since 1939.

(2737) STÖCKEL, G., 1979. Die Libellenarten des Kreises Gransee. (Ein Beitrag zur Odonatenfauna der Mark Brandenburg). Ent. Nachr. 23 (7): 97-102. (With Engl. and Russ. s's.). — (*Rudower Str. 22, DDR-208 Neustrelitz, GDR*).
An annotated list is given of 51 odon. spp. known to occur in the District of Gransee, Mark Brandenburg, German Democratic Republic.

(2738) SUGERMAN, B.B., 1979. Additions to the list of insects and other arthropods from Kwajalein Atoll (Marshall Islands). Proc. Hawaii. ent. Soc. 13 (1): 147-151. — (*B.P. Bishop Mus., Honolulu, Hawaii, USA*).
Tholymis tillarga (Fabr.) from the Roi-Namur Islet is added to the list of odon. spp. given in the paper listed in *OA* No. 929.

(2739) TOMBO. ACTA ODONATOLOGICA. Published by the Society of Odonatology, Tokyo. Vol. 22, Nos. 1/4 (dated Dec. 31, 1979). — Annual subscription/membership for individual bona fide odonatologists Y 2000.— (orders to be sent to the Treasurer, Dr. S. Eda, Dept. Oral Pathol., Matsumoto Dental Coll., 1780 Gobara, Hirooka, Shiojiri, Nagano, 399-07, JA), for libraries and institutions Y 4000.— (orders to be sent to the Japan Publication Trading Co., Central P.O.B. 722, Tokyo, JA). — (Mostly in English, Japanese papers with Engl. s's). — (c/o *Dr. S. Asahina, 4-4-24 Takadanobaba, Shinjuku-ku, Tokyo, 160, JA*).

Eda, S. (for address cf. above): Copulation of Enallagma deserti circulatum [photograph only] (1); — *Asahina, S.* (for address cf. above): Notes on Chinese Odonata, XI. On two North Chinese gomphids, with special reference to palaearctic Ophiogomphus species (2-12); — A gynandromorphic specimen of Leucorrhinia intermedia ijimai (12); — *Asahina, S. & K. Matsuki*: Rhyothemis triangularis from Taiwan (13-14); — *Asahina, S.*: A revisional study of the genus Mnais, VIII. A proposed taxonomy of the Japanese Mnais. Tombo 19, 2-16, 1976. Corrigenda [cf. *OA* No. 1655] (14); — *Svihla, A.* (555 Indian Trail, Palm Springs, Ca. 92262, USA): Notes on Tanypteryx hageni (Selys) in the Olympic (15-16); — *Miyashita, T.* (c/o Mr. Takahashi, 4-36-11, Hongo, Bonkyo-ku, Tokyo, 113, JA): A new locality of Platycnemis echigoana (16); — *Sata, T.* (Shobara, Kachitachi, Omuta, Fukuoka Pref., 836, JA): Life-history of Tramea virginia observed in Omura, North Kyushu (17-21); — *Eda, S.* (for address cf. above): Photo's of Epiophlebia superstes in nature, appeared in old literatures (before 1940) (22); — *Miyakawa, K.* (Imafuku 1024, Kawagoe, Saitama Pref., 356, JA): A marine accident of Pantala flavescens (Fabricius) (23); — Vinyl shield of vegetable farm as a releaser of dragonfly reproductive behaviour (24-26); — *Sonehara, I.* (Tazawa 5035, Toyoshima-machi, Minamiazumi-gun, Nagano Pref., 399-82, JA): The number of eggs in the egg-string of Epitheca bimaculata sibirica and their hatching ratio (27); — *Yokoi, N.* (2-37-11, Kaijo, Koriyama-shi, Fukushima Pref., 963, JA): Some noteworthy dragonfly species from Fukushima Prefecture (27-28); — *Eda, S.* (for address cf. above): Further observations on the "non-contact flying oviposition" in the genus Sympetrum (28-30); — [The 1979 Annual Meeting of the Society of Odonatology, Tokyo] (30, with a photograph of the attendants) (30); — *Watanabe, K.* (845 A104, Tonoshiro, Ishigaki, Okinawa Pref., 907, JA): Further observations on three interesting dragonfly species in Yayeyama Islands (31-34); — *Tennessen, K.J.* (1949 Hickory Ave., Florence, Alabama 35630, USA): The Fifth International Symposium of Odonatology (34-35).

(2740) TRACY, C.R., B.J. TRACY & D.S. DOBKIN, 1979. The role of posturing in behavioral thermoregulation by Black Dragons (Hagenius brevistylus Selys; Odonata). Physiol. Zool. 52 (4): 565-571. — (*Dept. Zool. & Ent., Colorado St. Univ., Fort Collins, Colorado 80523, USA*).

The effectiveness of thermoregulatory postures in H. brevistylus was tested relative to wind speed and air temperture on live and dead dragonflies in a closed circuit wind tunnel. The postures appeared to allow the dragonflies to behaviorally select body temperatures exceeding a range of 20°C and reach temperatures as low as the ambient air or as high as the sun-warmed substrate. At least one posture appeared to be transitory and appeared to be used primarily to warm up from low body temperatures. Live dragonflies kept individually in a large flight cage showed different patterns of posturing depending on the amount of insolation. Free-ranging dragonflies were not active at low air temperatures, and postured differently in response to different substrate temperatures. We concluded that black dragons can select from a broad range of potential body temperatures as the result of behavioral posturing. (Authors). — (Cf. also *AO* No. 2579).

(2741) UÉDA, T., 1979. Plasticity of the reproductive behavior in a dragonfly, Sympetrum parvulum Barteneff, with reference to the social relationship of males and the density of territories. Res. Popul. Ecol. 21 (1): 135-152. (With Jap. s.). — (*Dept. Zool., Fac. Sci., Kyoto Univ., Sakyo, Kyoto, 606, JA*).
The observations were carried out at a small bog, Hanno City, Saitama Pref., Japan. — ♂♂ were classified into 2 social status, viz. territorial ♂ (occupying a territory at the oviposition site), and the wandering ♂ (showing no site tenacity). — Territorial ♂♂ seized ♀♀ arrived at the oviposition site. The territorial ♂ and his mate in copula suffered little interference by other ♂♂. Duration of copulation of territorial pair was mostly 1-3 min. After copulation, the ♂ released the ♀, but he remained close to, and protected her from other ♂♂ approached by aggressive flight during ♀'s oviposition (the guarding behaviour). — Wandering ♂♂ often grasped ♀♀ elsewhere outside the oviposition site; then, they came to the bog in copula. At low density of territories, the wandering ♂♂ could also grasp considerable numbers of ♀♀ at the bog. The wandering ♂ and his mate in copula were frequently disturbed by territorial ♂♂. Frequency of the interference depended on the density of territories. Duration of copulation of wandering pair was much the same as territorial pair at low density (little interference), but it became longer as density increased. After copulation, the wandering ♂ released the ♀ and guarded her at low density, but he did not release the ♀ and attended her ovipostion in tandem (tandem behaviour: the ♀ retains his ♀, grasping the head with his abdominal appendages) at high density (frequent interference). — 5 'take-overs' (a second ♂ displaced the original ♂ and mated with the ♀) were observed when ♂♂ released their ♀♀, but it was not in tandem oviposition. — ♂ choice of post-copulatory behaviour was not influenced by individual difference, but it related to the social status of the ♂ and the density of territories at the oviposition site. From these results, strategic difference of the 2 behavioural patterns after copulation is discussed. (Author).

(2742) WAAGE, J.K., 1979. Adaptive significance of postcopulatory guarding of mates and nonmates by male Calopteryx maculata (Odonata). Behav. Ecol. Sociobiol. 6 (2): 147-154. — (*Div. Biol. & Med., Brown Univ., Providence, Rhode Island 02912, USA*).
The postcopulatory behaviour was studied in field populations to determine the adaptive significance of guarding of ovipositing ♀♀ by ♂♂. Of particular interest was an explanation for the guarding of ovipositing nonmates by ♂♂. A promiscuous mating system and the large variation in mating success among territorial ♂♂ indicated that sexual selection may have been a significant factor in the evolution of C. maculata postcopulatory behaviour. — Territorial ♂♂ defend ovipositing mates by chasing and displaying toward conspecific ♂♂ attempting takeovers. Guarded mates averaged 12-15 min. of undisturbed oviposition while unguarded ♀♀ averaged only 1-2 min. of oviposition prior to disturbance by ♂♂ Postcopulatory guarding is advantageous to both sexes because it allows undisturbed oviposition. — During mating, 88%-100% of the sperm stored by a ♀ from a previous mating was removed by a ♂ before he transferred his own sperm to her storage organs. Given this potential for sperm displacement, postcopulatory guarding is advantageous to the guarding ♂ since it assures him of fertilizing a substantial number of eggs prior to a subsequent mating by his mate. — The duration of guarding (interval between matings) for ♂♂ was 10-15 min. It did not differ significantly between 2 populations in 1 yr. Guarding duration did not significantly change with (a) time of day, (b) time devoted to defensive behaviour, (c) ♀ arrival rate, and (d) presence or absence of an ovipositing ♀. — ♂♂ frequently guarded ♀♀ with which they did not mate. Nonmates were guarded only when the ♂ was simultaneously guarding a mate or had recently mated. These nonmates deposited eggs fertilized by rival ♂♂. Their presence did

not significantly increase the time and energy expended by guarding ♂♂ but did attract additional ♀♀. However, these additional ♀♀ did not lead to an increase in mating frequency for the guarding ♂. — 3 factors appeared to limit the ability of guarding ♂♂ to exclude or attempt matings with arriving nonmates: (1) a lack of individual recognition, (2) a risk of losing a previous mate while failing to copulate with an arriving ♀, and (3) a probable physiologic limit to mating frequency. These limitations in male postcopulatory behaviour were exploited by ♀♀. — Some ♂♂ were not territorial. While appearing less effective at obtaining mates, they devoted no time and energy to defending territories or mates. Because of sperm displacement, their reproductive success depended upon the ability of their mates to exploit the limitations in guarding behaviour of territorial ♂♂. (Author). (Cf. also *OA* No. 2690).

(2743) WALKER, A.K. & L.L. DIETZ, 1979. A review of entomophagous insects in the Cook Islands. N.Z. Ent. 7 (1): 70-82. — (*Ent. Div., DSIR, Private Bag, Auckland, NZ*).
Agriocnemis exulans, Ischnura aurora, Anax guttatus, Diplacodes bipunctata and Pantala flavescens are listed from the Rarotonga Island, Southern Cooks.

(2744) WATSON, J.A.L. & M.S. MOULDS, 1979. New species of Australian Lestidae (Odonata). J. Aust. ent. Soc. 18 (2): 143-155. — (*Div. Ent., CSIRO, Canberra, A.C.T. 2601, AU*).
2 new spp. of Australian Lestidae are described and illustrated, viz. Austrolestes aleison (♂ holotype, ♀ allotype: Lake Josephine, W. of Harvey, S.W. Australia; 29-12-1955; numerous ♂, ♀ paratypes from various W. Austr. localities), A. minjerriba Watson sp.n. (♂ holotype: Brown Lake, North Strandbroke Island, Queensland; 3-1-1976; numerous ♂, ♀ paratypes from Queensland and New South Wales), and Indolestes obiri Watson sp.n. (♂ holotype: Cannon Hill, E. Alligator Riv., Northern Territory; 27/28-5-1973; numerous ♂, ♀ paratypes from various Northern Territory localities). The adults of 14 known Australian lestids are keyed. Lectotypes are designated for Lestes psyche Hagen in Selys and L. leda Selys, and Austrolestes albicauda tindalei Tillyard is newly placed in synonymy with Indolestes alleni (Tillyard).

(2745) WATT, J.C., 1979. Abbreviations for entomological collections. N.Z. Jl Zool. 6 (3): 519-520. — (*Ent. Div., Dept. Sci. & Ind. Res., Private Bag, Auckland, NZ*).
Standard 4-letter abbreviations are proposed for and the postal addresses are given of 40 main entomological institutions and museums of the world. The use of these will be henceforth obligatory in the papers published in the N.Z. Jl Zool.

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(2746) CLAUSNITZER, H.-J., 1980. Hilfsprogramm für gefährdete Libellen. Natur & Landschaft 55 (1): 12-15. — (*Südstr. 6, D-3106 Eschede, GFR*).
The endangered (German) odon. spp. are grouped into 4 habitat categories. The influence of the man-caused breeding site deterioration is discussed and some suggestions on biotope management and conservation are advanced.

(2747) CORBET, P.S., 1980. Biology of Odonata. Ann. Rev. Ent. 25: 189-217. — (*Dept. Zool., Univ. Canterbury, Christchurch-1, NZ*).
This is a review of the main features of the odon. life history, intended as a highly condensed supplement to the author's 1962 volume (A biology of dragonflies. Witherby, London). Accordingly, prominence is given to research published after 1960 (231 references listed), and sources for information already reported in the said book are not cited.

(2748) EMSLEY, M. (with photographs by K. Sandved), 1980. Insect magic. Reader's Digest (S. Afr. edn) 116 (Febr.): 140-147. — — (*Author's address unknown*).
The general article includes a photograph of

a "Female Palpopleura lucia" (i.e. ssp. portia) from Ghana, with a remark on eyes and vision (p. 143).

(2749) JÖHREN, M., 1980. Die Grube. Zum Tierleben eines Baches im Oberen Weserbergland. Jb. Kreis Höxter 1980: 181-194. — (c/o *the Editor, Der Oberkreisdirektor, Moltkestr. 12, D-347 Höxter, GFR*).
The invertebrate fauna of a montane creek in eastern Westfalia, German Federal Republic, is reviewed. Larval Calopteryx splendens and Cordulegaster sp. are the only Odon. mentioned.

(2750) MARTENS, K., 1980. Libellen aan de kleiputten te Hemiksem. (Dragonflies in the clay-pits of Hemiksem). Phegea 8 (1): 17-24. (Dutch, with Engl. and Fr. s's.). — (*Mastplein 19, B-2710 Hoboken*).
17 spp. are listed form this locality, south of Antwerp, Belgium. A few of the more interesting taxa are discussed in some detail, and an aberrant ♀ form of Ischnura pumilio is described.

(2751) NACHTIGALL, W., 1980. Insekten mit Mach 1? Kosmos 76 (1): 44-52. — (*Zool. Inst., D-66 Saarbrücken 15, GFR*).
This is a narrative talk on the flight technique of insects. Dragonflies are mentioned with regard to their wing coordination, wing muscles, and to their ability to perform soaring flight. Colour photographs of a female Coenagrion pulchellum and of Aeshna cyanea in free flight are added.

(2752) PFLETSCHINGER, H., 1980. Das Rätsel der Metamorphose. Wenn Tiere aus der Haut fahren. Sielmanns Tierwelt 4 (2): 32-39. — (Publishers' address: *Paul Parey, Spitalerstr. 12, D-2000 Hamburg-1, GFR*).
This article on arthropode metamorphosis is directed at the general reader and contains 4 colour photographs of emerging Anax imperator.

(2753) SCHMIDT, E., 1980. Zur Gefährdung von Moorlibellen in der Bundesrepublik Deutschland. Natur & Landschaft 55 (1): 16-18. — (*Biol. Seminar, Pädagog. Hochschule, Römerstr. 164, D-5300 Bonn, GFR*).
3 types of moorland water bodies are described, their odon. fauna is characterized, and the utility of faunistic mapping, as a prerequisite for conservation efforts, is stressed.