



AGRION

NEWSLETTER OF THE WORLDWIDE DRAGONFLY ASSOCIATION

PATRON: Professor Edward O. Wilson FRS, FRSE

Special edition in memory of Philip Steven Corbet
(21 May 1929 - 13 February 2008)

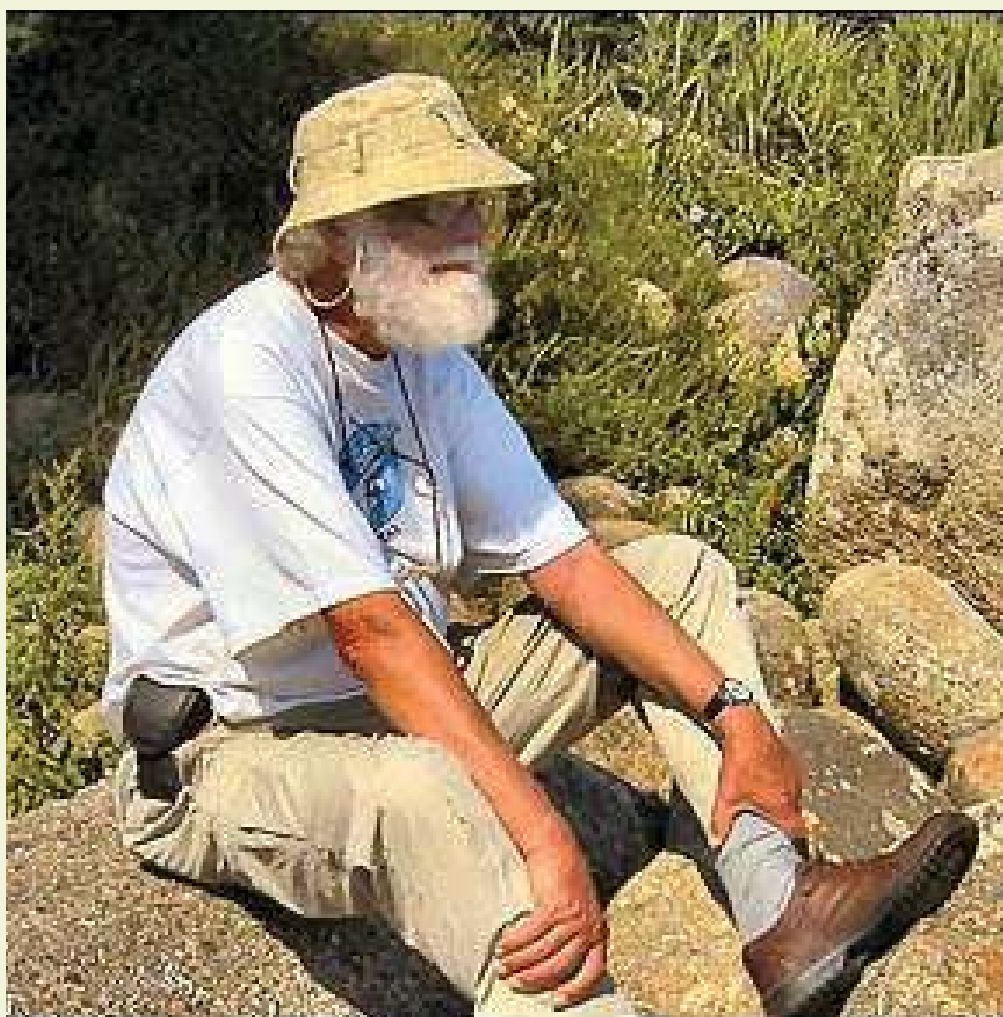
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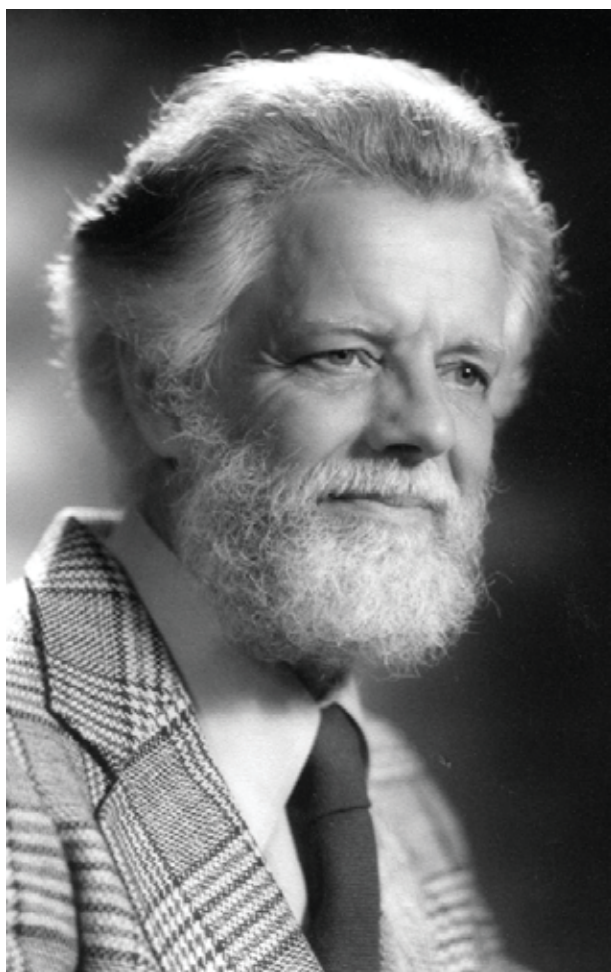
NEWSLETTER OF THE WORLDWIDE DRAGONFLY ASSOCIATION

AGRION is Worldwide Dragonfly Association's (WDA's) newsletter, which is normally published twice a year, in January and July. The WDA aims to advance public education and awareness by the promotion of the study and conservation of dragonflies (Odonata) and their natural habitats in all parts of the world. *AGRION* covers all aspects of WDA's activities; it communicates facts and knowledge related to the study and conservation of dragonflies and is a forum for news and information exchange for members. Members can download previous issues of *AGRION* from the WDA website at <http://ecoevo.uvigo.es/WDA/dragonfly.htm>. WDA is a Registered Charity (Not-for-Profit Organization), Charity No. 1066039/0.

Editorial

Keith Wilson [kdpwilson@gmail.com]

This issue is the first Special Edition of *AGRION*. It has been prepared in memory and tribute to Philip Steven Corbet, who died in west Cornwall, UK on 13th February 2008, in hospital, following a heart attack suffered in his local village shop. Philip had a remarkable academic career, following his tertiary education in the UK, that included long periods of work in four countries. Several articles, written by Philip's sister Sarah Corbet, colleagues and friends, cover his family background, early years, and work periods in Uganda, Canada, New Zealand and United Kingdom. Graham and I are most grateful to all contributors who willingly responded to our invitations to write articles. Philip's own obituary notes are also included here. These notes formed the basis of obituaries published elsewhere; notably in the Telegraph, Times and Independent newspapers.



International Journal of Odonatology - Philip Corbet Memorial Issue Reinhard Jödicke [ijo.editing@ewetel.net]

Volume 12 (2) of the *International Journal of Odonatology* (IJO), to be published 1st October 2009, will be dedicated to Philip Corbet. The tribute issue will contain invited and submitted papers, preferably in the areas of ecology and behaviour as well as taxonomic papers with new taxa names dedicated to Philip.

Anyone interested in submitting a paper to this issue should contact the editor, Reinhard Jödicke <ijo.editing@ewetel.net> before 31 July 2008 to state their intention and to give the title of their contribution. A firm commitment will be required by 31 October 2008 and the deadline for submission will be 28 February 2009. All submissions should comply with IJO guidelines - see the IJO home page at <<http://ijo.tuubs.de/home.html>>. Authors are reminded that *The International Journal of Odonatology* only publishes original articles dealing with research on dragonflies. All submitted papers are evaluated for publication by the Editor and an Editorial Board of experienced odonatologists, assisted by external referees. The Editor and at least two referees will review each paper to determine its suitability for publication. When submitted to IJO, a contribution must not be under consideration for publication in another journal.

Cover photo: Philip S. Corbet. Credit: Sarah A. Corbet

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Philip Steven Corbet - Summary of career history

Uganda

Entomologist for the East African High Commission in Uganda based at East African Freshwater Fisheries Research Organization at Jinja (1954-1957).
 Research entomologist studying behaviour and ecology of mosquitoes at the East African Virus Research Institute, Entebbe (1957-1962).

Canada

Full-time research entomologist with Canada Department of Agriculture Research Branch, Entomology Research Institute (later the Biosystematics Research Institute), Ottawa - involved study of mosquito biology in the Canadian High Arctic - (1962-1967).
 Director of the Canada Department of Agriculture Research Institute at Belleville, Ontario (1967-1971).
 Professor and Chairman of the Biology Department at the University of Waterloo, Ontario (1971-1974).

New Zealand

Professor and Director of the Joint Centre for Environmental Sciences at the University of Canterbury and Lincoln Agricultural College (now Lincoln University), Canterbury, New Zealand (1974-1978).
 Chair in the Department of Zoology at the University of Canterbury (1978-1980).

United Kingdom

Commonwealth Visiting Professorship in the Department of Applied Biology at the University of Cambridge (1979-1980).
 Foundation chair of Zoology in the Department of Biological Sciences at the University of Dundee (1980-1990); served as Head of Department from 1983 to 1986.
 Retired as Professor Emeritus of Zoology, University of Dundee (1990).
 Honorary capacity at Department of Zoology, University of Edinburgh (1990-1996).
 Honorary Professor, Department of Zoology, University of Edinburgh (1996).
 Member of the Council and Executive of the Cornwall Wildlife Trust and served as Foundation Chair of the Trust's Conservation Strategy Committee (1996- 13th February 2008).

Philip's family background and early years

Sarah A. Corbet [sacorbet@stloy.u-net.com]



Photo: Philip, 1944.

Philip Corbet's father came of a Scottish family, and his mother Irene (nee Trewavas) was born and brought up in West Cornwall. She read chemistry with education at Reading University (then a constituent College of the University of London). She was involved in education for much of her life; she taught in schools in New Zealand, Malaya and England, acted as a home teacher for handicapped children in Reading, and ended her career as a senior lecturer in special education at Maria Grey College, Twickenham. As a student at Reading University she met Alexander Steven Corbet, who was doing a Ph.D. in inorganic chemistry. They married in 1927 and went to Malaya, where Steven was employed as a soil microbiologist at the Rubber Research Institute. Pursuing a lifelong love of entomology, he became an authority on Malayan butterflies and, with H. M. Pendlebury, wrote the standard work *Butterflies of the Malay Peninsula*. Steven's enthusiasm for natural history, and especially entomology, was infectious, and both his surviving children were to become professional entomologists.

Philip was their first child, born in Kuala Lumpur in May 1929. In 1931 his parents brought him back to England, where Steven worked at the ICI research station at Jealotts Hill, near Reading. Later Steven moved to the British Museum (Natural History) where he worked on his collection of Malayan butterflies, eventually becoming Deputy Keeper of Entomology there. Their second son, Nigel, died of meningitis as a baby, and their third son, Roger, died of diphtheria aged five. During the war Steven remained in London at the British Museum (Natural History) working on insect infestation in warehouses by day and fire watching on the roof by night, while Irene, expecting their fourth child, took

Philip to New Zealand. His sister Sarah Alexandra (Sally) was born there in December 1940. In New Zealand Philip attended Nelson Boys' College. Like other boys he enjoyed sport, especially swimming, but his interest in natural history had not fully developed at that time. Perhaps unlike the other boys, he also spent time caring for his baby sister and taking her for walks in the park with her teddy bear, or wheeling her, in her push chair, down the magnificent flight of steps in front of Nelson Cathedral, to their mutual enjoyment.

When he returned to England after the war Philip was delighted to be reunited with his father, whose influence greatly strengthened Philip's appreciation of natural history, and particularly his love of butterflies. Further, during a happy year as a boarder at Dauntsey's School, Wiltshire (1945-6), Philip received instruction in biology for the first time. He and his father enjoyed country walks together near our home in Reading in the school holidays, and on family holidays in South Wales. It was a great loss when Steven died of a heart attack in 1948, aged 51.

With the return of servicemen after the war there was fierce competition for access to university, so when Philip was offered a place at Reading University he accepted it although he was sorry to leave Dauntsey's School after only one year. At Reading (1946-50) Philip took a BSc in zoology, botany and geology, with honours zoology, and graduated with a first-class honours degree in Zoology, and the Colin Morley prize for zoology. As a postgraduate he went to Gonville and Caius College, Cambridge, to do a Ph.D. (1950-3) on seasonal regulation in dragonflies under the supervision of the eminent insect physiologist V. B. (later Sir Vincent) Wigglesworth. A major component of Philip's research revolved around a population of a *Anax imperator* at Burghfield Common,



Photo: Philip sampling *Anax imperator* at the Fish Pond, Burghfield Common, near Reading, Berkshire, England, ca 1950-1953.

near Reading, and also regular sampling visits to the New Forest for *Coenagrion mercuriale*.

Like his father, Philip loved to share his enthusiasm for natural history. On one sampling visit to the New Forest Philip kindly took me, his 10-year-old sister, as a “field assistant” to help him measure and record the lengths of larvae, and later he supervised my school A-level project which involved constructing an emergence curve for *Aeshna cyanea*, a summer species, to be contrasted with his own curve for *Anax imperator*, a spring species. In 1959, when I was between school and university, Philip and his first wife Hildegard had me to stay for several months at their home in Entebbe, where I relished my first taste of tropical natural history. These enriching experiences helped to cement my determination to become an entomologist, an ambition in which Philip always gave me every support.

For much of his life Philip lived and worked overseas, and our contact was limited to letters and occasional visits, so it gave me great pleasure when he came to live near my home in Cornwall in his retirement, and we were able to see each other frequently.

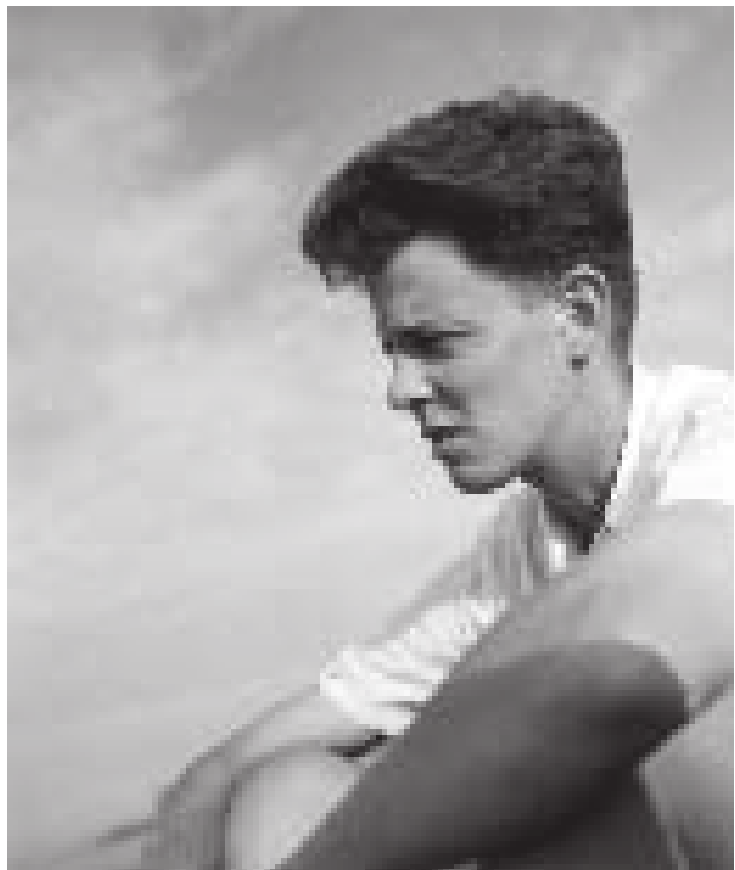


Photo: Philip at Jinja, Uganda, 1955.

Philip Corbet's Uganda days Ro Lowe-McConnell [ro@rhmcconnell.plus.com]

Philip Corbet came from a family in which both his father and his aunt were distinguished scientists at the Natural History Museum, London (then known as BMNH - British Museum [Natural History]). His aunt, Ethelwyn Trewavas, an authority on African lake fish, had in 1938 to 1939 spent several months at Lake Nyasa as a member of the Fish and Fisheries Survey; her glowing accounts of African lake research encouraged nephew Philip to join the East African Fisheries Research Organization (EAFRO), based in Jinja Uganda, in 1954. The Lake Nyasa study was interrupted in 1939 by World War II, but in 1945, I was sent there to continue Ethelwyn's work, after spending three months with her at the BMNH to learn about Africa's very rich fish fauna. In 1948 I moved to EAFRO where in 1954 I overlapped with Philip for three months. In December when I left EAFRO Philip inherited my house and dog (Swirrel).



Photo: Net preparation at the EAFRO laboratory, viewed from Philip's garden with the Napoleon Gulf of Lake Victoria visible in the background and Philip's inherited dog Swirrel. Credit: Ro Lowe-McConnell.

The EAFRO laboratory, overlooking the Napoleon Gulf of Lake Victoria, from which the river Nile leaves the huge lake (68,800 km²) on its northward journey, was a good site for a naturalist. Philip was employed by the East Africa High Commission at laboratories in Uganda from 1954-1962; first as the 'invertebrate zoologist' in the EAFRO team based at Jinja from 1954-57; then in 1957 he transferred to the East African Virus Research Institute (formerly the Rockefeller Yellow Fever Institute) at Entebbe as an entomologist from 1957-62. Under the leadership of A. J. Haddow his research output was exceptionally high and became widely known. Philip's achievements in the

EAFRO team, which had been set up to study the ecology of fishes to feed the rapidly-rising human populations, are less well known. In his own words, he produced the: "definitive account of the food of non-cichlid fishes in the Lake Victoria basin, leavening this work with detailed investigations of the insect food of the Nile crocodile and the behaviour of several groups of aquatic insects". Accounts of his work in EAFRO Annual Reports show that he continued the analyses of data on non-cichlid fishes after he left EAFRO until his major paper on the food of non-cichlids was published in the *Proceedings of the Zoological Society of London* in 1961.

The EAFRO team, directed by RSA 'Bobby' Beauchamp, a limnologist, included a planktonologist who investigated water chemistry, an invertebrate zoologist, other fish ecologists and supporting staff who carried out routine experimental fishing with fleets of nets set at various stations in the lake throughout the year. From their catch data information was amassed on the fish species present, their diets, breeding seasons, and growth rates. Philip's entomological predecessor was W.W. 'Bill' Macdonald, who was at EAFRO from 1948-53 and had concentrated on Diptera especially the life cycles of the abundant chironomid (non-biting midge) and *Chaoborus* (phantom midge) species. These latter two groups of insects rose from the lake periodically in vast clouds leading to Lake Victoria being dubbed the '*Lake of Flies*' in a later TV film.

What did Philip's work entail? The contents of fish stomachs had been recorded from the routine experimental fishing carried out by EAFRO since 1948. From 1954 Philip described the food of all the non-cichlid fishes in the Lake Victoria basin involving the mammoth task of analysing the data derived from over nine thousand stomachs of insectivorous and piscivorous fishes belonging to twenty-six species. In these pre-computer days data had to be entered onto punch cards for sorting with I.B.M. Hollerith machines, achieved with the assistance of the Geophysics Institute of the University of Bergen. Most non-cichlid species (unlike the cichlids) were shown to be facultative feeders, their food determined by size of fish, their feeding grounds and for some species the phase of the moon. Many of these non-cichlid fish species were riverine in origin and Philip's work also

illuminated how they had adapted to lacustrine conditions. As there were no keys to identify the aquatic juvenile stages of insect prey the larvae had to be correlated with adults by rearing them to maturity in the laboratory for the species to be determined. These included some fifty Odonata species and numerous Ephemeroptera and Trichoptera; many of which were sent to the BMNH and elsewhere for specialists to describe as new species and several descriptions of larvae of aquatic insects were published by Philip including many odonates.

Philip also worked with visiting scientists, including Hugh Cott from Cambridge who was investigating the biology of the then plentiful Nile crocodile, the juveniles of which were found to be mainly insectivorous, including many Odonata in their diet. Young crocodiles were important predators at the time of emergence. These dragonfly larvae fed mainly on other insect larvae, such as Chironomidae and Ephemeroptera. Of the Ephemeroptera, Philip investigated the life history of the large Polymitarcid mayfly, *Povilla adusta*, which is widely distributed and noted for boring into wooden boats, and was heavily preyed upon by fish. The larvae live in silken tubes and were common in reed stems; adults were found to swarm at monthly intervals, usually the second night after full moon. From the sizes of larvae in fish stomachs, Philip was able to calculate larval growth rates; a single generation was usually completed in four months and since swarming occurs every month there must be four age groups present in the lake at all times. A large collection of aquatic insects, obtained mainly from a mercury-vapour light trap, were taken to the BMNH for further study, greatly increasing our knowledge of aquatic insects.

Through Philip's contacts, Audfinn Tjonneland of Bergen University (Norway) came to Jinja to study the periodic emergences of lake flies, such a feature of these lakes; together they used mercury-vapour light traps, for 100 consecutive days at Jinja and elsewhere. Another project was to study the effects on the riverine faunas of DDT which the Medical Departments had put into East African rivers to control blackflies (*Simulium* spp.) some of which carried an organism causing river blindness. Philip assisted other members of the staff, particularly Humphrey Greenwood who was concentrating on the taxonomy and ecology of the 100+ cichlid fishes which had evolved in the lake using different diets, many of which were insectivorous, and also writing a book on 'The Fishes of Uganda'.

Philip was a delightful colleague, a dedicated naturalist, always lively and enthusiastic, good humoured and helpful to others; he worked extremely hard and was meticulous in his observations of the natural world.



Photo: EAFRO, December 1954, taken when Ro Lowe-McConnell departed, Uganda. Centre: Philip (then clean shaven!) squatting with dog Swirrel; back row, left to right: Geoff Fish (with pipe, part obscuring tall visiting scientist Audfinn Tjonneland), Cai Cridland (who looked after the laboratory), Mrs Cartnell (EAFRO accountant, part obscured), Pat Daly (friend of Ro) and Bobby Beauchamp (with glasses); front row, left to right: Marjorie Greenwood (with daughter Pamela), Kay Burford (EAFRO secretary), Humphrey Greenwood and Douglas Roberts (standing). Credit: Ro Lowe-McConnell.

Philip in Canada Gordon Pritchard [gpritcha@ucalgary.ca]

Philip spent 12 years in Canada, from 1962 to 1974 and during that time he made a major impact on the Canadian entomological scene. As he points out in his obituary, his principal research accomplishments during this period were the discovery of facultative autogeny in Arctic mosquitoes and the diagnosis and subsequent suppression of the insect nuisance in the St. Lawrence River that threatened the viability of Expo 67 in Montreal. This “insect nuisance” has been reported in some versions of Philip’s achievements as being due to biting flies, but was actually primarily caused by mass emergence of caddis flies or ‘shad flies’. But for odonatologists, we would rank his arduous work that resulted in the publication of Volume 3 of E.M. Walker’s *“Odonata of Canada and Alaska”* as the pinnacle of his achievements.

I was privileged to meet Philip for the first time in May 1963, a few months after his arrival in Canada, when a fellow-graduate student and I defended our Ph.D. theses at the University of Alberta. David Happold and I had been working for the past two summers at a field site north of Edmonton, David on mosquitoes and Gordon on dragonflies. When it came time to defend our work, Philip’s presence in Ottawa made him available to examine us both. I had, of course, read all of Philip’s dragonfly papers and had been really inspired by his 1962 book, *“A Biology of Dragonflies”*. So this was a wonderful opportunity for me - to meet the already acknowledged ‘master’ - and I truly value his support and encouragement from that time and throughout my career.

After defending, I went to Australia to work on Queensland fruit flies and when I came to Calgary in 1967 I set up a project on tipulid flies which occupied me, along with work on mosquitoes, for the next dozen years. It was not until the late ‘70s that I eased back into odonatology and by that time Philip had left Canada for New Zealand. And, as Philip also points out in his obituary, his career as a full-time research entomologist effectively ended in 1967. So I saw rather little of him for most of the time he spent in Canada. I do remember, however, the inspirational talk he gave in 1974 on receipt of the Entomological Society of Canada’s Gold Medal. This talk, titled *“Entomological Reflections”*, was published in the *Bulletin of the Entomological Society of Canada* (6[3]: 70-75) and is reprinted here along with the Gold Medal Citation (see below). Also we have reprinted an article by Hugh Danks that was originally published in 1990 in the *Bulletin of the Entomological Society of Canada* (22[4]: 210-211) on the occasion of Philip’s retirement. Hugh, himself an Entomological Society of Canada Gold Medal winner, has recently retired as Head of the Biological Survey of Canada and worked with Philip at the University of Waterloo. We are very grateful to Hugh for helping us to put together this account of Philip’s life in Canada.

The Entomological Society of Canada Gold Medal Award, 1974



The Entomological Society of Canada Gold Medal for 1974 was awarded to Professor Philip S. Corbet in recognition of his contributions to Canadian Entomology and presented to Philip in Halifax, Nova Scotia, 27 August 1974. The Entomological Society of Canada is gratefully acknowledged for the Gold Medal citation, originally published in the *Bulletin of the Entomological Society of Canada*, (6[3]: 66-68), which is reproduced here.

Philip Corbet was born in 1929 at Kuala Lumpur and spent his first two years in Malaya. His father, Dr. A. S. Corbet, was a scientist with broad interests who worked as bacteriologist, chemist, and entomologist in the course of his career, and his mother, Irene Trewavas, has been an educator of children and schoolteachers. His sister, Dr. Sarah A. Corbet, is a freshwater biologist who presently teaches at the University of Cambridge.

Philip obtained his early education in New Zealand and England. Subsequently he obtained the degree of B.Sc. (General) in 1949 and B.Sc. (Special: Zoology) in 1950, both with First Class Honours, from the University of Reading. He obtained a Ph.D. in entomology in 1953 at the University of Cambridge where his studies were supervised by Professor (now Sir Vincent) Wigglesworth. In 1962 Philip was awarded a D.Sc. in Zoology from the University of Reading. He was married in 1957: his wife, Hildegard, who obtained a Ph.D. in Psychology at Carleton University, Ottawa, has been an Assistant Professor Psychology at the University of Waterloo and is a Registered Psychologist (Ontario).

Philip's research has covered a variety of subjects within the broad disciplines of zoology and ecology. Much of his work falls within two broad areas: freshwater biology, including specialisation on the biology of dragonflies; and medical entomology, including specialisations on the biology of mosquitoes. His research has taken him to several parts of the world. From 1954 to 1962 he worked with the East Africa High Commission in Uganda, initially at the Freshwater Fisheries Research Organisation, Jinja and, from 1957, at the Virus Research Institute, Entebbe. He came to Canada in 1962 to join Agriculture Canada at the Entomology Research Institute, Ottawa, and in 1967 became Director of the Research Institute, Belleville. In 1971 he was appointed Professor and Chairman of the Department of Biology, University of Waterloo, Ontario, and in May 1974 became Professor and first Director of the Joint Centre for Environmental Sciences, University of Canterbury and Lincoln Agricultural College, Christchurch, New Zealand.

Philip's interest in the biology of aquatic insects led him into studies on the role of tropical culicine mosquitoes as vectors of virus diseases. His early work in this area involved the development of techniques for recognising potentially infective mosquitoes. He also studied the distribution of egg-laying sites of sylvan, culicine mosquitoes and the effects of predation by larvae of a carnivorous mosquito that had earlier been proposed as a biological control agent. Subsequently he participated in studies which established that anopheline mosquitoes were the principal vectors of O'nyong-nyong virus, an epidemic resembling dengue fever that eventually involved several million people in East Africa. This work provided the first evidence of a virus epidemic being transmitted by anopheline mosquitoes. Subsequently he was involved in collaborative studies which resulted in the isolation of other viruses from anophelines.

On coming to Canada in 1962, Philip continued his interest in freshwater biology and medical entomology, but concentrated on mosquitoes in the high arctic, studying their taxonomy, reproduction and general phenology. He paid particular attention to their sources of nitrogenous food and their mode of reproduction; this led to the discovery of facultative autogeny, a kind of ovarian development that appears to represent a specialized adaptation to intermittent shortage of vertebrate hosts. His earlier interest in the influence of microclimatic factors on insect behaviour was extended to include weather and microclimate at high latitudes, and this has led to a general explanation as to why terrestrial microclimate can be ameliorated at latitudes above 70°. In the mid 1960's he led the research team which advised Expo' 67 on the shadfly nuisance. Since his appointment as Director of



Photo: Entomological Society of Canada Gold Medal Award citation portrait, 1974

the Research Institute, Belleville, in 1967, Philip has been closely associated with agricultural science and has developed a special interest in pest management and integrated control. Just before leaving Canada he completed the third and last volume of E. M. Walker's *The Odonata of Canada and Alaska*.

A measure of Philip's scientific productivity is the fact that he has authored or co-authored more than 140 scientific papers, seven review articles, three books, and numerous articles of a less specialised nature. He has also presented many invitation lectures at national and international meetings and symposia.

Research accomplishment is only one facet of Philip's varied career. Over the years he has found time to serve on numerous national and international committees including, among others, the Ontario Department of Agriculture and Food Pesticide Advisory Committee; the Defence Research Board Advisory Committee on Entomological Research; the Canada Committee on Biting Flies; the Population Task Force of the Canadian Council of Resource and Environmental Ministers; the Steering Committee of the United States Project "Pest Management for Major Crop Ecosystems", a part of the International Biological Program; and United Nations committees of both the Food and Agriculture Organization and the World Health Organization. He has served as an advisor on vector biology to the World Health Organization in East Africa and to the Rockefeller Foundation in Brazil. He is a member of many scientific societies including the Entomological Society of Canada, having served on the Governing Board from 1969 to 1973 and as President during 1971-72. As President, he provided the Society with strong, dynamic leadership. He was a strong proponent of the Society's 1970 resolution on population limitation and resource use and was responsible for preparing the Society's 1971 publication *Pesticides and the Environment*. These two statements can be regarded as landmarks in the development of the Entomological Society of Canada's role in Canadian society.

Recently Philip's interest in biological education has led to his acceptance of faculty appointments, first at the University of Waterloo and now at the University of Canterbury and Lincoln Agricultural College. His enthusiasm and broad entomological experience will undoubtedly have a beneficial influence on university students at both the undergraduate and graduate levels.

The Entomological Society of Canada honours Professor Corbet for his outstanding contributions to entomology in research, public service and education.

Much of Philip's research has concerned seasonal and daily patterns of insect development and behaviour. His interest in these subjects was stimulated by his early work on the seasonal regulation of the adult flying season in British dragonflies; this included field investigations of larval growth and of the temporal patterns of emergence and adult density. The field work was supplemented by laboratory experiments on factors affecting developmental arrest. These studies led to the recognition of general principles governing seasonal regulation in Odonata and resulted in the publication of two books. The first was written to interest the general reader in natural history. The second aimed to present an integrated ecological study of the whole order, embracing tropical as well as temperate representatives, and was written for specialist readers; it has helped to systematize and direct subsequent research on the Odonata. The initial work on dragonflies marked the beginning of Philip's subsequent investigations on periodicities and rhythms of various activities such as emergence, egg-laying, feeding, swarming, and biting in other insect groups, particularly the Trichoptera and Diptera. He has also studied the modification of periodicities by microclimatic factors.

Entomological Reflections

Philip S. Corbet - 27 August 1974

Address given by Professor Philip S. Corbet to the Joint Annual Meeting of the Entomological Society of Canada and the Acadian Entomological Society, Dalhousie University, Halifax, Nova Scotia, 27 August 1974, when he received the Gold Medal Award for Outstanding Achievement from the Entomological Society of Canada.

Acknowledgement

I am particularly glad to have this opportunity to share with you in person my feeling of pleasure and privilege at having been chosen as this year's recipient of the Gold Medal of the Entomological Society of Canada. The award gives me pleasure because it will provide a tangible reminder of the happy, stimulating and extending twelve years that I have spent in Canada as an entomologist. And I feel a sense of privilege in being so recognized by the Entomological Society of Canada - an association distinguished by the achievements of its members and by the

contributions it has made, to entomology and to the scientific community as a whole.

In accepting this award I am reminded how much a person like myself is indebted to those with whom he works, whether these be members of the Society's Governing Board or an Advisory Committee, an Editor, graduate students or collaborators; or colleagues who give guidance, leadership or inspiration, as entomologists like Antony Downes, George Holland and Brian Hocking have given me in Canada.

During the twelve, rewarding years that I have spent here, at the Entomology Research Institute, at the Research Institute, Belleville and at the Department of Biology, University of Waterloo, I could not have wished for more generous and stimulating associates; and I welcome the opportunity of acknowledging this fact here, as I move from the third wonderful country I have worked into a fourth.

Reflections

During the next few days we shall necessarily be concerned with practical entomological problems that it is our responsibility, as entomologists, to solve in order to meet one of our obligations to society. Partly on this account, I shall adopt a different emphasis in this talk. To provide a perspective, I shall first reflect briefly on the events that have led to the holding of this meeting; and then I shall consider some of the possible reasons that exist for studying insects.

I find it intriguing that some 4.6 billion years after this planet was formed, 3 billion years after life materialized on it, 350 million years after insects appeared, and 7 million years after the primates arose, members of one species of primate should choose to assemble in one spot (much as certain Diptera do over a swarm-marker) in order to exchange information and ideas about insects - creatures which, until these last few moments in their history, had not attracted the attention of other animals except as objects to be eaten or nuisances to be driven away. It might well have been otherwise, particularly if the world's first cerebral opportunist had evolved from one of the largest families of organisms instead of from one of the smallest. We may sometimes forget how exceptional and ecologically anomalous were the developments that have made possible the human societies of today, and that if it had been the beetles, rather than the primates, that had produced a species capable of imaginative thinking, this gathering, presided over perhaps by a chairweevil, might be known as the Vertebratological Society of Grylloblattaland or perhaps of Greater Pterygota, or of the Union of Coleopterous Republics.

At this point, and since humans rather than beetles are holding this meeting, we may usefully reflect on some of our reasons for studying insects. Indeed, it was with such a question that a colleague and I used to introduce the entomology course given by the Department of Biology at the University of Waterloo. The reasons that we identified (not to put too fine a point on it) were two. First, insects constitute sources of wonder and delight; and as such they also provide a rich medium for sharing pleasure with other humans. This consideration applies whether or not a person wishes to make entomology, or even biology, his or her career. Second, insects are adapted to virtually every terrestrial and freshwater habitat where food is available. And because, despite their manifold adaptations, all insects are built on an easily recognisable basal plan, they offer unrivalled material for the study of evolution and thus of strategies that secure stability and long-term survival. As terrestrial animals ourselves, we can benefit from trying to understand these patterns of adaptation, either as object lessons should we wish to adopt such strategies ourselves, or as military intelligence should we wish to outwit those species of insects that we regard as pests.

During the rest of this talk I am going to share with you some personal reflections on each of these reasons for studying insects.

Wonder and Delight

First, then, let us consider insects as sources of wonder and delight. Both of the experiences I am about to describe relate to dragonflies - creatures distinguished by their peerless command of flight; and both incidents relate to migrations, phenomena which must surely be among the most compelling that an entomologist can witness. The first of these two events took place in the tropics, almost exactly on the equator, near the north shore of Lake Victoria in Uganda; the second occurred in a north-temperate latitude, at about 42°N. in Point Pelee National Park, the southernmost tip of the Canadian mainland.

The incident in Uganda took place in 1962, shortly before I left that country to come to Canada. I knew from circumstantial evidence that several species of dragonfly, all of which bred in temporary waters, underwent, regular long-distance flights as adults, travelling northwards and southwards across the equator with the rain-bearing winds; but I had never seen this happening, at least not in an unequivocal way. Late one afternoon I was standing in my garden looking straight up into the sky, straining to keep in sight a hawk that I had been watching, when I detected a moving speck, apparently not a bird, which, as I watched, appeared to grow larger. This speck was obviously very high above me. As I continued to watch, several and then many similar specks

came into view and became progressively larger until I could make out that they were dragonflies. With a surge of excitement I realized that I was witnessing the descent from a great height of a large migration. Before many minutes had passed, the first of the dragonflies had reached the ground, where they continued to fly steadfastly in one direction, at a height of a metre or so, rising to clear bushes and other obstacles in their path, the rustling of their wings filling the air as they flew by in the now falling light. As the sun set they chose their roosting sites - the bare tips of tree branches a few metres above the ground on western faces warmed by the setting sun. There was a noisy jostling as late arrivals tried to alight on perches that were already occupied. Then, as darkness fell, activity ceased, and I left my observation post for the night. I returned to it before sunrise the next morning. As the sky illumination increased during twilight, the dragonflies on their perches briefly fluttered their wings, whereupon one or two, then several, and then a tremendous wave of them took to flight. They climbed rapidly in the early morning sky until they once again became remote specks which soon disappeared from view. And the direction in which they departed was a continuation of the direction in which they had arrived the evening before, strongly suggesting that they were navigating by sun-compass orientation. That was the only occasion during my eight years in the tropics, on which I witnessed the arrival and departure of a dragonfly migration.

In the early fall of 1965, and again in 1967, my wife and I visited the Point Pelee National Park, the peninsula that projects southwards into Lake Erie, where many insects, such as the monarch butterfly and several kinds of dragonfly, gather at that time of year, presumably on their way to Ohio and destinations further south. On some days the Park abounded with dragonflies and we were able to observe their roosting behaviour in the evening. There as in Uganda, they settled on the western sides of bushes and trees, facing the setting sun. But in temperate latitudes in early fall such a habit presents difficulties if your timetable calls for an early morning start the next morning, because the nights can be cool and the western faces of bushes and trees are the last places to warm up after daybreak. This being so Hildegard and I went back to these roosting sites just before sunrise the following morning to see how the dragonflies would cope. They coped very well. Just before sunrise, after a period of wing-whirring, presumably to raise the thoracic temperature, the dragonflies took off, darted around at great speed and almost immediately alighted again, but this time on the eastern faces of vegetation where in due course they would be warmed by the rising sun. Having made this adjustment, they remained motionless for a considerable time until the ground surface began to warm up; then they gradually moved downwards on their perches until some individuals were actually on the ground. Their brief, mercurial flight before sunrise has taken them from the coldest microclimate at Point Pelee to the warmest, and their early departure, after they had warmed up, was thereby assured. As we left the Park that morning and saw all these dragonflies sunning themselves on the eastern sides of trees we reflected on how puzzled we should have been if we hadn't been around to witness the minute or two of frenzied flight in the half-light of dawn and to see how the trick was accomplished!

Strategies for Survival

The second reason for studying insects that my colleague and I had recognised was to observe, and try to understand, their strategies for survival in a terrestrial environment. During the rest of this talk I shall discuss the implications that such studies may have for the survival of man. To this objective he may sometimes add the provision that this survival should be achieved without wide-amplitude fluctuations in numbers and without major cultural discontinuities. Such a goal, we may note, is one that has been achieved by most extant species of insect from whose example, by the exercise of suitable humility, we should therefore be able to learn.

I suspect that there has never been a time in the history of man when it has been as necessary and as urgent as it is now to adopt a recipe for achieving stability of human populations. For just recently (extremely recently in terms of man's existence on earth) human populations in most parts of the world have exploded into what can only be called an outbreak - one that for its abruptness and extent has had no precedent on our planet. This outbreak is taking the form of an exponential rise in population and consumption powered by a rapid rise in productivity which, by positive feedback, provides the resource base on which the population and consumption can continue to grow.

It is important to note how recent this outbreak is. For about 99% of the time he has existed on earth (either as *Homo sapiens* or as his tool-making forebear, *Homo erectus*) man has apparently lived as a hunter-gatherer, regulated by the ecosystems of which he was a part and having little effect on them. Ecologically, this can be regarded as the typical human condition. During this time man could be likened to a satellite in stable orbit around the earth, held securely in its path by the interaction between its own centrifugal force and the earth's gravitational pull. But during the last 1% of man's voyage certain events have taken place which have culminated, during the last two hundred years, in this satellite breaking away from the earth's gravitational hold, and the stable course it was following, and then accelerating off into the unknown.

Sometimes populations of insects sustain an outbreak; this is particularly liable to happen if their food is grown in intensive monoculture. From our knowledge of insect populations we know that two conditions must



Photo: Point Pelee, Canada's southern tip jutting into Lake Erie. Point Pelee National Park, one of Canada's smallest national parks, is located 50 km (30 miles) south-east of Windsor, Ontario and contains a Carolinian forest oasis. Credit: Robert A. Mutch.

exist for an outbreak to occur: first, the factors that normally cause mortality must be rendered less effective; and second, there must be available a rich substrate on which the population can grow. The behaviour of certain crop insects when their predators and parasites have been reduced in numbers serves to illustrate this generalisation. We observe also that an outbreak usually ends with an abrupt drop in numbers when the food source is consumed or harvested.

The same two conditions exist in the case of man's outbreak: the death rate has been greatly reduced, mainly by the science of preventive medicine; and the domestication of plants and animals has provided a rich substrate on which human populations can grow. As our entomology tells us, there are termites, beetles and ants that domesticate other organisms and yet do not sustain fulminating outbreaks; so the practice of domestication itself would not seem to be a sufficient condition for instability. An important difference between the strategies of man and insects seems to reside in what man has done with this ability to domesticate other species. Further examination reveals that man's strategy has been significantly affected by two further developments, neither of which has a counterpart in any other organism.

First, the energy flux in agricultural systems has been accelerated tremendously by the injection of progressively greater amounts of fossil fuel. This has had the effect of greatly increasing the apparent productivity of such systems, albeit on a subsidy that has to be regarded as temporary, since fossil fuels are for practical purposes non-renewable. Use of this subsidy has provided the substrate on which the outbreak has been able to continue. Prolonging the outbreak has allowed the numbers to become very high and the residual productivity of the resource-base to become correspondingly low, thus rendering more difficult the accommodation that will have to be reached between the population and its resource-base when these temporary subsidies are withdrawn, and the outbreak is brought to an end.

Second, a system of trading has developed, whereby convertible tokens can be used as currency to acquire wealth. Since resources can be converted to currency, this development has contributed significantly to the speed with which certain resources are being depleted. Also such a system encourages patterns of resource utilisation that favour short-term profits at the expense of sustainable yields. It provides an effective way of accelerating consumption and encourages non-renewable resources to be used without restraint, and beyond the level at which they are actually needed to achieve comfort and survival.

From these reflections we may conclude that man's outbreak, and its persistence, have been largely due to the development of a high-energy technology and of trading, both of which seem to have been made possible by man's recently acquired powers of reasoning that have enabled him to devise methods for frustrating certain ecological regulating mechanisms to which he previously owed his stability. I suspect that, even if he had the

option to do so, man would not now wish to relinquish his mental powers together with all the excitements and satisfactions they command. Rather, it appears, he must use these powers not to leave the prospect of stability yet further behind him, but instead to chart a course that will steadily improve his chances of regaining a stable condition or perhaps of building a new kind of equilibrium.

One lesson to be learnt from insects, many of which were accomplished at long-term survival millions of years before entomologists were thought of, is that no harm need come from domesticating plants and animals as long as the death rate is kept equivalent to the birth rate (at least in the long run) and as long as resource consumption is derived from income and not from capital.

The elements of this lesson have been known, and articulated, for a long time but so far there has been little indication that they are being reflected in policy or action. In a recent book, Ken Watt (1973) points out that time also is a resource insofar as the probability that an event will occur increases with the time available for it to occur. In the present context this reminds us that an action postponed beyond a certain point may be an action forgone or an option forfeited.

Already the human satellite has been speeding away from its stable orbit, accelerating steadily, for several doubling-times of the human population, while the pressure on the planet's diminishing resources becomes more and more intense. The chances of the satellite regaining stability, already small, diminish for every day that remedial action is delayed. Already the extravagances of this generation have committed the next to a leaner and more crowded existence in a world of fewer choices.

As entomologists, we may be particularly well situated to generate awareness and to help to initiate remedial action. Not only are we intensely aware of the sources of wonder and delight that this world has to offer, but we can also see, on biological counts, where the imperatives for action must lie towards reducing demand so that it does not exceed the sustainable supply and not (as is current practice) towards mortgaging future supply so that demand can continue to rise.

Since the first entomological societies were formed more than a century ago, humans have learnt a great deal from their study of insects and many have enjoyed themselves hugely in the process. If the two reasons that my colleague and I identified for studying entomology are going to remain applicable into the future, man will have to modify his strategy for living on this planet, and to do so very soon, while options remain for this to be done in an orderly and humane way.

In 1966, at the Nobel Conference held at Gustavus Adolphus College, St Peter, Minnesota, Kenneth Boulding (1967) concluded his talk with the following passage, which merits attention today even more than it did eight years ago. He said:

"The picture which I now have of man is that he is walking a tightrope over an enormous chasm to a promised land. I think there is a promised land, in the sense that built into the human organism itself there is a covenant, a promise which is capable of redemption. There is a state of the world which is much better than what we have now, which is both possible and achievable; but it is achievable only across the tightrope. We may fall off it, and this part of the universe will have to be written off as an unsuccessful experiment. Jiggling the tightrope is absolutely out; we need to concentrate all our energies on getting across this next dangerous hundred years, perhaps the most dangerous hundred years in the history of the planet. What lies on the other side, however, looks very nice; and being a human being, I can't help having some optimism about it. This is a lovely planet, and it deserves to fulfil its potential I recommend it to you earthlings. Tend it with loving care."

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- Boulding, K.E. 1967. The prospects of economic abundance. In "The control of environment", J. D. Roslansky (ed.) pp. 41-57. Amsterdam, North-Holland Publishing Company.
Watt, K.E.F. 1973. Principles of environmental science. New York McGraw-Hill.

Philip Corbet's New Zealand years

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Phil lived in New Zealand on two separate and distinct occasions. In the early 1940s he lived with his mother and young sister in Nelson, a rural and somewhat sleepy province at the top of the South Island, famed for its sunshine. While there he attended Nelson Boys College, an old-fashioned school, but one which has (probably by accident rather than design) produced numerous noteworthy scientists, including the nobelist Ernest Rutherford.

Through his life Phil retained fond memories of aspects of growing up in Nelson, but he was always aware of living in a divided family. With the easing in transport at the end of the war the Corbet family reunited in England and Phil completed school and proceeded to develop a career.

After three decades Phil returned to New Zealand in 1974, appointed as the foundation Chair and Director of the Joint Centre for Environmental Sciences at the University of Canterbury and Lincoln Agricultural College (now Lincoln University). This was an exciting position in many ways. It was the very earliest days of integrated holistic environmental studies as an accepted academic discipline, and in New Zealand there was a buoyant and positive atmosphere associated with the recent election of a government led by Norman Kirk, an ebullient and larger than life figure. For the Joint Centre there were however, deep problems brought about by tensions between the University of Canterbury and Lincoln College, supposedly a College of the University but with significant influence of its own, and of a distinctly independent mindset. Given the political climate within and between the parent bodies the very creation of the Joint Centre was seen as a minor miracle, and Philip's considerable diplomatic skills were frequently exercised of necessity rather than of choice. Despite the appointment of an external candidate to lead 'The Joint Centre', institutional champions within each parent body never gave up their aspirations to control the organisation.

At 'The Centre' Phil set up a well-balanced forward-looking organisation, incorporating a diversity of bright young staff: ecological scientists, economists, social scientists and modellers. It was a body of, yet well ahead of, its time. The concept of considering and planning for timeframes of 25 or 50 years, while maintaining a watching brief much further into the future, was alien to established precepts. As Director of The Centre Phil served on many influential bodies (including the New Zealand Environmental Council, the New Zealand Government Fact-Finding Group on Nuclear Energy, the first council of the New Zealand Demographic Society and the first executive of the New Zealand Club of Rome) but it was always as an outsider. At that time in New Zealand the influential collegial networks were consequences of undergraduate experiences during the 1940s and 50s (or, in Christchurch circles, perhaps from interactions at primary school). In consequence Philip frequently felt frustrated. His influence had to wait a generation until the time when graduates from the specialised two-year MSc Degree in Resource Management that he had established at the Joint Centre rose to influential positions in government agencies and statutory bodies, responsible for environmental planning, resource allocation and nature conservation, both in New Zealand and elsewhere.

Just as The Joint Centre was firmly established and its programmes were running reliably and smoothly Phil's life was extensively disrupted through a conjunction of forces. The New Zealand Government had changed to one unsupportive of, if not actually antipathetic to, the goals of The Centre. Forces within the parent bodies were also behaving in a corrosive fashion as people manoeuvred to take over a going concern. And, and most importantly, Phil had become a father.

The neatly manicured, suit and tie wearing, 'English' Phil transformed to comfortable clothes, long beard, and shorts and sandals. In 1978 he resigned the Directorship of the Joint Centre and took up a Chair in Zoology at the University of Canterbury. The option for this transition had been negotiated as part of his original contract in the recognition that starting and running the Centre were different tasks.

His time in the Zoology Department was however, brief. He retained connections with the Joint Centre and was committed to completing tasks and in caring for those who, in the face of a new regime, wished to move on in their careers. Away from these residual tasks for The Centre he was deeply involved in preparing the *Odonata* article for the 1980 *Annual Review of Entomology*. This article was itself some years overdue and was serving as an update on the 1962 book and as a prodrome for what turned out to be the 1999 book.

In effect Phil was tied to a desk. During the time I knew him in New Zealand about the only occasion he got out to see his beloved dragonflies was on a field trip undertaken in January 1979 during a visit by his long-time friend Tony Watson. The pair spent the best part of three days watching dragonflies, bubbling with enthusiasm for culture, science and biology, and bouncing ideas off one another. It was the only time in New Zealand that I ever saw the Phil Corbet described by his Canadian students and by his old friends.

To escape the impositions of the continuing links, in late 1979 Phil took up a Commonwealth Visiting Professorship in the Department of Applied Biology at the University of Cambridge. During his tenure of the Visiting Professorship he was offered, and accepted, the foundation chair of Zoology in the Department of Biological Sciences at the University of Dundee.

Impacts on NZ entomology

Philip's most lasting effects in New Zealand entomology were the consequences of his strong proselytising for Integrated Pest Management programmes. Others were interested in, and developing, the field but Phil's profile and tightly documented arguments speeded acceptance within the upper levels of decision makers.

He introduced rigorous Corbet-style seasonality studies, in dragonflies of course. The outcome was the clear demonstration of strong seasonal regulation with classic diapause in several species. This came as something of a surprise for, until that time, local received wisdom had it that the New Zealand fauna was essentially aseasonal and merely responded to the sequence of local conditions. Unfortunately during the course of this programme, and for personal reasons, he became estranged from both Jane Peterson and Ken Deacon, research students who had accompanied him from the University of Waterloo.

His own publications on New Zealand dragonflies were few. Shortly after arrival he held in depth interviews with Dr John Armstrong, extracting information accrued from Armstrong's 50 years of field observation and collecting. This was published as Armstrong, J.S. & Corbet, P.S., 1980: Conversations about New Zealand dragonflies. *Societas Internationalis Odonatologica*, Utrecht. Rapid Communications 2: 73 pp. His observations of trans-oceanic movement of *Pantala flavescens* appeared as Corbet, P.S. 1979: *Pantala flavescens* (Fabricius) in New Zealand (Anisoptera: Libellulidae). *Odonatologica* 8: 115-121. He also contributed both a chapter on general biology and the core of the *Pantala flavescens* entry to *The Dragonflies of New Zealand* (Auckland University Press 260 pp).

Phil was elected Vice President of the New Zealand entomological Society for the 1977-8 executive, but, due to outside commitments, he was unable to contribute fully or to take up the Presidency of the Society.



Photo (left): Wandering glider (*Pantala flavescens*). Philip contributed to the core of the *Pantala flavescens* entry in the book: '*The Dragonflies of New Zealand*' (1987: Auckland University Press, 260 pp.) and published his observations on the trans-oceanic movement of *Pantala flavescens* in: '*Pantala flavescens* in New Zealand (Anisoptera: Libellulinae) *Odonatologica* 8: 115-121. Credit: Keith Wilson.

Philip's later years

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Some of his friends and former colleagues have contributed fascinating accounts of the various phases of Philip's astonishingly productive career in this current *AGRION*. In this brief article I will attempt to concentrate on his later years in Scotland and England after a working life in Uganda, Canada and New Zealand.

I first met Philip at the 12th International Congress of Entomology in London in 1964 when we were introduced by our friend and fellow odonatologist Robert Gambles. At that time Philip was a research scientist with the Canadian Department of Agriculture working on the reproductive physiology and periodicity of mosquitoes in the high arctic. It was, however, clear to me that Odonata were his first love, having studied the development and ecology of *Sympetrum striolatum* for his University of Reading B.Sc. dissertation and the seasonal regulation of dragonfly life cycles for his Ph.D. thesis at the University of Cambridge. I was just at the commencement of my work on the ecology of *Ischnura elegans*. The publications from his Ph.D. thesis were particularly interesting to me at that time and I found his comments about my work and proposed developments of it to be most stimulating and encouraging. From that point we regularly kept in touch but we did not see each other again until 1980.

Since Philip returned to live and work in the UK we were able to enjoy many occasions when it has been possible to combine dragonfly work and relaxed socialising. When he was spending the year 1979-80 as Commonwealth Visiting Professor at the University of Cambridge we travelled with Peter Mill and Eberhard Schmidt to Utrecht to discuss SIO business with Bastian Kiauta, including the proposed constitution and the formation of 'affiliated national associations' within SIO. Since that time Philip and I met at many international symposia and BDS gatherings.

Soon after his 1979-80 year at Cambridge Philip was appointed to the Foundation Chair of Zoology at the University of Dundee, becoming Head of Department for three years. He retired as Professor Emeritus of Zoology in 1990 and then spent six years in an honorary capacity as Professor in the Department of Zoology University of Edinburgh. The period in Edinburgh was particularly important in allowing him to finalise his *magnum opus* – *Dragonflies: Behaviour and Ecology of Odonata*, published in 1999. I recall a time in the mid-1980s when I was helping to review draft chapters of the book which he was constantly rewriting to update them. He was the ultimate perfectionist and I had to point out that if he continued in that vein the work would never get published!

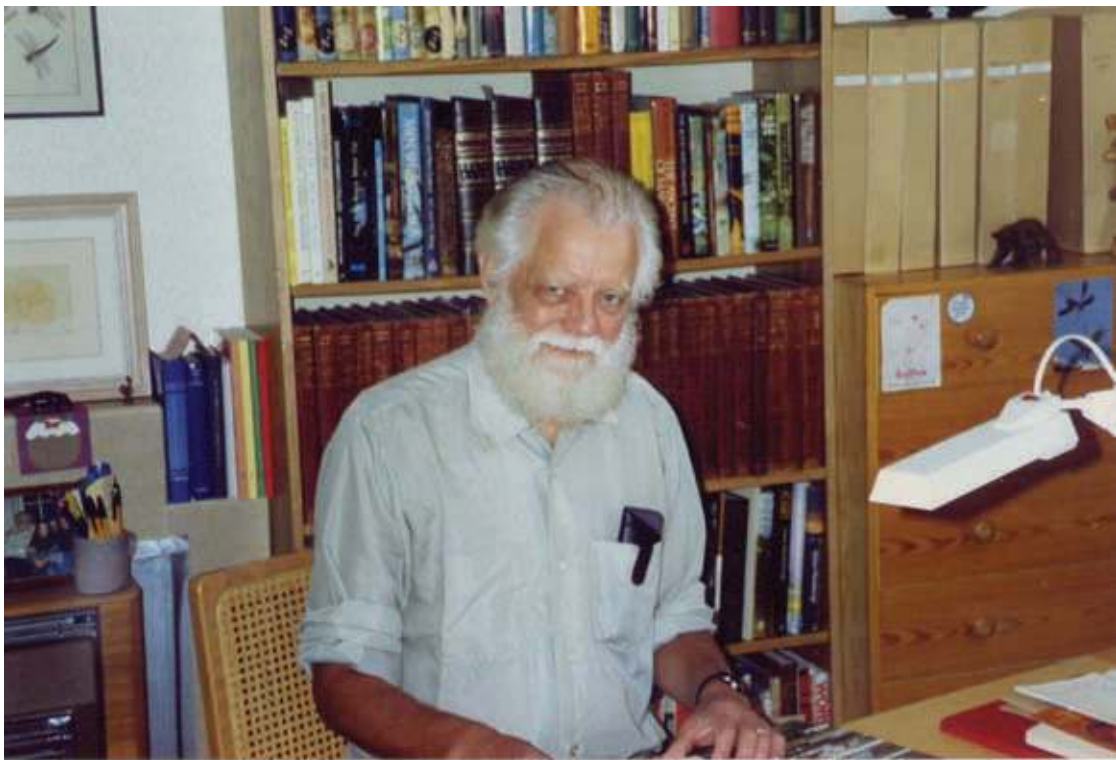


Photo: Philip at Edinburgh University in 1990. Credit: Mike Parr.

When he moved to Cornwall it was often convenient for him to break his journey en route to B.D.S. meetings by staying a night or two with us in Somerset, when his fund of jokes seemed absolutely limitless, especially when accompanied by a glass or three of Glenfiddich. When WDA was formed we worked closely with other Board members to ensure the young Association thrived. I am not sure how Philip avoided being inaugural President of WDA, but he took over from me in 2001 and the Association has gone from strength to strength.

All who knew Philip are able to testify regarding his enthusiastic and infectious love for natural history in general. One of the more colourful personalities in my part of Somerset is the internationally acclaimed potter John Leach. John has created many beautiful objects in his time, but he claims the most important is his 'pond' (in reality quite a large lake) in a conservation area on his own land. I took Philip to meet John and it was a delight to witness the pleasure they both derived at being able to converse about natural history in such a beautiful setting. Kingfishers, pike, marbled white butterflies – and of course dragonflies such as *Anax imperator*, *Aeshna grandis* (which only recently started breeding in this part of Somerset) and *Erythromma najas* all contributed to a very happy visit to the Leach's pond. In 2006 I was excited to spot a kingfisher beating the life out of an aeshnid larva by my own Somerset pond whilst I was phoning Philip. Two weeks later Philip visited us and while looking towards the pond from the window he exclaimed "There's your kingfisher!" It seemed as if I arranged it specially for him as it was only the second time we had seen the bird.



In 1997 Philip left Scotland and purchased Crean Mill, an old mill house in the far west of Cornwall. The Mill's natural garden with a permanent stream and large ponds meant that Philip could enjoy watching dragonflies at close quarters whenever he relaxed in the summer. Crean Mill is close to where Philip's sister Sally (also a naturalist) lives and I know it gave them much pleasure to be able to see each other frequently. Soon after establishing himself in Cornwall Philip met Sarah Jewell who became his much loved partner. Philip and Sarah seemed to be a perfect match for each other and he became very close with Sarah's daughter's family in Portugal, thoroughly enjoying the interaction with her two young grandsons.

Photo: Philip and Sarah at the Colgate University WDA Symposium, New York, 1999. Credit: Mike Parr.

Some of Philip's defining characteristics were his attention to detail; ensuring that correct procedures were followed; and that if it was evident that a warped version of events was being projected being the first to object and attempt to rectify matters. We both tried very hard to prevent the catastrophe which was the disintegration of SIO but we failed to avert the crisis which came to a head in 1997. Since that time it would appear that nothing has changed in the leadership of FSIO and because of this, Philip was understandably exceedingly wary of the apparent moves to engineer a reunion between the two international dragonfly groups. As he said to me on more than one occasion, "Mike, we've got to put our heads above the parapet over this." He had an immense sense of right and wrong and was never reluctant to make this clear. I have the highest regards for his sense of justice and fairness, which came to the fore during the demise of SIO and on problematic occasions in the organisation of both BDS and WDA.

A matter which concerned him greatly was the so called Penlee *Anax junius* incident. Most of our readers will already be familiar with this unfortunate event. Philip regarded the physical prevention by aggressive vigilantes of his securing a voucher specimen for the British Museum of the Green Darner as potentially constituting a major threat to biological science. Philip was acting with the express permission of the Cornwall Wildlife Trust, and when he was later attacked in two abusive emails by a life member of the BDS he was convinced about the dangers to anyone needing to collect voucher specimens. Similar incidents in Ireland and the Far East simply underlined the growing problem. But I know that Philip was also greatly distressed by the failure of the BDS to act swiftly to state their own position and give him support in order to settle the matter. There were several occasions in his later years when he considered that the major dragonfly organisations had fallen short of the highest standards in dealing with administrative, organisational and the scientific issues, but nevertheless, he maintained a scrupulously fair attitude to all individuals concerned and was, of course, renowned for his courteous and friendly manner both in public and in private.



Philip was a wonderful friend and engaging companion and his not being there at the end of the phone is going to be difficult. Between the pair of us we must have ensured the long term survival of the telephone companies! I have been immensely fortunate and grateful to have known Philip for some 43 years. I have had no better friend.

Photo: Philip in southern Portugal, August 2007. Credit: Mike Parr.

Philip S. Corbet's obituary notes

Philip S. Corbet

Philip Corbet, specialist on the ecology of dragonflies and mosquitoes, and earnest advocate of a human population policy

Philip Steven Corbet, who died on 13th February 2008, aged 78, at his home in West Cornwall, was a zoologist - by inclination, training, experience and achievement. His father, Alexander Steven Corbet, Deputy Keeper of Entomology at The Natural History Museum, was the recognised authority on Malaysian butterflies. The atmosphere in the Corbet family home was pervaded by his father's love of natural history. Philip's sister, Sarah A. Corbet, is an authority on British bumble bees and the pollination of plants by insects.

Philip Corbet was born on 21 May 1929 in Kuala Lumpur, West Malaysia, where his father was a microbiologist at the Rubber Research Institute. His schooling was at Nelson Boys' College, New Zealand and then, for one year only, at Dauntsey's School, Wiltshire. Only at Dauntsey's did he receive any instruction in biology. After graduating BSc with First Class Honours in Zoology at the University of Reading, where he was awarded the Colin Morley Prize for Zoology, Corbet undertook research for the PhD Degree at Gonville & Caius College, Cambridge under the supervision of Professor V.B. (later Sir Vincent) Wigglesworth FRS, the distinguished insect physiologist. Corbet remained grateful to Sir Vincent for allowing him to conduct his PhD research on a topic that Corbet himself had chosen - seasonal regulation in dragonflies - rather than on a subject suggested by his supervisor. The resulting research confirmed Corbet's deep affection for dragonflies. It also provided the foundation for his life-long interest in the group, and for an ecological classification that has formed an informative template for interpreting life histories of dragonflies and other aquatic insects. Corbet's PhD research led to his suggesting to James Fisher, then on the Editorial Board of the popular New Naturalist books, that a volume devoted to dragonflies would be an appropriate addition to the series. The outcome was the widely used volume *Dragonflies* by Corbet, Longfield and Moore, first published in 1960.

Corbet's professional career reflected the diversity of his zoological, and especially entomological, interests, being pursued in four continents and embracing research, administration and resource management.

During 1954–1962 Corbet was employed as a zoologist and entomologist by the East African High Commission in Uganda, first, from 1954 to 1957, at the East African Freshwater Fisheries Research Organization at Jinja, where he produced the definitive account of the food of non-cichlid fishes in the Lake Victoria basin, leavening this work with detailed investigations of the insect food of the Nile Crocodile and the behaviour of several groups of aquatic insects. Latterly, from 1957 to 1962, he specialized on the behaviour and ecology of mosquitoes at the East African Virus Research Institute, Entebbe, a prestigious laboratory which, as the Rockefeller Yellow Fever Institute, had been the place where, some years earlier, the jungle cycle of Yellow Fever had been elucidated by A.J. Haddow and others. At the E.A.V.R.I., under the inspiring leadership of Haddow, Corbet's research output was exceptionally high, and on the strength of this he was invited by the Canada Department of Agriculture Research Branch to join the Entomology Research Institute (later the Biosystematics Research Institute), Ottawa. He readily accepted this offer in 1962, a time when career prospects for expatriate staff in Uganda were being diminished by the imminence of self government. While at the E.A.V.R.I. Corbet led the field team that discovered the mosquito vector of O'nyong-nyong Fever, a hitherto unknown arbovirus, with Dengue-like symptoms, that was causing a fulminating epidemic among humans in Uganda and Kenya in 1959. However his principal assignment at Entebbe was to collect large samples of mosquitoes from different heights above the ground in rain forest and then to discover and validate external characters of females that enabled their physiological age to be estimated without having to resort to the laborious and time-consuming process of dissecting the ovaries. Corbet became adept at this arcane skill, to such an extent that, towards the end of his employment in Uganda, as he was wont to recall, he had an opportunity to demonstrate his aptitude in a memorable way. While relaxing on an open verandah at sundown, Corbet and an entomological colleague (the late A.W.R. McCrae) noticed a mosquito flying slowly between them, whereupon Corbet was able to state with confidence the mosquito's species and to add that it was a young female who had not yet laid eggs. Such proficiency served Corbet well in his next assignment – the study of mosquito biology in the Canadian High Arctic. There he discovered, and described, the phenomenon of facultative autogeny – a hitherto unknown reproductive strategy of mosquitoes. The strategy entails the ability by individuals of blood-sucking species to retain two options for oogenesis. If, after a period of trying to obtain vertebrate blood (normally a prerequisite for egg development of mosquitoes) a female fails to do so, she can safeguard her reproductive options by abandoning further attempts at host-seeking and dedicating her scant remaining energy reserves to developing at least a few eggs. This strategy, well suited to the High Arctic where sources of vertebrate blood are sparse and unpredictable, was later detected by other workers among mosquitoes in harsh and variable environments elsewhere. Corbet's other principal achievement while a research entomologist in Canada was to lead the investigative team that diagnosed, and subsequently suppressed, the insect nuisance in the St Lawrence River that threatened the viability of the 1967 World Exhibition (Expo 67) in Montreal.

His team's diagnosis and recommendations proved to be correct and practicable so that the threat was averted. Corbet's career as a full-time research entomologist effectively ended in 1967, with his appointment as Director of the Canada Department of Agriculture Research Institute at Belleville, Ontario. The Institute, formerly known as the Canadian Institute for Biological Control, adopted, under Corbet's direction, the broader remit of discovering and developing methods for pest suppression that avoided, or greatly reduced, the use of synthetic organic chemical pesticides. This responsibility, which Corbet discharged for four years, marked a turning point in his personal priorities. As an ecologist with a responsibility for pest management, Corbet saw clearly the driving role of human population pressure in destabilising ecosystems, and also of precipitating pest outbreaks. Thereafter he used his many opportunities as an invited symposium speaker to emphasise this causal relationship and to point to the need for national policies to balance the size of human populations and the resources available to support them on a sustainable basis. His compulsion to communicate these principles more widely led to his acceptance in 1971 of the position of Professor and Chairman of the Biology Department at the University of Waterloo, Ontario and in 1974 as Professor and Director of the Joint Centre for Environmental Sciences



Photo: Blue Emperor (*Anax imperator*), UK. Credit: Keith Wilson. The 'Emperor' dragonfly was one of Philip's favourite odonates. As a young man Philip conducted detailed field studies on the life-history of *Anax imperator* at the Fish Pond, Burghfield Common, near Reading, Berkshire, England (see photo page 5) during the period 1950 to 1953. These studies contributed to his Ph.D. thesis (The Seasonal Ecology of Dragonflies) and were the subject of several important papers including: -

- Corbet, P.S., 1955. The immature stages of the Emperor Dragonfly, *Anax imperator* Leach (Odonata: Aeshnidae). *Ent. Gaz. Lon.* 6: 189-204.
- Corbet, P.S., 1956. Environmental factors influencing the induction and termination of diapause in the Emperor Dragonfly, *Anax imperator* Leach (Odonata: Aeshnidae). *J. exp. Biol.* 33: 1-14.
- Corbet, P.S., 1957. The life-history of the Emperor Dragonfly *Anax imperator* Leach (Odonata: Aeshnidae). *J. Anim. Ecol.* 26: 1-69.

at the University of Canterbury and Lincoln Agricultural College (now Lincoln University), Canterbury, New Zealand. The directorship of the Joint Centre (now the Centre for Resource Management) afforded Corbet access to a variety of influential fora in which to present the ecological perspective, including service on the New Zealand Environmental Council, the New Zealand Government Fact-Finding Group on Nuclear Energy, the first council of the New Zealand Demographic Society and the first executive of the New Zealand Club of Rome. Many of the graduates from the Joint Centre, which administered a two-year MSc Degree in Resource Management, secured influential positions in departments and agencies concerned with environmental planning, resource allocation and nature conservation, in New Zealand and elsewhere. An additional source of satisfaction to Corbet and the architects of the programme was that senior employees from resource-oriented government departments were seconded to take the MSc course. While in Canada Corbet had been trying to gain wider recognition of the need for a population policy and in 1971 had orchestrated an open letter to the Prime Minister, signed by 25 senior biologists, calling for the Prime Minister to acknowledge this need and to put in place a demographic policy. Like other such initiatives at that time, it failed to generate a tangible response.

In 1978, after four years as Director of the Joint Centre, Corbet resigned to take a chair in the Department of Zoology at the University of Canterbury. He had found that the position at the Joint Centre had become too political and insufficiently scientific for his taste. Soon afterwards he was awarded a Commonwealth Visiting Professorship in the Department of Applied Biology at the University of Cambridge. While there, he and his Swedish wife, who had just become parents, decided to try to relocate in Europe so that their daughter would be able to know her wider family. Accordingly in 1980 Corbet accepted the foundation chair of Zoology in the Department of Biological Sciences at the University of Dundee, where he was Head of Department from 1983 to 1986.

While at Dundee Corbet served on the Nature Conservancy Council Committee for Scotland and chaired the Science Committee of the Scottish Wildlife Trust. In 1983 he was elected first President of the British Dragonfly Society.

Among those who study dragonflies, Corbet was well known for his books, especially two synoptic treatments of the behaviour and ecology of the group, both of which promptly became accepted as standard texts: *A biology of dragonflies* (1962, reprinted 1983) and *Dragonflies. Behaviour and ecology of Odonata* (1999, reprinted 2001, and 2004). Both books came to be regarded as foundation sources for students of dragonflies, the second appearing in Japanese translation in 2006. Corbet also co-authored three other books on dragonflies, each with a regional focus: the New Naturalist *Dragonflies* referred to above (1960, reprinted 1985 with C. Longfield and N.W. Moore); volume 3 of *The Odonata of Canada and Alaska* (1975, reprinted 1978 and 1998) with E.M. Walker); and an updated version of the 1960 New Naturalist book (to be published in early summer 2008 with S.J. Brooks). The book published in 1999, *Dragonflies. Behaviour and ecology of Odonata*, was regarded as a definitive synthesis for which Corbet was awarded the Neill Medal for Natural History by the Royal Society of Edinburgh. His output of published research was varied and extensive, comprising more than 250 papers in refereed scientific journals reporting findings on fishes, crocodiles, bats, mosquitoes and dragonflies and other aquatic insects, pest management, demography, resource management and arctic microclimate. His research led to the award of the Degrees of DSc by the University of Reading (1962), ScD by the University of Cambridge (1976) and DSc by the Universities of Edinburgh (2003) and Dundee (2005). He was elected Fellow of the Institute of Biology (1967), the Entomological Society of Canada (1977) of which he was President during 1971-1972 and from which he received the Gold Medal for Outstanding Achievement in 1974, the Royal Society of Tropical Medicine and Hygiene (1985), and the Royal Society of Arts (1991). He became a Fellow of the Royal Society of Edinburgh in 1987, being awarded the Society's Neill Medal in 2002. Honorary Memberships included the British Dragonfly Society (1991), the Société Française d'Odonatologie (1997) and the Dragonfly Society of the Americas (2002). During 2001 to 2003 he was President of the Worldwide Dragonfly Association. He served as consultant, as an applied entomologist, for the Food and Agriculture Organization and the World Health Organization of the United Nations and for the European Economic Community.

In 1990 Corbet retired from the University of Dundee, as Professor Emeritus of Zoology, to work in an honorary capacity at the Department of Zoology, University of Edinburgh, until 1996, when he was appointed Honorary Professor there.

While living in Cornwall after retirement, Corbet served on the Council and Executive of the Cornwall Wildlife Trust and as foundation chair of the Trust's Conservation Strategy Committee.

Each of Corbet's three marriages was dissolved. His daughter, Katarina, survives him. In January 2001 he suffered a mild stroke, from which he made an almost complete recovery. He enjoyed great happiness, during his closing years, from his partnership with Sarah Jewell who, with his sister Sarah Corbet, also an entomologist, survives him.

Philip S. Corbet's retirement, 1990 Hugh V. Danks

(This article, written in December, 1990, following Philip's retirement, has been reproduced with kind permission of the author, Hugh Danks, from the *Bulletin of the Entomological Society of Canada* 22[4]: 210-211)

As noted in the June *Bulletin* (22[2]: 107), Dr. Philip S. Corbet retired from the University of Dundee in 1990. He and his wife Mary live in Edinburgh. His daughter Katarina attends school in the same city.

Phil Corbet was born in 1929 in West Malaysia, and received his early education in New Zealand and England. His university studies were completed at Reading (B.Sc.) and Cambridge (Ph.D.; Supervisor Prof. [now Sir Vincent] Wigglesworth), and he later qualified for the degrees of DSc. (Reading 1962) and Sc.D. (Cambridge 1976).

Phil has had a long, distinguished and varied career, holding positions in equatorial Africa (East African Freshwater Fisheries Research Organization and East African Virus Research Institute in Uganda, 1954-1962), Canada (Entomology Research Institute and Belleville Research Institute of Agriculture Canada, and the University of Waterloo, 1962-1974), New Zealand (University of Canterbury and Lincoln College, 1974-1980), and Britain (University of Cambridge visiting professor 1979, and University of Dundee, 1980-1990).

His career has been characterized by an extraordinary range of interests and by remarkable productivity. Phil is the author or co-author of well over two hundred scientific publications, including several books and major review papers. Major emphases in his work are on the biology of dragonflies and the biology of mosquitoes, with these and other concerns being underpinned by interest in rhythmic and periodic patterns. However, his many studies of seasonal and daily patterns of insect development and behaviour in dragonflies and mosquitoes are supplemented by contributions on taxonomy, morphology, epidemiology, reproductive physiology, arctic microclimate, and even the ecology of fishes and crocodiles.

Key insights into insect biology and ecology resulted from these studies. For example, research on the seasonal regulation of emergence in dragonflies led to the recognition of two ecological categories of emergence ("spring species" and "summer species"), achieved in different ways that have been widely used as a reference point by later authors. Two books on dragonflies, *Dragonflies* (Corbet, Longfield and Moore 1960, intended for a general audience) and *A Biology of Dragonflies* (Corbet 1962, a more specialized volume), integrated considerable information on the group in very helpful ways. He completed the detailed treatment of Canadian dragonflies started by E.M. Walker (Walker and Corbet, 1975, *The Odonata of Canada and Alaska*, vol. 111). Another book, *The Ecology and Behaviour of Dragonflies*, is in preparation.

Seminal analyses of daily and seasonal periodicities in aquatic insects include a major review paper on temporal patterns of emergence and many research reports treating tropical, temperate and arctic insects: applications of these concepts about periodicity led to detailed and informative studies of arctic microclimates. Phil Corbet realized the great importance to insects of amelioration of ground surface conditions produced in the high arctic by the absence of a "nocturnal" temperature inversion, and he summarized this and other important lessons in a major review of the microclimate of terrestrial and aquatic organisms in the arctic (*Acta arctica* 18, 1972).

Detailed studies on east African mosquitoes also produced biological and ecological information that was of great value for medical entomology. Further understanding of mosquito biting patterns and virus vector relationships were obtained, and methods to assess parous condition, and thus the status of individual adults in relation to vector capability, were developed. At the opposite extreme of latitude, in the Canadian high arctic, studies of mosquitoes showed fascinating features of phenology and biology. Thus, a specialized mode of ovarian development (facultative autogeny) was identified, apparently related to the unpredictable supply of hosts. Oviposition patterns are precisely cued to temperature, so that eggs are laid in the warmest sites that first become free of snow in spring, ensuring early hatch.

Along with his specific studies of insect biology, Phil is interested in wider aspects of science, and in 1974 he moved to New Zealand to pursue this interest in depth, developing a resource management program at the newly established Joint Centre for Environmental Sciences (University of Canterbury and Lincoln College) that enhanced environmental education, and analyzed the energy costs of agriculture. He published several reviews on such themes as integrated control, pest management and energy use.

During his career, Phil's wide knowledge has been put to good use in teaching students, as an invited lecturer, and in particular as a member of the faculty at the University of Waterloo, at the University of Canterbury, and at the University of Dundee. His broad expertise was well recognized by those who invited him to present

papers or write scientific reviews (38 items), review books (22), serve as external examiner for doctorate degrees (candidates in 15 different institutions), and so on.

Phil's abilities are also reflected by his responsibilities in the organizations where he worked. For part or all of his tenure, he was Director of the Research Institute at Belleville, Chairman of the Department of Biology at the University of Waterloo, Director of the Joint Centre for Environmental Sciences at Canterbury, and Head of the Department of Biological Sciences at Dundee. Similarly, he held important responsibilities in various professional societies, such as the Entomological Society of Canada (see below), the Entomological Society of New Zealand, and the International Odonatological Society, and participated on several dozen national and international expert committees and other bodies.

Members of the Entomological Society of Canada will remember Phil's contributions to the Society in the 1960's and 1970's, culminating in his effective term as president (1971-1972). The ESC recognized his achievements with the award of the Gold Medal for outstanding achievement (1974) [see *Bull. ent. Soc. Can.* 6(3): 66-68] and the Fellowship (1977). Phil received many other awards, both research grants and professional recognition. For example, he is a Fellow of the Royal Society of Edinburgh, and an elected member of honour of the International Odonatological Society.

Phil is not only an excellent scientist. He participated fully in the professional community, and has been a member of no less than 32 professional societies and interest groups. In his scientific endeavours, he was able to collaborate successfully with many people: more than 50 different co-authors appear in his scientific publications. Those who were fortunate enough to work alongside him profited from both scientific and personal exposure. As a scientific colleague, Phil is organized and meticulous, with an incisive mind. In response to a complex question, for example, he might pause for a long while, but just as the questioner began to wonder if he had been heard, Phil would deliver the equally complex paragraph that he had composed in reply. At a personal level, too, Phil treated any colleague or visitor, student and senior scientist alike, with great grace and generosity.

Despite his retirement, Phil is able to continue with his work: he is an Emeritus Professor at the University of Dundee, and an Honorary Fellow at the University of Edinburgh; he has received an Emeritus Fellowship from the Leverhulme Trust for 1990-1992. This allows him to pursue further studies on dragonflies, his first love, and on mosquitoes, and he will doubtless add other papers to the many already published and in press. All those who know Philip Corbet will wish him a happy and productive retirement.



Photo: Philip enjoys an ice-cream with the Arnolds at the 4th WDA International Symposium of Odonatology, Pontevedra (Spain), July 2005. Credit: Gordon Pritchard.

Philip – the conscience of the WDA
Gordon Pritchard [gpritcha@ucalgary.ca]

I will not spend time recalling Philip's contributions to WDA Symposia – the Corbet Seminars, the questions asked during the scientific sessions, the discussions during the coffee breaks and at meals and during sight-seeing trips and Symposium tours. A mind so active that mine, at least, wonders how it could be possible for one to know, and retain, so much. What I do want to do is to give some idea of Philip's commitment to the Association as a collection of odonatologists dedicated to the furtherance of our science.



Photo: The post-symposium trip group in Österbybruk (Sweden) after the WDA Conference at Gällivare, July 2001. Philip is top right. Credit: Valerie Pritchard.

Philip was not at the historic Maribor meeting at which the WDA was established and so was not a founding member, but for several years he had been very concerned about the way in which our fore-runner was being run. His concern with the need for 'democratization' had occupied much of his time since at least the 1989 meeting of FSIO in Tennessee. I was a party to his concerns since that time, with transatlantic telephone calls, faxes, letters, conversations at meetings, and latterly long e-mail attachments. All of these communications were composed in Philip's usual careful and thorough style. I did not always support what I considered to be Philip's obsession with these matters but I had to admire his personal commitment. Not only did he resign from FSIO, but he made a point of relinquishing his Honorary status in that organization. Philip's determination to ensure that the WDA did not repeat what he saw as the errors of FSIO was paramount and in 2004 he was appointed as the WDA Archivist. In his words, "In July 2004 it was announced in *AGRION* that the Trustees of the Worldwide Dragonfly Association had approved the establishment of a WDA Archivist. The agreed Terms of Reference of this position stipulated that the incumbent was to prepare an article detailing significant happenings during his/her term of office I was appointed first Archivist and I demitted office at the WDA International Symposium of Odonatology at Vigo, Spain in July 2005. Therefore it falls to me to provide the required article. In Part 1, I aim to achieve two things: first, explain why WDA had to be formed and had to be independent of the Societas

Internationalis Odonatologica; and second, provide enough factual background to make it unlikely that WDA will follow the same path towards fragmentation. In Part 2, I review the development of WDA from its inception in July 1997 until July 2005.” In actual fact, the Board considered Part 1 to be rather too personal for publication in *AGRION*, but a modified Part 2 was published in *AGRION* 12 (1) in January of 2008 and, as we have not been able to find a new Archivist to follow him, Philip updated this report to the end of 2007. In this article, Philip lays out what he sees as the very strong features of WDA, an organization of which he was extremely proud.

Alarm bells went off everywhere in Philip’s world when we announced last year that we were working on an initiative to develop some sort of rapprochement with FSIO in order to bring the global dragonfly community back together. Specifically we were approached by FSIO to consider taking over the publication of *ODONATOLOGICA*. This request has since been extended to include joint International Symposia. The members of the WDA Board were very excited by the prospect of having a single journal and only one series of International Symposia, but we were a little concerned about how much of a compromise we should make in order to bring this about. Of course, we need not to have worried as long as Philip was willing to remind us of the errors of the past. Here are some of the comments that Philip sent to us:

“I wholeheartedly support the objective of a fusion, resulting in a single, unified international society..... [However], the resulting society should be democratic, operating under the constraints of a constitution and it should have an unblemished record of having done so..... With great difficulty, and with a resolute commitment to constitutional procedures, a few stalwarts established WDA to meet the needs of the many odonatologists who respected democracy and fair play..... If the decision-makers in WDA are wise and strong they will be presented with a wonderful opportunity to forge a unified, international society, committed to a constitution and to open, humane dealings among its members, and to establish a secure basis for the future of international odonatology. WDA is at present very strongly based to accomplish this. We are a happy, friendly association, free of dominance and privilege, and possessing a buoyant attitude towards the future..... The originators of WDA could hope for no finer legacy than to enable international odonatology to continue and prosper as a democratic, friendly association.”

We all agree with these sentiments and we thank you Philip for your part in making us the association that we are and for reminding us of the path along which we have traveled and the responsibilities that we all have for ensuring that we continue along this path. As the Québec car license plate says: ‘Je me souviens’.



Photo: The post-symposium trip group in Marysville (Victoria, Australia) after the WDA Conference at Beechworth, January 2003. Philip is located at the centre, bottom row, next to companion Sarah Jewell to the right. Credit: Gordon Pritchard.

Dragonflies - Behaviour and Ecology of Odonata by Philip S. Corbet
A summary of reviews
Graham Reels [gtreels@cyberdude.com]

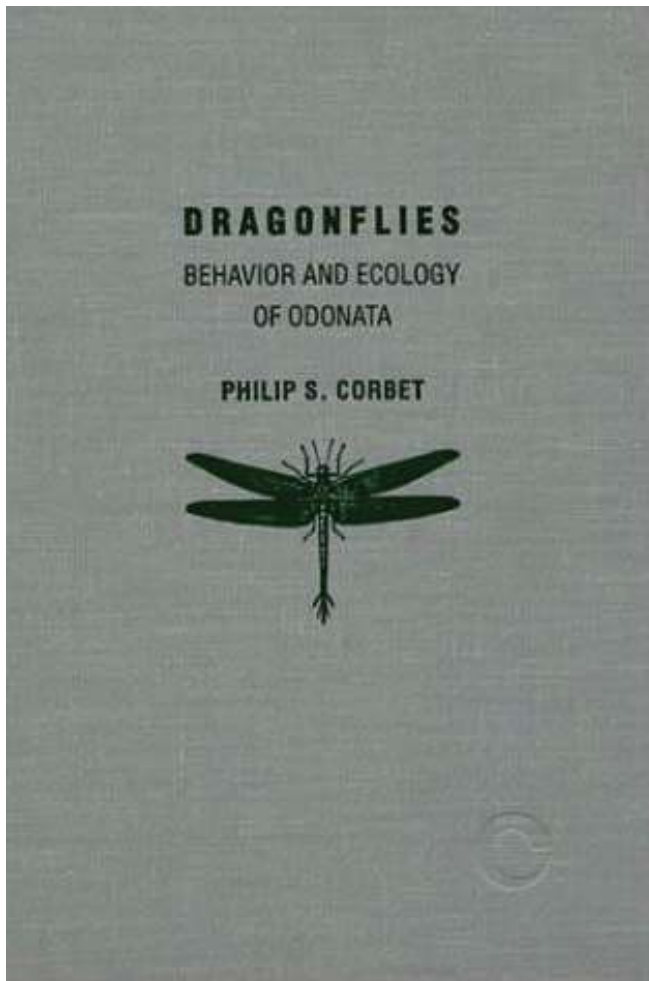


Photo: 1st Edition, Cornell University Press, Ithaca, New York, US (30 April 1999).

Philip Corbet's long-awaited *magnum opus*, "Dragonflies - Behaviour and Ecology of Odonata" was published to great acclaim by Comstock Books and Harley Books, in 1999. The culmination of many decades of meticulous study and assimilation, this landmark publication is an elegant and scholarly synthesis of the sum of all published knowledge (up to 1997) on the behaviour and ecology of an entire order of insects.

The book was widely reviewed in magazines and scientific journals. Re-reading some of the reviews, it is remarkable how unanimously the reviewers praised both author and book. One senses that every single reviewer immediately recognised that here was a work of extraordinary importance and outstanding merit. Writing in *The Naturalist*, Professor Geoffrey Fryer FRS predicted that "... This will become the standard work on dragonfly behaviour and ecology"; a sentiment echoed by, among others, *Choice* ("... This book will become the standard reference work for dragonflies"), Koen Martens in the *Zoological Journal of the Linnaean Society* ("... a monumental work, a milestone in Odonatology"), Dick Groenendijk in *Brachytron* ("... this book will be the standard encyclopaedia of the ecology and behaviour of dragonflies for a long time"), Andreas Martens in *Lauterbornia* ("Among the literature on dragonflies it has no equal and it is unlikely that it will be surpassed soon"), John Alcock of Arizona State University ("This is an astonishing book. A complete encyclopaedia of dragonfly behaviour and ecology"), John F. Brook in *Antenna: bulletin of the Royal Entomological Society* ("... destined to be the authoritative reference work for both professional and amateur Odonatists for years to come") Guy Woodward in *Freshwater Biology* ("... undoubtedly the definitive work on the behaviour

and ecology of dragonflies; there is no precedent with which to compare it and I doubt that there will be for many years to come") and, perhaps most lavishly, Raymond Hutchinson, in *Nouv'Ailes* ("One must salute the appearance of the most important work on the behaviour and ecology of dragonflies of the day, of which the great odonatologist Philip S. Corbet is the brilliant author"). Mike May aptly remarked that "The book is unique in the literature on dragonflies and has very few parallels among that on other insects."

Many reviewers went further than this, placing the book firmly in the pantheon of natural history classics. The prestigious journal *Nature* led the way, describing *Dragonflies* as "one of the definitive natural history texts of the twentieth century." The distinguished odonatologist and conservationist Norman Moore, writing in *Biological Conservation*, hailed the book as "... a truly splendid contribution to odonatology and to entomology in general," going on to state that "I am convinced that Philip Corbet's *Dragonflies* is and will remain one of the truly great entomological books." "A milestone in the field of biology" was the conclusion reached by Andreas Martens, Goran Sahlen and Frank Suhling, in *International Review of Hydrobiology*. Writing in *Lauterbornia*, Andreas Martens remarked that "... it deserves a secure place as a model for other animal groups", and drew a parallel between it and Bert Holldobler & E.O. Wilson's Pulitzer Prize-winning monograph, *The Ants*. One imagines that this comparison with Professor Wilson would have been particularly gratifying to Corbet, who, in *AGRION* 7(1), praised Wilson for his "... well-known commitment to in-depth taxon-focused biology," a commitment which Corbet emphatically shared. Michael T. Siva-Jothy, in a lengthy review for *Animal Behaviour*, went further still: "This work is an example of what a natural history monograph should be, and I believe it will stand as a, if not the, definitive example of the genre." In coming to this conclusion, Siva-Jothy opined that "I doubt whether I

will see another monograph of this stature in my lifetime... It is first and foremost an excellent natural history monograph, but its long-term value lies in the fact that it provides objectively presented foundation material for any behaviourist, ecologist, behavioural ecologist, evolutionary ecologist, naturalist, in fact pretty much any ‘-ist’ to build ideas on.”

This sense of a broader utility to biologists in general was stressed by a number of reviewers, including Peter Zwick in *Aquatic Insects* (“... a must, not just for those studying Odonata, but (for) all working on aquatic insects”), Mark R. Forbes in *SILnews* (“... an extremely useful reference for comparative work on other insects and invertebrates”), and most forcefully by Koen Martens in his review for the *Zoological Journal of the Linnean Society*, who remarked that the book carries “... a far more general impact, as it marks the revival of the natural history style of books, a kind of biological oeuvre that was considered dead and buried in professional science.” The latter sentiment was also expressed by Michael T. Siva-Jothy: “... this book is testament to the way biology used to be done... Corbet has simply (of course, it’s far from simple) taken the time and made the effort to understand everything he writes about (a virtue that sadly seems to be on the decline in recent years).”

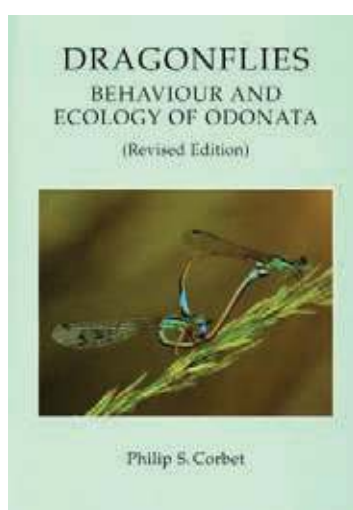
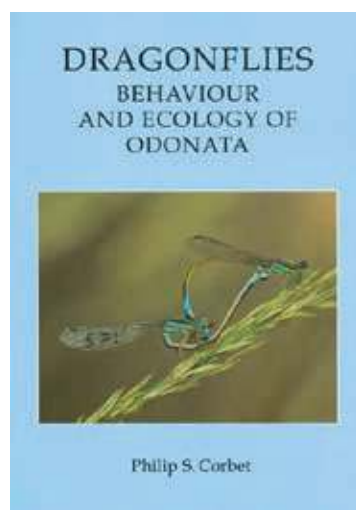
This brings us, last but not least, to the man himself. Again, the reviewers were united. To once more quote Siva-Jothy, “Corbet is an outstanding entomologist and biologist and is a figurehead for odonatologists around the world... I was, and still am, staggered by the sheer quantity of material that Corbet has synthesized...” The book is “... a superb testimony to Philip Corbet’s extraordinary ability to absorb, collate and present a huge amount of information...” (*British Wildlife*). “(His) breadth of analysis and dedication to his topic are extraordinary” (John Alcock). Perhaps the two most memorable compliments paid to Philip Corbet, amongst all these reviews, were made by Harold B. White in *Entomological News*, and Koen Martens in the *Zoological Journal of the Linnean Society*: -

“It is hard to imagine that a single author ever again will have such a thorough command of the Odonata to achieve such a broad synthesis.”

“Before 1999, it was difficult to imagine the science of Odonatology without Philip Corbet. Now, it is impossible.”

Philip Corbet was awarded the Neill Medal by the Royal Society of Edinburgh in 2001, with the Prizes Committee citing the book for making a “major contribution to natural history as an extraordinary piece of scholarship and biological insight.” *Choice* selected the book for inclusion in its annual Outstanding Academic Titles list for 2000. It is now in its second edition, and Professor Corbet was presented with a copy of the new Japanese edition (a monumental achievement in itself) by Hidenori Ubukata at the 5th WDA international symposium, held in Swakopmund, Namibia, in April 2007 (for more details on the Japanese edition see *AGRION* 12[1]: 22-23).

“Dragonflies - Behaviour and Ecology of Odonata” stands as the most marvelous, tangible legacy of the foremost odonatologist of his time, Professor Philip S. Corbet.



Photos: From left to right. - i) 1st edition, Harley Books, Colchester, UK (May, 1999), ii) 2nd edition, revised, Harley Books, Colchester, UK (2004), and iii) Japanese edition, Kaiyusha Publishers Co. Ltd., Tokyo (March, 2007).

Philip Corbet and the British Odonata

Stephen Brooks [S.Brooks@nhm.ac.uk]

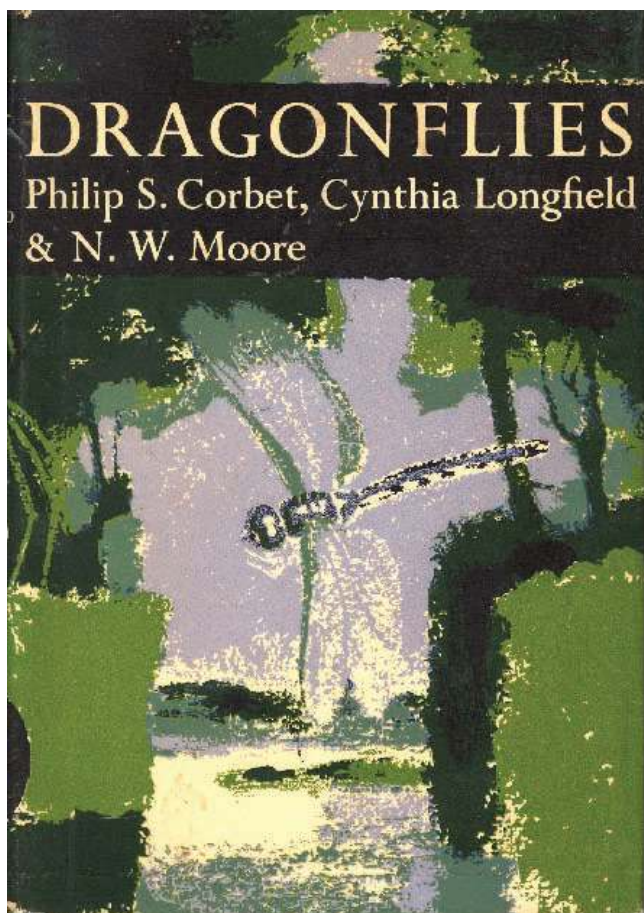
I had the privilege of meeting Philip Corbet shortly after I started working at the Natural History Museum, London, in 1979. I worked with him closely on the committee of the British Dragonfly Society when he was the first president and I was editor of the *Journal of the British Dragonfly Society* and, more recently, while we were co-authoring *Dragonflies*, to be published in the New Naturalist series in May 2008 (Corbet & Brooks, 2008). This, sadly, turned out to be Philip's last project.

I first became interested in dragonflies in the late 1960s when, as a boy, I was impressed by the size and voracity of dragonfly larvae, which I kept in aquaria, and by the awe-inspiring transformation of the larva to adult, which frequently kept me up into the small hours of the morning, even on school days. I quickly came across Cynthia Longfield's guide to British Odonata (Longfield, 1949) and the inspirational original New Naturalist volume *Dragonflies* (Corbet et al., 1960), which opened my eyes to the fascinating lives of dragonflies. It is no exaggeration to say that Philip Corbet, and of course Cynthia Longfield and Norman Moore, and the absorbing world of dragonflies that they revealed, were to have an enormous influence on the course my life was to take. After studying Zoology at Newcastle University, and in particular freshwater ecology, I had the great good fortune to land a dream job at the Natural History Museum, London, where I was told to sort out the dragonfly collections. I spent the first day at the Museum re-reading the New Naturalist *Dragonflies* volume and subsequently was delighted to meet both Norman Moore and Philip Corbet within a few months of starting work at the Museum.

Following the publication of Cyril Hammond's influential field guide to British Odonata (Hammond, 1977), which was the first field guide to the British species for over 30 years, interest in British dragonflies grew rapidly and it was not long before there was sufficient momentum for the formation of the British Dragonfly Society (BDS) in 1983 (Merritt, 1987). Philip Corbet became the first President of BDS in March 1983 and served until 1991. Philip provided a gravitas and a thoroughness that the incipient society required and it grew quickly under his guidance and soon had a solid membership base and was widely respected. His politeness

and impeccable manners, attention to detail, clear vision, open mind and firm hand, not to mention his authoritative knowledge of dragonflies, ensured well-organised, business-like committee meetings and a Society that delivered the goods for dragonfly conservation. During that period the membership increased to almost 1000, members received twice yearly publications of a Newsletter and Journal, regular and frequent field meetings were held and, perhaps most importantly, Philip established the Dragonfly Conservation Group (DCG) in 1986. Norman Moore was its first convenor and Philip served on DCG in his capacity as BDS president. DCG, in particular, ensured that BDS became well-known and respected among British conservation organisations and enabled the society to punch above its weight. Philip's contribution to BDS was immense. He provided firm foundations and a blueprint for BDS from which it is still working and has enabled the Society to grow from strength to strength. Philip provided a characteristically thorough account of the first ten years of the BDS shortly after his retirement as President (Corbet, 1993). Philip was enthusiastic in his encouragement of young people to develop research interests and projects on dragonflies and to that end the Philip Corbet Award was established in 1996 in his honour and is available from BDS on an annual basis for researchers under the age of 25.

In 1999 Philip was shocked to encounter abuse and hostility when he attempted to collect a single *Anax junius* in Cornwall. This was the first time an American species had ever been seen in Britain and Philip recognised the importance of collecting a voucher specimen. Despite having permission to do



The original 'New Naturalist - *Dragonflies*' by Philip S. Corbet, Cynthia Longfield and Norman W. Moore, which was first published in 1960.

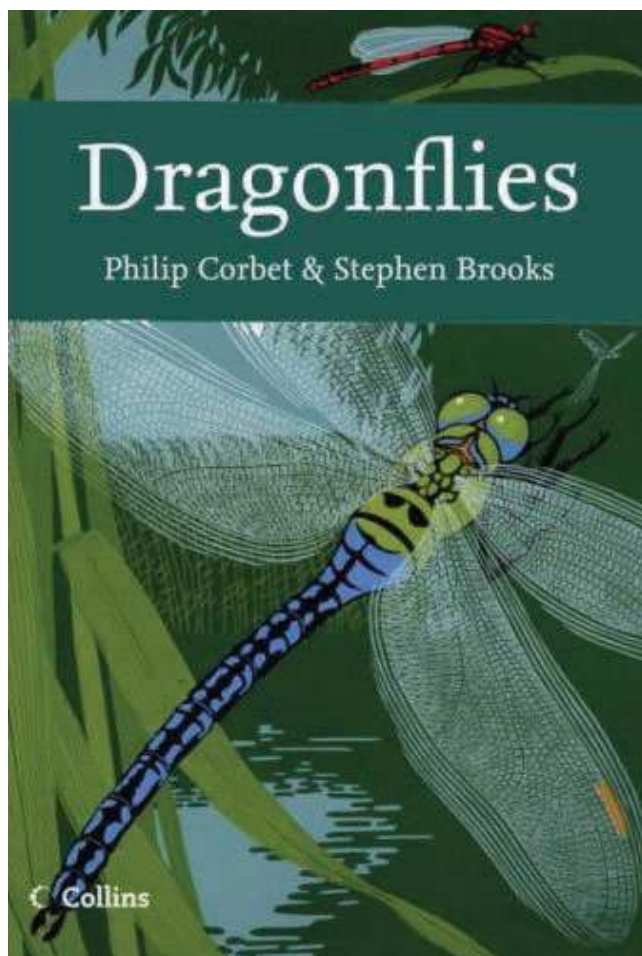
so, he was prevented from collecting the specimen by others present on the site who were opposed to insect collecting. More personal abuse followed in a widely circulated e-mail. This incident alarmed Philip as he saw it as an attack on the scientific method. He took many opportunities to alert scientific audiences to the threat he saw from the anti-collecting lobby and continued to stimulate debate to the end of his life. He was recently invited to write an article on this theme in the *Bulletin of the Royal Entomological Society* (Corbet, 2007).

In June 2000 Philip invited me to join him as co-author to write a new volume on dragonflies for the New Naturalist series (Corbet and Brooks, 2008). I have thoroughly enjoyed working closely with Philip on this project and have learnt from him a great deal, not only about dragonflies, but also about carefully structuring prose so it is clear, succinct and informative, and to choose the most appropriate words carefully (although it may be apparent from reading this piece that I require more lessons). We worked well together as a team and, although it was always his book, Philip was careful to listen to my views before coming quickly, decisively and politely to a well-reasoned conclusion either in my favour or against. Philip's encyclopaedic knowledge of dragonflies is legendary as was his ability to recall the precise paper in which some arcane description of dragonfly behaviour was recorded. His distress was therefore often apparent when, following his stroke, he sometimes found it difficult to recall recent conversations or decisions, although his long term memory seemed unaffected. He would sometimes phone me only to forget why exactly he had made the call, but he would always dismiss these events with good humour and we usually finished our conversations swapping amusing anecdotes. His difficulty with short-term memory meant that his meticulous note taking left him in good stead. The book was in the final stages of the publication process when he died and I regret that he will not see it published.

I will remember Philip as a kind and considerate man with punctilious manners. He had a dislike of bureaucracy, the inappropriate use of the word 'with', and felt deeply about wildlife conservation and the damage a world full of humans was doing to the environment. It seems appropriate that I am finishing writing this piece travelling on a train (I never saw Philip drive a car) to teach a course on the identification of British dragonfly larvae. Larvae were Philip's favourite dragonfly life stage and he was concerned that difficulties in larval identification, especially of the early stadia, were impeding research. He has left us a rich legacy as a result of his marvellous ability to synthesize what is known about the world's dragonflies, his own research on the neglected larval stages, and a thriving British Dragonfly Society.

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