

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

Bresseel, J. & Vermeersch, X.H.C. (2017) The first record of the genus *Olcinia* Stål, 1877 from Cambodia and Vietnam with the description of two new species (Orthoptera: Tettigoniidae: Pseudophyllinae: Cymatomerini). *Belgian Journal of Entomology*, **56**, 1–16.

Describes two species of katydids new to science, including one from Kirirom National National in Cambodia: *Olcinia constanti* sp. nov. A generic key is presented for all Asian genera of Cymatomerini as well as a specific key for the genus *Olcinia*. Author: joachim-bresseel@gmail.com

Heppner, J.B. & Bae Y.-S. (2017) A new *Prophaecasia* species from Cambodia and the female characters of the genus (Lepidoptera: Tortricidae: Olethreutinae: Olethreutini). *Zootaxa*. DOI 10.11646/zootaxa.4291.3.12

Paper not seen.

Kosterin, O.E. (2016) *Coelicia poungyi dasha* subsp. nov. (Odonata, Platycnemididae, Calicnemiinae) from eastern Cambodia. *Journal of the International Dragonfly Fund*, **97**, 1–16.

A new subspecies of damselfly to science is described from the Annamese Mountains in Mondulkiri Province. The new subspecies differs from the nominotypical one in colouration of the mesepisternum in males and end of the abdomen in both sexes, as well as in the length of the terminal lobe of the genital ligula. Author: kosterin@bionet.nsc.ru

Kosterin, O.E. & Kompier T. (2017) *Coelicia rolandorum* sp. nov. from eastern Cambodia and southern Vietnam, the eastern relative of *C. kazukoae* Asahina, 1984 (Odonata: Platycnemididae). *Zootaxa*, **4341**, 509–527.

The authors describe a species of damselfly new to science from Mondulkiri Province. The new species is related to *C. kazukoae*, which is known from the Cardamom and Sankampaeng Mountains, and replaces it in eastern Indochina. Author: kosterin@bionet.nsc.ru

Lacroix, A., Duong V., Hul V., San S., Davun H., Keo O., Chea S., Hassanin, A., Theppangna, W., Silithammavong, S., Khammavong, K., Singhalath, S., Afelt, A., Greatorex, Z., Fine, A.E., Goldstein, T., Olson, S., Joly, D.O., Keatts, L., Dussart, P., Frutos, R. & Buchy, P. 2017. Diversity of bat astroviruses in Lao PDR and Cambodia. *Infection, Genetics and Evolution*, **47**, 41–50.

Astroviruses infect humans and a wide range of animal species, and can cause gastroenteritis in their hosts. This study tested 1,876 bats for astroviruses at 45 sites from 14 and 13 provinces in Cambodia and Laos respectively. Results reveal a high diversity of astroviruses among Yangochiropteran and Yinpterochiropteran bats. These formed distinct phylogenetic clusters within the genus *Mamastrovirus*, which is most closely related to other known bat astroviruses, and include a new species of astrovirus to science in fruit bats. Author: buchypphilippe@hotmail.com

Merklinger, F.F., Chhang P. & Wong K.M. (2017) *Schizostachyum cambodianum*, a new species of bamboo (Poaceae: Bambusoideae) from Cambodia. *Zootaxa*. DOI 10.11646/phyto-taxa.298.1.9

Describes a species of woody bamboo new to science from the Cardamom Mountains. The new species is distinguished by a very large suborbicular projection at the base of the culm sheath and by forming lax clumps due to its long-necked rhizomes and largely glabrous culm sheaths with only scattered pale hairs.

Naiki A., Tagane S., Chhang P., Dang V.S., Toyama H., Nagamasu H. & Yahara T. (2017) Two new taxa and one new record of *Tarenna* (Rubiaceae) for the flora of Cambodia and Vietnam. *Acta Phytotaxonomica et Geobotanica*, **68**, 93–100.

Describes a new plant variety (*Tarenna pilosa* var. *parvifolia*) to science from Bokor National Park and reports the first record of *T. costata* for Cambodia. A key to species of *Tarenna* in Cambodia, Laos and Vietnam is also provided. Author: naiki@lab.u-ryukyuu.ac.jp

Oguri E., Tagane S., Chhang P., Toyama H., Murakami N. & Yahara T. (2017) Flora of Bokor National Park VI: a new species of *Wikstroemia* (Thymelaeaceae), *W. bokorensis*. *Phytotaxa*, **317**, 280–285.

The authors describe a species of *Wikstroemia* new to science from Bokor National Park. The species is morphologically most similar to *W. nutans* in southern China and Vietnam, but differs in having pubescent branches and leaves, smaller anthers, a single disk scale and glabrous ovary.

Park K.T. & Bae Y.S. (2017) Additional three new species of *Anarsia* Meyrick (Lepidoptera, Gelechiidae) from Cambodia and Vietnam. *Zootaxa*. DOI 10.11646/zootaxa.4254.2.8

Three new species to science are described within the butterfly genus *Anarsia*, including two from Cambodia: *A. pursatica* sp. nov. and *A. degeneralis* sp. nov. Images of adults and genitalia for the new species and a check list of species known from Cambodia and Vietnam are provided.

Pham T.T., Tagane S., Chhang P., Yahara T., Souladeth P. & Nguyen T.T. (2017) *Lagerstroemia ruffordii* (Lythraceae), a new species from Cambodia and Vietnam. *Acta Phytotaxonomica et Geobotanica*, **68**, 175–180.

Describes a tree species new to science within the *Lagerstroemia* genus from Vietnam and Cambodia. The new species is morphologically similar to *L. petiolaris*, but is distinguished mainly by its narrower leaves, larger flowers and distinctly 6-ridged calyx tube. Author: phamtrang.botanydep@gmail.com

Polhemus, D.A. (2017) An initial survey of aquatic and semi-aquatic Heteroptera (Insecta) from the Cardamom Mountains and adjacent uplands of southwestern Cambodia, with descriptions of four new species. *Tijdschrift voor Entomologie*, **160**, 89–138.

Aquatic Heteroptera were largely undocumented in Cambodia until recently. A literature review and recent surveys in the Cardamom Mountains and Kirirom and Bokor plateaus of southwestern Cambodia demonstrate that at least 68 species of water bugs occur in these areas. Four species new to science are described based on the recent surveys: *Amemboa cambodiana* sp. nov., *Microvelia penglyi* sp. nov., *M. setifera* sp. nov. and *M. bokor* sp. nov. Author: bugman@bishoppmuseum.org

Tagane S., Toyama H., Fuse K., Chhang P., Naiki A., Nagamasu H. & Yahara T. (2017) *A Picture Guide of Forest Trees in Cambodia IV, Bokor National Park*. Center for Asian Conservation Ecology, Kyushu University, Fukuoka, Japan.

Based on specimens collected between 2011 and 2013, the authors provide illustrated accounts for 747 plant species

at Bokor National Park, including 24 species new to science and mostly endemic to the national park. Author: stagane29@gmail.com

Zhao S., Park K.-T., Bae Y.-S. & Li H. (2017) *Dichomeris* Hübner, 1818 (Lepidoptera, Gelechiidae, Dichomeridinae) from Cambodia, including associated Chinese species. *Zootaxa*. DOI 10.11646/zootaxa.4273.2.4

Including related Chinese species, the authors recognise 13 micromoth species within the genus *Dichomeris* in Cambodia, eight of which are described as new to science: *D. arcuata* sp. nov., *D. splendiptera* sp. nov., *D. samkosensis* sp. nov., *D. foliforma* sp. nov., *D. magnimaculalis* sp. nov., *D. hainanensis* sp. nov., *D. cambodiensis* sp. nov. and *D. acutivalvata* sp. nov.

Biodiversity inventories

Averyanov, L.V., Pham V.T., Maisak, T.V., Le T.A., Nguyen V.C., Nguyen H.T., Nguyen P.T., Nguyen K.S., Nguyen V.K., Nguyen T.H. & Rodda, M. (2017) Preliminary checklist of *Hoya* (Asclepiadaceae) in the flora of Cambodia, Laos and Vietnam. *Turczaninowia*, **20**, 103–147.

Provides data on 33 species of *Hoya* obtained in fieldwork mainly during 2012–2017 in Cambodia, Laos and Vietnam, including first records of two species for Cambodia. Knowledge of the flora of Cambodia is increased to include at least eight species of *Hoya*, whereas the flora of eastern Indochina includes at least 45 species. Author: av_leonid@mail.ru

Averyanov, L.V., Ponert, J., Nguyen P.T., Nong V.D., Nguyen S.K. & Van C.N. (2017) A survey of *Dendrobium* Sw. sect. *Formosae* (Benth. & Hook.f.) Hook.f. in Cambodia, Laos and Vietnam. *Adansonia*, **38**, 199–217.

The authors provide an identification key for 19 species of *Dendrobium* orchids in Indochina, together with updated information on species nomenclature, morphology, phenology, ecology, distribution and tentative conservation status. Author: av_leonid@mail.ru

Kosterin, O.E. (2017) A short survey of Odonata in Stung Treng Province in northern Cambodia in midsummer 2016. *Journal of the International Dragonfly Fund*, **105**, 1–40.

Presents the results of surveys in Stung Treng Province in July–August 2016. Fifty-five species were recorded, including first records of two species in Cambodia: *Gynacantha saltatrix* and *Macrogomphus matsukii*. Author: kosterin@bionet.nsc.ru

Kosterin, O.E. & Chartier, G. (2017) Update of 2014 and 2016 to Odonata found at the marshy coast of SW Cambodia including three species added for the country. *Journal of the International Dragonfly Fund*, **101**, 1–26.

Reviews the Odonata of selected areas in Koh Kong Province. Fifty-five species are considered, including first records of three species for Cambodia: *Gynacantha bayadera*, *Lyriothemis mortoni* and *Pornothemis serrata*. Author: kosterin@bionet.nsc.ru

Lacroix, A., Duong V., Hul V., San S., Davun H., Keo O., Chea S., Hassanin, A., Theppangna, W., Silithammavong, S., Khammavong, K., Singhalath, S., Greatorex, Z., Fine, A.E., Goldstein, T., Olson, S., Joly, D.O., Keatts, L., Dussart, P., Afelt, A., Frutos, R. & Buchy, P. 2017. Genetic diversity of coronaviruses in bats in Lao PDR and Cambodia. *Infection, Genetics and Evolution*, **48**, 10–18.

It has been speculated that bats are hosts for zoonotic viruses such as Severe Acute Respiratory Syndrome (SARS) and are consequently responsible for outbreaks of the virus. Between 2010 and 2013, the authors sampled 1,965 bats for coronaviruses (CoV) at human-wildlife interfaces in Laos and Cambodia. A total of 93 samples (4.7%) from 17 genera of bats tested positive. Sequence analysis revealed the presence of potentially 37 and 56 coronavirus belonging to alpha-coronavirus and beta-CoV, respectively. The latter group is known to include coronaviruses pathogenic to humans, such as SARS-CoV and MERS-CoV. Author: buchphilippe@hotmail.com

McCann, G. (2017) Asian golden cat *Catopuma temminckii* at Virachey National Park, Ratanakiri Province, Cambodia. *Southeast Asia Vertebrate Records*, **2017**, 31–33.

Provides camera trap records for Asian golden cat between June 2014 and January 2017 in Virachey National Park, northeastern Cambodia. Author: greg.mccann1@gmail.com

McCann, G. & Pawlowski, K. (2017) Small carnivores' records from Virachey National Park, north-east Cambodia. *Small Carnivore Conservation*, **55**, 26–41.

Presents the results of a two-year camera trapping project in Virachey National Park, northeastern Cambodia. Ten species of small carnivore were recorded, including spotted linsang *Prionodon pardicolor*, binturong *Arctictis binturong* and hog badger *Arctonyx collaris*. The authors conclude that Virachey National Park appears to have many small carnivores, despite years of conservation neglect. Author: greg.mccann1@gmail.com

Rodpai, R., Intapan, P.M., Thanchomnang, T., Sanpool, O., Sadaow, L., Laymanivong, S., Aung, W.P., Phosuk, I., Laummaunwai, P. & Maleewong, W. (2016) *Angiostrongylus cantonensis* and *A. malaysiensis* broadly overlap in Thailand, Lao PDR, Cambodia and Myanmar: a molecular survey of larvae in land snails. *PLoS ONE*, **11**, e0161128.

Angiostrongylus cantonensis is a zoonotic nematode parasite which causes human eosinophilic meningitis (or meningoencephalitis) worldwide. A closely related species, *A. malaysiensis*, may also be a human pathogen. Using larvae obtained from land snails, this study provides the first molecular identification of the two species from Laos, Cambodia, and Myanmar, and maps overlap in their regional distributions. Author: wanch_ma@kku.ac.th

Ustjuzhanin, P.Y. & Kovtunovich, V.N. (2017) First data on Pterophoridae of Cambodia (Lepidoptera: Pterophoridae). *SHILAP Revista de Lepidopterologia*, **45**, 507–511.

Paper not seen.

Species ecology & status

Gray, T.N.E., Crouthers, R., Ramesh, K., Vattakaven, J., Borah J., Pasha, M.K.S., Lim T., Phan C., Singh, R., Long, B., Chapman, S., Keo O. & Baltzer, M. (2017) A framework for assessing readiness for tiger *Panthera tigris* reintroduction: a case study from eastern Cambodia. *Biodiversity and Conservation*, **26**, 2383–2399.

Reintroduction is a viable conservation strategy for large carnivores but requires robust feasibility assessments to ensure that ecological, management and social factors are considered before implementation. The authors provide a framework for undertaking feasibility assessments for tiger and other large carnivore reintroductions and apply this to existing plans to reintroduce tigers into Srepok Wildlife Sanctuary in Cambodia. They suggest that current conditions within the sanctuary are not suitable for tiger reintroduction because although densities of ungulate prey may be sufficient, levels of protected area management and law enforcement fall below global standards for tiger recovery. Author: tomngray@hotmail.com

Hoem T., Cappelle, J., Bumrungsri, S., Lim T. & Furey, N.M. (2017) The diet of the cave nectar bat (*Eonycteris spelaea* Dobson) suggests it pollinates economically and ecologically significant plants in southern Cambodia. *Zoological Studies*, **56**, 17.

The importance of the cave nectar bat as a pollinator of economically and ecologically significant plant species is increasingly recognised, although information on plants visited by the species was hitherto confined to Thailand and Peninsular Malaysia. The authors show that the diet of the bat in Cambodia includes at least 13 plant taxa. Only three significant colonies (>1,000 bats) of cave-roosting pteropodids are currently known in Cambodia, all of which are in Kampot. Public education and law

enforcement efforts are recommended to conserve these colonies because Kampot is the premier region for Cambodian durian and this crop depends on nectarivorous bats for fruit set. Author: neil.m.furey@gmail.com

Mahood, S.P., Silva, J.P., Dolman, P.M. & Burnside, R.J. (2016) Proposed power transmission lines in Cambodia constitute a significant new threat to the largest population of the Critically Endangered Bengal florican *Houbaropsis bengalensis*. *Oryx*. DOI 10.1017/S0030605316000739

The last population of Bengal florican in Indochina breeds in the floodplain of Cambodia's Tonle Sap Lake and could be affected by plans to construct high-tension power transmission lines in this area. Using data from 17 birds monitored by satellite transmitters over four years, the authors estimated the annual survival rate of adult birds to be 89.9%. Migration routes between breeding and non-breeding areas of all birds for whom data were sufficient crossed the proposed route for the transmission line. The route of the line also impinged on the margins of two breeding concentrations. The authors conclude that the proposed transmission lines present an additional threat to the species in Indochina. Author: smahood@wcs.org

Moritsuka E., Chhang P., Tagane T., Toyama H., Sokh H., Yahara T. & Tachida H. (2017) Genetic variation and population structure of a threatened timber tree *Dalbergia cochinchinensis* in Cambodia. *Tree Genetics & Genomics*, **13**, 115.

Despite legal protection, the conservation status of the commercially important tree *Dalbergia cochinchinensis* is of concern in Southeast Asia due to population declines. This study examines genetic variation and structure in four populations of the species in Cambodia. Author: htachscb@kyushu-u.org

Vamberger, M., Durkin, L., Kim C., Handschuh, M., Seng R. & Frit, U. (2017) The leaf turtle population of Phnom Kulen National Park (northwestern Cambodia) has genetic and morphological signatures of hybridization. *Journal of Zoological Systematics and Evolutionary Research*, **55**, 167–174.

Cambodia harbours three distinct species of Southeast Asian leaf turtles (*Cyclemys* spp.) which are heavily traded and common in wildlife seizures. Because confiscated leaf turtles are often released to natural habitats, knowledge of the distribution of each species is important to avoid introduction of non-native turtles and competition and hybridization risks. The authors conducted morphological and genetic analyses of leaf turtle populations at Phnom Kulen National Park and suggest these represent either a natural hybrid swarm of *C. atripons* and *C. oldhamii* or a distinct undescribed species with

introgressed mitochondria of *C. atripons*. Author: melita.vamberger@senckenberg.de

Coasts, wetlands and aquatic resources

Chheng P., Un S., Tress, J., Simpson, V. & Sieu C. (2016) *Fish Productivity by Aquatic Habitat and Estimated Fish Production in Cambodia*. Inland Fisheries Research and Development Institute and WorldFish, Phnom Penh, Cambodia.

Presents a review of existing information on the fish productivity of major aquatic habitats in Cambodia. The authors report average yearly values for fish production in rain-fed rice fields, flooded rice fields, reservoirs, flooded forest, shrub land, open water and flooded grassland and swamp. When related to the surface area of each habitat in Cambodia, rice fields are found to potentially contribute >60% of total fish production. The sum of production figures per habitat equals a total fish production of 560,000 tonnes per year. <https://www.worldfishcenter.org/content/fish-productivity-aquatic-habitat-and-estimated-fish-production-cambodia>

Gray, T.N.E., Phommachak, A., Vannachomchan, K. & Guegan, F. (2017) Using local ecological knowledge to monitor threatened Mekong megafauna in Lao PDR. *Plos One*, **12**, e0183247.

Pressures on freshwater biodiversity in Southeast Asia are accelerating, yet the status and conservation needs of many of the region's threatened fish species are unclear. This study interviewed fishermen from six villages on the Mekong River in the Siphandone area of Laos to generate monitoring baselines for eight species. Larger species and those with higher Red List threat status were caught less recently than smaller species of less conservation concern. The authors suggest that their approach may be effective for monitoring freshwater fish of conservation concern and highlight the importance of understanding the cultural background and context of sites where data are collected. Author: gray@wildlifealliance.org

Kang Y. (2016) Arsenic-polluted groundwater in Cambodia: advances in research. *International Journal of Water and Wastewater Treatment*. DOI 10.16966/2381-5299.116

Although arsenic pollution of groundwater in Cambodia has been investigated since the mid-2000s, the impacts on soil and rice as well as human health have not been sufficiently clarified. This article reviews transitions in drinking water supply, arsenic pollution of groundwater and health risks to residents, the impact of arsenic on paddy soil and rice, and technologies for removal of arsenic from tube well water in Cambodia. It suggests

that arsenic-affected areas deserve more attention and that regulations are needed to insure that arsenic-contaminated rice does not appear in markets. Author: kang@kochi-u.ac.jp

Krishna-Bahadur, K.C., Bond, N., Fraser, E.D.G., Elliott, V., Farrell, T., McCann, K., Rooney, N. & Bieg, C. (2017) Exploring tropical fisheries through fishers' perceptions: fishing down the food web in the Tonlé Sap, Cambodia. *Fisheries Management and Ecology*, **24**, 452–459.

Despite their importance as a source of protein for human populations, management of tropical fisheries such the Tonle Sap Lake are hampered by lack of data. This study explored the implications of increased fishing pressure by evaluating the perceptions of fishers who rely on the ecosystems of the lake for their survival. Although the total size of the fish catch has remained consistent in recent years, the size of individual fish and diversity of species caught has declined. These perceptions are examined in relation to food web theories that explore how fishing pressure can lead to ecosystem change. Author: krishnak@uoguelph.ca

Nop S., DasGupta, R. & Shaw, R. (2017) Opportunities and challenges for participatory management of mangrove resource (PMMR) in Cambodia. In *Participatory Mangrove Management in a Changing Climate. Disaster Risk Reduction (Methods, Approaches and Practices)* (eds R. DasGupta & R. Shaw), pp. 187–202. Springer, Tokyo.

Mangroves play a crucial role in protecting coastal areas and maintaining marine ecosystems but have declined in recent decades. The authors analysed opportunities and challenges for participatory management of mangrove resources in Cambodia. They identify major barriers to this and conclude that effective management of mangroves will require development of specific legislation for their protection, improved coordination and collaboration between relevant actors, community empowerment and further awareness raising on the importance of mangrove forests. Author: sothun.nop@gmail.com

Pool, T., Holtgrieve, G., Elliott, V., McCann, K., McMeans, B., Rooney, N., Smits, A., Phanara T., Cooperman, M., Clark, S. Phen C. & Chhuoy S. (2017) Seasonal increases in fish trophic niche plasticity within a flood-pulse river ecosystem (Tonle Sap Lake, Cambodia). *Ecosphere*, **8**, e01881.

Fish assemblages were studied for five years (2010–2014) in the Tonle Sap Lake using stable isotope and Bayesian statistical approaches to explore isotopic niche variation associated with seasonal flooding within and among species. Fish of the same species tended to have a broader isotopic niche during the wet season, while isotopic

niches among species tended to overlap and range more broadly during the same season. The authors conclude that the flood-pulse dynamic typical of tropical aquatic ecosystems may be essential to support the community structure and diversity of freshwater fish that underpin the food web of the Tonle Sap Lake. Author: tpool@uw.edu

Savage, J.M. (2017) *The design and implementation of marine management strategies in Cambodia*. PhD thesis, University of Southampton, UK.

This study identified changes in the health of coral reefs in the Koh Sdach Archipelago of Cambodia between 2002 and 2013. The author examined the socio-economic impacts of management programmes protecting the Cambodian coastal zone and explored community perceptions in relation to governance, change and threats. The findings of the study highlight governance issues at multiple institutional levels and stress the need for greater government support and communication within and between management organisations. They also suggest that involving volunteers and community members in field surveys would help address the current paucity of data for coral reef systems in Cambodia. <https://eprints.soton.ac.uk/413765/>

Tran T. (2016) Transboundary Mekong River Delta (Cambodia and Vietnam). In *The Wetland Book II: Distribution, Description, and Conservation* (eds C.M. Finlayson, G.R. Milton, R. Crawford Prentice & N.C. Davidson), pp. 1–12. Springer, The Netherlands.

Covering 5.5 million ha, the Mekong River Delta is one of the largest river deltas in the world. Wetlands within the delta support rich biodiversity and enormous ecosystem services and products. Rapid economic development in recent decades have resulted in extensive loss of wetlands within the region and as of 2016, only 14 protected wetlands existed, representing ca. 1.5% of the delta land area. Climate change and upstream hydro-power development pose the most important threats to wetlands of the delta, although their cumulative impacts are still poorly understood. Author: ttriet@gmail.com

Forests and forest resources

Beauchamp, E. (2016) *Seeing the people for the trees: impacts of conservation on human well-being in northern Cambodia*. PhD thesis, Imperial College London, UK.

Conservation initiatives increasingly include poverty alleviation goals or aim to improve human well-being alongside their conservation objectives. This study used three approaches to investigate the effects of conservation interventions on human well-being at different

geographical scales in northern Cambodia. Its findings highlight the complexity of attributing conservation impacts and capturing the direct and indirect consequences of conservation and development policies, and suggest more nuanced evaluations of their impacts on humans could guide future interventions. <https://spiral.imperial.ac.uk/handle/10044/1/54853>

Chervier, C. & Costedoat, S. (2017) Heterogeneous impact of a collective payment for environmental services scheme on reducing deforestation in Cambodia. *World Development*, **98**, 148–159.

Although Payments for Environmental Services (PES) schemes are increasingly used as incentives to improve forest conservation outcomes in tropical countries, little is known about the performance and conditions under which they can be effective. The authors assessed the impact of a PES scheme on reducing deforestation in the Cardamom Mountains and found that it contributed to saving about 0.17% of the enrolled PES area on average per year during 2005–12. The study highlights that factors such as slope, proximity to roads, and number of households involved are associated with heterogeneous PES impacts. Author: colas.chervier@irstea.fr

Chervier, C., Le Velly, G., Ezzine-de-Blas, D. (2017) When the implementation of payments for biodiversity conservation leads to motivation crowding-out: a case study from the Cardamoms forests, Cambodia. *Ecological Economics*. DOI 10.1016/j.ecolecon.2017.03.018

Payments for Environmental Services (PES) schemes in forest-dependent economies can involve significant restrictions on forest resource use. These imply changes in the way people relate to forests, including perceptions of why the forest is valuable. This study evaluated the impact of a PES scheme designed to conserve biodiversity on perceptions of forest values and assessed correlations between perceived values and conservation behaviours. Results suggest that the scheme had a significant impact on perceived forest values, which changed from subsistence-related to money-related values. The authors suggest that these changes will have consequences for the long-term effectiveness of the scheme, because significantly more individuals emphasizing money-related values reported they would break conservation rules after payments ended. Author: colas.chervier@irstea.fr

Dymrose, A.M.H., Turreira-García, N., Theilade, I. & Meilby, H. (2017) Economic importance of oleoresin (*Dipterocarpus alatus*) to forest-adjacent households in Cambodia. *Natural History Bulletin of the Siam Society*, **62**, 67–84.

The genus *Dipterocarpus* provides marketable liquid oleoresin which is an important source of income for

forest communities in Southeast Asia. This study quantified yields from one of the most intensively tapped resin species (*D. alatus*) and estimated household incomes from resin extraction in the Prey Lang forest complex. Forest-adjacent households were highly dependent on resin extraction for cash income and gross incomes from liquid resin averaged \$US 3,236 per household/year. Resin yields were positively correlated with the size and health of trees and proximity to watercourses. Yields were also influenced by season and condition of the tapping-hole. Author: am.dymrose@gmail.com

Harrison, R.D., Sreekar, R., Brodie, J.F., Brook, S., Luskin, M., O'Kelly, H., Rao, M., Scheffers, B. & Velho, N. (2016) Impacts of hunting on tropical forests in Southeast Asia. *Conservation Biology*. DOI 10.1111/cobi.12785

Though deforestation and forest degradation are often considered the most significant threats to biodiversity across Southeast Asia, substantial areas of natural habitat have few wild animals, except for a few hunting-tolerant species. This study reviews hunting impacts on forest vertebrate populations in the region and concludes that hunting is by far the greatest immediate threat to the survival of most of the region's endangered vertebrates. Unless a step change occurs in efforts to reduce wildlife exploitation to sustainable levels, the region will likely lose most of its iconic species and many others within the next few years. Author: r.harrison@cgiar.org

Hoeurn C. & Sopheak K. (2017) *Natural resource dependency and indigenous people's behavior toward biodiversity in Virachey National Park, Cambodia*. Economy and Environment Program for Southeast Asia, WorldFish, Los Baños, Philippines.

Virachey National Park is home to the Brou, Kavet and other indigenous communities. The authors conducted an economic valuation of the direct use values of selected natural resources within the national park and examined factors affecting indigenous peoples' behaviour toward biodiversity, particularly wildlife. Ninety-two percent of households surveyed were found to benefit directly from natural resources through fishing, wildlife hunting, being ecotourism guides and NTFP collection. Approximately 48% of households surveyed hunted wildlife. Larger household sizes were positively associated with the likelihood of hunting, but those that had a family member working for an NGO or the government were less likely to do so. Author: chebhoeurn@gmail.com

Kenzo T., Sano M., Yoneda R. & Chann S. (2017) Comparison of wood density and water content between dry evergreen and dry deciduous forest trees in central Cambodia. *Japan Agricultural Research Quarterly*, **51**, 363–374.

The authors compared the density and water content of wood samples from dry evergreen forest and dry deciduous forest in Cambodia. Overall, there were little differences in density and water content between the forest types, although their species composition and ecological traits differed significantly. Author: mona@affrc.go.jp

Kibria, A.S.M.G., Behie, A., Costanza, R. Groves, S. & Farrell, T. (2017) The value of ecosystem services obtained from the protected forest of Cambodia: the case of Veun Sai-Siem Pang National Park. *Ecosystem Services*, **26**, 27–36.

This paper provides a first valuation of Veun Sai-Siem Pang National Park in Cambodia, a forest area largely unfamiliar to the international community yet very significant in biodiversity values. The contribution of the park was estimated at US\$ 129.84 million annually, including air purification, water storage, soil-erosion reduction, soil-fertility improvement, carbon sequestration, provisioning services and recreation values. Additional values were also identified, including cultural significance, knowledge generation and network development services. Despite these, the park faces threats such as illegal logging, wildlife poaching, population pressure and corruption. Author: kibria.asmg@gmail.com

Kiyono Y., Ito E., Monda Y., Toriyama J., Saito H., Furuya N., Sum T., Tiith B., Keth N., Keth S., Chandararity L., Phallapharaoth O., Chann S. & Sokh H. (2017) A feasibility study for determining the mean annual aboveground biomass gain of tropical seasonal forests in Cambodia. *TROPICS*. DOI 10.3759/tropics.MS15-27

To assess the feasibility of determining the mean annual above-ground biomass gain of tropical seasonal forests in Cambodia, the authors estimated the gain (i.e., increase due to growth of living trees) and loss (i.e., decrease due to tree death) of above-ground tree stand biomass using 49 permanent sample plots nationwide from 2005 to 2015. Author: kiono@ffpri.affrc.go.jp

Environmental policy & practice

Claassen, A.H., Sok K., Arnold, T.W. & Cuthbert, F.J. (2017) Effectiveness of direct payments to increase reproductive success of sandbar-nesting river birds in Cambodia. *Bird Conservation International*. DOI 10.1017/S0959270916000368

Direct payments to communities or individuals are increasingly used as a tool for species conservation, although few studies have evaluated their effectiveness. The authors tested if direct payments for nest protection improved the reproductive success of six sandbar-nesting bird species on the Mekong River from 2010 to

2014. Nests were guarded by community members and exclosures were also used to protect nests of river tern *Sterna aurantia*. Overall, nest protection involving direct payments was highly effective, but required diligent use of nest exclosures, frequent monitoring and strong community relationships. Author: claas004@umn.edu

Gray, T.N.E., Marx, N., Khem V., Lague, D., Nijman, V. & Gauntlett, S. (2017) Holistic management of live animals confiscated from illegal wildlife trade. *Journal of Applied Ecology*. DOI 10.1111/1365-2664.12916

Failure to adopt holistic and multifaceted approaches for dealing with live animals confiscated from the illegal wildlife trade could create conservation, ethical, animal rights and resource issues. The authors suggest solutions to this issue and identify outstanding research needs based on 15 years of experience of wildlife rapid rescue teams in Cambodia. Author: gray@wildlifealliance.org

Gray, T., Milliken, T., Khem V. & Gauntlett, S. (2017) Cambodia's increasing role in the African ivory and rhinoceros horn trade. *TRAFFIC Bulletin*, **29**, 45–46.

Details seizures of African ivory and rhinoceros horn en route to, within and coming from Cambodia in 2011–2017. The authors suggest that Cambodia may be emerging as a transit hub for the illegal transcontinental trafficking of high-value wildlife products and that a robust response by law enforcement agencies and global conservation community is required. Author: gray@wildlifealliance.org

Mak S. (2017) Water governance in Cambodia: from centralized water governance to farmer water user community. *Resources*, **6**, 44.

Cambodia has abundant water resources in the wet season and a scarcity of water in the dry season. Because these phenomena undermine development in the country, effective water governance is critical. This study explored practices, challenges and opportunities for water governance in Cambodia using a large-scale water management system and community-based water management systems in three provinces. It concludes that water governance in Cambodia is too weak and fragmented to address water security issues affecting the country and that reorganisation of the framework for water governance is required to address long term issues. Author: maksithirith@cdri.org.kh

Nathan, I. & Pasgaard, M. (2017) Is REDD+ effective, efficient, and equitable? Learning from a REDD+ project in northern Cambodia. *Geoforum*, **83**, 26–38.

Drawing on results from a REDD+ project in Cambodia, this paper contributes to the debate about whether

REDD+ projects can accommodate economic (efficiency), environmental (effectiveness) and social (equity) concerns. The authors illustrate some mechanisms that are likely to constrain the ability of REDD+ projects to ensure net-gains for local communities, and the risk that effectiveness and equity could suffer if these projects rely solely on the private market. They conclude that a tension exists between the objectives of creating financial value from carbon stored in trees through the private market, and environmental and social equity concerns. Author: in@ifro.ku.dk

Nguyen T. & Frechette, J. (2017) The market for elephant ivory in Cambodia. *TRAFFIC Bulletin*, 29, 65–72.

Presents the results of market surveys in 2015–2016 which aimed to determine levels of ivory trade and consumer demand in three major cities: Phnom Penh, Siem Reap, and Sihanoukville. These revealed that the domestic market for ivory may be growing and that many retailers of ivory products target Chinese tourists. Author: trang.nguyen@wildact-vn.org

Nhem S., Lee Y.J. & Phin S. (2017) Sustainable management of forest in view of media attention to REDD + policy, opportunity and impact in Cambodia. *Forest Policy and Economics*, 85, 10–21.

The media plays a vital role in raising public awareness and concerns. The authors analysed media attention to the policy, opportunity and impact of REDD+ in enhancing sustainable forest management and mitigating climate change. They found that major factors limiting media discourses on REDD+ were that institutions did not share information on related events with the media and that journalists lacked knowledge of REDD+ and found the technical issues difficult. Author: leeyj@kongju.ac.kr

Peou H., Natarajan, I., Tianhua, H. & Philippe, D. (2016) From conservation to sustainable development—a case study of Angkor World Heritage Site, Cambodia. *Journal of Environmental Science and Engineering A*, 5, 141–155.

The World Heritage Committee of UNESCO has called for strategic commitment from state parties to strengthen links between heritage conservation and sustainable development. This will require integration of world heritage site conservation with sustainable use and management of natural resources beyond their boundaries. This article argues that the Angkor World Heritage Site has the potential to demonstrate an ecosystem approach to sustainable development which is advocated under the UN Convention on Biological Diversity.

Pienkowski, T., Dickens, B.L., Sun H. & Carrasco, L.R. (2017) Empirical evidence of the public health benefits of tropical

forest conservation in Cambodia: a generalised linear mixed-effects model analysis. *Lancet Planet Health*, 1, e180–87.

Empirical evidence of the effect of ecosystem degradation and protection on public health outcomes is scarce, restricting the ability of policy makers to assess the health effects of land-use changes. The authors analysed demographic data for 1,766 communities across forest gradients in Cambodia between 2005 and 2014. Loss of dense forest was associated with an increased incidence of diarrhoea, fever and acute respiratory infections in children. Protected area coverage was associated with decreased incidences of diarrhoea and acute respiratory infection. The authors suggest that protected areas could help to alleviate health burdens and present possibilities for simultaneously achieving public health and conservation goals. Author: pienkowski.thomas@gmail.com

Spiegel, S. (2016) Land and ‘space’ for regulating artisanal mining in Cambodia: visualizing an environmental governance conundrum in contested territory. *Land Use Policy*, 54, 559–573.

This article draws on a case study of disputed gold mining territory in Kratie Province to examine how commitment to the Minamata Convention presents a conundrum for the Cambodian government given its prioritization of larger-scale concessions in land use policy. In most mineral-rich regions of Kratie and other provinces, mineral exploration and/or mining rights — and other kinds of resource concessions — have already been granted to established companies and powerful actors, leaving ambiguous physical and political space for licensing artisanal mining. Author: sam.spiegel@ed.ac.uk

Souter, N.J., Hughes, A.C., Savini, T., Rao, M., Goodale, E., Van Nice, A., Huang N., Liu J.-X., Hunt, M.P., O’Connor, D.A., Heung-Lam A.L., Gnuen, G., Sun Y. & Silva, I. (2017) Building conservation capacity in Southeast Asia: outcomes of the ATBC 2015 Asia-Pacific chapter meeting conservation education symposium. *Applied Environmental Education & Communication*. DOI 10.1080/1533015X.2017.1322012

Presents the outcomes of discussions during the 2015 ATBC meeting in Phnom Penh on three types of capacity-building programmes: career development, project-specific activities and outreach, and delivering conservation information to diverse audiences. The authors suggest that successful delivery of conservation education in Southeast Asia requires understanding conservation’s place in society, developing a feeling of community among students, providing students with financial support, practical teaching, and crafting

appropriate messages. Author: nicholas.souter@alumni.adelaide.edu.au

Va D., Taplin, R., Bajracharya, B., Regan, M. & Lebel, L. (2016) Entry points for climate-informed planning for the water resources and agriculture sectors in Cambodia. *Environment, Development and Sustainability*. DOI 10.1007/s10668-016-9788-5

Incorporating climate change concerns into national development planning can help adaptation to occur alongside sustainable development of a country. This article identifies entry points for incorporating climate change issues into the water resources and agriculture sectors in Cambodia. It suggests that the national planning process restricts the involvement of actors such as researchers, civil society and private sector, but is also flexible in providing opportunities for including climate change and other related concerns. Author: dva@bond.edu.au

Touch V., Martin, R.J., Scott, F., Cowie, A. & De L.L. (2016) Climate change impacts on rainfed cropping production systems in the tropics and the case of smallholder farms in North-west Cambodia. *Environment, Development and Sustainability*. DOI 10.1007/s10668-016-9818-3

The consequences of climate change on smallholder farms are locally specific and difficult to quantify because of variations in farming systems, complexity of agricultural and non-agricultural livelihood activities and climate-related vulnerability. This study identifies practical, social and economic constraints to the adoption of climate adaptation options in upland cropping systems in northwest Cambodia. Author: van.touch84@gmail.com

The Recent Literature section was compiled by Neil M. Furey, with contributions from Andrea Claassen, Thomas Gray, Oleg Kosterin and Tagane Shuichiro.