

Recent literature from Cambodia

This section summarizes recent scientific publications concerning Cambodian biodiversity and natural resources. The complete abstracts of most articles are freely available online (and can be found using Google Scholar or other internet search engines), but not necessarily the whole article. Lead authors may be willing to provide free reprints or electronic copies on request and their email addresses, where known, are included in the summaries below.

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New species & taxonomic reviews

Adamson, E.A.S., Britz, R. & Lieng S. (2019) *Channa auroflammea*, a new species of snakehead fish of the *marulius* group from the Mekong River in Laos and Cambodia (Teleostei: Channidae). *Zootaxa*, **4571**, 398–408.

The authors describe a new species of snakehead fish to science from the Mekong River system: *Channa auroflammea* sp. nov. Previously reported as *C. marulius*, *C. cf. marulius* or *C. aff. marulius*, the new species is readily distinguished from *C. marulius* and other members of the *marulius* group by its differing colour pattern. It also forms a regular component of the wild fisheries catch in the Tonle San and Tonle Srepok rivers.

Assing, V. (2018) A revision of Palearctic and Oriental *Pseudolathra*. V. Two new species from Cambodia and Thailand, and additional records (Coleoptera: Staphylinidae: Paederinae). *Linzer biologische Beiträge*, **50**, 1005–1014.

This study presents records of beetles within the *Pseudolathra* genus from Thailand and Cambodia, including the first records of four species in Cambodia and a description of one new species to science: *P. aviformis* nov. sp. Author: vassing.hann@t-online.de

Averyanov, L.V., Averyanova, A.L., Nguyen K.S., Orlov, N.L., Maisak, T.V. & Nguyen H.T. (2018) New and rare orchid species (Orchidaceae) in the flora of Cambodia and Laos. *Novitates Systematicae Plantarum Vascularium*, **59**, 24–41.

The authors present data on orchids based on herbarium material collected in Cambodia and Laos in 2012–2017. These include the first records of three orchid species in Cambodia: *Eria ochracea*, *Luisia macrotis* and *Trichoglottis seidenfadenii*. Author: av_leonid@mail.ru

Bae, Y-S. & Bayaraikhan, U. (2019) New and newly recorded species of the genus *Halone* Walker, 1854 (Lepidoptera, Erebiidae, Arctiinae, Lithosiini) from Cambodia, Laos and Vietnam. *Zootaxa*, **4586**, 395–400.

Paper not seen.

Burse, C.R., Goldberg, S.R. & Grismer L.L. (2019) New Species of *Meteterakis* (Nematoda: Heterakidae) in *Physignathus*

cocincinus (Squamata: Agamidae) from Cambodia. *Comparative Parasitology*, **86**, 1–4.

The authors describe a new species of nematode (*Meteterakis pursatensis* n. sp.) to science which was found in the large intestine of a Chinese water dragon (*Physignathus cocincinus*) in Pursat Province. Author: Igrismer@lasierra.edu

Constant, J. & Bartlett, C.R. (2019) New records and species in five planthopper families from Keo Seima Wildlife Sanctuary, Cambodia with checklist of Cambodian planthoppers (Hemiptera: Fulgoromorpha). *Belgian Journal of Entomology*, **83**, 1–27.

This paper presents recent records of planthoppers from Keo Seima Wildlife Sanctuary. These include the description of one species new to science (*Vishnuloka bunonga* sp. nov.) and the first country records of three species: *Vizcaya longispinosa*, *Macrobrachys tonkinensis* and *Hemisphaerius hippocrepsis*. A checklist of Fulgoromorpha planthoppers is also provided for Cambodia which includes 42 species. Author: jerome.constant@naturalsciences.be

Gorfol, T., Furey, N.M., Bates, P. & Csorba, G. (2018) The identity of '*Falsistrellus*' *affinis* from Myanmar and Cambodia and new records of *Hypsugo dolichodon* from these countries. *Acta Chiropterologica*, **20**, 301–309.

This study reviews specimens reported as '*Falsistrellus affinis*' from Cambodia and Myanmar using molecular, morphological and morpho-metric methods. The authors conclude that these actually represent the long-toothed pipistrelle *Hypsugo dolichodon*, which was recently described as a new bat species to science from Laos and Vietnam. Author: gorfol.tamas@nhmus.hu

Hamalainen, M., Kosterin, O.E. & Kompier, T. (2019) *Euphaea cyanopogon* sp. nov. from the Cardamom ecoregion in Cambodia and Vietnam (Odonata: Euphaeidae). *Zootaxa*, **2555**, 28–44.

The authors describe a new species of damselfly (*Euphaea cyanopogon* sp. nov.) from the Kampong Saom Peninsula in Cambodia and Phu Quoc Island in Vietnam. They

discuss the differences and affinities of the new species with *E. pahyapi* and some of its other congeners. Author: matti.hamalainen@helsinki.fi

Kosterin, O.E. (2019) Occasional photographic records of butterflies (Lepidoptera, Papilionoidea) in Cambodia. 1. The coastal Cardamom foothills (SW Cambodia), 2010–2018. *Acta Biologica Sibirica*, **5**, 84–105.

The author presents records of butterflies at 63 localities in four provinces in southwestern Cambodia. These include 151 confirmed species and 15 provisionally identified species. Thirty-nine of the former and eight of the latter represent first records for the country. Author: kosterin@bionet.nsc.ru

Kosterin, O.E. (2019) New synonyms and a new subspecies of *Macrogomphus* Selys, 1858 (Odonata: Gomphidae) from continental south-east Asia. *Zootaxa*, **4615**, 57–90.

The author revises the taxonomy of species within the *Macrogomphus* genus in mainland Southeast Asia and describes a new subspecies to science (*M. phalantus jayavarman* subsp. nov.) from the northern bank of the Tonle Sap Lake in Siem Reap Province. Author: kosterin@bionet.nsc.ru

Kosterin, O.E. (2019) Update of 2017–2018 to Odonata of Kampong Saom Peninsula, Cambodia. *Journal of the International Dragonfly Fund*, **129**, 1–24.

This report presents new data on Odonata recorded in the Preah Sihanouk Province, with survey areas including the Kbal Chhay Waterfall, Ream Peninsula and Koh Rong Island. The total number of Odonata recorded in the Kampong Saom Peninsula now amounts to 74 species and the presence of *Onychargia atrocyana* in Cambodia is also confirmed. Author: kosterin@bionet.nsc.ru

Kosterin, O.E. (2019) On Odonata of Phnom Tumpor (Cambodia) in the late dry season (March 2019). *Journal of the International Dragonfly Fund*, **132**, 1–26.

This report presents data on Odonata collected from different habitats on Phnom Tumpor in Pursat Province. These include the first records of two species in Cambodia: *Polycanthagyra erythromelas* and *Macromia* sp. cf. *pinratani*. Author: kosterin@bionet.nsc.ru

Matalin, A.V. (2018) New records of tiger beetles (Coleoptera, Carabidae: Cicindelinae) from Cambodia. *Far Eastern Entomologist*, **356**, 9–16.

Matalin, A.V. (2018) Review of the tiger beetle genus *Naviauxella* Cassola, 1988, with the description of a new species from Cambodia (Coleoptera, Carabidae, Cicindelinae). *Entomologisch Blätter und Coleoptera*, **114**, 293–299.

Papers not seen.

Murdoch, M.L., Grismer, L.L., Wood Jr, P.L., Neang T., Poyarkov, N.A., Ngo V.T., Nazarov, R.A., Aowphol, A., Pauwels, O.S.G., Nguyen H.N. & Grismer, J.L. (2019) Six new

species of the *Cyrtodactylus intermedius* complex (Squamata: Gekkonidae) from the Cardamom Mountains and associated highlands of Southeast Asia. *Zootaxa*, **4554**, 0–62.

The authors present an integrated taxonomic analysis of specimens belonging to the *Cyrtodactylus intermedius* complex. They identify eight species-level lineages within the complex which are discretely diagnosable and occur in specific areas, including five in Cambodia which are described as new to science: *C. auralensis* sp. nov. endemic to Phnom Aural, *C. bokorensis* sp. nov. endemic to the Bokor Plateau, *C. cardomomensis* sp. nov. from the main block of the Cardamom Mountains, *C. thylacodactylus* sp. nov. endemic to Phnom Dalai and *C. laangensis* sp. nov. endemic to the Phnom Laang karst formation. Author: mmurdoch@villanova.edu

Choi J.B., Choi E.U., Lee H., Hwang J.H., Kim E. & Park J.K. (2019) Note on new records of the carabid beetles (Coleoptera: Carabidae) in Cambodia. *Journal of Asia-Pacific Biodiversity*, **12**, 320–323.

This short communication presents the first records for four species of carabid beetles in Cambodia, including diagnostic characters, collection information and photographs. Author: entopark@knu.ac.kr

Vermeulen, J.J., Luu H.T., Theary K. & Anker, K. (2019) New species of land snails (Mollusca: Gastropoda: Caenogastropoda and Pulmonata) of the Mekong Delta Limestone hills (Cambodia, Vietnam). *Folia Malacologica*, **27**, 1–35.

The authors describe 22 species of land snail new to science from a series of small and medium-sized limestone hills along the Cambodian and Vietnamese coasts. Relatively few species of land snail occur on these hills, but these exhibit high rates of endemism with 62 of the 113 species (55%) so far known being potentially endemic. This raises a conservation concern because the hills are being quarried for limestone by four large and several smaller cement factories, in addition to many local entrepreneurs. Author: jk.artandscience@gmail.com

Wiesner, J. & Constant, J. (2019) Records of tiger beetles (Coleoptera: Cicindelidae) collected in Cambodia, with description of a new species. 149. Contribution towards the knowledge of the Cicindelidae. *Insecta Mundi*, **700**, 1–12.

The authors describe a new species of tiger beetle to science from Cambodia: *Naviauxella varians* n. sp. They also present the first records of four species for the country and first records of additional species for several provinces. Author: juergen.wiesner@wolfsburg.de

Biodiversity inventories

Jocque, M., Clause, J.K., Emsens, W.J., Mittermeier, J.C., Sandvig, E.M., Stone, M., Puls, S., Stock W. & van Berkel, T. (2018) *The Kdan Mekong expedition: a biological assessment of two*

potential wildlife sanctuaries in Kratie Province, Cambodia. *Biodiversity Express Survey Report 7.0* (22 June 2018). Biodiversity Inventory for Conservation, Belgium. https://www.binco.eu/wp-content/uploads/2018/09/BES7_Prelim_27_June_2018.pdf.

This report describes the results of surveys of mammals, birds, herpetofauna and selected invertebrate groups within the Preaek Prasab Wildlife Sanctuary and Sambour Wildlife Sanctuary in Kratie Province in 2018. As well as confirming the presence of hog deer *Axis porcinus annamiticus* and Indochinese silvered langur *Trachypithecus germaini*, 220 bird species and over 50 amphibian and reptile species were recorded. All areas surveyed were found to have experienced varying levels of anthropogenic impacts. Author: merlijn.jocque@binco.eu

Species ecology & status

Chhin S., Souter, N.J., Ngoprasert, D., Browne, S.J. & Savini, T. (2018) Population density and habitat loss of chestnut-headed partridge *Arborophila cambodiana* in south-west Cambodia. *Bird Conservation International*. DOI 10.1017/S095927091800045X

Thirty-two percent of bird species in Southeast Asia are at risk of extinction by the end of this century. The authors used line transects and camera traps to estimate population densities of chestnut-headed partridge in the Cardamom Mountains and assessed its current distribution and broad scale habitat changes from 1996 to 2016. They found that the species occurred at a density of 1.23 calling males/km² in evergreen and semi-evergreen forest above 400 m in elevation and that total evergreen forest cover in the Cardamom Mountains decreased by 20%. They conclude that the chestnut-headed partridge has a very restricted range within which the habitat has been fragmented and propose that the species be considered as Near Threatened. Author: sopheachhin@gmail.com

Choden, K.S., Ravon, S., Epstein, J.H., Hoem T., Furey, N.M., Gely, M., Jolivot, A., Hul V., Neung C., Tran A. & Cappelle, J. (2019) *Pteropus lylei* primarily forages in residential areas in Kandal, Cambodia. *Ecology and Evolution*. DOI 10.1002/ece3.5046

Circulation of Nipah virus has been reported in *Pteropus lylei* in Cambodia, but little is known about the distribution of this flying fox nationally and the associated implications for public health. The authors deployed GPS collars on 14 *P. lylei* in Kandal Province to study their movements and foraging behaviour. Most foraging locations were in residential areas (54%), followed by plantations (27%), and the maximum distance travelled each night ranged from 6.9–105 km and averaged 28.4 km. The use of residential and agricultural areas may create opportunities for *P. lylei* to interact with humans and livestock and suggests that anthropogenic habitats may

be important for the species. Author: julien.cappelle@cirad.fr

Davis, E.O., Crudge, B., Lim T., O'Connor, D., Roth V., Hunt, M. & Glikman, J.A. (2019) Understanding the prevalence of bear part consumption in Cambodia: A comparison of specialised questioning techniques. *PLOS ONE*, 14, e0214392.

The trade in bear parts poses a conservation challenge throughout Asia. Studies suggest that legislation alone cannot prevent illegal hunting and trade and that the demand for bear parts and products must also be addressed. The authors employed four survey techniques to determine the key motivators for individuals to consume bear parts and assess whether specialised questioning techniques are helpful in this regard. Their results suggest that the efficacy of different methods varies greatly in certain contexts, but also indicate that individuals in Cambodia are under-reporting their consumption of bear parts when directly asked. They further estimate that the prevalence of bear part use in Cambodia may be as high as 15% of the population, presenting a significant conservation challenge. Author: eoneitadavis@gmail.com

Gonzalez-Monge, A. & Behie, A.M. (2019) The effects of selective logging on the habitat use of the Annamese silvered langur (*Trachypithecus margarita*) in northeast Cambodia. In *Primate Research and Conservation in the Anthropocene* (eds A. Behie, J. Teichroeb & N. Malone), pp. 101–119). Cambridge University Press, Cambridge, UK.

Paper not seen.

Leroux, N., Roth B. & Marx, N. (2019) The reintroduction of captive-born pileated gibbons (*Hyllobates pileatus*) into the Angkor Protected Forest, Siem Reap, Cambodia. *Primate Conservation*, 33, 1–11.

This paper describes the reintroduction of pileated gibbons sourced from the Phnom Tamao Wildlife Rescue Centre into the Angkor Protected Forest following a period of acclimatization and supplementary feeding. Post-release monitoring indicated that the first two pairs of gibbons, including three captive-born individuals raised by their mother, reverted easily to life in the forest and bore four infants within the first five years. A third pair, which was hand-raised, proved inappropriate and was recaptured after ten days. This was replaced by a young, captive-born and mother-raised pair, which is undergoing acclimatization in Angkor. The authors suggest that mother-raised and captive-born gibbons that have had minimal interactions with people are more appropriate for release into natural habitats than infants that have been rescued from trade and hand-raised. Author: nicole.andre.leroux@gmail.com

Pruvot, M., Cappelle, J., Furey, N., Hul V., Heng H.S., Duong V., Dussart, P. & Horwood, P. (2019) Extreme temperature event and mass mortality of insectivorous bats. *European Journal of*

Wildlife Research, **65**, 41.

The authors describe their investigation of a mass mortality event of *Chaerephon plicatus* and *Taphozous theobaldi* bats which occurred during a heat wave in April 2016 in Cambodia. Field evidence, clinical signs and gross pathology findings were consistent with a heat stress hypothesis, though the detection of novel bat paramyxovirus raises questions about its possible role as a contributing factor or a coincidental finding. Author: mpruvot@wcs.org

Coasts, wetlands & aquatic resources

Boonroumkaew, P., Sanpool, O., Rodpai, R., Sadaow, L. Somboonpatarakun, C., Laymanivong, S., Aung, P.P.W., Un, M., Laummaunwai, P., Intapan, P.M. & Maleewong, W. (2019) Molecular identification and genetic diversity of *Gnathostoma spinigerum* larvae in freshwater fishes in southern Lao PDR, Cambodia, and Myanmar. *Parasitology Research*, **118**, 1465–1472.

Gnathostomiasis, an emerging food-borne parasitic zoonosis in Asia, is mainly caused by *Gnathostoma spinigerum*. Consumption of raw meat or freshwater fish in endemic areas is the major risk factor. The authors provide the first molecular evidence that *G. spinigerum* occurs in freshwater fish and specifically the snakehead fish (*Channa striata*) in Cambodia, Laos and Myanmar. They recommend that public authorities advise people living in or travelling to these areas to avoid eating raw or undercooked freshwater fish. Author: wanch_ma@kku.ac.th

Chea P., Tey S., Suvedi, M. & Ghimire, R. (2018) Assessment of community fish refuge management practice in the Siem Reap province of Cambodia. *Environments*, **6**, 1.

Community Fish Refuges (CFR) are a conservation measure which aim to provide dry season refuges for fish and improve the productivity of rice field fisheries. The authors interviewed 120 to examine the socio-economic impacts of CFRs in the Srey Snam district of Siem Reap Province. Households involved in CFRs were found to benefit significantly in terms of savings and incomes from fish production, although illegal fishing and financial constraints to implementing CFRs also presented issues. The authors conclude by outlining measures that could help to strengthen and sustain CFRs in Cambodia. Author: suvedi@msu.edu

Oeurng C., Cochrane, T.A., Chung S., Kondolf, M.G., Piman, T. & Arias, M.E. (2019) Assessing climate change impacts on river flows in the Tonle Sap Lake Basin, Cambodia. *Water*, **11**, 618.

The Tonle Sap is the most fertile and diverse freshwater ecosystem in Southeast Asia, receiving nurturing water flows from the Mekong and its immediate basin. In addition to rapid development in the Tonle Sap basin, climate change may threaten natural flow patterns that sustain its diversity. The authors evaluated impacts of climate change on river flows in 11 sub-basins contributing to the lake to quantify the potential magnitude of future hydrological alteration. Their models indicate that future decrease in wet and dry season flows is likely. Mean annual projected flow reductions ranged from 9 to 29%, 10 to 35% and 7 to 41% for projections until the 2030s, 2060s and 2090s, respectively. A decrease in extreme river flows was also found, implying that there could be a decline in flood magnitudes and an increase in drought occurrences throughout the basin. Author: tom.cochrane@canterbury.ac.nz

Tha T., Chung S. & Oeurng C. (2019) Integrated modelling to assess flow changes due to future dam development and operation in Stung Sen River of Tonle Sap Lake Basin, Cambodia. *Journal of Water & Climate Change*. DOI 10.2166/wcc.2019.115

Plans to build additional hydropower dams in Cambodia have raised concerns that these will change seasonal flow regimes and negatively affect fisheries and biodiversity downstream. This paper models how a multi-purpose dam on the Stung Sen River would affect downstream water flows under three operational scenarios. Daily and seasonal flows changed significantly in their full-level and seasonal variation scenarios, with an average increase of 42% in dry season flow and an average decrease of 46% in wet season flow at the outlet of the Stung Sen basin. The authors conclude that dam construction on the Stung Sen River would significantly change its natural flow regime. Author: chantha@itc.edu.kh

Forests & forest resources

Debonnea, N., van Vlieta, J. & Verburg, P. (2019) Future governance options for large-scale land acquisition in Cambodia: impacts on tree cover and tiger landscapes. *Environmental Science and Policy*, **94**, 9–19.

This study investigated how large-scale land acquisitions (LSLAs) can be governed to avoid underuse and spare room for other land uses, specifically nature conservation. The authors mapped converted and unconverted areas within LSLAs in Cambodia using remote sensing and examined the effects of three policy scenarios for managing LSLA underuse on overall land use until 2040. They found that interventionist policies performed best in limiting tree cover loss and preserving natural areas, whereas preventative measures led to less fragmentation. Their results suggest that only preventative policies can

reconcile LSLAs with tiger reintroduction in the Eastern Plains and that tigers are unlikely to survive there in the absence of these and well-enforced protected areas. Author: n.debonne@vu.nl

Kong R., Diepart, J.-C., Castella, J.-C., Lestrelin, G., Tivet, F., Belmain, E. & Bégue, A. (2019) Understanding the drivers of deforestation and agricultural transformations in the North-western uplands of Cambodia. *Applied Geography*, **102**, 84–98.

The authors analysed land use cover changes in four upland districts in northwestern Cambodia using Landsat data from 1976 to 2016 and identify drivers of deforestation using demographic data and qualitative information from local actors and other stakeholders. They found that forest cover declined by 65% over a period of 15 years due to conversion by smallholders into agricultural land for maize and cassava cultivation. They further investigate the mechanisms underlying this land use change to understand the diversity of individual farm trajectories and decision-making processes in relation to land conversion. Author: radakong@yahoo.com

Lonn P., Mizoue N., Ota T., Kajisa T. & Yoshida, S. (2019) Using forest cover maps and local people's perceptions to evaluate the effectiveness of community-based ecotourism for forest

conservation in Chambok (Cambodia). *Environmental Conservation*, **46**, 111–117.

Increased attention has been given to evaluating the effectiveness of forest conservation projects, but it is not well known whether different methods provide similar results when evaluating changes in forest resources. The authors compared the use of forest cover maps and local perceptions for evaluating the effectiveness of an ecotourism initiative at Chambok. Forest cover maps suggested that the programme was effective at reducing deforestation, whereas local perceptions concurred, in that 64% of people perceived that forest resources increased and 75% felt the community could protect its own forest resources. The authors conclude that the initiative at Chambok has supported forest conservation and suggest that mixed-method approaches are essential for evaluating the effectiveness of conservation programmes. Author: mizoue@agr.kyushu-u.ac.jp

The Recent Literature section was compiled by Neil Furey, with contributions from Oleg Kosterin, Jaap Vermeulen, Leonid Averyanov and Jenny Daltry.