CROCODILE SPECIALIST GROUP NEWSLETTER

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IUCN Species Survival Commission

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Cover: E.A. McIlhenny at an American alligator nest in August 1921. Photograph: E.A. McIlhenny Collection, Avery Island, Louisiana. See pages 6-7.

CSG Newsletter

The CSG Newsletter is produced and distributed by the Crocodile Specialist Group of the Species Survival Commission (SSC) of the IUCN (International Union for Conservation of Nature). The CSG Newsletter provides information on the conservation, status, news and current events concerning crocodilians, and on the activities of the CSG. It is available as a free electronic, downloadable copy from http://www.iucncsg.org/pages/Publications.html

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Cathy Shilton, Darwin, Australia.

Editorial

It is with deep sorrow that we report on the passing of Bed Khadka from Nepal, in May 2025. We join the many friends and colleagues to extend our sincerest condolences to Bed's family. Details on Bed's life and dedication to Gharial (*Gavialis gangeticus*) conservation are contained in his obituary (see page 4).

On 19 February 2025, the "Crocodile Control and Conservation Bill 2025" was introduced into the state of Queensland Parliament, Australia. The Bill aims to establish a "Queensland Crocodile Authority" outside of the state wildlife agency, to manage and administer the scheme, which includes the proposed culling of Saltwater crocodiles (*Crocodylus porosus*) from waterways near human populations. This has attracted significant media attention. The Bill has been referred to the Queensland Health, Environment and Innovation Committee for detailed consideration, and public hearings are now being carried out throughout the state, seeking input from the public and other interested stakeholders. I (CM) was invited to attend one of the briefings and provided information on crocodile management, and other information. The deliberations of the Committee will be presented later in the year.

The history of CITES has been compiled by David Morgan, a long-time member of the CITES Secretariat, coinciding with the 50th anniversary of the convention's entry into force. "Regulating International Trade in Wildlife: 50 Years of the Convention on International Trade in Endangered Species of Wild Fauna and Flora" will be available in late-2025 (see page 5 for details).

We welcome Phoebe Griffith (Germany) and Brinky Desai (India) to the CSG Steering Committee, as focal points for the IUCN SSC Young Professionals Task Force (YPTF). The YPTF was recently established to "*propose a blueprint to execute the activities from the SSC perspective to achieve the goals of youth strategy developed by IUCN*". A key factor that exemplifies the suitability of Phoebe and Brinky for this role is their initiative, the Early Career Crocodile Network (ECCN) for Asia, which was launched in 2022. This platform is designed to bring together people in Asia who are early in their careers, to connect people and create opportunities for discussion and experience sharing - goals that are shared by the YPTF.

The "1wild Foundation", based in Switzerland, has invited CSG members working on crocodilian EDGE species to submit proposals for funding. Members should have received relevant information by e-mail. However, if you did not receive the e-mail, and are interested, please contact Sally Isberg (csg@wmi.com.au).

World Crocodile Day was celebrated on 17 June, with various activities occurring around the world, promoting the conservation of crocodilians and raising awareness on the threats they are facing.

We remind CSG members that the 28th CSG Working Meeting will be held in Morocco, in May 2026. The meeting website has now been launched, providing information on registration, venue and accommodation, veterinary workshop (11 May), and call for abstracts.

Alejandro Larriera and Charlie Manolis, *CSG Co-Chairs*.

Key Events in 2025

- "Management and Conservation of Crocodilians in the Face of the Challenges of the 21st Century", Havana, Cuba, 1-5 July 2025.
- "Second Siamese Crocodile Regional Species Meeting", Kasetsart University, Bangkok, Thailand, 19-21 August 2025.
- The 7th European Croc Network Meeting (ECNM) will be held on 1-2 August 2025, in Berlin, Germany. With the theme of "Human Dimensions of Crocodylian Conservation", the ECNM aims to facilitate collaboration and opportunities for people based in Europe who work with, or aspire to work with, crocodilians.
- "CSG Regional Workshop", San Salvador, El Salvador, 24-26 September 2025.
- IUCN World Conservation Congress (WCC), Abu Dhabi, United Arab Emirates, 9-15 October 2025.
- "Symposium on Conservation and Use of Crocodilians in Latin America: A Look at the Present, Reflections Towards the Future", held under the auspices of "XVI CIMFAUNA 2025" (organized by COMFAUNA), San Cristóbal de las Casas, Chiapas, México, 10-14 November 2025.
- "20th Conference of the Parties to CITES (CoP20)", Samarkand, Uzbekistan, 24 November to 5 December 2025.

Obituary

It is with deep sadness that we share the passing of Bed Bahadur Khadka, a lifelong conservationist whose tireless dedication to protecting Nepal's endangered Gharial has left a lasting legacy for both wildlife and future generations. Bed is remembered not only for his immense contributions to conservation, but also as a beloved colleague, a generous mentor, and a dear friend to many. Many of you will remember Bed well for his long and impactful role running the Chitwan National Park Gharial Conservation and Breeding Centre for 18 years, where he spearheaded efforts to protect and revive what would become, under his watch, Nepal's largest Gharial population. The very survival, and remarkable increases, in the Gharial population in Chitwan is a direct result of Bed's personal passion and dedication to saving Gharial. Under Bed's leadership, the population increased more than tenfold, and annual nesting rose from just one or two nests per year, to dozens.

Bed was not only a guardian of the species in the field but also a passionate advocate for Gharial conservation across Nepal. His popular and widely-read articles brought awareness to the public, and his name became synonymous with Gharial conservation. He was instrumental in work on nesting, population monitoring, movement ecology and post-release monitoring and growth of headstarts, and his scientific contributions are reflected in dozens of publications in international journals and this very newsletter. Never shy of challenging fieldwork, for many years it was a familiar site to see Bed camping out on a remote beach of the Narayani River, or passing downstream in a dugout canoe as he headed to a Gharial rescue, ensuring Gharial numbers continued to climb, and inspiring us all with his resolve and humility.

Bed began his distinguished career with Nepal's Department of National Parks and Wildlife Conservation (DNPWC) in 1989, after completing his degree in Forestry at Tribhuvan University. He went on to spend 31 years in service with the DNPWC, eventually retiring in the very senior role of Assistant Conservation Officer of the famous Chitwan National Park, Nepal's first national park and a World Heritage Site. In this illustrious career, Bed contributed to a huge range of conservation work, from research on Bar-headed Goose and Bengal Floricans - birds were another of his passions - to the famous residents of Chitwan, the rhinos, tigers and elephants. Bed's commitment and contribution to conservation was well recognised both nationally and internationally, highlighted in 2011 when he was awarded the Abraham Conservation Award by WWF Nepal.

As an active member of the Crocodile Specialist Group, many of you remember Bed fondly from past CSG meetings. He had a huge presence, but those of us who knew him well know his sometimes serious and scholarly demeanour were complemented by his quick sense of humour, ease to laugh, his thoughtful and generous mentoring, and his steadfast commitment and kindness to his staff. Ever a popular colleague, those of us lucky enough to work with Bed were happy to quickly become friends.

Bed has this amazing way of forming relationships based on trust and mutual respect with the local indigenous riverine communities living along the Rapti and the Naryani Rivers. He would recruit local fishers to track gravid female Gharial and monitor them. He would often go on field surveys in a dugout canoe, together with these teams that he had built, and together they spent days studying Gharial, and nights on the sandbanks of the rivers. Bed often spoke of how much he had learnt about Gharial from these locals and often emphasized that "long-term conservation can only be achieved by encompassing science with indigenous traditional knowledge".

Bed passed away in May following a long and courageous battle with cancer, at just 61 years old. He is survived by his wife, two daughters and a son. Bed's passing not only leaves a huge hole in Nepal's conservation community and the international world of crocodile conservationists, but also is all of our lives: he will be acutely missed and warmly remembered. If you are ever lucky enough to visit Nepal and see a Gharial basking on the banks of the Narayani River, think of Bed, the guardian of the Gharial, who made these sights possible for future generations.

Prepared by: Phoebe Griffith and Ashish Bashyal.

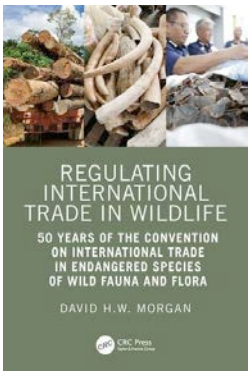
Regulating International Trade in Wildlife: 50 Years of the Convention on International Trade in Endangered Species of Wild Fauna and Flora

The Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES) was one of the first in a new wave of global multilateral environmental agreements (MEAs) formed after the 1972 United Nations Conference on the Human Environment. It is widely recognized as being one of the most successful biodiversity MEAs.

"Regulating International Trade in Wildlife: 50 Years of the Convention on International Trade in Endangered Species of Wild Fauna and Flora", written by Dr. David Morgan, represents the first published history of the Convention to coincide with the 50th anniversary of its entry into force. It examines the context under which the Convention was created, and charts the development of its internal organization, including its governing and intersessional bodies and its Secretariat, and the personalities that built them.

CITES' business is about the conservation of species affected by international trade. This book reviews the application of CITES to whales, the African elephant, crocodilians, vicuña, timber and tree species, fish and other marine species. The Convention's compliance framework is arguably its most pre-eminent feature. The book looks at the way that key obligations on Parties have been identified, the standards of implementation set, what efforts are made to help Parties comply with these and what sanctions are taken against Parties that fail to implement them.

Finally, David Morgan offers some personal reflections on the successes and failures of CITES, based on his 40 years of engagement with the Convention and looks ahead to how it might develop in its second half-century. This book will be of great interest to wildlife scientists, including conservationists, historians, biologists, as well as environmental scientists and non-governmental organizations.



Citation: Morgan, D. (2026). Regulating International Trade in Wildlife: 50 Years of the Convention on International Trade in Endangered Species of Wild Fauna and Flora. CRC Press: Boca Raton.

Note: the text here is largely made up of the book's Abstract, available ahead of publication of hardback, paperback and eBook vserions after 15 October 2025.

Hutton (1984) Thesis Now Available

It is 40 years since Dr. Jon Hutton completed his PhD thesis [Hutton, J.M. (1984). The Population Ecology of the Nile Crocodile, *Crocodylus niloticus* Laurenti, 1768, at Ngezi, Zimbabwe. PhD thesis, University of Zimbabwe, Harare, Zimbabwe], and it has now been made available at Researchgate. Publications drawn from Jon's thesis, together with additional publications reflecting Jon's later involvement with the global conservation sector since 1984, are listed below (most can also be found at Researchgate).

Hutton, J.M. (1986). Age determination of living Nile crocodiles from the cortical stratification of bone. Copeia (1986): 332-341.

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Phelps, R.J., Toet, M. and Hutton, J.M. (1989). DDT residues in the fat of crocodiles from Lake Kariba, Zimbabwe. Transactions of the Zimbabwe Scientific Association 64(2): 9-14.

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Hutton, J.M. and Van Jaarsveldt, K.R. (1987). Crocodile farming in Zimbabwe. Pp. 323-327 *in* Wildlife Management: Crocodiles and Alligators, ed. by G.J.W. Webb, S.C. Manolis and P.J. Whitehead. Surrey Beatty & Sons: Chipping Norton.

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Hutton, J.M. (1992). The status and distribution of crocodiles in Kenya. *In* The CITES Nile Crocodile Project. UNEP/CITES: Geneva, Switzerland.

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Hutton, J.M. and Webb, G.J.W. (1992). An Introduction to the farming of crocodilians. *In* Directory of Crocodilian Farming Operations. Second Edition. IUCN: Switzerland.

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Leader-Williams, N. and Hutton, J.M. (2005). Does extractive use provide opportunities to offset conflicts between people and wildlife? Pp. 140-161 *in* People and Wildlife: Conflict or Co-existence?, ed. by R. Woodroffe, S.J. Thrigood and A. Rabinowitz. Cambridge University Press: Cambridge.

Roe, D., Hutton, J., Elliot, J., Saruchera, M. and Chitepo, K. (2003). In pursuit of pro-poor conservation. Policy Matters 12, September 2003: 76-86.

Hutton, J.M. and Leader-Williams, N. (2003). Sustainable use and incentive-driven conservation: realigning human and conservation interests. Oryx 37: 215-226.

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CSG Student Research Assistance Scheme

The Student Research Assistance Scheme (SRAS) and Fritz Huchzermeyer Veterinary Science Student Research Assistance Scheme (FHVS-SRAS) provided funding to two students in the April-June 2025 quarter.

1. Brayan Pérez Ortiz (Colombia; Project 25/11): Abundance and habitat charactrization of *Crocodylus acutus* and *Caiman crocodilus fuscus* in the lower sub-basin of the Bogota River, Cundinamarca.

2. Santiago Pérez-Galvis (Colombia; 25/12): Hematological/biochemical reference intervals and morphological blood cell characterization of captive *Crocodylus acutus* in Colombia.

The following reports, submitted in April-June 2025 by SRAS applicants who have completed their studies, have now been posted on the CSG website:

1. Project 19/15: Jazmin Bauso (Argentina). *Caiman latirostris* as an indicator of heavy metals present in environments with different levels of anthropization. Download.

Dr. Sally Isberg, *CSG Executive Officer (csg@wmi.com.au).*

Avery Island Legacy: High School Student's Study Builds on a Century of Alligator Conservation

For over a century, the marshlands surrounding Avery Island, Louisiana, have been a stronghold for American alligator (*Alligator mississippiensis*) conservation, thanks in large part to the work of early conservationist E.A. McIlhenny. Now, nearly 90 years after the publication of "The Alligator's Life History", McIlhenny's great-great-granddaughter Scarlett Osborn is continuing that legacy - this time through the eyes of a high school student with a passion for science, heritage, and the bayou.

Scarlett recently graduated from the Episcopal School of Acadiana in Louisiana, where she completed an in-depth independent study titled "Alligator Management and Ecology Surrounding Avery Island: Revisiting E.A. McIlhenny's Observations". Her project, which included fieldwork, data analysis, and interviews with conservation professionals, offers a rare perspective that combines generational stewardship with contemporary ecological research.

Scarlett's work traces the evolution of alligator management in Louisiana, using McIlhenny's 1935 monograph as a historical foundation. She analyzed harvest and nest data from 2012-2024, conducted vegetation surveys, and used drones to locate and monitor nests. Her findings reflect not only on the ecological and economic impacts of Louisiana's $250 million alligator industry, but also highlight the careful management and adaptive strategies now required in the face of climate change and fluctuating market conditions.

Her mentors included coastal wetland expert Mark Shirley and Avery Island land manager Heath Romero, both of

Figure 1. (Top) Scarlett and James Shea collecting alligator eggs. (Bottom) Scarlett and Mark Shirley return a portion of alligator eggs collected back to the wild as juveniles. Photographs: Scarlett Osborn and Mark Shirley, LSU AgCenter, Louisiana Sea Grant.

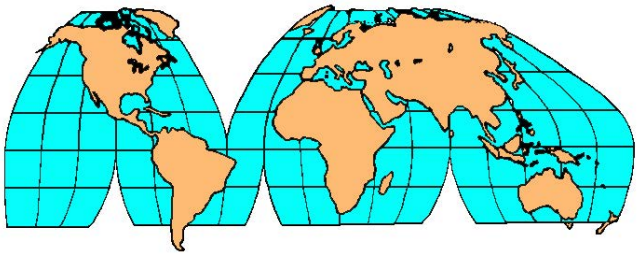
whom shared their insights on population monitoring, habitat suitability, and the balance between farming and wild harvesting. The study shows how Louisiana's "Marsh to Market" model, rooted in sustainable use and driven by science and policy, continues to evolve in response to environmental pressures and global leather markets.

"This study was personal," Scarlett writes. "It connected me to my family, my culture, and the marsh where we both grew up. I hope one day my great-great-grandchildren will hear the story of how I carried on E.A. McIlhenny's legacy."

Scarlett's work stands as a testament to the power of local knowledge, scientific curiosity, and intergenerational conservation. Her study reminds us that when it comes to the future of crocodilians, history is not just something to reference - it's something to build on.

Note: Scarlett Osborn (scarlettamosborn@gmail.com) will be studying Environmental Science at Tufts University in the fall.

Regional Reports



South Asia & Iran

India

50 YEARS (1975-2025) OF CONSERVATION ACTION IN INDIA BRINGS BACK THREE SPECIES OF CROCODILIAN FROM THE BRINK OF EXTINCTION. What began as a survey in late-1974 by FAO expert Dr. R.H. Bustard on the status of three species of crocodilians in India and explore the feasibility of crocodile farming (as desired by the Government of India), laid the foundation of a 50-year long (1975-2025) conservation effort that brought back the Gharial (*Gavialis gangeticus*; Figs. 1-3), Mugger (*Crocodylus palustris*; Fig. 4) and the Saltwater crocodile (*C. porosus*; Fig. 5) from the brink of extinction in India.

Based on existing information provided by J.C. Daniel (Bombay Natural History Society; BNHS), S. Biswas (Zoological Survey of India; ZSI), Romulus Whitaker (then Madras Snake Park Trust; MSPT) and his own 1974 survey, Dr. Bustard informed the Government of India (GOI) that: the Gharial was on the verge of extinction in the wild in the Gangetic and Mahanadi River system, with just a few pairs of breeding adults remaining; the Saltwater crocodile was holding on with less than 100 left in the wild along the Odisha coastal delta; and, the Mugger was in a somewhat better situation but with very isolated and fragmented breeding groups across its distribution range. He recommended the implementation of a National Crocodile Conservation Project

Figure 1. Female Gharial with hatchlings. Photograph: Subrat Behera.

Figure 2. Gharial in Gandak River. Photograph: Subrat Behera.

Figure 3. Gharial hatchlings. Photograph: Subrat Behera.

Figure 4. Mugger in the Chambal River. Photograph: Suhas.

Figure 5. Saltwater crocodile in the Sundabarns, West Bengal. Photograph: B.C. Choudhury.

with UNDP/FAO inputs, which was readily adopted by Government.

On 1 April 1975, the conservation effort was launched with a multi-pronged strategy of providing the highest protection to the remaining breeding populations of the three species in the wild, and to quickly build up the wild populations in the wild through "head-starting". This was to be achieved by the collection of wild crocodile nests and transferring the eggs to simulated nest incubation hatcheries and rearing the resulting hatchlings up to 1.2 m total length for subsequent release into identified and protected riverscapes.

The pilot project locations were in the East coast state of Odisha, where all three species still occurred, and in the Gangetic basin state of Uttar Pradesh where the chances of re-establishing *G. gangeticus* in the wild was considered high. Centres were established at: Tikarpada along the Mahanadi River in Odisha; Kukrail in Lucknow along the Gomti River; and, Katreniyaghat along the Girwa River in Uttar Pradesh. A center focussed on *C. porosus* was established at Dangamal in Bhitarkanika in Odisha. A third centre for Mugger conservation in Odisha was also planned at Similipal Tiger Reserve, for which Mugger hatchlings were brought from the Madras Snake Park Trust.

In early 1975, a single clutch of wild *G. gangeticus* eggs was fortunately located in the trans-boundary Narayani and Gandak River along the Indo-Nepal border, and shifted to the Tikarpada centre. The first hatching of that Gharial nest in June 1975 set the project to roll on, and the Dangmal centre soon contributed with successfully hatched *C. porosus* from eggs collected from wild nests from the Bhitarkanika mangroves.

In July 1975, Dr. Bustard, who was leading the project, convinced the Government of Odisha that qualified biologists must be included in the project for scientific and professional inputs, and in came Lala Ashwini Kumar Singh, Sudhakar Kar and Binod Chandra Choudhury to take responsibility for *G. gangeticus*, *C. porosus* and *C. palustris*, respectively. Later, to address the supplementary input of *ex-situ* conservation through captive breeding, a world class breeding pool for Gharial was constructed at the Nandankanan Biological Park in Bhubaneswar (Odisha), and Sudarshan Maharana also joined the biologist group. At the Uttar Pradesh centres, Sushant Chowdhury and Ajay Kumar Srivastava also joined as research biologists in due course.

Surveys in Uttar Pradesh by Dhruvajyoti Basu by then had successfully located small breeding populations of Gharial in the Chambal and Girwa Rivers, tributaries of the Ganges for the Uttar Pradesh Project, and the focus was to intensively monitor and protect the populations so as to maximize wild clutch collection for the centres at Kukrail and Katreniyaghat from the 1976 season.

With no breeding of Gharial being recorded in Mahanadi (Odisha), Dr. Bustard reached out to the Royal Nepal Wildlife Department, offering to conduct surveys of the Narayani River to assess the Gharial population there, and if successful to locate nests and transfer them to the Mahanadi center. In 1976 and 1977, eggs from the Narayani River in Nepal contributed significantly to the Gharial Conservation Programme of India. This also led to establishment of the Nepal Gharial Conservation project in Royal Chitwan National Park in 1978.

In 1976-1978, the crocodile conservation efforts in India expanded to eight other states (West Bengal, Andhra Pradesh, Tamil Nadu, Kerala, Maharashtra, Gujarat, Madhya Pradesh, Rajasthan) and the Union territory of Andaman and Nicobar. This resulted in setting up of a total of 21 crocodile rearing centres, of which 6 were dedicated to Gharial, 4 to Saltwater crocodile, and 11 to Mugger. With so many centres established, the GOI Ministry of Environment and Forests, with support from FAO/UNDP, also established the Central Crocodile Breeding and Management Training Institute (CCBMTI) at Hyderabad in 1977, linking this to the Andhra Pradesh Crocodile Conservation Project for capacity-building of personnel involved with the projects. CCBMTI also took up the responsibility of coordinating and monitoring the progress of the national projects.

While the centres in different states were producing three species of Indian crocodilians, the state wildlife organisations were simultaneously finalizing the establishment of Protected Areas to receive the captive-reared juvenile crocodiles. By 1979, 12 crocodile sanctuaries were created across the country and the first captive-reared Saltwater crocodile was released into Bhitarkanika Wildlife Sanctuary in 1977. This release was followed by other species in protected riverscapes of India. However, the most significant Protected Area established was the 450-km long Chambal River, and the Tri-State National Chambal Sanctuary spread across the states of Rajasthan, Madhya Pradesh and Uttar Pradesh. This ultimately became the stronghold and most celebrated location of reviving the wild Gharial population.

International collaboration saw an adult male Gharial from Frankfurt Zoo, Germany, brought to Nandankanan Biological Park, Bhubaneswar, to be included in the breeding group, and the world witnessed the first ever successful *ex-situ* breeding of the Gharial in 1980.

Key achievements of 50 years of effort in India include:

Gharial

- With over 3000+ Gharial in the wild, India holds 80% of the global population, with more than 2000 in the National Chambal Sanctuary.
- Over 400 wild Gharial, the second largest population, occurs in the Gandak River in the states of Bihar and Uttar Pradesh.
- In an attempt to re-establish the Gharial into its former distributional range in the Indus River system, the species has been re-introduced in the Beas River in the state of Punjab.
- In the Mahanadi River in the state of Odisha, wild Gharial have now been breeding since 2021.
- Plans are being developed to re-establish the Gharial in the Brahmaputra River system in northeastern India.
- A new Gharial project in India, declared by the Hon'ble Prime Minister Shri Narendra Modi at the 7th Meeting of the National Board for Wildlife, aims to take the Gharial from its current status of "Critically Endangered" to a better category.

Saltwater Crocodile

- In India, populations of *C. porosus* are found in; the Sundarban, the world's largest mangrove vegetation delta; Bhitarkanika National Park and Wildlife Sanctuary in Odisha; and, in the Brahminy and Baitarani River delta and mangrove fringed estuarine creeks of the Andaman and Nicobar Islands.
- Country-wide, the Indian population of *C. porosus* is estimated at around 2800 non-hatchlings, with the majority (around 80%) in Bhitarkanika National Park/Wildlife

Sanctuary. Sundarban Biosphere Reserve in West Bengal holds around 250 *C. porosus* and Andaman/Nicobar islands around 300 *C. porosus* - both of these populations are showing an increasing trend.

- The Bhitarkanika population of *C. porosus* has been monitored since 1976, with annual surveys being undertaken annually since 1993.

- Current efforts will focus on developing a mechanism of peaceful coexistence between *C. porosus* and the human population.

Mugger Crocodile

- The wild Mugger population in India is now estimated to be around 9000-10,000 individuals.

Beside these wild populations, zoos and crocodile rearing centres holding at least another 2000-3000 crocodilians. What began in India as a feasibility study for crocodile farming in I975 has become a globally acclaimed conservation success story. Although India does not support the consumptive use of its wildlife, including crocodilians, the latter have been promoted as a non-consumptive resource in the eco-tourism sector. The three crocodilian species have been brought back from the edge of extinction, but more effort is required to ensure their long-term survival in what is a complex human-dominated environment.

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A PRELIMINARY SURVEY OF THE MUGGER CROCODILE (*CROCODYLUS PALUSTRIS*) AT BHAGHDARRA LAKE, UDAIPUR, RAJASTHAN, INDIA. Following discussions with the Aravalli Nature Society and Madras Crocodile Bank Trust, Mugger (*Crocodylus palustris*) surveys were carried out at Baghdarrah Lake (see Fig. 1) on 3-7 March 2025. A literature search revealed that in the region: Mahur (2019) surveyed the reptile fauna concerning road mortalities (though no records of crocodiles were recorded), and noted tourism and its impacts on disturbance on basking crocodiles; and, Mahur *et al*. (2010) surveyed Mugger in Baghdarrah Lake and recorded basking patterns of different size classes, including sightings, but not sizes, of "juveniles".

Baghdarrah Lake (24.47° N, 73.87° E; 557 m asl) is located near Udaipur, in the State of Rajasthan (Fig. 1). Surface area varies with season, but generally covers around 0.1 km^2, with a catchment area of 500 ha (Mahur *et al*. 2020). The lake perimeter is around 2.6 km, and the surrounding area of Baghdarrah Reserved Forest is 368 ha.

Water levels at the time of survey were considered "high". The lake is only fed by rainfall, and the region receives 760 mm annual rainfall (Verma and Pandey 2017), which falls largely between the monsoon period from June to September.

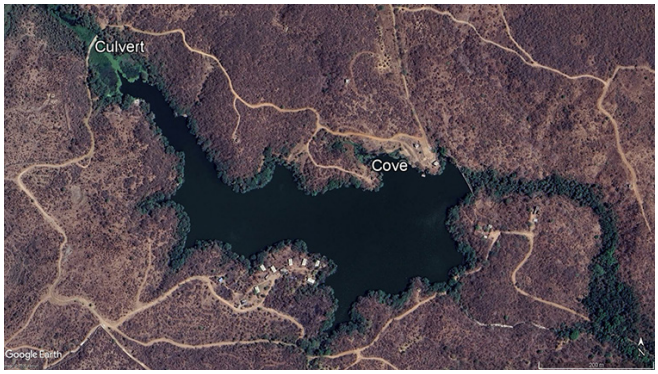

Figure 1. Baghdarrah Lake and environs. Dera Baghdarrah Camp is located in the southern side of the lake.

In the present survey, daytime surveys at Baghdarrah Lake were conducted by walking along the shoreline, or by viewing crocodiles from a Gypsy jeep from roads that transversed the boundary of the lake (Fig. 1). Surveys were conducted from vantage points around the lake to count visible crocodiles in the daytime. We took the opportunity to observe crocodile activity, such as basking or swimming.

A Garmin E-Trex 10™ GPS was used to record paths walked and latitude/longitude recorded for crocodiles, basking sites, and other areas of interest were sighted. Further, the GPS camera Android app was used to geo-tag locations of interest. Survey data were loaded onto Google Earth™ and Arcgis Pro™ .

Weather conditions were excellent for observing crocodiles at this time of year, with cool mornings, resulting in bouts of initial surface basking, rising to warm temperatures when crocodiles emerged onto land. Weather conditions were acquired from Ease Weather, which included minimum and maximum temperatures, and relative humidity for the town of Udaipur, which is 12 km northwest of Baghdarrah Lake.

Results

3 March 2025: Shortly after arriving at Dera Baghdarrah Camp, we conducted a reconnaissance survey to understand the lake and its surrounding terrain. Between 0800 and 1830 h, we visited the public viewing area, where the Rajasthan Forest Department (RFD) has placed a crocodile warning sign board (Fig. 2). At this time, we sighted 9 adult crocodiles, a basking site and a single scat. Ambient temperatures ranged between 23 and 35°C and relative humidity between 24 and 50%.

4 March 2025: Two crocodiles, an adult and a sub-adult, were sighted at 1300 h, both of which dived into the water from the rock on which they were basking when we approached from the landward side (see Fig. 3). We were shown three "old" nesting sites, and observed three scats and an adult crocodile. Areas of habitat considered suitable for hatchling habitation, with thick reeds and low rocks/logs for basking, were also observed. A basking/nesting site created by the RFD was shown to us. Temperature ranged between 24 and 32°C and relative humidity between 15 and 53%.

Figure 2. Crocodile warning sign for tourists.

Figure 3. Area where a sub-adult and an adult Mugger were observed basking on a rock outcrop (circled) on 4 March, and a single adult (presumably the same one) was observed basking alone.

5 March 2025: We observed two more sites cleared by the RFD, and at 1050 h we saw two adult crocodiles around 45 m away in the lake. Another crocodile, estimated at 2.5 m TL, was observed at 1140 h. Shortly after we observed a trial nest (Fig. 4), adjacent to an area where five adult crocodiles were observed in the water at varying distances from us.

Also visited was a basking site with numerous crawls (tracks) and a hind limb spoor good enough to measure to obtain a size estimate (Fig. 5). Using Whitaker's (2020) relationship between snout-vent length (SVL) and hind foot length (HFL) (SVL= 0.3629*HFL + 122.86), the track was estimated to have been made by a crocodile around 129 cm SVL (258 cm TL).

At 1210 h, we were able to quietly approach and photograph an adult crocodile half immersed in the water (Fig. 6). Temperature ranged between 20 and 31°C and relative humidity between 12 to 36%.

6 March 2025: We covered areas that we had walked and driven on previous days, and found further evidence to support two key areas frequented by Muggers in the lake. The first area, near Dera Baghdarrah Camp, southeast from the culvert, is where an adult was observed basking on a large granite rock. Between this rock and the opposite bank, the

Figure 4. Trial nest found adjacent to the "Cove" (see Figs. 1 and 8).

Figure 5. Spoor of Mugger hind foot, the measurement of which allowed size of crocodile to be estimated.

vegetation at this time of year was marshy, with thick grassy undergrowth, with an abundance of water birds. The opposite bank was also observed to be a basking site for crocodiles, and is where we also found several old Baya Weaver bird nests (Fig. 7). The second area, which we named "the Cove" (Fig. 8) due to its shape, is thickly vegetated at the water's edge, and further inland has areas of soil suitable for nesting. Temperature ranged between 16 and 34°C and relative humidity between 10 and 41%.

7 March 2025: We sighted five adult crocodiles basking on land, and another four adults in the water. An "old" nesting site was also observed just metres from one of the camp tents at Dera Baghdarrah Camp - this was a nesting and hatching site as recently as 2024. The microhabitat appeared ideal for higher survival of hatchlings, with its abundance of water reeds, small fish and invertebrates.

Figure 6. Adult Mugger at water's edge.

Figure 7. One of several Baya Weaver (*Ploceus philippinus*) nests found adjacent to the culvert area (see Fig. 1).

Notwithstanding the logistic difficulties in carrying out the survey, and the possible factors that may have impacted on sightability of crocodiles, surveys results are summarised in Table 1. As expected with this type of survey, no hatchlings were observed, even though they may be present. As the survey was carried out at the onset of nesting, as evidenced by trial nests dug by females, hatchlings would have been around 8-9 months of age.

Figure 8. The 'Cove' and surrounding landmarks. Stars (N= 3) indicate basking sites identified by direct presence of crocodiles or indirect evidence (spoor and scat).

Conclusions

The number of Muggers sighted during this survey (Table 1), undertaken when water levels in Baghdarrah Lake were high, would most likely differ had the survey been carried out during low water levels. Discussions with Dera Baghdarrah Camp personnel suggest that a more favorable time for a repeat survey would be June/July 2025 (dry season), when hatching occurs. This timing, coupled with additional survey time (5-6 nights), would allow a clearer picture of the size of the Mugger population in the lake.

In terms of size structure, it is unclear whether the low numbers of small crocodiles sighted (eg juveniles) indicates biases associated with the survey (eg fringing vegetation, day versus night), lack of successful recruitment, or whether the Mugger population in the lake has reached stability and small crocodiles are preyed upon by larger ones. Mahur *et al*. (2010) reported sightings of "young ones", but provided no details on size classes involved. Unfortunately, we were unable to carry out spotlight surveys on the lake, and so this question remains unanswered.

Mahur *et al*. (2010), in their year-long Mugger basking study in 2007-2008, reported maximum numbers of sightings of 79 adults and 64 "young ones". However, as their observations were conducted weekly (and summarised on a monthly basis), sightings represent multiple sightings of the same crocodiles. Comparisons of abundance between 2007-08 (Mahur *et al*. 2010) and 2025 (this study) are thus not possible.

Muggers rescued from nearby areas have been released into Baghdarrah Lake (as informed to us by Dera Baghdarrah Camp). Crocodiles have been known to be able to return to their sites of capture, and the release of crocodiles in new areas may cause social conflicts with resident crocodiles. The implications of these releases merit investigation.

While crocodiles often acclimatize to disturbance, the 24/7 working of crushers and excavators involved in mining near

Table 1. Crocodile sightings and other evidence recorded during daytime surveys at Baghdarrah Lake. Surveys on 6-7 March were over same areas surveyed on 3-5 March, and sightings were likely to be of the same animals. Distances on any day exceed lake perimeter due to different vantage points resulting in overlapping views of the lake - around 2.5 km (96%) of the lake perimeter was surveyed. H= hatchling (<0.5 m), J= juvenile (0.5<1 m), SA= sub-adult (1.0<1.5 m), A= adult (>1.5 m) (Andrews 1999).

Date	Time	Distance (km)	H	J	SA	A	Scats	Trial Nests	"Old" Nests
3 March	0800-1830 h	3.5	-	-	-	9	1		
4 March	0830-1900 h	4.9	-	-	1	2	3	-	3
5 March	1100-1230 h	2.9	-	-	-	9	-	1	-
6 March	0710-1520 h	3.9	-	-	-	1	-	-	-
7 March	0900-1010 h	4.0	-	-	-	9	-	-	1

the reserve, beginning at a mere one kilometre northwest of the lake, may require mitigation of noise levels and reduction of activity periods, to reduce the impact on other fauna, in particular birds and mammals that inhabit this refuge, and which are more sensitive to this type of disturbance.

Mahur (2019) commented on the wariness of crocodiles basking at Baghdarrah Lake, which could be related to disturbance by people. We also agree that tourism needs to be regulated at the lake, so as to minimise disturbance on crocodiles. Tourists were observed at the time of our visit shouting at basking crocodiles, driving them into the water to see some movement. Bathing, swimming and fishing are allowed in this area. Moreover, an interpretation centre displaying the life-cycle of crocodiles and their role in the ecosystem could be jointly set up by Dera Baghdarrah Camp and the RFD, to inform and educate visitors about crocodiles.

Acknowledgements

I thank the Madras Crocodile Bank Trust's Trustees for supporting this work. This survey would not have been possible without the assistance of the Aravalli Nature Society/ Dera Baghdarrah Camp, namely Arefa Tehsin, Saadat Tehsin, Adityavikram More, Naveen Singh and Pankaj Choudhury. Sagarika Phalke ably assisted with collection of GPS data and associated photographs. Charlie Manolis reviewed earlier drafts and provided constructive criticism.

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CELEBRATION OF GOLDEN JUBILEE ON COMPLETION OF 50 YEARS OF CROCODILIAN CONSERVATION IN THE STATE OF ODISHA, INDIA. This year (2025) marks a significant milestone, specifically the Golden Jubilee of the implementation of the FAO/UNDP/Government of India/ Odisha Forest Department "Project Crocodile" in Odisha, India, in 1975. The celebration represents five decades of dedication and commitment to the conservation and recovery of three crocodilian species (*Gavialis gangeticus*, *Crocodylus porosus*, *Crocodylus palustris*) in the State. This occasion holds national significance as the Government of lndia formally launched a new National Conservation Project for the Gharial during the 7th meeting of the National Board for Wildlife in early 2025.

ln commemoration of this landmark achievement, the Forest, Environment & Climate Change Department, Government of Odisha, organised a State-level function on 17 June 2025 (Fig. 1), at which myself, Dr. Lala A.K. Singh and Prof. Sudarsan Maharan were praised and recognised for our contributions by the State wildlife organisation (Fig. 2).

The State-level event was followed by a National Workshop on 18 June 2025 in Bhubaneswar (Fig. 3). The workshop aimed to provide a platform for the exchange of insights and research experiences on crocodilian conservation and

Figure 1. State level function. Right to left: Prof. Pravat Kumar Roul (Vice Chanceller, Odisha University Agriculture and Technology), Sri Suresh Pant IFS (Principal Chief Conservator of Forests, Odisha), Sri Satyabrata Sahu IAS (Addl. Chief Secretary. Forest, Environment and Climate change Department, Odisha), Sri Prem Kumar Jha IFS [Principal Chief Conservator of Forests (Wildlife) and Chief Wildlife Warden Odisha], and Dr. Manoj V. Nair IFS [Chief Conservator of Forests (Wildlife)].

Figure 2. Golden Jubilee celebration for completion of 50 years of crocodilian conservation and research in Odisha state and felicitation to crocodile researchers: Right to left: Dr. L.A.K. Singh, Dr. Sudhakar Kar and Prof. Sudarsan Maharana.

research efforts over five decades and to prepare a road map for the future management of the species and their habitats.

In the first session, I delivered a talk on "Conservation of Saltwater crocodiles in Odisha, India: Issues and challenges", which was followed by a talk by Dr. L.A.K. Singh on "Gharial conservation in Odisha: Issues and challenges". Prof. Sudarsan Maharan delivered a talk on "Ex-situ conservation of crocodilians in Odisha & conservation of Muggers".

After each presentation there was a panel discussion by eminent senior forest officers/wildlife experts, retired professors and biologists from within and outside the state. Representatives from: the Wildlife Institute of India, Dheradun; Zoological Survey of India, Kolkata; West Bengal Sundarbans; states of Gujarat, Uttar Pradesh and Madhya

Figure 3. National workshop. Right to left: Sri A. Mishra IFS (Deputy Director General, Ministry of Environment Department, Government of India), Prof. P. Mohanty-Hejmadi (Ex-Vice Chanceller, Sambalpur University), Sri Suresh Pant IFS (Principal Chief Conservator of Forests, Odisha), Sri Prem Kumar Jha IFS [Principal Chief Conservator of Forests (Wildlife) and Chief Wildlife Warden, Odisha], Sri S.K. Patnaik IFS (Ex-Chief Wildlife Warden, Odisha) and Dr. Manoj V. Nair IFS [Chief Conservator of Forests (Wildlife)].

Pradesh; and, the state Wildlife Headquarter, actively participated in the workshop and deliberations. Prof. Binod C. Choudhury, now retired from the Wildlife Institute of India and a well-known crocodilian expert summed up the day's long technical sessions and gave a concluding remark on the conservation and future of crocodilians in the state as well as in the country as a whole (Fig. 4).

Figure 4. Professor B.C. Choudhury (left) summed up the day's technical sessions. On screen is an image (taken by Ashish Chandola) of Dr. H.R. Bustard (FAO Chief Technical Advisor to India) collecting Gharial eggs on the Gandak River, Bihar, in 1976. Photograph: Devi Priyadarshini.

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UPDATE ON THE GHARIAL (*GAVIALIS GANGETICUS*) POPULATION IN KATERNIAGHAT WILDLIFE SANCTUARY, INDIA. The Gharial (*Gavialis gangeticus*) is a Critically Endangered crocodilian that is endemic to the Indian subcontinent. Gharial habitat in Katerniaghat Wildlife Sanctuary (KWS), Uttar Pradesh, comprises parts of the

Girwa and Kaudiyala Rivers (a total of ~20 km). Gharials are also present in the Ghaghara River downstream of KWS, but with no confirmed nesting recorded as yet (Vashistha *et al*. 2024).

In 2010, the main river channel discharge shifted from the Girwa to the Kaudiyala, subsequently degrading the nesting habitat in Girwa by facilitating vegetation succession on sandy substrates. Since 2020, artificial sandbanks have been constructed annually by KWS staff in the Girwa River to support Gharial nesting (Vashistha *et al*. 2021a).

The current survey started at Ambah on the Girwa River, downstream to the Girijapuri Barrage, and then upstream to the in the Kaudiyala River on the Indo-Nepal border. Population counts and nesting data collection followed the conventional boat survey method during basking, nest laying and hatching periods between 2020 and 2024.

The results of the latest survey for KWS reveal:

1. Gharial counts have increased from 14 in 1975, to 66 in 2016 and 72 in 2020 (Vashistha *et al*. 2021b), to 142 in 2024.

2. Majority of Gharials were sighted in the Kaudiyala River because the sandy habitat in the Girwa River has degraded in the last decade (Vashistha *et al*. 2021b).

3. Latest count in 2024 comprised 3 juveniles (1-2 m TL), 30 sub-adults (2-3 m TL) and 109 adults (>3 m TL), of which 4 were adult males.

4. Counts of adult and sub-adult Gharials have more than doubled, from 38 to 109 and 11 to 30, respectively, over the 2016-2024 period.

5. Numbers of adult male Gharials sighted have decreased from 8 in 2016 to 4 in 2024.

6. Numbers of nests increased from 5 in 1975, to 36 in 2020-2021. However, since 2021 numbers of nests have decreased, to 23 in 2024 (Table 1).

7. Majority of nests were laid on the artificial sandbanks created in the Girwa River, with four natural sites also being used (Fig. 1; Table 1). However, the natural sites were only used for nesting once (ie NN2 in 2021, NN3 in 2022, NN1 in 2023, NN4 in 2024; see Fig. 1).

8. Main channel flow of the Karnali River has discharged into the Kaudiyala River since 2010, and the latter thus provides suitable sandy habitat with a deep flowing channel. Although trial nests have been observed in the Kaudiyala and locals have reported sightings of hatchlings, nesting has yet to be confirmed in the Kaudiyala section of KWS.

9. Mean clutch size has remained somewhat stable over time (Table 1).

10. Hatching success has decreased over time, from 93% in 2020 to 69% in 2024 (Table 1).

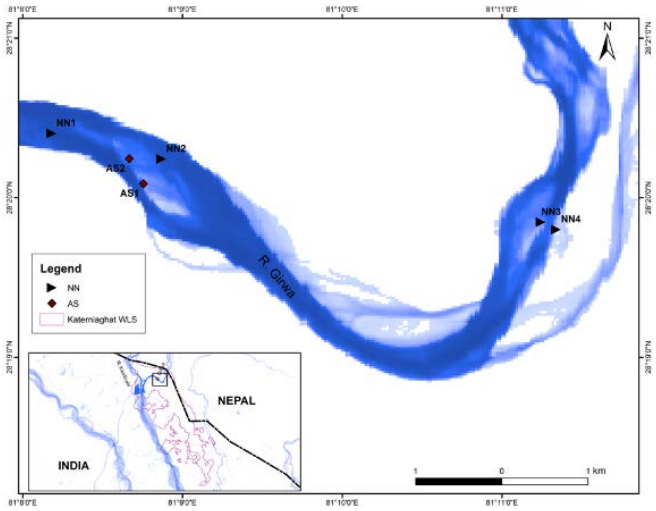

Figure 1. Gharial nesting sites in the Girwa River. AS= artificial sandbanks; NN= natural nesting sites. Map source: River occurrence layer, Global Surface Water Explorer (Pekel *et al*. 2016).

Gharials have been resident in the Girwa River since 1975, when the "National Crocodile Conservation Project" began in India. The population has clearly increased since the implementation of the head-starting program and legal protection of KWS, but the increase from 14 in 1975 to 142 in 2024 does not reflect the thousands of captive-raised individuals that have been released into the Girwa River over

Table 1. Gharial nesting in Girwa River, 2020-2024. Artificial sandbanks were first implemented in 2020 (Vashistha *et al*. 2021a). Values in brackets are standard deviation and sample size. "Unhatched eggs" include infertile eggs.

Nest Parameters	2020	2021	2022	2023	2024
Total nests	36	36	33	29	23
Mean clutch size	30.1 (6.07; 24)	29.30 (5.46; 30)	-	37.2 (9.95; 22)	31.0 (3.99; 23)
Mean hatching success (%)	92.5 (4.56; 24)	87.9 (11.39; 30)	-	78.3 (27.54; 20)	68.3 (29.38; 23)
Mean incubation period (d)	75.3 (2.61; 24)	84.1 (3.60; 30)	-	75.2 (6.24; 22)	-
Unhatched eggs	128	123	-	89	227
Mean distance from water (m)	7.6 (1.79; 24)	8.2 (1.98; 30)	-	11.4 (4.62; 27)	9.2 (1.89; 18)

a 50-year period. Limited habitat resources are considered to be largely responsible.

The recent reduction in nest numbers could be attributed to the reduced number of breeding males. The fate of these "missing" males is unknown, although dispersal downstream into the Ghaghra River is a possibility - return would not be possible due to the presence of Girijapuri Barrage. Gharials are known to disperse across seasons for feeding, basking and mating, and it is possible that transboundary movement between India and Nepal is occurring.

In addition, rapid habitat degradation and reduced availability of sandy substrate could also be a contributing factor. Based on the available nesting data (Table 1), the number of hatchlings being produced annually is estimated to have decreased by around 50% between 2020 and 2024.

The benefits of the artificial sandbanks constructed by the forest department each year is difficult to interpret. Although they have been utilised, the quality of these sites is sub-optimal due to lack of sufficient sand and vegetational succession. But perhaps most importantly, reduced channel flow in the Girwa River, siltation of channels, growth of reed species in the channels (*Typha*, *Saccharum*, *Phragmites*, etc.), and poor co-ordination between stakeholders, have led to absence of water near Gharial nesting sites in Girwa (Fig. 2).

Figure 2. Girwa River channel in KWS at hatching time (June 2025). The Girijapuri Barrage gates are open and there is no water in the channel near the sites.

Gharials prefer free flowing rivers with annual flooding behaviour to facilitate erosion-deposition of sediments, to create sandy banks and mid-river sandbars. Habitat parameters such as substrate quality, distance from water, presence of deep pools and vegetation on the riverbanks for hatching, are some key requirements for successful nesting in Gharials. The channel shift in the Karnali River in 2010 led to poor floods and reduced erosion-deposition, and thus facilitated growth of reed species in the riparian areas (Vashistha *et al*. 2021b).

The gates of Girijapuri Barrage downstream are opened three times per year, twice for maintenance and once during the flood season. The river channel decreases to the basic level (up to 2-3 m reduction) because the backwaters of the Girijapuri Reservoir are drained. In the last few years, the gates were opened when the nesting or hatching were taking place, thus making the nesting sites inaccessible to female Gharials. In several instances, nests had to be excavated manually to avoid the mortality of the hatchlings.

We recommend that water flow in the Girwa River be increased by desiltation at Chisapani in Nepal and diverting water back to Girwa to maintain a minimum ecological flow in the river. Further, if the degradation of Girwa is to be considered a natural fate of the river, Gharial monitoring in Kaudiyala should be prioritized. The Girwa-Kaudiyala Rivers complex acts as a source for Gharial dispersal into the downstream Ghaghara. Hence, a joint effort should be made to monitor and conserve Gharials in the protected areas of Girwa and Kaudiyala inside KWS as well as in the unprotected stretches of Ghaghara downstream, together (Vashistha *et al*. 2024). Initiatives should also be taken to study the impact of the habitat and environmental changes on the thermal dynamics of the nests, including incubation temperatures, hatchling sex ratios and development (Sharma *et al*. 2025).

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Australia & Oceania

Papua New Guinea

On 28 May 2025, the National Agriculture Research Institute of Papua New Guinea organized its 14th Agricultural Innovations Show and Exhibit in Lae, Morobe Province. Mainland Holdings Ltd Crocodile Farm (MHLCF) was invited to participate at this annual event.

Heidi Loize and Cynthia Anton, MHLCF employees on duty at the stall, were kept very busy all-day providing information on crocodile husbandry and answering many questions about crocodile biology and ecology (Figs. 1 and 2), while keeping a watchful eye on the couple of live hatchlings (displayed for the enjoyment of the kids; Fig. 3). They also particularly emphasized how the farm positively contributes to the conservation and sustainable management of the wild crocodile populations in PNG, as well as to the economic development of the resource owners living in remote wetlands through the annual harvest of wild Saltwater crocodile (*Crocodylus porosus*) eggs in the Middle Sepik River.

Our biggest attraction was undoubtedly the skull of the late "Charlie", who was our largest Saltwater crocodile amongst our captive breeding stock. In 1997, when he was last measured, he weighed 720 kg and was 5.10 m long. Twenty-six years later, when he died in January 2023, he was 5.45 m long.

Figure 1. Cynthia Anton and Heidi Loize getting ready to showcase MHLCF and the crocodile program.

Figure 2. MHLCF employees Mitchel Kouro (left), Cynthia Anton (middle) and Heidi Loize (right) greet their first visitor (red shirt).

Figure 3. Curious showgoers looking at hatchlings.

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West & Central Africa

Nigeria

UPDATE ON THE WEST AFRICAN SLENDER-SNOUTED CROCODILE (*MECISTOPS CATAPHRACTUS*) IN NIGERIA. In 2000, the Executive Director of Biodiversity Preservation Center (BPC) embarked on a project named "Voyage of Discovery", and travelled all over Nigeria to search for the "forgotten" animals of Nigeria and document them for conservation and posterity. He searched every known habitat of the Critically Endangered West African Slender-snouted crocodile (*Mecistops cataphractus*), but couldn't find any. In June 2006, Professor Luca Luiselli (University of Rome, Italy) sighted a *M. cataphractus* at Hawkins Street Beach Market at Calabar, Cross River state. This latest report encouraged us to intensify the search across the six states of Akwa Ibom, Bayelsa, Cross River, Delta, River and Ogun - but up until 2009, no specimens were found.

In 2010, fearing local extinction of the species, Edem Eniang offered a cash reward to anyone who would show any evidence of the animal in Nigeria (eg photograph, video, skin, skull, etc.; Fig. 1), but to no avail. Hope of finding the species in Nigeria was almost lost until the Critical Ecosystem Partnership Fund (CEPF), in conjunction with Birdlife International, awarded BPC a small grant in June 2017 for a tortoise conservation project in southern Nigeria. In December 2020, the Global Environment Facility (GEF), under its Small Grants Programme (SGP Nigeria) implemented by the United Nations Development Programme (UNDP), further assisted BPC to conduct tortoise and crocodile conservation initiatives. In 2021, Save The Manatee Club (STMC) of USA in conjunction with African Aquatic Conservation Fund (AACF) Senegal, sponsored an African Manatee conservation project for BPC. A poster of the target species, with a dedicated hotline for citizens to call 24/7 whenever they sighted the species, resulted (Fig. 1).

Figure 1. Campaign poster used in the ongoing nationwide "Voyage of Discovery" program.

ITeam BPC then intensified the "Voyage of Discovery" that started in 2000, and continued exploring known and potential habitats of the species across Nigeria. However, they only recorded unconfirmed sightings and numerous false alerts and misidentifications, especially in two separate indigenous communities that worship crocodiles as totems, namely Okwa, an enclave community in Okwangwo Division of Cross River National Park (CRNP), and Ukwa community in Eniong Abatim Clan of Odukpani Local Government Area (LGA).

In 2019, Team BPC encountered a local fisherman from Ibiono Ibom LGA, who hunts African Manatee (*Trichechus senegalensis*) for a living, and who described a crocodile he had killed in 2017, about 350 m from the Okopedi market jetty on Eniong Creek. He volunteered to hand the skull of the crocodile to BPC, and it is now held at the BPC Conservation Education Center in Uyo (Fig. 2).

Figure 2. Skull of adult *M. cataphractus* killed at Okopedi Itu (2017) and lower jaw bones of specimen killed at Ituntah (2025), held at the BPC Conservation Education Center.

Since the "discovery" of the species at Okopedi Itu on Eniong Creek in 2017, BPC intensified its surveys and recorded 5 sightings, comprising glimpses of the very shy and elusive crocodile in its severely altered habitat along the Eniong Creek channel with its black waters. At the same time (2020-2024), and in the same habitats, Team BPC encountered 17 West African crocodiles (*Crocodylus suchus*) and 29 Dwarf crocodiles (*Osteolaemus tetraspis*). This effort was later boosted when Dr. Matthew Shirley visited BPC and went to one of the habitat communities of Obio Usiere in March 2022, and interacted with stakeholders about conservation of the species (see Fig. 3).

Figure 3. Dr. Matthew Shirley with children from the indigenous Efik community of Obio Usiere.

BPC continued working, despite having no further funding, and maintained contact with informants across known territories to report on sightings and hunting incidents. On the

evening of 12 April 2025, Team BPC (Inemesit Eniang) were alerted by a community informant of the killing of a large *M. cataphractus* in a small swampy river tributary that flows into Eniong Creek by a fisherman from the village of Ituntah in Igbere clan of Bende LGA, Abia state. The fisherman had caught the crocodile using a hook baited with a large bull frog and tethered with a long marine rope. When the fisherman arrived on the scene, he was scared due to the crocodile's size, and invited a hunter to come and shoot the animal with a firearm.

Team BPC visited the site (Figs. 4 and 5) on 18-21 April 2025 to investigate the incident and collect data that could help understand more on the hunting of *M. cataphractus*. At Itunta Ebere (Ikwuano LGA), the team was led by a hunter to the Enhi River, which flows into Eniong Creek, Akwa Ibom state. Investigation revealed that hunters use hooks and lines locally called "Aret" in the Igbo dialect. The hook is made in Norway, and is commercially called "Size 1" (75 mm in length) (Fig. 6). The system of hunting involves the use of live bait such as adult frogs (Bull and Platanna), Giant African snails and Catfish, which often remain alive on the hooks and moving to attract crocodiles or other animals.

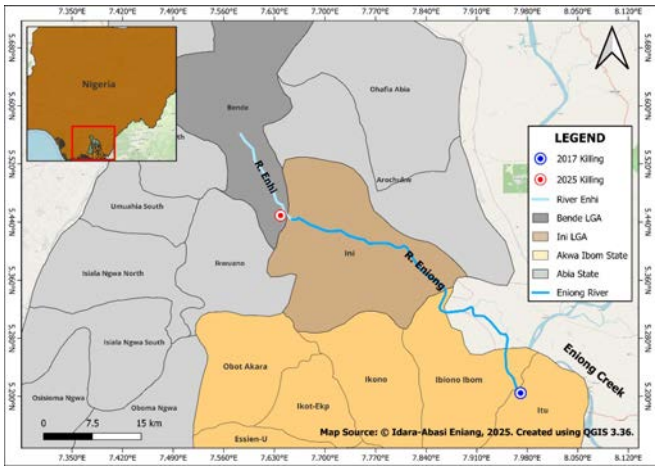

Figure 4. Locations where *M. cataphractus* were killed in 2017 (Itu) and 2025 (Intuntah).

Figure 5. Inemesit Eniang of Team BPC (right) poses with a community leader by the Enhi River, Abia state, where a large *M. cataphractus* was killed in April 2025.

Figure 6. Francis Akor with crocodile hook.

The crocodile was assumed to be an adult male (Fig. 7). Following tradition, part of the animal was shared with the fisherman's family and kin, and the remaining carcase was sold for 600,000 Nigerian Naira (= $US370.50).

Figure 7. Large *Mecistops catapractus* killed in April 2025, a large portion of which was sold as bushmeat (see text).

The Enhi River (Abia state) flows into the Eniong River and through Eniong Creek (Akwa Ibom state) into the Cross River. It is somewhat slow-moving, with minimal current and brownish in colour as a result of persistent anthropogenic activities. It is generally shallow in depth and approximately 4 m wide with sandy banks and some floating aquatic plants. The area is mainly riparian forest with mixed undergrowth, with suitable terrain such as sandy riverbanks on which crocodiles can bask. There is a low-medium level of human activity in the region, mainly farming, fishing and emerging cocoa plantations following the post-COVID19 cocoa bean boom that has come to stay in Nigeria. With its emerging threats to biodiversity conservation, the latter fosters habitat destruction through land clearing and forest destruction as well as poisoning of water bodies with agrochemicals (herbicides and pesticides). The hunter responsible for the April 2025 killing is involved with artisanal fishing and subsistence farming as his major economic engagements.

Some community members reported that there are "many" crocodiles in their river, but the lack of confirmed records on *M. cataphractus* suggest that this may reflect other species. They also stated that no government agency has carried out any conservation awareness in the area.

Based on the foregoing, BPC recommends:

1. Intensive field surveys be organized to cover the stretch of river channel between the Enhi River and Eniong Creek, to collect information that will foster policy and sustainable conservation of *M. cataphractus*.

2. At a broader level, implement a program to quantify distribution and population density of *M. cataphractus* throughout Nigeria.

4. Conservation education, awareness and sensitization of all stakeholders, sponsored by state and local Governments at all levels.

5. Develop options for the long-term conservation of *M. cataphractus,* including re-establishment of totem animal traditions with indigenous people and local communities, and celebrate iconic species instead of killing them for bushmeat, and discourage illegal hunting of crocodiles and other wildlife species.

Acknowledgements

Prof. Edem Eniang and Team BPC are very grateful to the following organizations and people: Institute of Development Ecology Conservation and Cooperation, Rome, Italy; Critical Ecosystems Partnership Fund in conjunction with Birdlife International under their Guinean Forest of West Africa Hotspot Conservation Program; Save The Manatee Club (STMC) of USA; African Aquatic Conservation Fund, Joal, Senegal; Global Environment Facility, under its Small Grants Programme (SGP Nigeria) implemented by the United Nations Development Programme; the indigenous people and local communities of Eniong Abatim, Odukpani LGA, Cross River state, Nigeria; the indigenous people and local communities of Bende LGA, Abia state, Nigeria; and, the indigenous people and local communities of Ibiono Ibom and Itu LGAs of Akwa Ibom state, Nigeria.

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Recent Publications

Eme, J., Martinez Batista, G., Keneda, A., Tate, K., Melancon, G. and Crossley II, D.A. (2025). Cardiovascular responses of embryonic alligator (*Alligator mississippiensis*) exposed to 10% O_2 and sodium cyanide (NaCN), a chemoreflex-inducing compound. Comparative Biochemistry and Physiology A (doi: 10.1016/j.cbpa.2025.111865).

Abstract: The possibly interactive effects of changes in atmospheric respiratory gases (hypoxia or hypercapnia) and pharmacological chemoreceptor stimulation have not been assessed previously. We present a series of experimental protocols investigating embryonic alligators' capacity to modulate a cardiovascular neural chemoreflex response to a known chemoreceptor stimulant, sodium cyanide (NaCN). We incubated alligator embryos in 21% (normoxia) and 10% O_2 (hypoxia) beginning at 20% of embryonic incubation, and at 70% and 90% of incubation we measured heart rate and blood pressure responses to NaCN. These NaCN responses also included examining the effects of NaCN after 1-h exposure to 10% O_2, ganglionic blockade with hexamethonium chloride and α-adrenergic blockade with phentolamine. Injections of NaCN into the chorioallantoic artery caused a rapid bradycardia followed by a secondary hypertension, which can be attributed to an autonomic nervous system mediated reflex loop. We compared the heart rate response to injections of 1 mg kg^{-1} NaCN before and after a 1-h 10% O_2 exposure, and it was clear that embryonic alligators lacked capacity to change the intensity of cardiovascular responses to this compound. Hexamethonium greatly lessened the rapid bradycardia, and at 90% of incubation, the secondary hypertensive response to NaCN appeared due to α-adrenergic stimulation, as phentolamine lessened the response. Collectively, these data indicate that while a cardiovascular chemoreflex can be induced by NaCN, the heart rate response lacks plasticity and is not modulated by hypoxic incubation in embryonic alligators.

Suvo, M.S.H., Uddin, M.S., Shafiquzzaman, M., Islam, M.T. and Bari, M.S. (2025). Cloacal prolapse of a Marsh crocodile (*Crocodylus palustris*) at Chittagong Zoo in Bangladesh: A case report. Journal of Advanced Veterinary Research 15(2): 281-283.

Abstract: A male Marsh crocodile (*Crocodylus palustris*) weighing 50 kg from Chittagong Zoo was reported to have suffered from depression, anorexia for a day, difficulty in passing feces and an observed mass at the cloacal area. The animal was reported to be

apathetic and lethargic. During a controlled clinical examination performed in dorsal recumbency, a large, inflamed, edematous, and reddish prolapsed mass protruded through the cloaca. In keeping with the prolapsed organ's extended exposure, the affected area showed tissue damage and localized irritation. Thus, a cloacal prolapse was diagnosed based on the clinical findings. Treatment involved the cleaning of the prolapsed tissue with warmed saline to reduce chances of infection, smearing with a concentrated sugar solution to reduce edema and inflammation, replacing the prolapsed tissue gently, and the application of transverse sutures to avoid recurrence but not compromising the functioning of the vent. Antibiotics and NSAIDs were given intramuscularly to combat infections and inflammation respectively. The post-operative care included rehydration and a change of diet to ensure the healing process and prevent the recurrence of the condition. This case serves to illustrate a multidisciplinary approach in the management of cloacal prolapse in crocodiles and emphasizes once more the dietary, hydration, and stress components that are considered critical in captivity.

Piczak, M.L., Lennox, R.J., Vollset, K.W., Preisner, B., Eros, T., Bulté, G., Keevil, M.G., Richardson, J.S. and Cooke, S.J. (2025). On the underappreciated role of scavengers in freshwater ecosystems. BioScience (https://doi.org/10.1093/biosci/biaf032).

Abstract: The role of scavengers is well understood in terrestrial and marine systems but less so in freshwater ecosystems. We synthesized existing knowledge of scavenger ecology in freshwater, particularly within the context of the Anthropocene, including the patchy distribution of carrion, consumer responses, competition, and transfer of energy, nutrients, and diseases. We also explored ecosystem services provided by freshwater scavengers, such as direct material benefits and improvements in water quality. In addition, we examined how human activities - such as climate change, disturbance, exploitation, and fragmentation - are affecting scavenger behavior and abundance. To mitigate these anthropogenic impacts, we identified management options for environmental practitioners and decision-makers, emphasizing the importance of integrating freshwater scavenger roles into management plans and providing adequate policy protections. Finally, we highlighted key knowledge gaps, particularly regarding how changes in scavenger populations and their food sources may alter ecosystem structure and function.

Usami, K. and Kubo, M.O. (2025). *In-vitro* puncture experiment using alligator teeth tracks the formation of dental microwear and its association with hardness of the diet. Anatomical Record (doi: 10.1002/ar.25659).

Abstract: With the development of dental microwear texture analysis (DMTA), there has been an increasing application of DMTA for dietary estimation in extant and fossil reptiles, including dinosaurs. While numerous feeding experiments exist for herbivorous mammals, knowledge remains limited for carnivorous reptiles. This study aimed to qualitatively and quantitatively evaluate the formation of dental microwear through repeated puncture of different types of food using isolated teeth from the American alligator (*Alligator mississippiensis*) in an *in-vitro* experiment. Eleven isolated teeth were mounted on a force gauge, and each tooth sample was repeatedly punctured 200 times into sardines (tooth sample size, N= 6) and crayfish (N= 5). The tooth surfaces were scanned using a confocal laser microscope before, during, and after the experiment to track changes in the tooth surface. Additionally, the maximum force during puncture was measured with the force gauge. Examination of surface roughness parameters before and after the experiment revealed a significant increase at the tooth apexes for both types of food. Furthermore, the trials with crayfish increased microwear depth and density more than the sardine trials. There was a significant positive correlation between the total force experienced by each tooth and the changes in surface roughness parameters in the crayfish trials, indicating that greater force results in more dental wear. The findings of this study are significant as they complement existing feeding experiments and comparative studies of wild species with different diets, and they demonstrate the effectiveness of experimental approaches in understanding the formation mechanisms of dental microwear.

Santana, D.J., Moura, A., Siqueira, A.L., Antures, J., Nunes, A.V., Espinoza, A., Garcia, L.C. and Martins, P.I. (2025). First recorded predation of a Yacaré caiman, *Caiman yacare* (Daudin, 1801), by a Tuiuiú, *Jabiru mycteria* (Lichtenstein, 1819), in the Southern Pantanal, Brazil. Herpetology Notes 18: 289-291.

Buenfil-Rojas, A.M., González-Jáuregui, M., Ochiai, M. and Iwata, H. (2025). Developing an efficient protocol for RNA extraction from Morelet's crocodile caudal scute biopsies. MethodsX (https://doi.org/10.1016/j.mex.2025.103315).

Abstract: Addressing the challenge of RNA extraction from hard tissues of wild animals is crucial, especially given the species' conservation and the ethical imperative to avoid lethal sampling methods. This study focuses on optimizing a protocol for non-invasive RNA extraction from the caudal scutes of *Crocodylus moreletii*, an endemic species in the Yucatan Peninsula, Mexico, highlighting the significance of conducting research in tropical areas with limited laboratory access. Accompanying with RNA preservation buffer for the scute tissue, we explored various tissue disruption and homogenization techniques to facilitate RNA isolation and purification. The purity and integrity of RNA were assessed to determine the best extraction method. The optimized protocol involved ultrasonication of 75 mg samples, followed by a 3-hour Proteinase K incubation, yielding RNA with concentrations from 18.7 to 154.7 ng/μL, satisfactory purity (260/280 ratio ~2), and integrity (RNA Integrity Number >5.5). Further validation through quantitative PCR analyses confirmed the suitability of the extracted RNA for studies on gene expression levels and were sufficient for next-generation sequencing (NGS). This protocol may provide a basis for developing similar methodologies for other non-model species with hard tissues.

Pritz, M.B. (2025). Development of the epithalamus in *Alligator mississippiensis*. Brain Structure and Function 230: Article 50.

Abstract: The epithalamus is present in all vertebrates where it is a central part of the dorsal diencephalic conduction system whose functions are critical for survival. The epithalamus consists of both nuclei and tracts. Studies on the development of the epithalamus in amniotes (reptiles, birds, and mammals) based on cytoarchitecture have commonly been part of a larger report on the embryogenesis of the diencephalon. Of these, observations on the epithalamus of reptiles are few with limited descriptions and figures. The present analysis fills this gap in knowledge by examining the development of the epithalamus in one group of reptiles, *Alligator mississippiensis*, using stains for cells and fibers. The time of origin and subsequent development of the nuclei and the tracts that course through the epithalamus were determined. These data provide a basis for future studies and for comparisons with other amniotes.

Pacheco-Sierra, G., Amavet, P., Siroski, P., Piña, C., Patrón-Rivero, C. and Yáñez-Arenas, C. (2025). Hybridization patterns and evolutionary clues in broad-snouted caiman and yacare caiman: Insights from phylogeographic and ecological analysis. Journal of Zoology (https://doi.org/10.1111/jzo.70013).

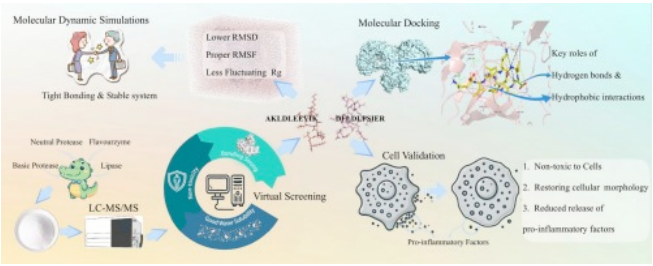
Abstract: Our study explores the dynamics of introgressive hybridization between two sympatric crocodilian species, *Caiman latirostris* and *Caiman yacare*, shedding light on the ongoing genetic exchange. Hybrid individuals exhibit a notable absence of distinct boundaries between parental and hybrid forms, potentially

influenced by factors like limited dispersal potential or unexplored extrinsic variables. Despite sympatric coexistence, the species occupy distinct ecological niches, limiting hybridization. Climatic factors, particularly during autumn and winter, may further impact migration and energy allocation, contributing to the observed introgression pattern. Significantly, the prevalence of individuals with hybrid index values indicates introgressive hybridization between *C. yacare* and *C. latirostris* populations, supported by ecological niche models that found wide areas with potential for hybridization across much of their distribution. The range of hybrid index values suggests gene flow and the transfer of adaptive traits through hybridization. The divergence between *C. yacare* and *C. latirostris*, approximately 26 million years ago, aligns with geological and climatic changes during the Oligocene. Furthermore, our findings support a directional radiation pattern in *C. latirostris* populations from south to north, influenced by climatic changes and ecological niche shifts. This study revealed the dynamics of introgressive hybridization between *C. yacare* and *C. latirostris*s, emphasizing the complex interplay of ecological, temporal, and environmental factors in shaping genetic patterns and evolutionary history.

Ugemuge, S., Badhawan, A.D., Gupta, P. and Vashistha, G. (2024). Twinning in a wild breeding population of Gharials (*Gavialis gangeticus*) in India. Reptiles & Amphibians 1: e21619.

Hu, Y., Ma, W., Xu, G., Zhao, W. and Yu, Z. (2025). Valorization of crocodile head for anti-inflammatory peptides: In silico screening and cellular validation. Food Research International 211 (https://doi.org/10.1016/j.foodres.2025.116457).

Abstract: In this study, two novel anti-inflammatory peptides were identified from the hydrolysates of crocodile heads using computer-assisted techniques and *in vitro* cellular experiments. Their interaction mechanisms were elucidated through molecular docking and molecular dynamics simulations. A total of 67 peptides were identified via LC-MS/MS, with AKLDLEEVIK and DFLDLPSIER emerging as promising candidates for anti-inflammatory activity. Results of in vitro cellular experiments demonstrated that these peptides significantly inhibited LPS-stimulated macrophage hyperactivation, resulting in reduced release of nitric oxide (NO) and pro-inflammatory cytokines, ie TNF-α, IL-1β, and IL-6. Molecular dynamics (MD) simulations and docking analyses revealed that AKLDLEEVIK and DFLDLPSIER displayed high affinity for the TLR4-MD2 complex, with stable and tight interactions. Key residues Arg90, Ser118, Cys133, and Arg264 were identified as critical for the recognition and interaction between the peptides and TLR4-MD2. This study provides a theoretical foundation for the development of anti-inflammatory functional foods derived from crocodile heads.



Yan, L., Zhang, Q., Liu, D., Zhao, W. and Yu, Z. (2025). Identification and molecular mechanism of novel salt-enhancing peptide in crocodile hemoglobin: a combined E-tongue, molecular docking, and dynamic simulation. Journal of Science and Food Agriculture (doi: 10.1002/jsfa.14289).

Abstract: This study aimed to reduce salt intake without compromising food sensory properties. Novel salt-enhancing peptides were identified from crocodile hemoglobin via virtual screening and evaluated for their salt-reducing effects using molecular docking, electronic tongue analysis, and molecular dynamics simulations. A total of 24 water-soluble and non-toxic peptides were obtained by virtual enzymolysis. The protein structure of human transmembrane channel-like 4 (TMC4), a novel salt taste receptor, was constructed using AlphaFold2 and applied as a receptor. The salt-reducing effect of these peptides was verified using electronic tongue analysis, in which the peptide SSDDK had a significant salt-reducing effect. Molecular docking results showed that the main force for peptide binding to the TMC4 receptor was conventional hydrogen bonding, and Arg 583, Arg330, and Glu284 were the key amino acid residues for its binding. Molecular dynamics simulations also verified the stability of peptide-receptor binding. This study demonstrates that the peptide SSDDK, derived from crocodile hemoglobin, can be used to enhance salty taste and reduce sodium salt use.

Lozano, H.K. (2025). "A Perfect Paradise for Indians, Alligators, Serpents, Frogs": Reptiles and Florida in the era of the Seminole Wars. Animal History 1-21 (https://doi.org/10.1525/ah.2025.2631634).

Abstract: This article explores the cultural and environmental significance of reptiles - in particular, crocodilians and snakes - within US accounts of Florida during the first half of the 19th century, with a specific case study of the Second Seminole War of the 1830s and 1840s. Interpreting Florida as a human-reptile contact zone has value both for our understanding of the territory's US borderland history and for the field of animal history, in which reptiles have remained often at the fringes. I argue that herpetofauna (reptiles and amphibians) shaped in myriad ways the experiences and imaginations of white soldiers and travelers in "frontier" Florida. Race and species at times blurred in fearful Euro-American conceptions of Florida as an inhospitable, water-logged territory - understood as in (disputed) possession of Native Americans, but also the alligators and snakes that seemed to "abound" in its rivers, woods, and everglades, and thus became actors within this historical "more-than-human".

Melstrom, K.M., Angielczyk, K.D., Ritterbush, K.A. and Irmis, R.B. (2025). For a while, crocodile: crocodylomorph resilience to mass extinctions. Palaeontology 68(2): e70005.

Abstract: Crocodylomorphs are the sole survivors of the pseudosuchian clade and have endured two mass extinctions. Despite being stereotyped as 'living fossils', the characteristics that facilitated their survival remain largely unknown, but trends in other clades, such as mammals, suggest that dietary ecology may play a key role in persisting during and after mass extinctions. To test the role of dietary ecology in the survival of crocodylomorphs, we use geometric and linear morphometrics to quantify the cranial shape of crocodylomorphs throughout the Mesozoic and into the Cenozoic. We then compare these data to living amniotes and combine the results with additional morphological proxies, which together facilitate the reconstruction of dietary ecology. We find that crocodylomorph cranial morphology exhibits a greater disparity during much of the Mesozoic Era than is seen today. Many extinct crocodylomorphs express morphologies that overlap with extant crocodylians and lepidosaurs, indicating a diverse range of diets, but convergence with extant mammals is exceptionally rare. Numerous crocodylomorphs from across geological time and phylogeny span a range of morphospace not occupied by sampled extant amniotes. Using these data, we suggest that a generalist dietary ecology is associated with mass extinction survivors, a trend previously observed in other clades, such as mammals. Terrestrial generalists appear to survive and diversify following the end-Triassic mass extinction, whereas semiaquatic generalists persist through the end-Cretaceous mass extinction. We propose that one reason for the success and longevity of the crocodylomorph clade is their remarkable dietary flexibility, a characteristic that is still observed

in living crocodylians.

Dittrich, C., Mangione, R., Marquis, O., Ringler, E. and Lemaire, J. (2025). Ecological and behavioral implications of multiple paternity in the Smooth-fronted caiman in French Guiana. Ecology and Evolution 15: e71337.

Abstract: The identification of genetic mating systems in a variety of species has challenged the previous view on animal mating patterns over the past decade, resulting in the identification of multiple paternity across all vertebrate classes. In crocodylians, all species that have been investigated demonstrate multiple paternity, which may represent the ancestral state of the clade. The smooth-fronted caiman, *Paleosuchus trigonatus*, is one of the last species whose genetic mating system has yet to be investigated. In this study, we analyzed genetic samples of the smooth-fronted caiman in French Guiana, a secretive species that is difficult to observe in the wild. Scute samples were taken from three populations and five groups of neonates that hatched shortly before. Microsatellite markers were used to infer the minimum number of fathers that sired each clutch. Our results clearly show that multiple paternity was common, with 60% of the sampled group of neonates showing a minimum of two sires. The potential ecological and behavioral implications of this finding are discussed, as well as recommendations for future research avenues to elucidate this cryptic species' mating behavior and environmental constraints.

Chávez-Dagostino, R.M., Ojeda-Adame, R.A. and Bravo-Olivas, M.L. (2025). Fishermen-crocodile interactions in a Mexican tourist context. Pp. 12-22 *in* Human-Animal Relations in Tourism, Leisure and Development: Perspectives from Latin America. CABI: Boston.

Abstract: Tourism along the coast influences relationships with small-scale fishing activities. It has been suggested that a touristm context might promote a positive perception of fishers' quality of life in the region of Puerto Vallarta, Mexico. Generally, people living in coastal zones perceive a rising population of crocodiles, which increases conflicts between fishermen and crocodiles. This chapter analyses the relationship between anglers and crocodiles in a tourism context. Through qualitative research, 12 experienced anglers from the region were invited to participate in semi-structured interviews. The responses were analysed and synthesized into categories of conflictual and harmonious relationships, and their relation to tourism. Both types of interactions were found, along with a perceived negative influence of tourism activity on the fishermen's lives, resulting in unfavourable scenarios for crocodile conservation. While in rural contexts with alternative tourism models there is a cultural significance attached to crocodiles, this was absent in Puerto Vallarta.

Karawita, K.V.D.H.R., Fernando, K.R.A.W., Illukkumbura, K.M.T.W., Wijenanda, K.R.A.T., Rathnayaka, K.W.A.M.A.G.T.M. and Kulathunga, G.H.D.D. (2025). Human-crocodile conflict in the Nilwala River Basin: Socio-economic impacts on flood-prone communities. Pp. 48 *in* Proceedings of the 29th Forestry and Environment Symposium, Volume 29.

Abstract: This study investigates the socio-economic impacts of human-crocodile conflict in the Nilwala River Basin, focusing on flood-prone areas such as Kadduwa, Karagoda, Uyangoda, Kirabha Ara, and Paraduwa. Primary data were collected through semi-structured interviews with 100 households located in flood-prone areas. Focus group discussions were also held with victims of crocodile attacks and community members. Frequent crocodile encounters, particularly during flooding events, have significantly disrupted agricultural activities of farmers. The number of 11 victims who were severely injured by crocodile attacks experienced long-term physical and financial hardship, being unable to return to normal life, work or farming. Moreover, out of recorded crocodile attacks, 47 were on domestic animals such as dogs and cattle, while 12 cases led to human fatalities, further heightening fear and insecurity within the affected communities. Qualitative analysis of the data revealed recurring socio-economic challenges due to crocodile attacks, including medical expenses, psychological trauma, and a loss in productivity of cattle farming. Despite the negative impact of crocodile attacks, there is a benefit for local tourism as 60% of interviewees specified that crocodile sightings during boat rides along the Nilwala River have attracted foreign tourists, generating a new source of income for the community. The study highlights the urgent need for effective mitigation strategies to address human-crocodile conflicts. These should include community awareness programs to minimize the risk of encounters while ensuring crocodile conservation, as the species is protected and plays a crucial ecological role. The study findings have further shown the importance of policies to ensure human safety, economic well-being, and wildlife conservation, supporting sustainable development in the Nilwala River Basin.

Gila, A., Maina, A.N. and Mnisi, C.M. (2025). Utilisation of Nile crocodile (*Crocodylus niloticus*) offal meal waste by-products as a novel protein substrate in the formulation of diets for Jumbo quail. Discover Agriculture 3: 59.

Abstract: This study evaluated the effects of incorporating full-fat crocodile offal meal (COM) in Jumbo quail diets as a replacement for soybean meal. A total of 256, one-week-old quail were assigned to 32 cages (8 birds/cage) in a completely randomized design, with eight replicates per treatment. Four diets were formulated: a control diet with no COM and three others containing 50 (COM5), 100 (COM10), and 150 g/kg COM (COM15). Body weight was recorded weekly, and daily feed intake was monitored to calculate the gain-to-feed ratio. At 5 weeks, post-slaughter measurements were taken. Weekly feed intake was significantly affected ($P<0.05$), with COM15 having the lowest and COM5 the highest intake values ($P<0.001$). COM5 yielded the greatest weight gain ($P<0.001$) and higher survival rates ($P<0.001$) compared to the other groups. Organ, breast, and thigh weights were generally higher in COM5. Symmetric dimethylarginine (SDMA) levels were elevated in the COM5 and COM15 diets ($P<0.05$), while the Control showed lower SDMA. Feed digestibility, cholesterol, and water-holding capacity increased linearly ($P<0.05$) with COM inclusion, while large intestine sizes decreased. Survival rates, organ weights, and muscle yields exhibited linear and quadratic trends ($P<0.05$). Negative quadratic effects were observed for glucose and calcium, while positive ones were observed for haemoglobin and amylase. In conclusion, a 50 g/kg COM inclusion provided optimal results for quail performance, while higher levels negatively impacted outcomes, suggesting further research on COM inclusion levels.

Shuai, Y., Zhou, Y., Yi, P. and Zhao, J. (2025). Case report: the first record of *Eustrongylides* sp. infection in the Chinese alligator (*Alligator sinensis*). Frontiers in Veterinary Science 12 (doi: 10.3389/fvets.2025.1579738).

Abstract: Although digestive tract parasites are widely spread in wild or farmed crocodiles worldwide, only limited data are available on *Eustrongylides* sp. reported in crocodiles. The Chinese alligator (*Alligator sinensis*) is endemic to the Yangtze River in China, and only a few parasites have been reported to infect the Chinese alligator.In this study, a nematode was collected in the abdominal fascia of a captive deceased Chinese alligator. Cytochrome oxidase I (COI), internal transcribed spacer region (ITS) and partial small subunit DNA segments (18S) sequences were amplified to further confirm the genetic information of the species. The results showed that the nematode was attributed to the genus *Eustrongylides*. Over all, this is the first report of *Eustrongylides* sp. infected in the Chinese alligator, expanding the known host range of this nematode and contributing to a better understanding of its life cycle.

Walter, J.D., Massonne, T., Paiva, A.L.S., Martin, J.E., Delfino, M. and Rabi, M. (2025). Expanded phylogeny elucidates *Deinosuchus* relationships, crocodylian osmoregulation and body-size evolution. Communications Biology 8(1): 611 (doi: 10.1038/s42003-025-07653-4).

Abstract: Transmarine distribution and gigantism in the Late Cretaceous North American crocodyliform *Deinosuchus* has been difficult to reconcile with consistently inferred phylogenetic relationships to alligatorids, an otherwise freshwater and smaller-bodied group. We present an expanded phylogeny with increased spatiotemporally coherence that reinterprets species of *Deinosuchus* as stem-group crocodylians together with further putative alligatoroids, *Leidyosuchus canadensis* and the European *Diplocynodon* spp. (closely related to North American *Borealosuchus*). The novel topology elucidates the evolution of osmoregulation in Crocodylia and its close relatives by inferring plesiomorphic saltwater tolerance for *Deinosuchus* and the crown-group as well as secondary loss already in stem-group alligatorids. Divergence of Alligatoroidea coincided with extreme mid-Cretaceous sea level highs and the distribution of *Deinosuchus* across the Western Interior Seaway can be best explained by marine dispersal. Phylogenetic body-length analysis using a head-width proxy reveals phyletic dwarfism early in alligatoroid evolution and a reasonable total length estimate for the most complete specimen of *Deinosuchus riograndensis*. We find that gigantism in crocodyliforms is correlated with high-productive extensive aquatic ecosystems in the present and the past.

Colston, T.J., Pirro, S. and Pyron, R.A. (2025). The complete genome sequences of 101 species of reptiles. Biodiversity Genomes (doi: 10.56179/001c.129597).

Abstract: We present the complete genome sequences of 101 species of reptiles (four testudines, one crocodilian and 96 squamates) including the complete genome of one type specimen. Illumina sequencing was performed on DNA extracted from wild-caught specimens. The reads were assembled using a de novo method followed by a finishing step. The raw and assembled data are publicly available via Genbank.

Boucher, M.N., Stilwell, J.M., Tellez, M., Boylan, S.M., Rainwater, T.R., Whitmire, S.L. and Anderson, J.T. (2025). Pansteatitis in wild American alligators (*Alligator mississippiensis*). Journal of Wildlife Diseases (doi: 10.7589/JWD-D-24-00190).

Abstract: Pansteatitis can be fatal and contribute to wild crocodilian population declines. We documented lesions consistent with pansteatitis in two wild American alligators (*Alligator mississippiensis*) from South Carolina and Mississippi, US. These findings extend our knowledge of pansteatitis in wild crocodilians, for which few observations exist beyond Nile crocodiles (*Crocodylus niloticus*).

Sharma, S.P., Katdare, S., Badola, R. and Hussain, S.A. (2025). Nest thermal dynamics and predicted sex ratio in endemic freshwater crocodylian, gharial (*Gavialis gangeticus*) in Chambal River, India. Evolutionary Ecology (https://doi.org/10.1007/s10682-025-10340-9).

Abstract: Understanding the thermal dynamics of nests is critical for crocodylians, as they rely on optimal environmental temperatures for physiological processes, developmental success, and sex determination. Each of these factors is critical for maintaining population dynamics and the long-term persistence of species in the wild. In the present study, we assessed the thermal dynamics of the 17 wild gharial (*Gavialis gangeticus*) nests over three nesting seasons (2017-2019). We observed a significant difference in incubation temperature between the monitored nests across the years. The lowest and the highest incubation temperatures were (mean ± standard deviation) 30.3 ± 2.3°C and the highest was 32.9 ± 2.8°C, respectively. The predicted hatchling sex ratio based on constant temperature equivalent (CTE) suggests female dominanc (1:3.2) in the monitored gharial nests. Considering the skewed sex ratio and nest temperatures reaching viable upper thermal limit (33.5°C), it is recommended to implement continuous monitoring of thermal dynamic of the gharial nests. Conservation efforts should therefore prioritize the protection and management of nesting habitats, establishing long-term monitoring of nest thermal dynamics and reproductive success across multiple nesting sites to mitigate temperature-related impacts.

Angalet, B. and Green, N.S. (2025). Assessing the osmoregulatory capabilities of American alligator lingual glands. Symposium of Student Scholars 250 (https://digitalcommons.kennesaw.edu/undergradsymposiumksu/spring2025/spring2025/250).

Abstract: Crocodilians inhabit a wide variety of aquatic, marine, and estuarine habitats on 4 continents. Saltwater-adapted species and populations face considerable osmoregulatory challenges in maintaining homeostasis with respect to plasma salt [NaCl] concentration. In addition to the kidneys and cloaca found in all crocodilians, crocodiles possess a salt-secreting lingual gland whose presence and function is less understood in other crocodilians. This study investigates the lingual gland anatomy, physiology, and potential function of American alligator (*Alligator mississippiensis*) populations exposed to varying salinity levels. At each of four sites (Jekyll Island, Sapelo Island, Okefenokee NWR, and Banks Lake NWR), we will capture 12 to 15 alligators and collect plasma ion concentrations and lingual tissue samples for histological analysis. Anatomical and histological assessments of tissue biopsies processed via microscopy will identify inter-population differences. Researcher safety will be ensured using a field-standard jaw prop device. This study will enrich our understanding of alligator physiology in estuarine habitats, which will become critical over the next 100 years as sea levels rise and many coastal alligator habitats are expected to become more saline. Findings will advance reptilian physiology research by clarifying the evolutionary novelty and significance of the crocodile (and perhaps alligator) lingual gland. As apex predators, the individual health and population viability of alligators is crucial to the conservation of ecosystems they inhabit. Additionally, the study's insights into alligator osmoregulatory mechanisms may inspire advancements in treating human conditions related to fluid and electrolyte imbalances, such as kidney disease, heart failure, and dehydration, by revealing natural strategies for managing salt and water balance under extreme environmental stress.

Wilkinson, A., Reber, S.A., Root-Gutteridge, H., Dassow, A. and Whiting, M.J. (2025). Cold-blooded culture? Assessing cultural behaviour in reptiles and its potential conservation implications. Philosophical Transactions of the Royal Society B 380: 20240129.

Abstract: It is becoming clear that the cognition of a species plays an important role in successful conservation, with cultural processes being a fundamental part of this. However, in contrast to mammals and birds, very little is known about cultural processes (and the social learning that underlies these) in reptiles. Here, we summarize the current state of knowledge, consider why this information is so limited and assess candidate behaviours observed in the wild, which warrant further investigation through the lens of cultural traditions. We then make suggestions for the fundamental next steps necessary to start to address this issue. This includes future experimental work and also consideration of how existing datasets, such as those capturing animal movement or acoustic activity, can be used to assess cultural questions. In addition, we emphasize the important role that engaging key conservation stakeholders, such as zoos, aquaria and ecotourism providers, could play in furthering our understanding of cultural behaviour in this group and the potential conservation implications of this knowledge. Whether there is cultural behaviour

in reptiles and the relationship that this has with conservation remain unclear; however, the findings of this review suggest that these are areas worthy of further research.

Hilevski, S., Seimandi, C., Siroski, P. and Parachu-Marci, M. (2025). Embryonic communication in *Caiman latirostris*. Authorea (doi: 10.22541/au.174559559.94065597/v1).

Abstract: Synchronous hatching is defined as the adjustment, coordination, and control of development and hatching periods among embryos. To achieve synchronization, embryos modify their duration of incubation period and hatching periods, either by delaying or accelerating their embryonic development through "metabolic compensation". The heart rate may facilitate this communication, but its role in *Caiman latirostris* is unknown. This study evaluated whether intra- and inter-clutch hatching synchronization occurs through embryonic communication. Using eggs from four clutches at different developmental stages, we assessed the effects of mixed, individual, and control incubation treatments on heart rate, incubation period, hatching, and neonate fitness. Results revealed that mixed incubation accelerated metabolic rates, extending the incubation period without compromising hatchling development and health. Behavioral differences indicated possible some kind of exchange beyond metabolic adjustments. Also, these findings suggest heart rate as a mechanism for embryonic communication and development synchronization, though synchronous hatching was confined to eggs within the same clutch.

Baker, C.J., Campbell, M.A. and Campbell, H.A. (2025). Effects of food supplementation from tourism on crocodile bioenergetics and abundance. Journal of Environmental Management 384: 125529.

Abstract: Tourism operators frequently use supplemental feeding to enhance wildlife viewing experiences, particularly in wildlife tours. While the effects of such feeding practices on animal behaviour are well-documented, their contribution to the energetic requirements of the target species has received significantly less attention. In Australia, jumping crocodile tours utilise meat to attract estuarine crocodiles (*Crocodylus porosus*) to boats, encouraging them to leap from the water. This study aimed to assess the extent to which the meat provided by these tours sustains the daily energy requirements of the crocodiles and how this, in turn, might influence crocodile abundance and biomass. The amount fed during crocodile tours is not generally measured and varies within and between tours. Therefore, we estimated a range of feeding scenarios, from which 60-180% of the daily energetic requirements for the crocodiles residing in the designated feeding area could be met. We also found that crocodile abundance and biomass were statistically greater within the feeding area. While our findings do not definitively indicate a positive or negative effect of feeding upon the local estuarine crocodile population, it does provide insights into the potential impact tourism-based supplemental feeding may have on wild crocodile populations and provide information to assist the development of practice guidelines.

Johnson, A.R. (2025). Landscape Physiology and Drivers of Stress Proxies in the American Alligator (*Alligator mississippiensis*). MSc thesis, Southeastern Louisiana University, Hammond, Louisiana, USA.

Abstract: Despite calls to integrate physiological data into landscape ecology, most vertebrate studies focus on ecological occurrence patterns rather than physiological responses to landscape variation. Although research that quantifies comparative stress is growing, little is known about physiological variation across demographic groups, space and chronothermal conditions in wild populations. This study examines demographic, chronothermal, and land cover influence on American alligator stress proxies. Results indicate that sex, but not size or origin, biases stress levels, with seasonal and temperature-dependent variation. Landscape analyses were then conducted at the population- and demographic scales to understand the influence of land cover type on alligator stress proxies. These findings suggests that alligator stress proxies generally do not vary across land cover types at the population scale or when assessing variation between land type and alligator size. However, when accounting for sex, landscape analyses revealed sexually dimorphic variation in stress proxies in relation to exposure to human development.

Barbosa, J., Gondhali, U., Petrossian, G., Sharma, K., Chakraborty, S., Jacquet, J. and Freire, J. (2025). A cost-effective LLM-based approach to identify wildlife trafficking in online marketplaces. arXiv (arXiv: 2504.21211v1).

Abstract: Wildlife trafficking remains a critical global issue, significantly impacting biodiversity, ecological stability, and public health. Despite efforts to combat this illicit trade, the rise of e-commerce platforms has made it easier to sell wildlife products, putting new pressure on wild populations of endangered and threatened species. The use of these platforms also opens a new opportunity: as criminals sell wildlife products online, they leave digital traces of their activity that can provide insights into trafficking activities as well as how they can be disrupted. The challenge lies in finding these traces. Online marketplaces publish ads for a plethora of products, and identifying ads for wildlife-related products is like finding a needle in a haystack. Learning classifiers can automate ad identification, but creating them requires costly, time-consuming data labeling that hinders support for diverse ads and research questions. This paper addresses a critical challenge in the data science pipeline for wildlife trafficking analytics: generating quality labeled data for classifiers that select relevant data. While large language models (LLMs) can directly label advertisements, doing so at scale is prohibitively expensive. We propose a cost-effective strategy that leverages LLMs to generate pseudo labels for a small sample of the data and uses these labels to create specialized classification models. Our novel method automatically gathers diverse and representative samples to be labeled while minimizing the labeling costs. Our experimental evaluation shows that our classifiers achieve up to 95% F1 score, outperforming LLMs at a lower cost. We present real use cases that demonstrate the effectiveness of our approach in enabling analyses of different aspects of wildlife trafficking.

Séon, N., Vincent, P., Delsett, L.L., Poulallion, E., Suan, G., Lécuyer, C., Roberts, A.J., Fourel, F., Charbonnier, S. and Amiot, R. (2025). Reassessment of body temperature and thermoregulation strategies in Mesozoic marine reptiles. Paleobiology 1-21 (https://doi.org/10.1017/pab.2025.2).

Abstract: Ichthyosauria, Plesiosauria, and Metriorhynchidae were apex predators in Mesozoic oceanic trophic networks. Previous stable oxygen isotope studies suggested that several taxa belonging to these groups were endothermic and that some of them were homeothermic organisms. However, these conclusions remain contentious owing to the associated uncertainties regarding the $\delta^{18}O$ value and oxygen isotope fractionation relative to environmental seawater. Here, we present new bioapatite phosphate $\delta^{18}O$ values ($\delta^{18}O_p$) of Ichthyosauria, Plesiosauria, and Metriorhynchidae (Middle Jurassic to Early Cretaceous) recovered from mid- to high paleolatitudes to better constrain their thermophysiology and investigate the presence of regional heterothermies. The intraskeletal $\delta^{18}O_p$ variability failed to reveal distinct heterothermic patterns within any of the specimens, indicating either intrabody temperature homogeneity or an overriding diagenetic overprint of the original biological $\delta^{18}O_p$ bone record. Body temperature estimates have been reassessed from new and published $\delta^{18}O_p$ values of well-preserved isolated teeth, recently revised Mesozoic latitudinal $\delta^{18}O$ oceanic gradients, and ^{18}O-enrichment factors of fully aquatic air-breathing vertebrates. Our results confirm that Ichthyosauria were homeothermic endotherms (31°C to 41°C), while Plesiosauria were likely poikilothermic endotherms (27°C to 34°C). The new body

temperature estimates of the Metriorhynchidae (25°C to 32°C) closely follow ambient temperatures and point to poikilothermic strategy with no or little endothermic ability. These results improve our understanding of Mesozoic marine reptile thermoregulation and indicate that due to their limited body temperature variations, the $\delta^{18}O_p$ values from Ichthyosauria fossil remains could be used as valuable archives of Mesozoic oceans $\delta^{18}O_{sw}$ values that may help improve paleoenvironmental and paleoclimatic reconstructions.

Non-technical Summary: Some marine reptiles from the Mesozoic, such as ichthyosaurs, plesiosaurs, and metriorhynchids, were capable of reaching elevated body temperatures, and some could maintain body temperatures a few degrees above those of their marine environments, a characteristic similar to that observed in modern cetaceans. Nevertheless, the estimation of their body temperatures from the chemical oxygen signatures of their fossil remains (bones and teeth) is accompanied by uncertainties associated with the chemical oxygen signatures of the surrounding water and the mineralization processes of the bones and teeth. In this study, new data were collected from four ichthyosaurs, three plesiosaurs, and one metriorhynchid in order to gain a deeper understanding of the mechanisms by which these marine reptiles were able to maintain body temperatures higher than those of their environments. The chemical signatures of oxygen in the bones and teeth of the specimens did not exhibit any discernible patterns indicative of specific zones of heat production or loss, unlike what has been observed in modern marine vertebrates. Concurrently, we reassessed the estimated body temperatures of these marine reptiles, thereby corroborating the hypothesis that ichthyosaurs were homeothermic endotherms. Conversely, our new estimates suggest that plesiosaurs were likely poikilothermic endotherms, whereas metriorhynchids were probably also poikilothermic endotherms but with a limited capacity for heat production. Finally, the narrow range of body temperatures maintained by ichthyosaurs indicates that the oxygen chemical signatures of fossilized remains could serve as valuable markers for reconstructing variations in the oxygen isotope composition of the Mesozoic oceans, paving the way to enhance our understanding of the environment and climate of this period in Earth's history.

Crossley, J., Rippamonti, J.D., Crossley, D.A. and Dzialowski II, E.M. (2025). Cardiac mitochondria function in embryonic and 1-year old American alligators, *Alligator mississippiensis*, is not altered by hypoxic incubation or an acute anoxic challenge. Journal of Comparative Physiology B (https://doi.org/10.1007/s00360-025-01618-z).

Abstract: Hypoxic conditions naturally occur in nests of egg laying reptiles including the American alligator, *Alligator mississippiensis*. The effects of developmental hypoxia have been delineated in several studies of this species, with changes in cardiovascular function persisting into juvenile life. However, several questions regarding the effects of developmental hypoxia remain. In this study we designed a series of experiments to quantify the effects of developmental hypoxia on permeabilized cardiac muscle fiber mitochondrial respiration, reactive oxygen species production, and response to acute anoxia in American alligators. Alligator eggs were incubated in 21% O_2 (normoxia) or 10% O_2 (hypoxia) at 30°C beginning on day 14 of a 72-day incubation period through hatching. Animals were studied at two ages, at 90% of incubation and 1-year post hatching. Mitochondrial respiration and ROS production under leak and oxidative phosphorylation states were measured in permeabilized cardiac muscle fibers with high-resolution respirometry coupled with fluorometry. To examine the response of mitochondria to acute anoxia and subsequent reoxygenation, permeabilized cardiac muscle fibers were exposed to 20 min of anoxia, followed by reoxygenation during measurement of mitochondria respiration and ROS production. Hypoxic incubation resulted in a decrease in embryos mass which was maintained through the first year of juvenile life. Hypoxic incubation had no effect on cardiac mitochondria respiration or ROS production at either 90% of incubation or 1-year post hatching. After exposure to anoxia for 20 min, the rate of mitochondria respiration did not differ between the pre-anoxia respiration levels for all animals tested. There was no change in ROS production observed upon reoxygenation of the permeabilized cardiac muscle. Our results suggest that hypoxic incubation has little influence on cardiac myocyte mitochondrial physiology in the developing alligator and the cardiac mitochondria are resistant to acute bouts of anoxic exposure.

Delbosc, N.C., Thévenet, J., Grosjean, N., Méès, L., Boyer, N., Schneider, M., Grimault, N. and Mathevon, N. (2025). Temporal integration and decision-making in crocodiles. Biology Open 14(5): bio061844.

Abstract: To make appropriate behavioural decisions, animals continuously process a flow of information provided by different sensory channels. Could temporality, i.e. the order in which independent stimuli are perceived, lead the animal to give greater importance to one stimulus than to another? Here we show that the decision of a crocodile to move preferentially towards the source of water surface waves than towards the source of an airborne sound is irrespective of the relative time of arrival of the sound and water vibrations to the animal, as long as the delay between these two stimuli does not exceed a few seconds. To test whether the late arrival of water waves - which travel more slowly than sound - could explain crocodiles' preference for the source of water waves, we controlled the relative timing of stimulus arrival within a time window of a few seconds. Our results reveal that crocodiles preferentially move towards the source of the water waves, whether they arrive after, at the same time as, or before the sound. This suggests that the temporal integration of information from different sensory channels can occur within a certain time window, where the behavioural decision-making remains independent of the arrival order of stimuli. The maximum delay between simultaneously evaluated stimuli probably depends on animal species and context.

Dias, G.G. (2025). Mudanças espaçotemporais dos vetores de perda de habitat em populações do jacaré-de-papo-amarelo (*Caiman latirostris*) no Brasil. Universidade Federal do Espirito Santo, Vitória, Espirito Santo, Brazil.

Abstract: Human activities, such as deforestation, agricultural expansion, and urbanization, have caused significant changes in land use and land cover, directly impacting biodiversity and species survival. Tropical forests, essential for climate regulation and global biodiversity maintenance, face an increasing threat due to the intensification of these pressures. This study investigated the spatiotemporal dynamics of habitat loss for *Caiman latirostris* populations in Brazil, focusing on the drivers of these changes and their implications for species conservation. Using geoprocessing tools such as Google Earth Engine and MapBiomas, land use patterns between 1985 and 2023 were analyzed for two populations with distinct occurrences. One population, known as the Northeast of the Atlantic Forest (NORMA), spans from the state of Espírito Santo to Sergipe, and the other, known as Fluminense (FLUMI), extends from Rio de Janeiro to Santa Catarina. The results reveal different patterns of pressure on the analyzed populations. The NORMA population experienced a significant loss of 16.42% in "Natural Areas," with agricultural expansion standing out as the primary driver of habitat loss. Additionally, NORMA showed a notable reduction of 8.86% in "Wetlands." In contrast, the FLUMI population exhibited greater stability in its "Natural Areas," with a slight growth of 0.49% and a decrease of 2.33% in "Wetlands." However, both populations face concerning levels of habitat fragmentation, reducing the connectivity of remaining areas, hindering species movement, and compromising gene flow. The study calls for the implementation of new methodological approaches, such as the estimation of Area of Occupancy (AOO) and Extent of Occurrence (EOO), which may contribute to a more detailed assessment of the populations' distribution and vulnerability. The potential of the MapBiomas

Água tool is also highlighted, as it enables more accurate analysis of "Wetlands" dynamics and water availability, which are crucial for the conservation of species like *C. latirostris* that depend on these habitats. The study emphasizes the urgency of public policies and ecological restoration initiatives that consider the specificities of each population.

Resumo: Atividades humanas, como desmatamento, expansão agrícola e urbanização, têm provocado mudanças significativas no uso e cobertura do solo, impactando diretamente a biodiversidade e a sobrevivência das espécies. As florestas tropicais, essenciais para a regulação climática e manutenção da biodiversidade global, enfrentam uma crescente ameaça devido à intensificação dessas pressões. Este estudo investigou a dinâmica espaçotemporal da perda de habitat de populações de *Caiman latirostris* no Brasil, focando nos vetores responsáveis por essas mudanças e nas implicações para a conservação da espécie. Utilizando ferramentas de geoprocessamento, como Google Earth Engine e MapBiomas, foram analisados padrões de uso do solo entre 1985 e 2023 para as duas populações com ocorrências distintas. Uma se distribui do estado do Espírito Santo até o Sergipe, chamada Nordeste da Mata Atlântica (NORMA), e outra, do Rio de Janeiro até Santa Catarina, chamada Fluminense (FLUMI). Os resultados evidenciam diferentes padrões de pressão sobre as populações analisadas. A população NORMA sofreu uma perda significativa de 16,42% de "Áreas naturais", com a expansão agrícola destacando-se como o principal vetor de perda de habitat. Além disso, NORMA registrou uma redução expressiva de 8,86% nas "Áreas úmidas". Em contraste, a população FLUMI manteve maior estabilidade de suas "Áreas naturais", apresentando um ligeiro crescimento de 0,49%, e decréscimo de 2,33% em suas "Áreas úmidas". Contudo, ambas as populações enfrentaram níveis preocupantes de fragmentação de habitat, o que reduz a conectividade das áreas remanescentes, prejudica a movimentação das espécies e compromete o fluxo gênico. O estudo prevê a necessidade de implementar novas abordagens metodológicas, como as estimativas de Área de Ocupação (AOO) e Extensão de Ocorrência (EOO), que podem contribuir para uma avaliação mais detalhada da distribuição e vulnerabilidade das populações. Também se destaca o potencial da ferramenta MapBiomas Água, que possibilita uma análise mais precisa das dinâmicas das "Áreas úmidas" e da disponibilidade hídrica, sendo fundamental para a conservação de espécies como *C. latirostris*, que dependem desses habitats. O estudo reforça a urgência de políticas públicas e iniciativas de restauração ecológica que considerem as particularidades de cada população.

Spindler, F. and Kimmig, J. (2025). Fragmentary snout of a marine crocodile from the Upper Palatinate, Bavaria. Archaeopteryx 40: 38-47.

Abstract: A snout fragment is described as the first tetrapod from the Kimmeridgian «Plattendolomit» (finely layered dolomite, Pottenstein Formation) near Kallmünz, Bavaria. Its locality was determined through investigation by the Geological Survey of Bavaria. The few observable characteristics led to a tentative assignment to *Bathysuchus*, based on the pronounced premaxillary widening that surpasses the proportions of the close relative *Aeolodon*, from a similar spatiotemporal distribution. The fragment suggests a greater diversity of the rare Teleosauridae in the Franconian Jurassic, though a consistent ecotype. It is further underpinned that juvenile teleosaurids preferred habitats that were more nearshore, or reef-related, than their adults.

Pritz, M.B. (2025). Early development of a vertebrate telencephalon: Observations before areal differentiation. Brain Mechanisms (https://doi.org/10.1016/j.bramec.2025.202509).

Abstract: The telencephalon is a fundamental part of the brain in all amniotes (reptiles, birds, mammals). Although many similarities are shared by amniotes, telencephalon development and organization differ significantly between mammals and sauropsids (reptiles and birds). Two major differences are the development and structure of the pallium and the presence of the dorsal ventricular ridge in sauropsids but not in mammals. How these differences have occurred remains incompletely understood. While multiple studies have described telencephalon development in mammals, similar reports in reptiles are few. To fill this gap in knowledge, the present analysis was undertaken. This report details the development of the telencephalon in *Alligator mississippiensis* using a variety of cell stains. This study, which is the first of its kind in any reptile, begins shortly after egg laying and ends when differentiation of major brain areas occurs. The development of the subpallium from a unitary structure into its subsequent divisions and the changes in the septum and pallium are described. This analysis provides a roadmap and timetable for early telencephalon development. As such, these observations will serve as the basis for future studies to compare, for example, the expression of genes and transcription factors with other amniotes.

Górka, M., Březina, J., Chroust, M., Kowalski, R., López-Torres, S. and Tałanda, M. (2025). Crocodylian remains from the Miocene of the Fore-Carpathian Basin and its foreland - including the world's northernmost Neogene crocodilian. Acta Palaeontologica Polonica 70(2): 225-251.

Abstract: The geographic distribution of Crocodylia in Europe throughout the Cenozoic experienced fluctuations in the extension of its northern limit. Whereas crocodylians reached very high latitudes during the early Eocene (78ºN), their northward extension was more moderate during almost the entire Paleogene and the Neogene. Here we reassess previous Early-to-Middle Miocene crocodylian records from the Fore-Carpathian Basin and its foreland, namely from marine limestones of Pińczów (Poland), and Židlochovice (Czechia) and from the new vertebrate site of Szczerców (Poland), currently interpreted as a freshwater paleoenvironment. All crocodylian material from these three sites represents Crocodylia indet. and its possible taxonomic attribution is discussed. The new Szczerców specimen, an osteoderm, represents the world's northernmost record of a crocodylian from the entire Neogene.

Courville, E., Métais, G., Antoine, P-O., Marivaux, L. and Jouve, S. (2025). Giant longirostrine crocodylians from the Lower Miocene of Pakistan: new material and taxonomic review. Papers in Palaeontology 11(3): e70010.

Abstract: This study, based on previously undescribed crocodylian remains from the Lower Miocene of the Bugti Hills (Balochistan, Pakistan), identifies at least three distinct species. It confirms the validity of the species initially identified as '*Gavialis*' *pachyrhynchus*, establishing it as the sister taxon to the massive Miocene crocodylian *Rhamphosuchus crassidens*. Consequently, it is reclassified as *Rhamphosuchus pachyrhynchus*. Additionally, '*Gharialis*' *curvirostris* is now acknowledged as a valid species under the new genus name *Pseudogavialis*, closely related to *Gavialis*. Another set of remains represents a third species, although the poor preservation hinders precise identification. The phylogenetic relationship between *Tomistoma* and *Gavialis* is one of the most debated issues in crocodylian phylogeny. Molecular analyses suggest a sister-taxa relationship dating back to the Early Miocene, while morphological analyses place *Gavialis* at the base of the tree, diverging from 'thoracosaurs', with a Gavialoidea-Crocodyloidea split in the Cretaceous. The inclusion of newly described species in phylogenetic analyses yields variable outcomes, highlighting the sensitivity of results to the species considered. The insertion of *Portugalosuchus azenhae*, found as a 'thoracosaur', aligns with traditional morphological findings, while the inclusion of Indo-Pakistani species of *Rhamphosuchus* supports the molecular hypothesis. Nevertheless, the large number of morphological gavialoids and 'thoracosaurs' makes the molecular result strongly stratigraphically incongruent. The inclusion of fossil species in the phylogenetic analyses significantly impacts our understanding of

crocodylian relationships. Even when molecular results align with morphological data, the persistent stratigraphic incongruence does not resolve the *Gavialis-Tomistoma* dilemma.

Viñola López, L., Vélez-juarbe, J., Munch, P., Almonte Milan, J.N., Antoine, P-O., Marivaux, L., Jimenez-Vasquez, O. and Bloch, J.I. (2025). A South American sebecid from the Miocene of Hispaniola documents the presence of apex predators in early West Indies ecosystems. Proceedings of the Royal Society of London B (https://media.hal.science/CIRAD/hal-05046395v1).

Abstract: Absence of terrestrial apex predators on oceanic islands lead to the evolution of endemic secondary apex predators like birds, snakes, and crocodiles and loss of defense mechanisms among species. These patterns are well documented in modern and Quaternary terrestrial communities of the West Indies, suggesting that biodiversity there assembled similarly through overwater dispersal. Here, we describe fossils of a terrestrial apex predator, a sebecid crocodyliform with South American origins from the late Neogene of Hispaniola that challenge this scenario. These fossils, along with other putative sebecid specimens from Cuba and Puerto Rico, show that deep-time Caribbean ecosystems more closely resembled coeval localities in South American than those of today. We argue that Plio-Pleistocene extinction of apex predators in the West Indies resulted in mesopredator release and other evolutionary patterns traditionally observed on oceanic islands. Adaptations to a terrestrial lifestyle documented for sebecids and the chronology of West Indian fossils strongly suggest that they reached the islands in the Eocene-Oligocene through transient land connections with South America or island hopping. Furthermore, sebecids persisted in the West Indies for at least five million years after their extinction in South America, preserving the last populations of notosuchians yet recovered from the fossil record.

Sun, H., Chen, M., Chang, Q., Zhou, Y., Tu, G., Yi, P., Mei, L., Liang, J., Pan, T. and Zhao, J. (2025). Microbial diversity and composition on the surface of Chinese alligator eggs with different phenotypes during artificial incubation. Frontiers in Microbiology 16: 1567353.

Abstract: The internal and external environments affect the Chinese alligator (*Alligator sinensis*) eggs during the incubation period. This study aimed to explore the composition, diversity, and function of microorganisms on the surface of Chinese alligator eggs with different phenotypes during artificial incubation, providing a theoretical basis for improving the hatching success rate of Chinese alligator eggs. The development of high-throughput sequencing technology has enabled microbial DNA sequencing. In this study, the microbial community on the surface of Chinese alligator eggs (42 samples) was analyzed via 16S rRNA sequencing. The microbial profiles significantly varied among Chinese alligator eggs with a clean, shiny, crack-free surface (G group) and those with a dirty, dull, cracked surface (B group). The composition and abundance of microorganisms markedly varied between the B and G groups. The predominant bacterial taxa on the surface of Chinese alligator eggs were Proteobacteria, Actinobacteria, Firmicutes, and Bacteroidota, with Proteobacteria exhibiting the highest abundance. The abundance of Actinobacteria and Firmicutes in the G group was greater than that of the B group. Moreover, the abundance of Proteobacteria and Bacteroidota in the B group was greater than that of the G group. These findings indicate that the structure and diversity of microbial communities significantly varied on the surface of Chinese alligator eggs with different phenotypes during the incubation period and that different developmental stages of the eggs are dependent on microbes. The findings of this study provide a novel perspective on microbial dynamics during the incubation of Chinese alligator eggs and provide a scientific basis for the optimization of artificial incubation environments in the future.

Gayo, L. and Ngonyoka, A. (2025). Do wildlife management areas help to mitigate negative human-wildlife interactions? A case of eastern bufferzone of Selous Game Reserve, Tanzania. Tropical Conservation Science (https://doi.org/10.1177/194008292513405).

Abstract: Negative interactions with wildlife hinder biodiversity conservation, and attempts to devolve wildlife management to local communities near protected areas have had limited success. This study applied Citizen Science Theory (CST) as a bottom-up approach to examine the role of Wildlife Management Areas (WMAs) in reducing human-wildlife conflicts in the eastern buffer zone of the Selous Game Reserve. Data were collected from 240 households through surveys, focus group discussions, and key informant interviews. Qualitative data were analyzed via content analysis, while quantitative data were processed using SPSS version 26. Following the establishment of WMAs, 67.5% and 83% of respondents reported decreases in illegal wildlife offtake and habitat destruction, respectively. However, incidents of crop damage, livestock predation, and human attacks caused by wild animals increased by 28.6%, 40.6%, and 79.2%, respectively. Regarding interaction patterns, annual crop damage was higher near WMAs, averaging 7.2 ± 0.1 acres, compared to 0.6 ± 0.1 acres in areas farther away. Similarly, approximately 83 livestock were attacked within 500 m of WMA boundaries, while only 11 livestock were attacked beyond 30 km. About 72% of respondents indicated that human attacks occurred primarily during farming activities, with lions, leopards, hyenas, crocodiles, elephants, buffalo, and hippopotamuses identified as the responsible species. We concluded that the expansion of wildlife habitats through a community-based conservation approach increased wildlife populations; however, it also heightened the challenges posed by wild animals to local communities. Implications for conservation: WMAs inception is paramount to wildlife conservation particularly those requiring large home ranges. Enhancing wildlife control by encouraging local monitoring, using sound and odor deterrents, and promoting public education on safely interacting with wild animals, strengthening traditional enclosures using predator-proof materials such as thorny bushes or modern steel fences to reduce nighttime attacks, should be prioritized to mitigate negative interactions with wildlife.

Bagot, A. (2025). Road Rage or Road Cage: A Study of the Ecological Impacts of Roads on Wildlife Corridors and the Resultant Habitat Fragmentation. Master of Landscape Architecture thesis, Louisiana State University, Baton Rouge, Louisiana, USA. Retrieved from https://repository.lsu.edu/designres/1.

Abstract: As global road networks continue to expand, the resulting habitat fragmentation poses a significant threat to wildlife populations and ecological connectivity. In the United States, wildlife-vehicle collisions (WVCs) account for approximately 10 million animal deaths and 40,000 human fatalities annually, with incidents increasing by 50% over the past 15 years. This research investigates the ecological impacts of transportation infrastructure through a case study of Interstate 10 in Louisiana, specifically a 15-mile segment between Sorrento and LaPlace that cuts through the Maurepas Swamp Wildlife Management Area. This forested wetland, home to a rich diversity of species including the American alligator, has no safe crossing corridors for wildlife, leading to increased mortality and disrupted ecological processes. Focusing on the American alligator as a representative species, this study combines roadkill inventory data, spatial analysis, and conceptual design to propose a wildlife crossing intervention. The project aims not only to mitigate local impacts but to establish a repeatable design framework for reconnecting fragmented habitats globally. Ultimately, the research supports ecological restoration while honoring and preserving Louisiana's cultural and environmental heritage.

Eme, J., Martinez Batista, G., Keneda, A., Tate, K., Elsey, R. and Crossley II, D. (2025). Is the cardiovascular chemoreflex response to NaCN plastic in embryonic American alligators, *Alligator*

mississippiensis. Abstract presented at American Physiology Summit 2025 (https://journals.physiology.org/doi/abs/10.1152/physiol.2025.40.S1.0234).

Abstract: Developmental environments can modify organismal phenotypes via epigenetic mechanisms, and phenotypic changes can first become evident during embryonic or fetal life. Phenotypic plasticity of the cardiovascular system has been suggested to be particularly susceptible to environmentally induced phenotypic changes, in part due to its early and essential function during development. Prior studies using egg-laying reptiles as models have revealed that cardiovascular phenotypes can be altered by low developmental oxygen (hypoxia). Hypoxia for embryonic American alligators, *Alligator mississippiensis*, alters the morphological and physiological cardiovascular phenotype. For example, incubation in 10% O_2 produces embryonic alligators with relatively larger hearts, that are hypotensive, that are bradycardic and have a blunted cardiovascular response to phenylbiguanide (a chemoreflex-inducing compound). While the cardiovascular chemoreflex has been demonstrated to be plastic, the capacity of embryonic alligators to modulate this reflex was unknown. The main objective of this study was to determine the capacity of embryonic alligators chronically incubated in normoxia (21% O_2) or hypoxia (10% O_2) to respond to another chemoreflex-inducing agent, Sodium cyanide (NaCN) and modulate that reflex during prolonged exposure to 10% O_2. Our first study demonstrated that the embryonic alligator cardiovascular response to NaCN injections consisted of an initial rapid decrease in heart rate followed by a secondary increase in arterial blood pressure. Chronic normoxic (21% O_2) or chronic hypoxic incubation (10% O_2) did not affect the intensity of heart rate or blood pressure response to NaCN in embryonic alligators at both points of incubation studied (70% and 90% of incubation). Our second study demonstrated that ganglionic blockade with hexamethonium chloride inhibited or dampened the NaCN bradycardic response, indicating the bradycardia was mediated via a reflex loop. Our third study demonstrated that the cardiovascular response to an Injection a NaCN during a 1 hr exposure to 10% O_2 caused similar cardiovascular responses to those measured prior to the hypoxic exposure. Based on the data, embryonic alligators exhibit a cardiovascular chemoreflex that is elicited by NaCN but lack the capacity to modulate this reflex during exposure to 10% O_2. Finally, the cardiovascular response to NaCN does not display the plasticity previously reported for the chemoreflex inducing agent phenylbiguanide in embryonic alligators.

Membreno, N. and Warren, D. (2025). Eggshells of the Western painted turtle sequester CO_2: Implications for gas exchange, pH homeostasis, and overwintering in hatchling turtles. Abstract presented at American Physiology Summit 2025 (https://journals.physiology.org/doi/abs/10.1152/physiol.2025.40.S1.1711).

Abstract: Newly hatched painted turtles remain in the nest and generally emerge 7 to 8 months after hatching. During that time, atmospheric conditions inside the nest potentially become hypoxic and hypercapnic. However, recent nest gas sample analysis has shown lower than expected CO_2 levels (unpublished data). One possible explanation for the reduced CO_2 levels may be due to the presence of eggshells. The calcareous portion of avian and most reptilian eggshells is composed of $CaCO_3$ primarily in the crystalline form of calcite, but the crystalline portion of turtle eggshells is composed of aragonite. Compared to rigid archosaur eggshells, painted turtle eggs are thin and lightly mineralized. Does the extent of eggshell mineralization relate to its ability to sequester CO_2? To test the hypothesis that turtle eggshells sequester CO_2, we measured CO_2 uptake gravimetrically in alligator, chicken, and painted turtle eggshells. Whole eggshells (n= 3) were placed inside separate 30 ml glass syringes and a rubber stopper connected to a one-way stopcock valve was used to seal each chamber. The one-way stopcock valves on both ends of the syringes were then opened and the syringes were flushed with nitrogen gas overnight to remove any lingering CO_2. Afterwards, they were flushed with increasing concentrations (25%, 50%, 100%) of CO_2 and weighed until constant mass before switching to the next concentration. To determine the reversibility of the process, nitrogen gas was flushed through the chambers that were saturated with 100% CO_2. Powdered x-ray diffraction was also used to assess compositional differences of dried eggshell powder, and eggshell that was ashed at 900°C. The results showed that turtle eggshell was significantly better at sequestering CO_2 at all concentrations measured. At 25% CO_2, alligator, chicken, and turtle mean sequestered 0.029 ± 0.002, 0.017 ± 0.002, and 0.306 ± 0.081 mmol CO_2/g eggshell, respectively. At 50% CO_2, alligator, chicken, and turtle mean sequestered 0.051 ± 0.005, 0.044 ± 0.003, and 0.622 ± 0.174 mmol CO_2/g eggshell, respectively. At 100% CO_2, alligator, chicken, and turtle mean sequestered 0.112 ± 0.009, 0.106 ± 0.008, and 1.366 ± 0.374 mmol CO_2/g eggshell, respectively. On average 87.06 ± 0.62% of the sequestered CO_2 could be washed from the dried turtle eggshells following nitrogen flush. Powdered x-ray diffraction analysis confirmed calcite as the crystalline structure in raw chicken and alligator eggshell and aragonite in painted turtle eggshell, but no consistent differences in composition in ashed eggshells. These results suggest that the turtle eggshell can remove CO_2 from the nest cavity and that a portion of this process is reversible. We posit that painted turtle eggshells may play an important role in preventing environmental hypercapnia in overwintering hatchlings.

Rippamonti, J., Crossley II, D.A. and Dzialowski, E. (2025). Chronic developmental in ovo hypoxic exposure alters femoral artery and vein contractility in juvenile alligators (*Alligator mississippiensis*). Abstract presented at American Physiology Summit 2025 (https://journals.physiology.org/doi/abs/10.1152/physiol.2025.40.S1.0229).

Abstract: The oxygen level experienced during development is an important factor dictating the phenotype of juvenile and adult animals via developmental phenotypic plasticity. Thus, low oxygen (hypoxia) if experienced during a critical window of development can lead to physiological changes that persist into adulthood. Prior studies of American alligators *Alligator mississippiensis* have demonstrated that the cardiovascular phenotype exhibits plasticity in response to developmental hypoxia and these phenotypic changes persist into juvenile life. However, the majority of studies have focused on the effects of developmental hypoxia on the heart of these animals, and little is known about the phenotypic responses of the vasculature of the animals. Therefore, we designed a series of studies to investigate the contractility of the femoral artery and vein in response to pharmacological manipulation to understand how chronic hypoxic incubation alters vascular function in juveniles. *Alligator mississippiensis* eggs were collected from nests and incubated at 30°C and 21% O_2. At approximately 20% of incubation, eggs were randomly assigned to either normoxia (21% O_2) or hypoxia (10% O_2) for the remainder of *in ovo* development. After hatching, animals were raised in normoxic conditions for 4 to 6 years. We examined femoral artery and vein *in vitro* contractility responses to pharmacological manipulations using wire myography. Regardless of O_2-incubation conditions, veins exhibited significantly stronger contractions to stepwise increases in KCl levels than did arteries. Neither arteries nor veins responded to the alpha-adrenergic stimulant phenylephrine (PE). In response to angiotensin II (Ang II) contractile response of the veins to was significantly blunted by O_2 incubation levels, with hypoxic animals producing significantly less tension in response to Ang II when compared with veins from normoxic animals. Normoxic arteries and veins generated higher tensions in response to the thromboxane A mimic U 46619 when compared to hypoxic incubated animals. Veins had a significantly stronger relaxation response to sodium nitroprusside when compared to arteries, regardless of oxygen incubation levels. Our findings suggest chronic developmental hypoxic incubation alters femoral artery and vein contractile phenotypes in juvenile alligators, which may be linked to decreased heart rate and lower mean arterial blood pressure seen in previous studies.

Clarac, F., Campos, Z., Traimond, M. and Marquis, O. (2025).

Some insights into the thermoregulation strategies of Amazonian caimans from ingested temperature sensors and thermal imaging. hal-05061576.

Abstract: We investigated the body temperature of three caiman species (*Paleosuchus palpebrosus*, *Caiman crocodilus*, and *Melanosuchus niger*), in captivity, that inhabit the Amazonian basin and share an ecto-poikilothermic metabolism typical of all extant crocodylians. In the wild, these species occupy different habitats and have distinct ecological requirements that relate to their size differences, which range from the world's smallest caiman species *P. palpebrosus* to *M. niger* that may exceed 5 m in length. We confirm that *P. palpebrosus* is a thermoconformer whereas *C. crocodilus* and *M. niger* are active thermoregulators. It appears that there are correlations between the kinds of habitats occupied by each species and their thermoregulatory strategies. Furthermore, we provide some data showing that the two thermoregulating species use the extended vascular network of the skull and dorsal osteoderms to store heat.

Senphan, T., Mungmueang, N., Karnjanapratum, S., Wangtueai, S., Jongjareonrak, A. and Yarnpakdee, S. (2025). Characterization of biocalcium microparticles from Saltwater crocodile (*Crocodylus porosus*) bone and their potential for enhancing fish bologna quality. Foods 14: 1732.

Abstract: Saltwater crocodile (SC; *Crocodylus porosus*) bone, an underutilized by-product, can be converted into high-value bio-calcium (Biocal), serving as a potential source of calcium and minerals. This study aimed to produce SC bone Biocal as functional gel enhancer for fish bologna development and to increase calcium intake. The resulting bone powder was evaluated for physicochemical, microbiological, and molecular properties. Additionally, the textural, physicochemical, structural, and sensorial properties of the formulated fish bologna incorporating Biocal at varying levels (0-10% w/w) were also evaluated. Biocal, obtained as a fine white powder, had a 16.83% yield. Mineral analysis showed 26.25% calcium and 13.72% phosphorus, with no harmful metals or pathogens detected. X-ray diffraction confirmed hydroxyapatite with 69.92% crystallinity, while calcium bioavailability was measured at 22.30%. Amino acid analysis indicated high levels of glycine, proline, and hydroxyproline, essential for collagen support. The findings confirmed that SC bone Biocal is beneficial and safe for food fortification. Incorporating SC Biocal (2-10% w/w) significantly affected the fish bologna characteristics ($p<0.05$). As the Biocal level increased, the gel strength, hardness, and shear force also increased. The addition of 6% (w/w) Biocal significantly improved the textural property, without a detrimental effect on the sensory attributes of the bologna gel ($p<0.05$). SDS-PAGE analysis showed TGase-enhanced myosin heavy chain (MHC) cross-linking, particularly in combination with Biocal. Moreover, the enriched Biocal-bologna gel exhibited a finer and denser microstructure. Thus, SC Biocal, particularly at 6% (w/w), can serve as a functional gel enhancer in surimi-based products, without compromising organoleptic quality.

Zuniga Lopez, Z., Erdle, L., Fulfer, V.M., Flores, L., Brady, G. and Vermaire, J. (2025). Plastic pollution in mangrove forest and ingestion by an American crocodile (*Crocodylus acutus*) in Roatan, Honduras. Available at SSRN: https://ssrn.com/abstract=5256340 or http://dx.doi.org/10.2139/ssrn.5256340).

Abstract: Plastic pollution poses a threat to marine and coastal ecosystems, including mangrove forests, which serve as carbon sinks and biodiversity hotspots. However, research on plastic accumulation in mangroves remains limited, particularly in the Caribbean. This study quantifies marine litter in mangrove forests in Roatan, Honduras, and examines marine litter ingestion in a necropsy of an American crocodile (*Crocodylus acutus*). Surveys across four mangrove sites revealed litter concentrations averaging 6.83 ± 13.35 items/m^2, with a mean weight of 0.12 ± 0.13 kg/m^2. Plastics comprised approximately 99% of all anthropogenic material. Despite a municipal single-use plastic ban enacted in 2019, banned items - including plastic bottles, bags, and straws - were among the most frequently recorded. The crocodile, found near one of the sampling sites, had ingested 60 anthropogenic items, including plastic bags, fishing lines, and a large plastic sack. The crocodile's stomach contents closely resembled the local site litter profile based on a Principal Component Analysis (PCA). Plastic bottle age was estimated using expiration and best-before dates, averaging seven years, with some dating back nearly two decades. These results suggest that mangroves may act as long-term sinks for plastic debris and that resident wildlife, including apex predators, are at risk from local contamination. This study establishes a baseline for future research and informs plastic policy in the region.

Herrera Moreno, M.N., Valenzuela Quiñonez, W., Mohedano López, F., Castañeda de los Santos, G., Gerardo Kautzman, V.H., Flores Flores, F.A., Lachica, K.L., Chávez Medina, J.A., Pérez González, E., Ley Quiñónez, C.P. and Salomón Soto, V.M. (2025). Environmental education for basic education students and perception of the adult rural population about *Crocodylus acutus* (Cuvier, 1807) (Crocodylia: Crocodylidae) in Sinaloa, Mexico. Acta Zoologica Mexicana 41(1): 1-18.

Abstract: Due to anthropogenic pressures, wildlife faces challenges in sharing resources and habitat with humans, which leads to conflicts between them. Environmental education is an accepted resource to shape human behavior and perception towards wildlife, improving a pacific interaction. This study aimed to raise awareness in students from basic education (elementary and middle school), about the biodiversity of Mexico and the American crocodile (*Crocodylus acutus*) biology, as well as studying adults' perception about this crocodile species in three communities from Navolato, Sinaloa, Mexico. Two workshops were designed and conducted in October 2022 to basic education students; and semi-structured surveys were also applied to the adult population. Students demonstrated unsatisfactory knowledge about the biodiversity of Mexico and crocodile biology, reflecting on the lack of knowledge of basic biology concepts. Adults over 62 years old dominated the surveyed population. The 53.5% of respondents considered a risk for crocodiles to live near their homes. However, 71% stated that there are no human-crocodile confrontations. Population from two of the three studied communities expressed a fear of crocodiles due to the impact of floods on their homes, facilitating crocodile invasion. Both, students and adults agreed that crocodiles require protection. It is necessary to strengthen the knowledge about natural resources and the crocodile populations near these human settlements, to create training programs for human-wildlife coexistence, based on the land planning of the area, and to the creation of protected areas for crocodile conservation.

De Celis, A., Narváez, I. and Ortega, F. (2025). Assessing the phylogenetic utility of molecular sequences in Crocodylia. Pp. 242 *in* Proceedings of 5th Palaeontological Virtual Congress. Palaeontological Virtual Congress.

Abstract: Palaeontologists traditionally rely on morphological characters and parsimony analyses to reconstruct phylogenetic relationships among organisms. In contrast, neontologists can use molecular sequences from extant species, a powerful tool for investigating evolutionary relationships. However, not all molecular sequences are equally valuable for elucidating phylogenetic affinity between taxa. While mitochondrial sequences like COX1 and CYTB are widely used and have a recognised phylogenetic utility, others are included in phylogenetic analyses without prior assessment. This is relevant for studies employing computationally demanding methodologies, such as Bayesian Inference, where increasing data size does not always improve phylogenetic resolution but significantly increases processing time. Therefore,

33 mitochondrial and nuclear nucleotide sequences from 23 extant crocodylian species were retrieved from NCBI GenBank to analyse their phylogenetic utility. Each sequence was aligned, tested for substitution saturation (protein-coding genes), and assigned its best nucleotide substitution model. Phylogenetic inference was performed using Bayesian Inference (BI) and Maximum Likelihood (ML), classifying the resulting trees in categories based on their ability to solve crocodylian relationships. Sequences producing trees with significant polytomies, mostly partial nuclear sequences, were discarded, reducing the dataset from approximately 26000 base pairs to17500. The remaining sequences were concatenated and analysed with BIand ML, yielding a highly robust tree congruent with previous molecular phylogenetic hypotheses while optimising computational resources. These results underscore the importance of selecting molecular sequences with phylogenetic utility to improve both the robustness and efficiency of the analysis of crocodylian evolutionary relationships.

Gorza, L.L., Oliveira, E.C., Marcelino, S.A.C., Nóbrega, Y.C., Pinto, H.A., Tavares, G.C., Carvalho, M.P.N., Santos, M.R.D., Coutinho, M.E., Ossiboff, R.J. and Pierezan, F. (2025). Pathological and parasitological findings of free-ranging Yacare caiman (*Caiman yacare*) in the Brazilian Pantanal. Journal of Wildlife Diseases (doi: 10.7589/JWD-D-24-00102).

Abstract: Periods of drought have been observed in the Brazilian Pantanal for several decades, typically occurring from May to November. These droughts impact the conservation of thousands of species, including the Yacare caiman (*Caiman yacare*). This study aimed to describe the pathologic and parasitologic findings from postmortem examinations of free-ranging yacare caimans to provide insights regarding the influence of extreme drought on the health of this species. In total, 13 caimans were necropsied, representing deaths during a period of extreme drought (October 2021, 12 individuals) and a period of typical rainfall (October 2022, 1 individual). The main lesions identified in the respiratory tract included pulmonary granulomas (10/13, 77%), tracheal granulomas (8/13, 61.6%), tracheal pentastomids (5/13, 38.5%), and pulmonary pentastomids (3/13, 23.1%). The main lesions identified in the gastrointestinal tract included lesions caused by helminthiasis (Nematoda and Acanthocephala: 10/13, 77%), granulomas (5/13, 38.5%,), and intestinal hemorrhage (2/13, 15.4%). Other findings included myocardial granulomas, bacterial endocarditis, and unidentified helminths within renal tubules. Five helminth species were morphologically identified: the intestinal acanthocephalan *Polyacanthorhynchus rhopalorhynchus*, the respiratory pentastomids *Alofia platycephala* and *Leiperia gracilis*, the gastric nematode *Ortleppascaris alata*, and the intestinal nematode *Micropleura vazi*. The increased number of reported deaths and the consistent identification of parasite-associated lesions in the necropsied caimans from 2021 suggests an association between extreme drought, parasite infections, and the health status of Yacare caiman.

Walter, J.D. (2025). Origin, Diversity and Evolution of the Most Common Crocodylians of Europe in the Paleogene Greenhouse Context. PhD thesis, University of Turin (Turin, Italy) and Karls-Eberhard University of Tübingen (Tübingen, Germany).

Abstract: Crocodylia is an iconic reptile vertebrate group whose extant representatives inhabit most of the continental land masses. Modern Europe is a notable exception, as no crocodyliform populations are found in this region of the world, which is greatly contrasting with the past biogeographical history of the group. The early Cenozoic, specifically, shows an exceptionally diverse crocodyliform fauna mainly dominated by alligatoroids. Morphological disparity, complex biogeography or even stratigraphically young age of the earliest-branching forms have been difficult to reconcile with consistently inferred phylogenetic relationships to alligatorids, an otherwise freshwater and small-bodied group in the Paleogene. The European putative alligatoroid genus *Diplocynodon* is recognised as the most common and best sampled crocodyliform in the Paleogene of Europe, as demonstrated by the extensive fossil record spread across multiple occurrences throughout the Cenozoic. This record hints at an exceptional survivorship of the genus from the late Paleocene to the middle Miocene, that perplexes the comprehensive investigation of the taxon systematics and taxonomy, indication of an overdue revision. The thesis presents an expanded phylogeny with increased spatiotemporally coherence that reinterprets *Diplocynodon* spp. (recovered closely related to the North American *Borealosuchus*) as well as the North American *Deinosuchus* spp. and *Leidyosuchus canadensis* as stem-group crocodylians. The novel topology elucidates the evolution of osmoregulation in Crocodylia and its close relatives by inferring plesiomorphic saltwater tolerance for *Deinosuchus* and the crown-group, and secondary loss already in stem-group alligatorids. Divergence of Alligatoroidea coincided with extreme mid-Cretaceous sea level highs and the distribution of *Deinosuchus* across the American Western Interior Seaway can be best explained by marine dispersal. Phylogenetic body-length analysis using a head-width proxy reveals phyletic dwarfism early in alligatoroid evolution and a reasonable total length estimate for the most complete specimen of *Deinosuchus riograndensis*. Gigantism in crocodyliforms is suggested as being correlated with high-productive extensive aquatic ecosystems in the present and in the past. The second and third chapters tackle the complex ingroup taxonomy of *Diplocynodon*. The diagnoses of currently accepted *Diplocynodon* species commonly include shared and/or irreproducible characters, hampering specific delimitations. Based on the review of all currently known species, the first taxonomic revision of the group since its inclusion in modern phylogenetic works is presented. An identification key to assist researchers with the identification of the valid species is additionally provided. Furthermore, the present work quantitatively reviews the state of the entire fossil record of *Diplocynodon* (based on two openly available databases) and discusses the waste-basket status of the taxon with respect to better taxonomical practices. Within *Diplocynodon*, the Eocene species *Diplocynodon darwini* Ludwig, 1877 has the largest sample in the Paleogene period, consisting of tens of complete well-preserved specimens, but yet critically lacks a detailed osteological description. The taxon is here redescribed for the first time based on type specimens collected 150 years ago and abundant excellently preserved material from the Messel and Geiseltal Konservat-Lagerstätten. Insights into the intraspecific variation in the taxon are provided in a detailed morphological description on the skeletal elements, including ontogenetic variation in temporally restricted populations. The complex ingroup taxonomy of *Diplocynodon* is furthermore explored and discussed through a review of previously published and newly retrieved phylogenies.

Goldsmith, E.R. (2025). Ontogeny within a Convergent Evolutionary Context. PhD thesis, Virginia Polytechnic Institute and State University, Blacksburg, Virginia, USA.

Abstract: Morphological innovations and the evolution of these key features have long been primary targets of paleobiological investigations; yet not all morphologies are entirely novel, and focus on convergent morphologies (eg longirostry, limblessness, wings) provide a unique opportunity to investigate the micro- and macroevolutionary processes that drive disparity and diversification. Convergent evolution currently is hypothesized to occur when distantly related clades occupy similar ecological niches, resulting in lineages evolving similar morphologies; therefore, studies of convergence can also be used to investigate the relationship between environment, form, and function. Even though there are multiple studies to assess the extent of convergence between similar morphologies, investigations on how convergent morphologies develop (ie through growth) are less common and may illuminate convergent evolutionary processes. Afterall, an organism only exhibits the anatomies and morphologies that it does because of the ontogenetic (= growth) processes that form them. The fauna of the Triassic Period (~252-201.5 Ma) were shown to have evolved body

plans that were converged upon by crocodylians and dinosaurs after the Triassic-Jurassic Mass Extinction (~201.5 Ma) and represent an opportunity to investigate the ontogenetic processes that form convergent morphologies, especially in organisms that are still alive today (ie crocodylians). The Middle and Late Triassic phytosaurs are a cosmopolitan clade of large, longirostrine, semi-aquatic archosaur-relatives whose overall morphologies were later converged upon by crocodylians, but the processes that shaped that convergence remain understudied. My PhD dissertation aims to conduct a detailed qualitative and quantitative study of phytosaur ontogeny and addresses the following research questions: (1) How do the crania and postcrania change through ontogeny in a single phytosaur genus, '*Redondasaurus*'? (2) How do traits related to rostral morphologies (ie dental alveolus dimensions) change throughout growth across phytosaurs, and how do those features compare to those of their convergent counterparts, crocodylians? (3) How do the bone microstructural properties of an inferred hatchling phytosaur compare to those from other earlier diverging archosaur-relatives and their convergent counterparts, crocodylians? Ultimately, these questions will add valuable insight into the growth dynamics at the base of the archosaur tree, new or unexpected growth trajectories that have yet to be considered in the clade, and whether convergent growth trajectories are tied to convergent morphologies in distantly related clades. My first chapter aims to provide the qualitative foundation for understanding phytosaur cranial ontogeny in the only known size series across all of Phytosauria: '*Redondasaurus*' *bermani* from the Coelophysis Quarry in New Mexico. This ontogenetic series reveals that the youngest ontogenetic stages of '*Redondasaurus*' possess morphologies more commonly associated with earlier diverging phytosaur taxa, suggesting that some heterochronic processes have influenced the evolution of phytosaur crania. My second chapter quantitatively tests the qualitative observations from Chapter 1 and integrates postcranial data via osteohistological analyses by producing an ontogram (= cladistic analysis of ontogeny) that shows that the two known species of '*Redondasaurus*' could be synonymized because all morphological differences between the species are ontogenetically variable characters. In my third chapter, I test the ontogenetic (ie allometric) trajectories of dental alveoli between phytosaurs and extant crocodylians to determine whether the relationships between rostral shapes and dental characteristics are shared between these two clades, given their hypothesized shared ecological and dietary niches. This analysis shows that ontogenetic trajectories are variable between these two groups and that crocodylian and phytosaur rostra and dental features were subjected to variable ontogenetic influences. Lastly, my fourth chapter describes the osteohistological properties in the smallest known phytosaur femur within an evolutionary context and reveals that phytosaurs do not exhibit the fast-to-slow growth signal typically observed across Archosauria and instead, appear to exhibit size-dependent growth. Phytosaurs have long been considered "crocodile-like"; however, my dissertation reveals nuanced differences in the development and evolution of these two convergent clades suggesting that their respective evolutionary processes are unique despite forming convergent morphologies.

Ready, Z.C., Adamovicz, L. and Allender, M.C. (2025). Adenoviruses across reptiles. Journal of Herpetological Medicine and Surgery (doi: 10.5818/JHMS-D-24-00051).

Abstract: Adenoviruses (AdV) have emerged as a potential threat to the health of reptiles. Morbidity and mortality associated with AdV has been reported in squamates, chelonians and crocodilians. Adenoviruses detected within reptile taxa are diverse and belong to three genera thus far: *Barthadenovirus*, *Testadenovirus*, and *Siadenovirus*. Clinical implications of AdV infection vary widely depending on the species and host, ranging from no clinical disease to severe multisystemic disease and death. Adenoviruses of significant clinical concern include agamid adenovirus 1 (*Barthadenovirus*) and Sulawesi tortoise adenovirus (*Siadenovirus*), as both of these have been associated with mortality events. Diagnosis of AdV in reptiles has been accomplished with molecular detection (consensus nested polymerase chain reaction (PCR) and sequencing, quantitative PCR), direct visualization (electron microscopy, *in situ* hybridization (ISH), immunohistochemistry), and host response (histopathology). This review will discuss taxonomy, pathogenesis, pathologic findings, diagnosis, and treatment of adenoviruses detected in reptiles. The prevalence and impact of AdV in free-living populations of reptiles has yet to be determined, warranting further investigation. Understanding the implications of adenoviruses for reptile health at the individual and population levels may aid both clinical medicine and conservation efforts.

Laut, S., Poapolathep, S., Sitthiangkool, P., Klangkaew, N., Phaochoosak, N., Giorgi, M., Badillo, E., Escudero, E., Marín, P. and Poapolathep, A. (2025). Pharmacokinetics of antibiotics in crocodiles: A review. Animals 15(10):1363.

Simple Summary: Antibiotics are used to treat bacterial infections in crocodiles; however, determining appropriate dosing regimens remains challenging due to interspecies variations in pharmacokinetics and the limited availability of pharmacological data. This review critically examined the commonly used antibiotics, their therapeutic efficacy, and the factors influencing optimal dosage. It identified the need for further pharmacokinetic (PK) and pharmacodynamic (PD) research to refine dosing strategies, thereby improving treatment outcomes and minimizing the risk of adverse effects.

Abstract: This review aims to provide an overview of the pharmacokinetics of antibiotics in crocodilian species, focusing on species-specific variations in drug absorption, distribution, metabolism, and elimination (ADME), as well as the influence of environmental factors. A review of the available literature across crocodilian species reveals notable pharmacokinetic variability. Environmental influences, such as temperature and metabolic rate, are shown to impact these pharmacokinetic parameters significantly. Despite the frequent use of antibiotics in clinical and conservation settings, the lack of standardized dosing regimens presents risks of under- or over-dosing. This variability is compounded by limited research on species-specific drug metabolism and elimination processes. The review highlights the need for further pharmacokinetic studies to develop evidence-based dosing protocols, optimize therapeutic outcomes, and address concerns related to antimicrobial resistance. Future research should focus on filling the gaps in PK data to refine dosing strategies and ensure both efficacy and safety in crocodilian species.

Schmidt-Ukaj, S., Abbott, W., Araujo, L., Keller, K. and Marschang, R.E. (2025). Infectious agents of reptiles and amphibians: Peer-reviewed publications, July-December 2024. Journal of Herpetological Medicine and Surgery 35(2): 61-70.

Shuai, Y., Zhou, Y., Yi, P. and Zhao, J. (2025). Case report: The first record of *Eustrongylides* sp. infection in the Chinese alligator (*Alligator sinensis*). Frontiers in Veterinary Science 12: 1579738.

Abstract: Although digestive tract parasites are widely spread in wild or farmed crocodiles worldwide, only limited data are available on *Eustrongylides* sp. reported in crocodiles. The Chinese alligator (*Alligator sinensis*) is endemic to the Yangtze River in China, and only a few parasites have been reported to infect the Chinese alligator. In this study, a nematode was collected in the abdominal fascia of a captive deceased Chinese alligator. Cytochrome oxidase I (COI), internal transcribed spacer region (ITS) and partial small subunit DNA segments (18S) sequences were amplified to further confirm the genetic information of the species. The results showed that the nematode was attributed to the genus *Eustrongylides*. Overall, this is the first report of *Eustrongylides* sp. infected in the Chinese alligator, expanding the known host range of this nematode and contributing to a better understanding of its life cycle.

Boatman, A.K., Kudzin, G.P., Rock, K.D., Guillette, M.P., Robb, F., Belcher, S.M. and Baker, E.S. (2025). Novel PFAS in alligator blood discovered with non-targeted ion mobility spectrometry-mass spectrometry. Science of the Total Environment (doi: 10.1016/j.scitotenv.2025.179760).

Abstract: Per- and polyfluoroalkyl substances (PFAS) are a large and growing class of chemicals gaining global attention due to their persistence, mobility, and toxicity. Given the diverse chemical properties of PFAS and their varying distributions in water and tissue, monitoring of different matrices is critical to determine their presence and accumulation. Here, we used a platform combining liquid chromatography, ion mobility spectrometry, and high-resolution mass spectrometry for non-targeted analysis to detect and identify PFAS in alligator plasma from North Carolina (5 years, 2018-2022) and Florida (2021 only). Structures for 12 PFAS were elucidated, including 2 novel structures, and an additional 34 known PFAS were detected. Three of these compounds were previously unreported in environmental media. More PFAS were detected in North Carolina alligators and no novel PFAS were detected in Florida gators. Quantitative analysis of 21 of the known PFAS revealed that plasma concentrations did not change over the 5-year study.

Stevenson, E.A., Lucas, S., McGowan, P.J.K., Smallegange, I.M. and Mair, L. (2025). To what extent can life history strategies inform reptile conservation planning? Ecology and Evolution 15: e71488

Abstract: Global policy aims to prevent species extinctions; to support these aims, conservation planners must effectively target interventions to reduce the extinction risk of species. However, there is often a lack of knowledge on the magnitude and direction of species responses to interventions and, in turn, the extent to which a species extinction risk is reduced. If we can use a species' life history strategies to predict their responses to interventions, this offers a promising approach to better understand species extinction risks and conservation potential. Here we apply Dynamic Energy Budget Integral Projection Models to 23 reptile species to investigate whether their derived life history traits can be summarised into a life history strategy framework using principal component analysis, and whether species' positions along these axes predict their population growth rate, demographic resilience, sensitivity to perturbations and extinction risk. We found that species' positions on reproductive and pace of life axes predicted reptile population growth rate and demographic resilience but not sensitivity to perturbations or extinction risk. Our findings show that reptile life history strategies can inform our understanding of reptile species conservation potential and could be applied to influence management decisions such as establishing monitoring timelines.

Cedillo-Leal, C.N., Barrios-Quiroz, G. and Padilla-Paz, S.E. (2025). Details of a non-fatal human-crocodile interaction in the Laguna del Carpintero, Tampico, Mexico. Neotropical Biology and Conservation 20(2): 115-123.

Abstract: Human-crocodile interaction in the Laguna del Carpintero, Tampico, Tamaulipas, Mexico has been a growing concern for the last several years, with homeless people being the most affected, although individuals of fixed address have also been involved. The objective of this document is to describe in detail a case of non-fatal human-crocodile interaction in this lagoon and the response of the SOS Crocodile Tampico working group. To document the case, we collected information on the interaction, the causative crocodile and the affected person. On June 8, 2024 a male person was involved in a non-fatal interaction with a 278 cm long crocodile, which caused a fracture in his left leg, requiring him to be transported to the nearest hospital. This event activated the first response team who provided pre-hospital and hospital care; search and capture of the crocodile involved, as well as the custody, handling and final disposal of the crocodile into captivity. Therefore, we consider that inter-institutional coordination between federal, state, municipal, health and crocodile specialists, integrated as the SOS Crocodile working group, is fundamental to rapidly and efficiently attend the interactions with crocodiles in urban areas.

Masina Kasongo, J., Mumba Djamba, A., Iyav Muhunga, C., Ngoyi Malongi, L., Ibanda Kasongo, B., Metena Mambote, M., Bwangila Ibula, C., Bamuene Solo, D., Lukombo Lukeba, J.C. and Umba di M'balu J. (2025). Enquêtes sur le traitement ethnomédecine vétérinaire de la Peste Porcine Africaine dans le secteur de Kingulu, province du Kwango en RD Congo. Journal of Animal & Plant Sciences 64(1): 11971-11987.

Résumé: L'objectif de cette étude était de mener des enquêtes auprès de 168 éleveurs afin d'inventorier les différentes plantes et parties des animaux qui pourraient être utilisées dans le traitement de la Peste Porcine Africaine. L'étude sur l'éthno-médecine vétérinaire a été menée à Kingulu, secteur du territoire de Kasongo-Lunda dans la province du Kwango en République Démocratique du Congo.. Il ressort des investigations menées auprès des éleveurs Yaka de Kingulu qu'ils utilisent 11 recettes destinées à traitement préventivement et de façon curative les animaux atteints de peste porcine africaine. De ces 11 remèdes, 8 remèdes sont destinés au traitement préventif et les 3 autres à caractère curatif. Les ingrédients animaux sont associés à la préparation aux organes végétaux pour préparation des différences recettes destinées aux soins de la peste porcine. Les excréments du buffle et le caméléon sont ajoutés aux plantes pour les produits vétérinaires préventifs, tandis que les insectes, le pancréas du crocodile ou du boa sont réservés au profit de la fabrication des recettes curatives.

Abstract: The objective of this study was to conduct surveys with 168 breeders in order to inventory the different plants and parts of animals thar could be used in the treatment of African Swine Fever. The study on veterinary ethno-medicine was conducted in Kingulu, a sector of the Kasongo-Lunda territory in the Kwango province in the Democratic Republic of Congo. It emerges from the investigations carried out with the Yaka breeders of Kingulu that they use 11 recipes intended for preventive and curative treatment of animals affected by African swine fever. Of these 11 remedies, 8 remedies are intended for preventive treatment and the other 3 are curative. The animal ingredients are associated with the preparation of plant organs for the preparation of the different recipes intended for the treatment of swine fever. Buffalo and chameleon excrement are added to plants for preventative veterinary products, while insects, crocodile or boa pancreas are reserved for the benefit of making curative recipes.

Wang, L., Clark, J.M., Li, H., Ruebenstahl, A. and Bi, S. (2025). A new specimen of the early branching crocodyliform *Platyognathus hsui* extends the record of gobiosuchids back 67 million years. Zoological Journal of the Linnean Society 204(2) (https://doi.org/10.1093/zoolinnean/zlaf032).

Abstract: Crocodyliforms are poorly known from the Early Jurassic Lufeng Formation of China, and a new specimen of *Platyognathus hsui* is by far the most complete specimen yet known. It shares with the missing holotype and the neotype the very unusual features of a dentary caniniform that is polygonal in cross-section and the complete fusion of the dentary symphysis, and the new specimen provides four additional features diagnosing the species. Features such as a relatively broad rostrum and a posteroventrolateral process on the squamosal place it with taxa closer to extant crocodylians than are *Orthosuchus* and *Protosuchus*, as an early branching relative of the Gobiosuchidae. The oldest previous record of the gobiosuchid lineage was from the late Barremian stage of the Early Cretaceous, and this extends the fossil record of the lineage back by 67 Myr. We recognize a new superfamily, Gobiosuchoidea, to include *Platyognathus hsui* and gobiosuchids.

López-Rojas, J.J., Solé, M. and Lourenço-de-Moraes, R. (2025). Patterns of endemism and beta diversity in amphibians and reptiles of the Amazon Basin: effects of habitat heterogeneity and anthropic impact. Biological Journal of the Linnean Society 145(2) (https://doi.org/10.1093/biolinnean/blaf023).

Abstract: Identifying conservation priorities in ecological hotspots such as the Amazon Basin requires an understanding of beta diversity and endemism patterns. This study explores amphibian and reptile diversity across 32 Amazonian ecoregions, analysing their relationships with habitat heterogeneity and anthropogenic impacts. Using spatial data for 1839 species, we calculated weighted endemism and beta diversity and its components (turnover and nestedness). Habitat heterogeneity variables (water, bare ground, trees, flooded vegetation, and rangeland) and anthropogenic impact indicators (built areas and crops) were derived from land cover data, and regression models assessed their effects on diversity metrics. Our results reveal substantial variability in endemism across ecoregions, with the western montane ecoregions exhibiting the highest values. Beta diversity, driven primarily by turnover, was elevated in Anura, Gymnophiona, lizards, and snakes, reflecting regionally distinct species compositions. Habitat heterogeneity, particularly bare ground, positively influenced both endemism and beta diversity, while caudates and crocodilians showed lower sensitivity to habitat variability. Anthropogenic impacts such as built areas contributed to higher values of endemism and beta diversity across most groups, whereas crops had minimal effects. These findings highlight the Amazon Basin's western montane ecoregions as critical biodiversity hotspots with high endemism and species turnover. The dominance of turnover over nestedness emphasizes the unique species compositions within each ecoregion. Targeted conservation strategies are urgently needed to mitigate the impacts of urbanization and prioritize the preservation of habitats with high endemism, ensuring the long-term protection of Amazonian biodiversity.

Khadka, B.B., Bashyal, A. and Griffith, P. (2025). Population changes in Gharials (*Gavialis gangeticus*) vary spatially in Chitwan National Park, Nepal. Reptiles & Amphibians 31: e21018.

Abstract: Gharials, large crocodilians found only in South Asia, are widely seen as a flagship species for river conservation in Nepal, especially in Chitwan National Park, where a headstart program has supplemented the population since 1981. The population has shown signs of recovery only in the last decade, so continued monitoring of population trends is vital for conservation. We conducted annual winter population surveys for Gharial in Chitwan between 2017 and 2022, during which we also characterized riverbank substrate availability and basking preferences. We documented potential threats to the species in Chitwan throughout the year. Overall, we counted an increasing number of Gharials in Chitwan; however mixed-effects modelling of Gharial encounter rate showed that increasing encounters rates are not evenly distributed throughout available habitat, with some river stretches having stable or decreasing trends. Encounter rates on the Rapti River increased in all transects, compared to more variable results on the Narayani River, likely attributable to higher levels of human disturbance and the impact of captivity on habitat selection. Fewer Gharials were seen in transects with high levels of disturbance due to sand mining and the extraction of river substrates, highlighting this threat as a major concern. Regular reports of bycatch in illegal gillnets was the major observed source of mortality. A lack of an increasing population trend in the stretch above a large barrage suggests that recruitment is minimal in this area, and the dam likely has a negative impact on upstream Gharial recruitment. We cautiously suggest that the Chitwan population is recovering, but that recovery is hampered by threats, especially substrate extraction, illegal gillnet fishing, and river fragmentation by a dam.

Dos Santos Medeiros, A.L., Bezerra de Oliveira, A.L., Araújo de Medeiros, M. F., Tregidgo, D., Bistriche Giuntini, E., De Menezes Neto, E.J., Da Silva Maia, J.K. and Medeiros Jacob, M.C. (2025). Comprehensive nutritional composition of wild meat: A systematic review using data Imputation with artificial intelligence. Ethnobiology and Conservation 14: 21.

Abstract: While not promoting wild animal consumption, this study acknowledges its crucial role for Indigenous Peoples and Local Communities (IPLC) worldwide, making comprehensive nutritional data essential for informed dietary assessments and policy decisions. Employing advanced data imputation techniques to address data gaps ethically, this systematic review, following PRISMA guidelines, analyzed 20 peer-reviewed articles and one grey literature document. We focused on the nutritional composition of wildmeat from 26 species across mammals, birds, and reptiles. We assessed 10 key nutrients, revealingsignificant variations. Bird muscle tissue did not demonstrate statistically higher iron concentrationsthan previously recognized in mammalian muscle ($p<0.05$), challenging established nutritional understanding of red and white meat. Reptile muscles contained 60% more iron than mammalian muscles,while bird muscles showed 200% higher potassium and omega-6 fatty acid levels compared to mammals ($p<0.01$). Mammalian muscles exhibited the highest zinc content among taxonomic classes. As inthe case of non-wild animals, viscera consistently showed higher mineral concentrations than muscle tissues across all species. These findings enhance understanding of wild meat's nutritional value, contributing vital data to food composition databases and supporting evidence-based policy decisions for communities reliant on these resources.

Bonilla-Liberato, E.D., Ojeda-Rojas, M.C., Briggs-Gonzalez, V., Mazzotti, F.J. and Balaguera-Reina, S.A. (2025). Illegal trade of crocodylians in Colombia: Spatiotemporal dynamics and implications on conservation efforts. Conservation Science and Practice 2025: e70064

Abstract: Crocodylian conservation efforts have encountered significant obstacles from species overhunting to negative local perception. While conservation strategies such as sustainable use have helped the recovery of several crocodylian species around the world, its effectiveness has been limited by illegal wildlife trade as well as changes in control and trade policies. We assessed the spatiotemporal dynamics of illegal crocodylian trade in Colombia from 2010 to 2022 based on data collected by regional and district environmental authorities and discussed its implications on conservation efforts. Illegal trade of crocodylians in Colombia has been predominantly characterized by spectacled caimans (*Caiman crocodilus*, 97.37%). However, most of the species inhabiting the country (especially American crocodiles - *Crocodylus acutus* and black caiman - *Melanosuchus niger*) have been seized/confiscated at least once by law enforcement in the last decade, with the exception of Orinoco crocodiles (*Crocodylus intermedius*). Illegal trade was most prominent in departments from the Caribbean region especially those with spectacled caiman farms. A generalized additive model (deviance explained 55.9%, effect estimate= 7.35 ±0.18, n= 13) showed very strong evidence of an effect of CITES exports (leather products and in a lesser extend tails) on the number of spectacled caimans illegally traded in Colombia, meaning spectacled caiman leather products and tails were able to predict illegally traded spectacled caiman in the country. Overall, local demand, cultural practices, and low economic conditions appear to exacerbate illegal trade of crocodylians in Colombia.

Slape, R.L., Piggott, M.P. and Milic, N.L. (2025). Understanding the structure and blemishes of Australian farmed saltwater crocodile (*Crocodylus porosus*) leather. Veterinary and Animal Science (https://doi.org/10.1016/j.vas.2025.100467).

Abstract: Australian saltwater crocodiles (*Crocodylus porosus*) are farmed to harvest their belly skin to produce high quality leather

products. This is the first descriptive study to explore the structure of leather across different finishes; incrust, matte and gloss as well as variation within lesions. Using scanning electron microscopy (SEM) and image analysis, the thickness across the belly skin leather and the differences in the gross surface were analysed. This study identified statistically significant differences between leather type, scale row down and side of the midline (p= 0.011), and leather type and the scale row down (p= 0.043). It also identified the differences in collagen arrangement in linear and foci lesions when compared to normal leather, and the impact at different depths of leather. This study noted a foci lesion with variation in the leather structure indicative of a pathogenic agent such as Kunjin strain of West Nile virus.

Proctor, T., Rathnasiri, P. and Honarvar, S. (2025). Preliminary data on saltwater crocodiles, *Crocodylus porosus* Schneider, 1801, and an updated assessment of threats in the Nilwala River, Matara, Sri Lanka. Herpetology Notes 18: 361-363.

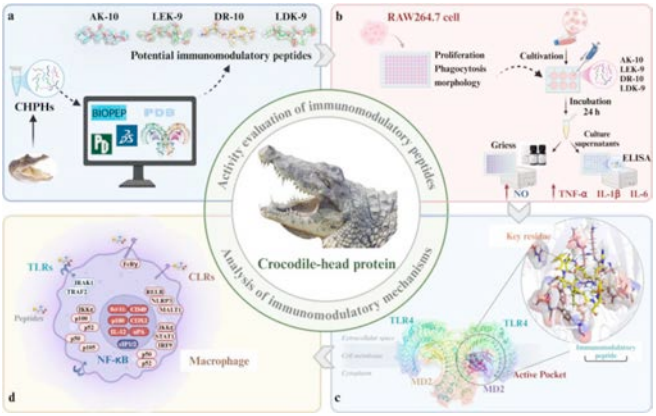
Avilés Argueta, C.R., Paiz, J.S., Sermeño, J., Pérez, J.A., Segura, J.H. and Espinal Acevedo, R.J. (2025). Malformacion caudal EN Caiman crocodilus (Alligatoridae) en el sitio RAMSAR Barra de Santiago, El Salvador. Revista Latinoamericana de Herpetología 8(2): 254-258.

Resumen: La presencia de malformaciones ha sido observada en la mayoría de vertebrados, en cocodrilianos como el caimán de anteojos (*Caiman crocodilus*), los registros son limitados y provienen de estudios realizados con ejemplares en cautiverio (granjas, zoológicos). La presencia de anomalías en la morfología de cocodrilianos en poblaciones silvestres no ha sido registrada anteriormente para El Salvador, sin embargo, durante los monitoreos nocturnos de *C. crocodilus* (2022) se capturó un ejemplar que presentó braquiuria, crecimiento no vascularizado y fusión de crestas caudales 1-5, posteriormente (2024) fue recapturado con un aparente buen estado de salud lo que indica que la condición que presenta no involucra una dificultad en su locomoción y alimentación.

Abstract: The presence of malformations has been observed in most vertebrates. In crocodilians, such as the spectacled caiman (*Caiman crocodilus*), records are limited and primarily come from studies on captive individuals (farms, zoos). The occurrence of morphological anomalies in wild crocodilian populations had not been previously documented in El Salvador. During nocturnal monitoring of *C. crocodilus* in 2022, an individual was captured exhibiting brachyury, non-vascularized growth, and fusion of caudal crests 1-5. The same individual was recaptured in 2024 in apparently good health, suggesting that the condition does not impair its locomotion or feeding ability.

Xu, G., Ma, W., Zhao, W. and Yu, Z. (2025). Identification of immunomodulatory peptides from crocodile head protein hydrolysates: Targeted screening and immunomodulatory activity by activating NF-ϰB signaling pathway. Food Research International 217 (https://doi.org/10.1016/j.foodres.2025.116792).

Abstract: Long-term unhealthy lifestyles are prone to triggering immune disorders, leading to infections and chronic diseases, posing serious health risks. Immunomodulatory peptides, with the advantages of being natural and having low toxicity and few side effects, contribute to maintaining immune balance. However, their mechanism of action remains unclear. It is crucial to conduct in-depth research on immunomodulatory peptides to understand their potential health benefits. This study aims to identify novel immunomodulatory peptides from the crocodile (*Crocodylus siamensis*) head protein hydrolysates (CHPHs) and explore their intracellular immunomodulatory mechanisms. Four crocodile-derived peptides with potential immunomodulatory activity were screened from CHPHs, ie, AKLDLEEVIK (AK-10), LEKEKSELK (LEK-9), DFLDLPSIER (DR-10), and LDLEEVIKK (LDK-9), which stably bind to TLR4-MD2 and activate the immune response. These four peptides promoted the proliferative and phagocytic activities of RAW264.7 cells, activated the resting state of the cells, and boosted the expression of NO and cytokines. Peptide DR-10 had the most significant immunomodulatory function and promoted up-regulation of intracellular immune-related factors Acod1, Ccl9, COX2, CD40, NF-ϰB1, IKKε, and NF-ϰB2. Additionally, the peptide DR-10 activated the NF-ϰB signaling pathway, thereby releasing immune effectors and exerting immune effects. These findings suggest that crocodile-derived immunomodulatory peptides may be considered an effective immune supplement, providing new ideas for future research on dietary supplements.



Huang, Y., Zheng, X., Ming, X., Jiao, Q., Xiao, W., Wu, Q., Zhengen, L., Cheng, S., Wang, R., Yang, J., Bian, Y. and Yao, J. (2025). Recent advances in crocodilian oil research: Bioactive components and potential therapeutic applications. Frontiers in Medicine 12 (doi: 10.3389/fmed.2025.1573925).

Abstract: The economic value of crocodilian farming has risen substantially in recent years, drawing increasing attention to crocodilian oil as a traditional natural remedy rich in diverse bioactive constituents. Despite its therapeutic potential, crocodilian fat remains underutilised, and its nutritional and medicinal properties have not been widely recognised. This review provides a bibliometric analysis of past research trends and highlights current developments related to crocodilian oil. Recent advances in the characterisation of its physicochemical properties and health-related applications are summarised. The primary biological activities of this oil are attributed to its high unsaturated fatty acid and stearic acid contents. Emerging evidence supports its anti-inflammatory, antimicrobial, and scar-reducing effects mediated through key signalling pathways, including p38 mitogen-activated protein kinase, transforming growth factor-β1/Smad3, and AMP-activated protein kinase. Reported benefits include improvements in skin conditions and the modulation of energy metabolism. Potential applications encompass adjunctive treatment for *Candida albicans* infections, topical anti-inflammatory agents, moisturisers, and permeability enhancers in cosmetic formulations, and dietary oil substitutes for managing hypertriglyceridaemia and metabolic disorders affecting the liver and brain. Challenges and future research directions in this field are also discussed.

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de Bakker, M.A.G., Nurhidayat, L., Dijkerman, A.K., Chung, W.Y., Oudesluys, E.C., de Jager, K., Willemse, J. and Richardson, M.K. (2025). Changes in evolutionary developmental control points in the amniote limb may explain hyperphalangy. Molecular Biology and Evolution (https://doi.org/10.1093/molbev/msaf113).

Abstract: Amniotes show a great diversity of limb phenotypes, including limbs specialised for running, flying, swimming, digging. Here, we have examined how this diversity is generated during limb development in 13 species using transcriptomics and *in situ*

hybridization. The selected species show evolutionary changes in the number of phalanges, and/or loss of claws. We first looked at genes that show cyclical expression during digit development. Significantly, we find that Gdf5 cycles more rapidly in digits developing more phalanges. We identified two novel cyclically-expressed genes: Ackr3 and Wnt9a. We also identified a transition point at which phalanx formation stops and claw development begins. We found that this transition point is marked by downregulation of multiple developmental genes in the phalanx forming region, and upregulation of claw-related genes. The timing of this transition is conserved, taking place at the same developmental stage in all digits of all species examined - except in the clawless digits of the Chinese soft-shelled turtle, the crocodilians and birds. We suggest a model based on transcriptional heterochrony, in which the frequency of phalanx formation, and the timing of the phalanx-claw transition, are evolutionary control points open to natural selection on the phenotype. Further, our model suggests that relaxation of developmental constraints on the timing of the phalanx-claw transition allows the digits to develop more phalanges (hyperphalangy). This is seen in some turtles, crocodilians and dolphins. More broadly, our findings are consistent with the hypothesis that 'hotspots' in otherwise conserved developmental pathways may be targets for evolutionary tinkering.

Ibrahim, A.A. and Leyer, S. (2025). From nature to engineering: Bio-inspired spacer solutions for membrane distillation. Desalination 613 (https://doi.org/10.1016/j.desal.2025.119064).

Abstract: Biomimetic design principles, inspired by the structure of alligator osteoderms, are employed to provide innovative solutions for enhancing membrane distillation system performance. A novel spacer design for membrane distillation (MD) systems is introduced, incorporating the unique structural features of these natural formations. Three-dimensional computational fluid dynamics (CFD) simulations are performed to investigate nine new spacer configurations, with particular emphasis placed on enhancing mixing efficiency within the feed channel, which serves as the primary focus of this research. Results demonstrate that the novel spacer configurations exhibit superior performance, achieving up to a fivefold increase in mixing efficiency relative to the baseline of an empty channel. Furthermore, the new spacers are assessed and contrasted with two types of conventional spacers and the empty channel configuration with respect to pressure drop, thermal performance, and mass transfer properties.

Barbosa Pessoa, L., Polizzeli Azevedo, L., Macedo Marques, L.A., Barbosa Pessoa, J., Bertoncello Pael, L.A., Garcia Tafarelo Moreno , K., Fidelis da Silva, M.L., Viana Silva, B., Tavares de Almeida, D.A., Utrera Martines, M.A., Rodriguez Amado, J.R., Rios-Santos, F., Dos Reis Lívero, F.A. and Gasparotto Junior, A. (2025). Ethnopharmacological investigations on the cardiometabolic protective effects of *Caiman yacare* fat oil in hypertensive and dyslipidemic rats. Journal of Ethnopharmacology (doi: 10.1016/j.jep.2025.120140).

Abstract: The fat derived from different species of the genus *Caiman* is traditionally used in Brazil for the prevention and treatment of cardiovascular complications. Despite its widespread use, data on the efficacy and mechanisms of action of these preparations remain scarce. To evaluate the potential cardiovascular protective effects of treatment with *Caiman yacare* visceral fat oil (YO) in spontaneously hypertensive rats (SHRs) associated with multiple risk factors. SHRs received an atherogenic diet for 8 weeks to induce cardiovascular and metabolic dysfunction. Treatments with YO (19, 56, and 168 mg/kg), rosuvastatin (5 mg/kg), and fish oil (56 mg/kg) started after 4 weeks and continued for 4 weeks. Renal function, blood pressure, and cardiac activity were monitored. Serum lipids, inflammatory and oxidative stress markers, as well as liver and kidney function parameters, were assessed. Vascular reactivity of mesenteric vascular beds was evaluated, and tissue samples from the kidneys, heart, and arteries were collected for histopathological analyses. Treatment with YO at 168 mg/kg significantly reduced serum lipids, urea, creatinine, and oxidized LDL levels while preventing arterial endothelial dysfunction and intima-media thickening. The treatment with YO visceral fat oil exerts lipid-lowering effects, reduces LDL oxidation, and prevents endothelial dysfunction, while also partially modulating renal function in SHRs with multiple risk factors. Further preclinical *in vivo* studies are necessary to fully elucidate the benefits and risks associated with the use of YO, particularly in the context of cardiovascular diseases.

Phuyal, N., Kc, N., Neupane, B., Dhami, B., Miya, M.S., Silwal, T., Adhikari, G., Pudasaini, S., Bhandari, B. and Adhikari, H. (2025). Diurnal encounter-based size distribution, nesting sites and habitat characteristics of the Mugger crocodile (*Crocodylus palustris*) in Beeshazari Lake Complex, Nepal. Ecology and Evolution 15(6): e71486.

Abstract: Mugger crocodiles are the apex predator species of the wetland ecosystem in Nepal, and their conservation could safeguard the entire ecosystem. However, studies on their population status and habitat characteristics are limited, with no scientific research conducted on their nesting ecology to date. Therefore, we selected muggers as a representative species to better understand their daytime sightings, nesting characteristics, and the fine-scale anthropogenic and environmental factors influencing their occurrence in five lakes of the Beeshazari Lake complex (BLC; Beeshazar Lake, Kumal Lake, Tikauli Lake, Kingfisher Lake, and Batuli Pokhari) of Chitwan National Park, Nepal. We conducted a preliminary survey, followed by a daytime sightings survey, a nesting site survey, and a habitat assessment survey in March 2023. A generalised linear model under binary logistic regression was used to analyse the factors influencing the habitat characteristics of Muggers. During the research period, 50 detections of Muggers were recorded, 66% of which were observed basking and 34% were submerged in the lakes. The Relative Abundance Index of the Muggers in the BLC was 3.29 km^{-1}. Nesting sites (two from Tikauli Lake and three from Beeshazar Lake) were recorded during the study period. The probability of sighting a Mugger was significantly influenced by the slope (moderate slope), substrate type (clay, grass, and sand), mid-lake depth, presence of anthropogenic threats, and presence of invasive species. We recommend that future researchers employ more robust models, such as N-mixture models, to provide up-to-date information on the population abundance of Muggers in the BLC. Furthermore, a comprehensive multi-seasonal study focusing on ecological and behavioural aspects of nesting sites alongside environmental aspects influencing nest success rates is critical. Such research will be crucial in guiding the development of targeted conservation strategies aimed at protecting and preserving essential nesting sites. Moreover, we recommend conducting robust studies on the carrying capacity of wetlands in Nepal to provide insights into the sustainable population size that a wetland can support.

Rodríguez-Caro, R.C., Gumbs, R., Graciá, E., Blomberg, S.P., Cayuela, H., Grace, M.K., Carmona, C.P., Pérez-Mendoza, H.A., Giménez, A., Davis, K.J. and Salguero-Gómez, R. (2025). Synergistic and additive effects of multiple threats erode phylogenetic and life history strategy diversity in Testudines and Crocodilia. Ecology Letters 28(6): e70147.

Abstract: Understanding how multiple threats interact is crucial for the prioritisation of conservation measures. Here, we investigate how interactions between six common threats (climate change, habitat disturbance, global trade, overconsumption, pollution and emerging diseases/invasive species) reduce the life history strategy diversity and phylogenetic diversity of 230 species of Testudines and 21 of Crocodilia. We classify threat interactions into additive, synergistic and antagonistic according to the reduction of life history strategy and phylogenetic diversity. Most threat interactions are

antagonistic; the effect of threats jointly is lower than the sum of the effects of threats separately. However, we find that the interaction between emerging diseases or invasive species with other threats has synergistic and additive effects, meaning that the combined effects are greater than or equal to the effects of threats separately. Our work can help target conservation strategies and detect key places to address multiple threats when they appear together.

Vera-Concha, M.I., Rojas, M., Cartes, D., Ceballos, M.C., Villarroel, M.C., Pérez, M., Venegas, V., Briceño, C., Calderón-Amor, J. and Luna, D. (2025). How happy do these animals look? Exploring factors influencing children's perceptions of animal welfare at the zoo. Animals 15(11): 1595.

Abstract: Understanding how children and adolescents perceive zoo animal welfare provides insights into public views on captive conditions. This study used a mixed-methods approach to investigate these perceptions. A total of 254 participants (aged 7-18) were surveyed, with 113 completing the full circuit, which included species from distinct phylogenetic groups: monkey, macaw, caiman, frog, fish, and tarantula. Qualitative analysis (n= 254) evaluated children's recognition of animal needs, whereas quantitative analysis (n= 113) examined how phylogenetic distance, participants' emotional state, and overall welfare perception influenced animal and environmental assessments-a structured survey evaluating perceived animal health, enclosure conditions, and behavioral expression. Participants' understanding of animal welfare extended beyond basic needs, recognizing the importance of species-specific behaviors and appropriate environments. Environmental and animal assessment scores were significantly influenced by species, participants' emotional states, and overall welfare perceptions: fish received the highest scores, positive emotions were associated with higher ratings, and a better overall welfare perception correlated with more favorable assessments. We inferred that phylogenetic distance, emotional state, and general welfare impressions shaped how children and adolescents evaluate animal welfare. The study supported zoo-based educational strategies and reinforced the role of zoos in promoting welfare awareness and conservation-oriented attitudes.

Erfani, M. and Salmanmahiny, A. (2025). Habitat management of Mugger crocodile (*Crocodylus palustris*) through regional-scale niche modeling for practical conservation planning. Journal of Environmental Studies 51(1): 141-58.

Abstract: Macro-environmental variables influence the distribution of species on a regional scale, and bioclimatic variables are the most important among them. The Mugger crocodile (*Crocodylus palustris*), which is a keystone species and the only crocodile in Iran, needs freshwater habitats to survive in regions with low precipitation. Also, every temperature fluctuation in the nest location impacts the sex ratio of its offspring. Consequently, the continuity of survival of this cold-blooded species is fundamentally influenced by climatic conditions rather than other ecological conditions on a regional scale. Therefore, this study was conducted on habitat modeling of the Mugger crocodile using historical bioclimatic variables on a regional scale. In the present study, habitat suitability modeling for the Mugger crocodile was conducted using maximum entropy modeling (MaxEnt) and bioclimatic variables extracted from the KGClim_V1 climate model database. Bioclimatic variables were screened based on their correlation and the variability of each dataset, as assessed through standard deviation (SD), ultimately leading to the selection of seven from an initial dataset of twelve variables. Using species presence data as the dependent and bioclimatic variables as independent variables, the MaxEnt model was executed with 15 repetitions to identify potentially suitable areas for the species at regional scale based on the average results from the repetitions. The modeling results indicated that the highly suitable habitat areas were located near the observation points of the species. This finding reflected a significant gain associated with a high area under the curve (AUC) value of 0.938. The jackknife test identified the most effective climatic variables, including PWM, PWMwint, and Tavg. According to the logarithmic response curves of this species to rainfall bioclimatic variables, suitable habitat areas were predicted to be in regions with low rainfall. By comparing the results with those of other studies, it was concluded that different scales of biological, ecological, geographical, and human factors influence the species distribution. Therefore, predicting species distribution across multiple spatial scales is essential for a more accurate valuation of the relationships among these variables. The findings of this study showed the necessity of integrated watershed management, especially in upstream areas, to ensure the survival of mugger crocodile downstream. Accordingly, a hierarchical modeling approach was recommended for future studies utilizing environmental variables at different scales. This approach is based on modeling macro factors separately from local-scale influences. In this context, micro and macro-scale studies are both important; however, their integration may pose problems because of inconsistency in spatial resolution and the scale of their effect on the species.

Ornellas, I.S., Coelho, F.E.A., Magalhães, F. de M., Nobrega, Y.C., Costa, L.P. and Gehara, M.C. (2025). Genomic data reveals cryptic diversity and suggests five putative species in the Broad-snouted caiman in South America. Available at SSRN: https://ssrn.com/abstract=5293523.

Abstract: The inclusion of molecular data in evolutionary studies revealed a vast underestimation of species richness and allowed for assessing the relative importance of landscape features on the evolutionary history of species with different ecological requirements. Here, we used genomic-scale data to assess the genetic diversity of the crocodilian *Caiman latirostris*, exploring drivers of diversification. Using phylogenomic analysis, we identified five deeply diverged populations that are putative new species under *C. latirostris*. Genetic structure is coherent with South American watersheds, with putative species occurring mainly in the Atlantic Eastern Northeast Coast, São Francisco, Atlantic Southeastern, Atlantic South, and Paraná watersheds. Populations also show congruence with freshwater ecoregions, suggesting that not only watersheds, but also other landscape features, may act on species diversification. This is reinforced by a low migration rate between populations separated by mountain ranges. We highlight the need for separate management plans for each population of this historically threatened species due to their unique evolutionary history and genetic diversity. Future studies focusing on possible morphological and ecological differences, as well as demographic history, may reinforce the existence of putative species.

Rachuene, P., Nemutandani, K.R., Mugwabana, J.T. and Tyasi, T.L. (2025). Prediction of total skin length in Nile crocodiles (*Crocodylus niloticus*) using measurable skin traits. Research Square (doi: https://doi.org/10.21203/rs.3.rs-6810779/v1).

Abstract: Nile crocodiles are common in South Africa, reaching up to 6 m in total length. The objectives of this study were (1) to determine the phenotypic correlation between total skin length and other measurable skin traits, and (2) to derive a model for predicting total skin length of Nile crocodile. 180 skins were used to measure total skin length and skin traits viz skin weight (SW), skin thickness (ST), neck total length (NTL), neck width at the top (NWT), neck width at the middle (NWM), belly width (BW), belly length (BL), total tail Length (TTL), tail length from the middle (TLM), and Tail width (TLW). Data analysis was computed using Pearson's correlation, Simple linear regression and stepwise multiple regression techniques in Statistical Package for Social Sciences (SPSS) software version 29.0. Highly positive correlations ($P<0.01$) were found between total skin length and SW (0.81), BL (0.79), BW (0.75), TTL (0.87), TLM (0.78), TLW (0.48), NTL (0.37), NWT (0.51) and NWM (0.60). High positive correlations ($P<0.05$) were

found between TSL and ST (0.17). Linear regression ndings showed that TTL (R^2= 0.76) was the best trait to predict TSL. Furthermore, regression ndings showed that a combination of (ST, BL, BW, TTL, TLM, TLW, NTL, NWT, NWM (R^2= 0.90; RMSE= 14.23) was the best in predicting TSL of Nile crocodiles. The results suggest the traits, particularly TTL, can be used as a selection criterion for improving total skin length in Nile crocodiles.

Gao, Y., Wang, D., Pan, T., Tu, G., Jiang, X., Pang, F. and Wu, X. (2025). Investigating the demeanor of the Chinese alligator during the breeding season across different habitats. Behavioral Ecology and Sociobiology 79: Article 73.

Abstract: Although nesting behavior and activity patterns of the Chinese alligator (*Alligator sinensis*) during the breeding season are crucial for offspring survival, previous studies have partially investigated these aspects; however, further research is needed to integrate existing findings and address remaining gaps. This study aimed to explore the behavior and activity patterns of Chinese alligators at their nests in a natural environment during the breeding season. Data collection occurred in two different regions (A and B) using cameras and camera traps. Region A is an agricultural area, while Region B is a hilly and mountainous area. A total of 23 species were recorded visiting Chinese alligator nests, including primary (hog badger and wild boar) and potential (Siberian weasel) predators. Chinese alligators successfully repelled predators' attacks during the breeding season and prevented nest destruction. The degree of habitat disturbance influenced the frequency and duration of nest visits by Chinese alligators. Specifically, the disturbance levels were higher (P<0.01) in Region A compared to Region B. Moreover, nest visit patterns were linked to the visitation patterns of other species. Furthermore, Chinese alligators exhibited strong parental care behaviors, such as assisting hatchlings in emerging from nests and transporting them to water, which were critical for successful young hatching. In conclusion, this study enriched the behavioral information of crocodilian species during the breeding season and provided valuable insights into the adaptive nesting behaviors of Chinese alligators. Understanding these behaviors is crucial for endangered species' survival and population recovery.

Mendes, D.M.M., Nogueira, D.S., Vivallo, F., Sobral. R. and Neto, A.M.S. (2025). First record of the bee *Centris longimana* (Apidae) lapping eye secretions from black caiman *Melanosuchus niger* (Reptilia: Alligatoridae) in the Brazilian Amazon rainforest. International Journal of Tropical Insect Science (https://doi.org/10.1007/s42690-025-01536-1).

Abstract: This scientific note reports the observation of an interaction between the oil-collecting bee *Centris longimana* and the black caiman *Melanosuchus niger* in the Brazilian Amazon, in which the bee was seen feeding on the caiman's eye secretions. The bee hovered in front of the caiman's eye, touching it with its flabellum to extract the fluids. This behavior appeared to cause discomfort to *M. niger*, which repeatedly closed its eyes and occasionally submerged its head in an attempt to drive the bee away. Detecting interactions such as this is important, as they may reflect evolutionary relationships between species, suggesting that bees could use eye secretions from crocodilians to fulfill specific ecological or physiological functions.

Pimentel, R.J., Hunt, A.P., Barroso-Barcenilla, F. and Berrocal-Casero, M. (2025). A new dentalite, *Piscidenticulus callapezi* igen. et isp. nov., on a crocodylomorph coprolite from the Upper Cretaceous of west-central Portugal. Cretaceous Research (https://doi.org/10.1016/j.cretres.2025.106193).

Abstract: Recently discovered dentalites preserved on an Upper Cretaceous coprolite are described. The coprolite was likely produced by a crocodylomorph that lived in a shallow water, marginal environment along the West Iberian Margin. The specimen was collected from an uppermost middle Cenomanian carbonate-siliciclastic marine bed, at the base of the Tentúgal Formation (Tentúgal, west-central Portugal). The dentalites exhibit unique characteristics, including sets of straight, parallel, and equidistant grooves, with separations wider than the grooves, themselves. These features support the definition of the new ichnogenus and ichnospecies *Piscidenticulus callapezi*. The dentalites are interpreted as the result of repeated fish-biting behaviour on the surface of the coprolite, likely in an attempt to obtain food, providing significant data on the scarcely known palaeoethology of Cretaceous homodont marine fishes.

Tanaka, M., Eda, M., Kobayashi, Y., Izumi, H., Kikuchi, H. and Sun, G. (2025). Identification of East Asian crocodylian collagen from the Tianluoshan Archaeological site of China. Available at SSRN: https://ssrn.com/abstract=5314867.

Abstract: Crocodylia, a group of semi-aquatic predators, comprises approximately 30 extant species distributed across tropical and subtropical regions. Despite significant ecological diversity, the group's limited morphological variation poses challenges for species identification in archaeological research, particularly when dealing with fragmentary remains. Zooarchaeology by Mass Spectrometry (ZooMS), a method utilizing collagen peptide fingerprinting, has emerged as a powerful tool for species identification. This study introduces the first application of ZooMS to crocodylian bones, focusing on the identification of ancient specimens. Modern references included three specimens of *Alligator sinensis*, two of *Tomistoma schlegelii*, and two of *Crocodylus porosus*. Among these, *Alligator sinensis* is the only extant alligator species outside the Americas, coexisting in East Asia with *Tomistoma schlegelii* and *Crocodylus porosus*. Collagen extraction protocols tailored for ZooMS were implemented, followed by analysis using time-of-flight mass spectrometry (TOF-MS) and liquid chromatography tandem mass spectrometry (LC-MS/MS). Collagen peptide fingerprinting via TOF-MS and LC-MS/MS provided detailed taxonomic resolution for modern and ancient crocodylian specimens. Species-specific biomarkers were identified, with considerations for post-translational modifications and diagenetic alterations. The results highlight the potential of ZooMS for resolving the diversity of crocodiles in East Asia and analyzing archaeological specimens' relationship with humans. Future efforts should focus on expanding the ZooMS reference database, exploring diagenetic mechanisms, and applying the approach to older samples. By refining this methodology, ZooMS can offer new insights into the evolutionary and paleoecological history of Crocodylia.

Zhang, S., Meiri, S., Holyoak, M., Wang, J., Wang, Y. and Chen, C. (2025). Demand for small- and large-ranged reptiles in worldwide wildlife trade. Conservation Biology (https://doi.org/10.1111/cobi.70095).

Abstract: Wildlife trade poses a major threat to biodiversity, yet the drivers determining which species are traded are not fully understood. Through a comprehensive collection of official and online trade data, we applied a binomial test to identify families that contain an unexpectedly large or small number of traded species. We also analyzed which factors predispose reptile species to be traded and explored whether traded species were more likely to be threatened with extinction. Of the 10,919 reptile species in our dataset, 3889 species (35.6%) were traded. There was strong evidence for taxonomic biases in trade risk. In particular, all turtle and crocodilian families had higher trade risk than other reptiles. Species with large body sizes, habitat generalists, insular endemics, and those found in regions with high gross domestic product were traded in greater quantities and more frequently. Species with small and large ranges were more frequently involved in trade, suggesting a demand for rare and common species in wildlife trade. When connecting trade risk to extinction risk, data-deficient and not-evaluated species had fewer traded species and were less likely to

be traded than threatened or nonthreatened ones. Nonetheless, these species warrant special conservation attention considering their rarity, limited range size, and insufficient legal protection. Given the increased attention given to wildlife trade, we suggest implementing stronger regulatory measures to monitor and control the trade of reptile species, particularly those belonging to families with a high risk of being traded. Efforts should also prioritize the protection of species exhibiting traits that make them highly susceptible to exploitation. Finally, promoting international collaboration for stricter enforcement of wildlife trade regulations and support of sustainable trade practices can help mitigate the negative impacts on biodiversity.

Resumen: Demanda de reptiles con distribución amplia y reducida en el mercado mundial de fauna Resumen El mercado de fauna representa una grave amenaza para la biodiversidad, pero aún no conocemos a fondo los factores que determinan qué especies son objeto del comercio. Mediante una exhaustiva recopilación de datos comerciales oficiales y en línea, aplicamos una prueba binomial para identificar familias que contienen un número inesperadamente grande o pequeño de especies comerciadas. También analizamos qué factores predisponen a las especies de reptiles a ser comerciadas y exploramos si estas especies tenían más probabilidades de estar amenazadas de extinción. De las 10,919 especies de reptiles de nuestro conjunto de datos, 3,889 (35.6%) eran comerciadas. Había pruebas sólidas de sesgos taxonómicos en el riesgo de comercio. En particular, todas las familias de tortugas y cocodrilos presentaban un riesgo comercial más elevado que otros reptiles. Las especies de talla grande, las generalistas en cuanto a hábitat, las endémicas insulares y las que se encuentran en regiones con un producto interno bruto elevado fueron objeto de comercio en mayor cantidad y con mayor frecuencia. Las especies con áreas de distribución pequeñas y extensas participaron con más frecuencia en el comercio, lo que sugiere una demanda de especies raras y comunes en el comercio de especies silvestres. Cuando relacionamos el riesgo de comercio con el riesgo de extinción, las especies con datos deficientes y las no evaluadas presentaban menos especies comerciadas y tenían menos probabilidades de serlo que las amenazadas o no amenazadas. No obstante, estas especies merecen una atención especial para su conservación si consideramos su rareza, el tamaño limitado de su área de distribución y la insuficiente protección legal. Dada la creciente atención prestada al comercio de especies silvestres, sugerimos aplicar medidas reguladoras más estrictas para vigilar y controlar el comercio de especies de reptiles, en particular las pertenecientes a familias con un alto riesgo de ser comerciadas. También se debería dar prioridad a la protección de las especies que presentan rasgos que las hacen muy susceptibles a ser explotadas. Por último, el fomento de la colaboración internacional para una aplicación más estricta de la normativa sobre comercio de especies silvestres y el apoyo a prácticas comerciales sostenibles pueden ayudar a mitigar los efectos negativos sobre la biodiversidad.

Rhen, T., Costoe, T.A. and Crossley, D.A. (2025). Embryonic hypoxia alters cardiac gene expression patterns in American alligators, *Alligator mississippiensis*. Physiological Genomics (doi: 10.1152/physiolgenomics.00192.2024).

Abstract: How environmental conditions during embryogenesis shape development, physiology, and phenotype is a key question for understanding the roles of plasticity and environmental factors in determining organismal traits. Answering this question is essential for revealing how early-life environmental variation drives adaptive responses and influences evolutionary processes. Here we examine how hypoxia impacts cardiac gene expression during embryonic development in the American alligator (*Alligator mississippiensis*). Eggs were incubated in normoxic (21% O_2) or hypoxic (10% O_2) conditions from 20% to 90% of embryogenesis. Embryos were sampled at 70% and 90% of development to measure gene expression, embryo mass and organ mass. Hypoxia significantly restricted embryonic growth while enlarging hearts and brains relative to body size. Gene expression analyses show that hypoxia led to upregulation of 182 genes and downregulation of 222 genes, which were enriched in pathways related to muscle contraction, oxygen transport, protein catabolism, and metabolism. Developmental changes in 3544 genes were associated with cell division, extracellular matrix remodeling, and structural organization. Functional and network analyses highlighted hypoxia-induced shifts in cardiomyocyte physiology, suggesting adaptations to enhance cardiac performance under low oxygen availability. Despite hypoxia-related downregulation of sarcomere and metabolic genes, hypertrophic responses were evident, consistent with previous findings of improved cardiac function in hypoxia-exposed juveniles. Collectively, our findings offer new genome-wide insights into the effects of hypoxia on the embryonic alligator heart, uncovering significant adaptive developmental plasticity. These results have broad implications for understanding how environmental factors shape cardiovascular phenotypes and drive evolutionary responses to hypoxia in reptiles.

Griffith, P., Jähnig, S., Tharme, R., Phaka, F., Copeland, L., He, F., Hevalao, R., Kang, S., Langhans, S., Mailautoka, K., Petry, P., Rashni, B. and Reyes-Garcia, V. (2025). A framework to categorise the cultural significance of freshwater fauna. Research Square (https://doi.org/10.21203/rs.3.rs-6830897/v1).

Abstract: Freshwater ecosystems support rich biological and cultural diversity, each enhanced through biocultural co-evolution. However freshwater species, and their relationships with people, face escalating pressures from global change, threatening ecosystem function and human wellbeing. Addressing this crisis effectively and ethically requires transdisciplinary approaches that recognise the complex, culturally embedded interactions between people and freshwater fauna. Existing frameworks for integrating the cultural and ecological dimensions of freshwater fauna are either too general or conceptually misaligned to support practical application, and are often based on binaries such as 'tangible and intangible' that artificially segregate meaning and practice. To bridge this gap, we developed a novel framework for systematically categorising the cultural significance of freshwater fauna, drawing on pre-existing frameworks and human-freshwater-fauna interactions (n=612) from interdisciplinary literature. The resulting framework comprises seven overarching domains - Consumptive Use; Cultural Landscapes, Sites and Stewardship; Knowledge Systems; Worldviews, Beliefs and Identities; Cultural and Social Practices; Recreation, Leisure and Tourism; and Creative Expression - each subdivided into defined categories and subcategories. Applicable across diverse cultural, taxonomic and geographic contexts, our framework provides a pragmatic tool to support more holistic and inclusive approaches to freshwater ecosystem research, management, governance, and cross-cultural cooperation.

Wilberg, E., Hill, R.V., Pascucci, T.R., Roberts, E.M., Bouaré, M.L. and O'Leary, M.A. (2025). A new itasuchid (Crocodyliformes, Notosuchia) from the Early Cretaceous of Mali and the ancient Paleo-Tegama river system of Gondwana. Journal of Vertebrate Paleontology (https://doi.org/10.1080/02724634.2025.2505473).

Abstract: We describe a new genus and species of notosuchian crocodyliform from the "Continental Intercalaire" of the Republic of Mali represented by cranial, mandibular, and postcranial material. Phylogenetic analysis recovers the new taxon, *Sissokosuchus maliensis*, within Itasuchidae as the sister taxon to *Barreirosuchus*, and deeply nested within an otherwise South American radiation. *Sissokosuchus* is the first itasuchid recognized from the Lower Cretaceous "Continental Intercalaire" of West Africa (with *Fortignathus felixi* potentially representing a second). *Sissokosuchus* possesses the apomorphic dentary alveolar couplet morphology present in *Itasuchus* and other later diverging itasuchids. Our analysis also supports a clade-level dichotomy in rostral morphology: Itasuchidae is dominated by narrower, platyrostral taxa and Peirosauridae by oreinirostral taxa. Sedimentology of the site suggests that *Sissokosuchus* is associated with a large, ancient fluvial

channel system. Paleocurrents and detrital zircon data indicate that sediments were derived from myriad sources to the south and east. Our work corroborates hypotheses indicating westward paleoflow of stratigraphically correlative Aptian-Albian fluvial strata in Niger (that preserve similar taxa) into Mali. We hypothesize that a transcontinental river system, here named the Paleo-Tegama River System, was present during this time draining west out of Niger through Mali and into the Tethys Sea. This paleodrainage system would have acted as a late-lasting inland faunal corridor between South America and West Africa, via the West and Central African Rift System, prior to final Gondwanan break-up, or a post break-up dispersal route via the Tethys, for semiaquatic West African crocodyliforms to reach South America, or vice versa.

Dubois, A. and Fretey, T. (2025). Problems with the nomenclatural availability and promulgation date of zoological works, nomina and nomenclatural acts published electronically online. Bionomina 42(1): 10-75.

Abstract: Various problems posed by the 2012 Amendment to the International Code of Zoological Nomenclature are reviewed. They concern mainly the nomenclatural availability and the promulgation date of works published online and of the new nomina and nomenclatural acts they contain. A methodology is proposed for the analysis of these problems in many works published after 3 September 2012. A detailed survey of 120 herpetological online publications having nomenclatural implications is presented: 63 of them include unavailable nomina and nomenclatural acts, and 57 of them were made available through their printed versions at dates subsequent to that stated on their PDFs. Detailed proposals and recommendations to authors, editors and referees, publishers, libraries, and concerning the Code, Zoobank and the Commission, are offered to try to limit the negative impact of these problems in zootaxonomy.

Su, S., Peng, X., Xing, H. and Dong, S. (2025). Reptile conservation in China: Issues, challenges and prospects. Journal of Southwest University Natural Science Edition 47(6): 2-11.

Abstract: China holds the seventh global position in reptilian biodiversity. Reptiles play an important role in maintaining biodiversity and ecosystem stability, while also contributing to biomedical applications and cultural heritage. However, conservation efforts face significant challenges from human perturbations. To address these issues, this study systematically reviewed global conservation methodologies and analyzed the current situation and existing problems of reptile protection in China. Importantly, we propose a tripartite solution encompassing: Legislative reinforcement and policy optimization; Public awareness campaigns; Synergistic collaboration between governmental and non-governmental stakeholders. Furthermore, we present successful case studies related to habitat protection and captive breeding programs, demonstrating practical approaches to engage broader societal participation. The analysis extends to comparative evaluation of international conservation paradigms, advocating for enhanced transnational knowledge exchange and cooperative mechanisms to strengthen the current research on reptile protection in China. In conclusion, this study provides evidence-based strategic recommendations to advance China's reptilian conservation research and management protocols.

Zhang, S., Meiri, S., Holyoak, M., Wang, J., Wang, Y. and Chen, C. (2025). Demand for small- and large-ranged reptiles in worldwide wildlife trade. Conservation Biology (https://doi.org/10.1111/cobi.70095).

Abstract: Wildlife trade poses a major threat to biodiversity, yet the drivers determining which species are traded are not fully understood. Through a comprehensive collection of official and online trade data, we applied a binomial test to identify families that contain an unexpectedly large or small number of traded species. We also analyzed which factors predispose reptile species to be traded and explored whether traded species were more likely to be threatened with extinction. Of the 10,919 reptile species in our dataset, 3889 species (35.6%) were traded. There was strong evidence for taxonomic biases in trade risk. In particular, all turtle and crocodilian families had higher trade risk than other reptiles. Species with large body sizes, habitat generalists, insular endemics, and those found in regions with high gross domestic product were traded in greater quantities and more frequently. Species with small and large ranges were more frequently involved in trade, suggesting a demand for rare and common species in wildlife trade. When connecting trade risk to extinction risk, data-deficient and not-evaluated species had fewer traded species and were less likely to be traded than threatened or nonthreatened ones. Nonetheless, these species warrant special conservation attention considering their rarity, limited range size, and insufficient legal protection. Given the increased attention given to wildlife trade, we suggest implementing stronger regulatory measures to monitor and control the trade of reptile species, particularly those belonging to families with a high risk of being traded. Efforts should also prioritize the protection of species exhibiting traits that make them highly susceptible to exploitation. Finally, promoting international collaboration for stricter enforcement of wildlife trade regulations and support of sustainable trade practices can help mitigate the negative impacts on biodiversity.

Resumen: El mercado de fauna representa una grave amenaza para la biodiversidad, pero aún no conocemos a fondo los factores que determinan qué especies son objeto del comercio. Mediante una exhaustiva recopilación de datos comerciales oficiales y en línea, aplicamos una prueba binomial para identificar familias que contienen un número inesperadamente grande o pequeño de especies comerciadas. También analizamos qué factores predisponen a las especies de reptiles a ser comerciadas y exploramos si estas especies tenían más probabilidades de estar amenazadas de extinción. De las 10,919 especies de reptiles de nuestro conjunto de datos, 3889 (35.6%) eran comerciadas. Había pruebas sólidas de sesgos taxonómicos en el riesgo de comercio. En particular, todas las familias de tortugas y cocodrilos presentaban un riesgo comercial más elevado que otros reptiles. Las especies de talla grande, las generalistas en cuanto a hábitat, las endémicas insulares y las que se encuentran en regiones con un producto interno bruto elevado fueron objeto de comercio en mayor cantidad y con mayor frecuencia. Las especies con áreas de distribución pequeñas y extensas participaron con más frecuencia en el comercio, lo que sugiere una demanda de especies raras y comunes en el comercio de especies silvestres. Cuando relacionamos el riesgo de comercio con el riesgo de extinción, las especies con datos deficientes y las no evaluadas presentaban menos especies comerciadas y tenían menos probabilidades de serlo que las amenazadas o no amenazadas. No obstante, estas especies merecen una atención especial para su conservación si consideramos su rareza, el tamaño limitado de su área de distribución y la insuficiente protección legal. Dada la creciente atención prestada al comercio de especies silvestres, sugerimos aplicar medidas reguladoras más estrictas para vigilar y controlar el comercio de especies de reptiles, en particular las pertenecientes a familias con un alto riesgo de ser comerciadas. También se debería dar prioridad a la protección de las especies que presentan rasgos que las hacen muy susceptibles a ser explotadas. Por último, el fomento de la colaboración internacional para una aplicación más estricta de la normativa sobre comercio de especies silvestres y el apoyo a prácticas comerciales sostenibles pueden ayudar a mitigar los efectos negativos sobre la biodiversidad.

Dutton, H. (2025). Exploring Parasite Diversity: Taxonomic Studies of Parasites from Birds, Crocodilians, and Anurans Across Diverse Ecosystems. PhD thesis, Auburn University, Auburn, Alabama, USA.

Venegas-Anaya, M., Tejedor-Flores, N., Alonso, F.M., Perdices, A. and Jáuregui, M.G. (2025). Risk perception and popular knowledge about crocodilians (*Caiman crocodilus* and *Crocodylus acutus*) in river communities in the provinces of Veraguas and Chiriquí, Panamá, Central America. Revista Española de Desarrollo y Cooperación 52(1): 101-117.

Resumen: Esta investigación social empírica de tipo cualitativo estudia la coexistencia humano-crocodílidos para apoyar en el diseño del plan nacional sobre el manejo de crocodílidos en Panamá. Se analizó la percepción de riesgo y el conocimiento de las comunidades que conviven con crocodílidos mediante encuestas en 16 localidades de Veraguas y Chiriquí. El 82% de los encuestados poseía buen conocimiento sobre los crocodílidos, aunque solo la mitad concluyó la educación primaria. Los hombres están más familiarizados con los crocodílidos debido a su relación con la pesca y la agricultura. A pesar del temor hacia estos animales, el 74% de las personas encuestadas apoya su protección, resaltando la necesidad de programas educativos que fomenten un manejo sostenible de los crocodílidos.

Abstract: This empirical qualitative social research study examines human-crocodile coexistence to support the design of the National Crocodile Management Plan in Panama. The study analysed the risk perception and knowledge of communities living with crocodilians through surveys conducted in sixteen localities in Veraguas and Chiriquí. Overall, 82% of respondents showed a good knowledge of crocodilians, although only half had completed primary school. Men were more familiar with crocodiles due to their involvement in fishing and agriculture. Despite the fear of crocodiles, 74% of respondents supported their conservation, highlighting the need for educational programmes to promote sustainable crocodilian management.

Wu, Y., Yu, R., Yu, Q., Wang, C. and Zhang, Z. (2025). Evaluation and multi-scenario optimization of habitat quality in the basin of Yangtze River in Anhui Province. Ecology and Environmental Sciences 34(6): 961-973.

Abstract: Currently, due to the strain in human-land relationships, the accelerated advancement of economic globalization, and rapid population growth, various ecological challenges are gradually becoming a core focus for countries and international organizations. This is an important topic in research on the global ecosystem structure. With the rapid socio-economic development in China, the continuous expansion of construction land has become an inevitable trend, which not only exerts a profound impact on natural ecological changes and land cover structures but also poses a threat to the living environments of humans and animals. Habitat quality is the foundation and prerequisite of all ecosystem functions and services. Assessment of habitat quality and exploration of its impact mechanisms are key means of dealing with ecological problems and protecting the ecological environment. Additionally, research on the temporal and spatial changes in habitat quality and their influencing factors is vital for maintaining ecosystem balance and sustainability. The Basin of Yangtze River in Anhui Province serves as an essential ecological barrier in the middle and lower reaches of the Yangtze River, with important wetlands such as Shengjin Lake and Chaohu Lake. These wetlands are vital wintering and breeding grounds in China for dozens of nationally endangered wildlife species, including the Chinese alligator (*Alligator sinensis*) and hooded crane (*Grus monacha*), which also represent crucial nodes and wintering sites along the migration route of the East Asian-Australasian Flyway. Since 2010, the basin has been officially established as China's first national-level demonstration zone for industrial transfer, resulting in rapid regional economic growth. However, significant ecological changes have occurred with the ongoing land-use development, attracting the attention of local governments and scholars. Therefore, ecological and environmental protection research is important. Therefore, this study comprehensively used land use data of the study area from 1990 to 2020 and selected the InVEST model, PLUS model, and geodetector to focus on spatiotemporal changes in past and future habitats in the study area and the optimization strategies. The following scientific issues should be addressed: 1) What are the spatiotemporal evolutionary characteristics of land use and habitat quality in this region from 1990 to 2020? 2) What are the spatiotemporal evolution characteristics of land use and habitat quality in the study area under the four 2030 scenarios? 3) What are the impact mechanisms of habitat quality change in the study area? The scientific issues that this study focuses on provide valuable insights and effective decision support for regional landscape planning and ecological sustainability initiatives. The results showed the following: 1) The dominant land use types in the study area were paddy and forest lands, which accounted for approximately 77% of the total area. Notably, from 1990 to 2020, the main land use types in the study area were converted from paddy land to construction land, with a total of 2691.28 km^2; 2) During 1990-2020, the average habitat quality index decreased from 0.550 to 0.535 and the overall habitat quality decreased; 3) During 1990-2020, both natural and social factors influenced the spatial distribution of the habitat quality. The main influencing factor was land use followed by elevation. The interaction of all factors had stronger explanatory power for the change in habitat quality than that of individual factors; and, 4) The results of the multi-scenario simulation in 2030 showed that compared with 2020, the average habitat index would decline by 0.003 under inertia development and by 0.006 under urban development scenarios. Conversely, the habitat index for the paddy-land protection scenario should be maintained at the 2020 level. Notably, the average habitat index for the ecological protection scenario exhibited an increase of 0.004, indicating successful attainment of a dynamic balance between ecological protection and economic development. Research indicates that paddy land protection and ecological protection measures have played a significant role in effectively curbing the excessive expansion of construction land within the study area, thereby stabilizing and enhancing habitat quality. In the context of ecological protection, although there has been a slight reduction in paddy land and a minor increase in construction land, key ecological areas such as forest land have seen growth. This improvement in habitat quality compared with 2020 opens up new approaches for sustainable development in the Yangtze River Basin in Anhui Province. Therefore, the simultaneous implementation of paddy land and ecological protection policies is an effective strategy to prevent further habitat degradation. Future regional planning should prioritize the protection of ecological land, such as forestland and water, and strictly control the expansion of construction land to avoid encroaching on paddy lands, thus comprehensively enhancing the regional habitat quality. Moreover, due to the distinct diversity of topographical features in the Basin of Yangtze River in Anhui Province, planning authorities should adhere to the principle of "adapting measures to local conditions" in order to reasonably adjust and manage natural and human living spaces based on topographic characteristics. For instance, in the southwestern Dabie Mountains and southern Anhui Hills, where high terrain and rich forest resources are prevalent, low-intensity "agroforestry" zones can be established to moderately develop economic timber industries and distinctive ecological agricultural products. This approach not only bolsters the security of the region's ecological barrier, but also enhances local residents' well-being and promotes eco-economic development, thereby mitigating deforestation of surrounding forests driven by economic challenges. In relatively flat Jiangbei Plain and hilly regions with abundant paddy land resources, it is essential to rationally control the disorderly expansion of central cities. By improving the living environment of urban and rural residents as a focal point, comprehensive rural environmental remediation should be pursued, with the appropriate consolidation of small, dispersed settlements and the optimal utilization of existing construction land resources. In water-rich areas along a river, it is crucial to adopt a development philosophy that balances "protection and development." All high-intensity anthropogenic development activities must be strictly prohibited to safeguard habitats for rare and endangered species and to maintain regional biodiversity stability. Major urban areas along the river should be aligned with

urban development positioning, uphold ecological priorities, and restrict high-pollution and high-energy-consumption industries to mitigate adverse impacts of human activities on ecosystem quality.

Denton, M.J., Cherkiss, M.S., Mazzotti, F.J., Brandt, L.A., Godfrey, S.T., Johnson, D. and Hart, K.M. (2025). Isotopic niche plasticity of American alligators within the southern Everglades. PLoS One 20(6): e0326148.

Abstract: Hydrologic alterations within the Everglades have degraded American alligator (*Alligator mississippiensis*) habitat, reduced prey base, and increased physiological stress. Alligator body condition declined across many management areas from 2000 through 2014, prompting us to investigate the relationship between their intraspecific isotopic niche dynamics and body condition. Alligators within the estuary had a larger niche driven by a wider range in stable carbon isotope ratios than those sampled in freshwater habitats. Spatially, model predictability was higher at the smaller scale, reflecting the variability in basal sources and biochemistry among capture sites. Male niches were often larger than those of females, driven by wider ranges of $\delta^{13}C$ values, suggesting that they differ in their proportional use of habitats and or resources. However, the similar ranges of $\delta^{15}N$ values indicated both sexes foraged within the same trophic level. Furthermore, while not significantly different, large alligators often had a larger niche with elevated $\delta^{15}N$ values compared to medium-sized alligators. Although alligators utilize similar stable carbon and nitrogen isotope pools through time, there was considerable temporal variability. These temporal variations in alligators' isotopic niche were likely influenced by seasonal hydrologic fluctuations within each site, with their niches often being larger in the spring captures than the fall captures. Alligators' body condition estimates were correlated with intraspecific niche characteristics, including the mean centroid distance between sexes and the interaction between male and female niche size and overlap, within a site, capture period, and year. The variability in intraspecific niche dynamics, landscape heterogeneity, and dynamic hydrology are considerations for designing sustainable management strategies to conserve and enhance alligator populations within the Everglades landscape.

Debrot, A.O., Van Den Burg, M.P., Sideleau, B.M. and Van Der Ploeg, J. (2025). New records for the American crocodile (*Crocodylus acutus*) for the Southern Dutch Antilles, placed in the context of the species' regional range re-expansion. Caribbean Journal of Science 55(1): 205-215.

Abstract: Following centuries of persecution and the destruction and degradation of wetland habitat, the coastal populations of the American crocodile, *Crocodylus acutus*, of Colombia and Venezuela show signs of recovery, in part, due to conservation efforts. Here we first report on the sequence of events surrounding a crocodile arrival and death in the Southern Dutch Antilles in 2024, and discuss this along with three additional older records for the same island group. The results are then integrated regionally by discussing three remarkable crocodile records for the island of San Andrés, Colombia, since 2012, and nine for the Cayman Islands since 2006. The findings indicate the species' ability to disperse hundreds of kilometers across the open sea to colonize new and/or former habitat. We conclude by arguing that the islands we discuss should also be considered part of the current natural range of occurrence of the species, even though this has generally not been acknowledged, and the few animals noticed have typically been persecuted. Finally, we urge island Governments and conservation organizations to prepare awareness and action plans to accommodate this vulnerable and valuable top predator in the wild.

Maudens, Y., Debruyn, G., Loccufier, E., Daelemans, L., Savino, E., Tonetti, C., Vineis, C., Varesano, A., Shawkey, M., D'Alba, L. and De Clerck, K. (2025). Modular design of biomimetic electrospun keratin composites for tunable gaseous sorption inspired by reptile eggshells. Materials Today Bio (https://doi.org/10.1016/j.mtbio.2025.102032).

Abstract: Biomimicry, the replication of natural structures, is an emerging strategy in materials engineering for developing advanced functional materials. Reptile eggshells serve as compelling models for tunable bioinspired material design due to their diversity in forms and functions. This study presents a modular approach to designing keratin-based composites with customizable vapor sorption behavior. Inspired by reptile eggshells, four key biomimetic components were reconstructed: (1) electrospun keratin membranes resembling the fibrous shell membrane, (2) an egg protein matrix replicating the proteinaceous eggshell matrix, (3) calcium carbonate ($CaCO_3$) particles introducing mineralization, and (4) a paraffin coating representing the lipid-rich cuticle layer. The modular accuracy of these biomimetic models was validated by comparison with representative reptile eggshells through Scanning Electron Microscopy analysis and Fourier-Transform Infrared Spectroscopy. Dynamic vapor sorption (DVS) analysis confirmed that varying the $CaCO_3$ content allows precise control over the absorption profiles, ranging from low to high sorption values. Additionally, integrating the organic matrix and lipid coating enabled fine-tuning of the sorption properties. The resulting biomimetic composites exhibited sorption characteristics comparable to those of natural eggshells, including *Caiman crocodilus* (low absorption) and *Pantherophis guttatus* (high absorption), demonstrating the effectiveness of the modular design strategy. These findings establish a foundation for engineering advanced biocompatible materials with adaptable sorption behavior, offering potential applications in moisture-regulating wound dressings, tissue engineering scaffolds, sustainable packaging, and filtration systems.

Paul, G.K., Kumar, P., Kumar, N., P., S., Alam, S.S., Devi, R.S. and Kumar, S. (2025). Threatened freshwater faunal species of India and their conservation strategies. Asian Journal of Environment & Ecology 24(6): 282-290.

Abstract: The present study aimed to compile information on selected threatened aquatic fauna, their roles in food webs, and the significance of their relationships with associated vegetation. It also explores ways to restore and conserve the habitats of these vulnerable species, highlighting the importance of preserving ecological balance and biodiversity in aquatic ecosystems. Freshwater ecosystems in India, encompassing rivers, lakes, ponds, and wetlands, are home to a rich variety of aquatic life, including mammals, fish, amphibians, crustaceans and mollusk. These ecosystems rely on a delicate balance of food chains and food webs, with aquatic plants serving as the primary producers. India's freshwater ecosystems support a rich diversity of aquatic life, including threatened species like the Ganges River Dolphin, Ganges Shark, Mugger Crocodile, and Hump-backed Mahseer. Human activities such as pollution, overfishing, habitat destruction, and fragmentation have significantly impacted these species, leading to population declines and local extinctions. Therefore, studies on threatened freshwater faunal species are very important to draw attention towards their conservation. The present study documented 19 threatened freshwater fauna in India. Effective conservation approaches include awareness programs, anti-poaching efforts, pollution control, habitat restoration, and restoring native vegetation. This study emphasizes the need for urgent conservation action to protect India's freshwater ecosystems and the threatened species that depend on them. By adopting a holistic approach that balances human needs with ecological sustainability, we can work towards preserving the rich biodiversity of India's freshwater ecosystems and ensuring the long-term survival of its threatened aquatic fauna.

De Celis, A., Narvaez, I., Villaneuva, A. and Gamonal, A. (2025). Unraveling crocodylomorph evolution: Insights from Fossils and new methodologies. 5th Palaeontological Virtual Congress,

10-25 March 2025 (https://www.palaeovc.org/thematic-session/crocodylo-evolution/).

Abstract: Crocodylomorphs are a major archosaur lineage that originated in the Mesozoic Era and whose descendants are still present in modern ecosystems, with some species ranking among the largest reptiles in the world. Although only 26 recognised species of crocodylians roam the Earth today, this is in sharp contrast to the remarkable diversity of crocodylomorphs in the past. This thematic session aims to explore new research and findings in this group, focusing on their evolutionary history and diversity, which has been further elucidated by groundbreaking fossil discoveries and cutting-edge research methods in recent decades. The discovery of exceptional crocodylomorph fossil specimens around the world has provided new insights into their taxonomy, morphological evolution, and evolutionary transitions. Collaborative efforts by international research groups have deepened our understanding of their palaeobiology and ecological significance throughout their evolutionary history. Furthermore, the development of new analytical techniques, including advances in biomechanical studies, 3D imaging, isotopic analysis, geometric morphometrics, and phylogenetics, has allowed detailed reconstructions of their locomotion, feeding strategies, sensory capabilities, physiology, and even their global dispersal patterns. This thematic session is an open invitation to share the latest findings in crocodylomorph research, improving our understanding of this group and their role in past ecosystems, while promoting interdisciplinary approaches and collaboration between researchers. Contributions spanning from systematic taxonomy to large-scale evolutionary research on crocodylomorphs are welcome in this session.

Xu, G., Ma, W., Zhao, W. and Yu, Z. (2025). Identification of immunomodulatory peptides from crocodile head protein hydrolysates: Targeted screening and immunomodulatory activity by activating NF-κB signaling pathway. Food Research International (doi: 10.1016/j.foodres.2025.116792).

Abstract: Long-term unhealthy lifestyles are prone to triggering immune disorders, leading to infections and chronic diseases, posing serious health risks. Immunomodulatory peptides, with the advantages of being natural and having low toxicity and few side effects, contribute to maintaining immune balance. However, their mechanism of action remains unclear. It is crucial to conduct in-depth research on immunomodulatory peptides to understand their potential health benefits. This study aims to identify novel immunomodulatory peptides from the crocodile (*Crocodylus siamensis*) head protein hydrolysates (CHPHs) and explore their intracellular immunomodulatory mechanisms. Four crocodile-derived peptides with potential immunomodulatory activity were screened from CHPHs, ie AKLDLEEVIK (AK-10), LEKEKSELK (LEK-9), DFLDLPSIER (DR-10), and LDLEEVIKK (LDK-9), which stably bind to TLR4-MD2 and activate the immune response. These four peptides promoted the proliferative and phagocytic activities of RAW264.7 cells, activated the resting state of the cells, and boosted the expression of NO and cytokines. Peptide DR-10 had the most significant immunomodulatory function and promoted up-regulation of intracellular immune-related factors Acod1, Ccl9, COX2, CD40, NF-κB1, IKKε, and NF-κB2. Additionally, the peptide DR-10 activated the NF-κB signaling pathway, thereby releasing immune effectors and exerting immune effects. These findings suggest that crocodile-derived immunomodulatory peptides may be considered an effective immune supplement, providing new ideas for future research on dietary supplements.

Pippert, C. and Tripodi, F. (2025). The "Reality" of Living Off the Land. Television & New Media (https://doi.org/10.1177/15274764251350272).

Abstract: The reality television show Swamp People (2010–present) claims to capture Cajun cultural identity. Through participant observation, in-depth interviews, and content analysis based on understandings of television as a site where identity formations are formed and negotiated, we explore how Swamp People's depiction of Cajun culture is interpreted by the community it depicts. Our findings suggest that Swamp People serves as a cultural authority for residents who control the community's oral history and yet no longer make their "living off the land." This substantial influence rewrites Cajun cultural practices through the lens of the History Channel's interest in appealing to male viewers, which perpetuates a vision of alligator hunting that obscures the familial aspect of the activity. In this way, Swamp People demonstrates reality television's power to not only reinforce but also redefine white masculinity as a cultural reality.

Godfrey, S.T., Rochford, M.R., Metzger III, E.F., Kern Jr, W.H., Daykin, B.L., Balaguera-Reina, S.A., Russell, D.L., Cole, J.M., Klovanish, C.A. and Mazzotti, F.J. (2025). Diet of Spectacled caimans (*Caiman crocodilus*) removed from Broward and Miami-Dade Counties, Florida, USA. Journal of Herpetology 59(2): 1-12.

Abstract: Spectacled caimans (*Caiman crocodilus*) are an approximately 2 m long crocodilian native to Central and South America. Caimans were introduced in southern Florida, USA in the mid-1950s and have occurred primarily in Palm Beach, Broward, and Miami-Dade Counties. Our study characterizes the diet of Spectacled caimans removed from Broward and Miami-Dade counties based on samples collected from gastrointestinal (GI) tracts. GI samples were rinsed, sorted, dried, examined, and identified to the lowest taxonomic level possible. We calculated diversity metrics for prey items and percent dietary overlap to assess differences in caiman prey by size class, sex, season, and area. We examined 108 GI tracts (49 males, 20 females, 39 of undetermined sex) from 32 hatchlings, 53 juveniles, and 23 adults collected over six years (2017-2022) and identified 685 prey items from 107 individuals. Only one caiman had no identifiable prey items in the GI tract. Insects were the most common prey item recovered from GI tracts of all size classes, sexes, and seasons. We found evidence of ontogenetic diet changes with hatchlings almost exclusively preying on insects, juveniles frequently preying upon malacostracans and reptiles, and adults preying upon gastropods and reptiles. Adult caimans exhibited the highest dietary diversity and evenness, females exhibited higher diversity and evenness than males, and dry season captures exhibited higher diversity and evenness than wet season captures. Our observations confirm that Florida's Spectacled caimans are dietary generalists whose broad diets and apparent geographic expansion could negatively impact native species where they occur.

Tavalieri, Y.E., Luque, E.H., Muñoz-de-Toro, M. and Galoppo, G.H. (2025). Long-term disruption of oviductal immune homeostasis in *Caiman latirostris* following in ovo exposure to endosulfan or atrazine. Research in Veterinary Science (https://doi.org/10.1016/j.rvsc.2025.105795).

Abstract: The oviduct of reptiles can be infected by a wide range of pathogens, potentially compromising organ health and egg viability. Early exposure to endocrine-disrupting compounds (EDC) can lead to immune system alterations, by either suppressing or exacerbating the immune response. In this study, we investigate immune homeostasis in the oviduct of *Caiman latirostris* and assess whether *in ovo* exposure to endosulfan (END) or atrazine (ATZ) disrupts immune homeostasis at the pre-pubertal juvenile stage. We analyzed the mRNA expression of β-defensin 12 (BD12), the correlation between defensin expression and circulating sex hormones, the presence of circulating and infiltrating immune cells (lymphocytes, heterophils, basophils, eosinophils, monocytes, macrophages, and mast cells), and the pattern of acidic and neutral epithelial secretions in the oviduct of *C. latirostris*. Exposure to END increased the percentage of acidic epithelial secretions and established a positive correlation between circulating estradiol levels and BD12

expression. Meanwhile, ATZ exposure decreases the percentage of neutral epithelial secretions in the oviduct. These findings suggest that EDC may disrupt oviductal immune homeostasis in *C. latirostris*, potentially compromising future reproductive health and embryo survival.

Leardi J.M. (2025). Redescription of *Pseudhesperosuchus jachaleri* (Archosauria: Crocodylomorpha) from the Los Colorados Formation (Norian), Argentina. Journal of Systematic Palaeontology 23(1): Article 2507779.

Abstract: *Pseudhesperosuchus jachaleri* Bonaparte, 1969 represents one of the best known early non-crocodyliform crocodylomorphs. The only known specimen, PVL 3830, was described by Bonaparte (1972) in his seminal publication dealing with the Los Colorados Formation (Norian; NW Argentina) faunal assemblage. Afterwards, this taxon was never properly described and depicted, considering that it was figured using drawings in which several parts of the skull and postcranium were reconstructed. In this contribution I redescribe this specimen, recognizing its diagnostic features and identifying features previously unnoticed like the presence of pneumatic features on the quadrate and the base of the braincase (ie a large posteroventral recess, basioccipital recess *sensu lato*). These anatomical traits described here are incorporated in a new data set that corresponds to the fusion of a widely used crocodyliform matrix (Pol *et al*. 2014 and subsequent modifications) and a previous expanded matrix based on basal crocodylomorphs (Leardi *et al*. 2017 with posterior changes). This allowed me to evaluate the phylogenetic position of *Pseudhesperosuchus* and the phylogeny of non-crocodyliform crocodylomorphs in a more inclusive matrix. The incorporation of most non-crocodyliform crocodylomorphs into the data set will prove useful to test other issues in crocodyliform phylogeny (eg the position of Thalattosuchia, monophyly of Protosuchia). *Pseudhesperosuchus* is recovered at the base of the crocodylomorph clade, in a clade that excludes large-bodied forms (CM 73732, *Redondavenator* and *Carnufex*), and in several most parsimonious trees forming a clade with *Trialestes romeri* from the Ischigualasto Formation of Argentina. Non-crocodyliform crocodylomorphs are found as successive sister taxa to Crocodyliformes, and no internal small clades were recovered (except under extreme conditions of extended implied weighting). As other recent analyses, a monophyletic Solidocrania is recovered, with *Dibothrosuchus* or *Hallopus* being the sister taxa it. Unlike previous analyses, *Eopneumatosuchus colberti* is placed outside Protosuchidae and Crocodyliformes and is the sister taxon of the later clade.

López Tuberquia, N.P. (2025). Análisis de las causas de admisión y procedencia de fauna silvestre en la oficina territorial Panzenú (Corantioquia) e importancia de la afectación de extracción antropogénica de su hábitat natural. BSc thesis, Universidad de Antioquia, Caucasia, Colombia.

Abstract: This degree work focused on analyzing the factors of wildlife extraction in the jurisdiction of the Panzenú Territorial Office of Corantioquia between January and June 2024. During this period, 53 cases of fauna entry that were registered were analyzed, covering municipalities such as Caucasia, El Bagre, Nechí, Tarazá, Valdivia and Zaragoza. The methodology involved creating a detailed database using technical reports, the "fauna" application and control reports. With quantitative analysis in Microsoft Excel to evaluate temporal distribution, extraction patterns and frequency of factors. Additionally, the records were georeferenced using QGIS to identify and visualize the critical points of extraction and distribution. The study revealed that illegal wildlife trafficking was the main extraction factor, affecting 44 individuals, followed by displacement (27 cases), illegal possession (14 cases), accidents (11 cases) and poaching (4 cases). The families Psittacidae, Caviidae, and reptiles such as hicotea (*Trachemys callirostris*) and babilla (*Caiman crocodilus*) were the most impacted, with records concentrated in Caucasia. The analysis showed that capture peaks occur during Holy Week, related to cultural practices and illegal trafficking, concluding the urgent need to implement conservation strategies that strengthen institutional presence and community awareness.

Resumen: Este trabajo de grado se enfocó en analizar los factores de extracción de fauna silvestre en la jurisdicción de la Oficina Territorial Panzenú de Corantioquia entre enero y junio de 2024. Durante este periodo, se analizaron 53 casos de ingreso de fauna que fueron registrados, abarcando municipios como Caucasia, El Bagre, Nechí, Tarazá, Valdivia y Zaragoza. La metodología implicó crear una base de datos detallada utilizando informes técnicos, el aplicativo "fauna" y actas de control. Con análisis cuantitativo en Microsoft Excel para evaluar la distribución temporal, patrones de extracción y frecuencia de factores de extracción como la tenencia o mascotismo, tráfico, desplazamiento, y accidentes. Complementariamente, mediante QGIS se georreferenciaron los registros para identificar y visualizar los puntos críticos de extracción y concentración. El estudio reveló que el tráfico ilegal de fauna fue el principal factor de extracción, afectando a 44 individuos, seguido por desplazamiento de individuos de su hábitat (27 casos), tenencia ilegal (14 casos), accidentes (11 casos) y caza furtiva (4 casos). Las familias de aves y mamíferos Psittacidae, Caviidae respectivamente y reptiles como hicotea (*Trachemys callirostris*) y babilla (*Caiman crocodilus*) fueron los más impactados, con registros de fauna concentrados en Caucasia. El análisis evidenció que los picos de captura para factores como el tráfico, tenencia o mascotismo ocurren durante la Semana Santa, relacionados con prácticas culturales y tráfico ilegal, concluyendo la necesidad urgente de implementar estrategias de conservación que fortalezcan la presencia institucional y sensibilización comunitaria.

He, J., Zhao, R., Guo, Z., Li, Y., Zhao, Y., Liang, L., Ji, S. and Tian, H. (2025). A high-performance pressure sensor combining the biomimetic structures of shark and crocodile skins. Advanced Functional Materials (https://doi.org/10.1002/adfm.202510130).

Abstract: Flexible pressure sensors have shown great potential in the fields of electronic skin, healthcare, and intelligent robots. However, how to balance the high sensitivity and wide working range of the sensors remains a challenge. Inspired by micrometer-level shark ridge-like scales and millimeter-level crocodile skin with multi-level dome structures, this study introduces an innovative sensor design concept cross-scale complementary composite flexible pressure sensor combination strategy, and develops three bioinspired sensor architectures: Shark-Shark (S-S), Crocodile-Crocodile (C-C), and Crocodile-Shark (C-S). The S-S design, leveraging microscale ridge-like scaly structure, achieves exceptional sensitivity (32 kPa^{-1}) in low-pressure regimes (0-2.5 kPa), making it ideal for high-precision applications like acoustic monitoring. The C-C design employs millimeter-scale domes to enable stable deformation and signal output under high pressures (≈100 kPa), excelling in scenarios such as gait analysis. The C-S design synergistically integrates both biological structures, offering comprehensive pressure detection across a wide range (1 Pa-80 kPa) with high sensitivity (18.2 kPa^{-1}), outstanding stability (20,000 cycles), and rapid dynamic response (21/28 ms response/recovery times). Its universality is demonstrated in complex applications like pulse monitoring, limb motion analysis, and adaptive robotic grasping. This performance-balancing strategy establishes a new paradigm for optimizing the sensitivity-range trade-off in next-generation flexible pressure sensors.

Leonard, J., Zahirovic, S., Holden, P.B., Salles, T., Edwards, N.R. and Mallard, C.A. (2025). Polar wander leads to large differences in past climate reconstructions. Communications Earth & Environment 6: Article 508.

Abstract: The position of continents and oceans in geological time dictates the biogeographic dispersal of life, influences the preservation of mineral resources, and informs our understanding of Earth's climate trajectory. Reconstructing past crustal locations

requires a plate tectonic model that differs depending on whether the model uses a mantle reference frame, or a paleomagnetic reference frame, which considers the rotation between the plate-mantle system and the planetary core (true polar wander). However, reconstructions with mantle or paleomagnetic reference frames have been used interchangeably without quantifying their impact on paleoclimate simulations. Here, we conduct a sensitivity experiment to assess the impact of using a mantle versus a pure paleomagnetic absolute reference frame in simulating global paleoclimate. We show that throughout the Mesozoic and Cenozoic, reference frame choice leads to regional surface temperature differences of over 20 °C and 15 °C respectively. An analysis of Jurassic glendonite and Eocene crocodilian distribution suggest favourable conditions that are more consistent with a paleomagnetic reference frame. These results emphasize the importance of selecting an appropriate tectonic reference frame in deep-time climate research. We advocate for adopting a pure paleomagnetic reference frame, which provides a more reliable record of paleo-latitudes by capturing motions from true polar wander.

Cordero, G.A., Holloway, A.K., Friedrich, T., Eme, J., Eckalbar, W., Kusumi, K., Janzen, F.J., Hicks, J.W., Conlon, F.L., Bruneau, B.G. and Pollard, K.S. (2025). The interplay of ontogeny and phylogeny at the transcriptome level of the tetrapod heart. Journal of Experimental Zoology B: Molecular and Developmental Evolution (doi: 10.1002/jez.b.23312).

Abstract: The tetrapod heart is characterized by three chambers in amphibians and non-avian reptiles, as opposed to four in birds, crocodilians and mammals. We explored this diversity via the most phylogenetically comprehensive comparison of heart transcriptomes undertaken to date. Transcriptomes representing the ontogeny of heart compartmentalization (septation) in alligator, chicken, frog, mouse, lizard and turtle embryos exhibited a clear species-specific signal, which was driven by genes involved in heart contraction. During the stage dominated by septation-related tissue transformations, the most highly expressed genes shared by species originated before the tetrapods diversified and were related to septum morphogenesis, ventricular development, and chamber formation. The expression of septation-related genes did not adhere to phylogeny or heart chamber number, and genes differentially expressed across developmental stages within species varied in their evolutionary ages and predicted functions. We discuss how the acquisition of novel structures in some lineages, convergent evolution of four heart chambers, embryonic metabolism, microstructural variation, and ontogenetic shifts (heterochronies), collectively, provide insight into evolved and conserved patterns of transcriptome-level variation. These data serve as a resource to further stimulate evo-devo research on complex organ systems, such as the heart.

Kimura, K., Goto, T., Ito, K., Kinugasa, T., Chiba, K., Naniwa, K., Nakanishi, D., Osuka, K. and Sugimoto, Y. (2025). Modeling musculoskeletal systems with branching structures: A case study with the auxiliary tendon of the caudofemoralis longus muscle in crocodilians. Nonlinear Theory and Its Applications 16(3): 310-311.

Abstract: The branching in the musculotendinous structures is crucial to control complex, nonlinear musculoskeletal systems in vertebrate bodies. Although common, their functional impact remains unclear. Here, we present a dynamical model of musculoskeletal networks that explicitly incorporates branching points as mass points, representing geometric constraints and internal force distribution. Applying this model to the crocodilian hindlimb with branching musculotendinous structures, we validate results against robotic and anatomical studies. We find that branching reduces required muscle force, enhances joint coordination, and enables stable standing and propulsion with minimal input. These insights can guide biomechanical research and bio-inspired robotic designs.

Miller, A.D., Koehler, J.W., Oevermann, A. and Rissi, D.R. (2025). Special focus on veterinary neuropathology. Veterinary Pathology 62(4): 421-423.

Dehmel, N., Schreckenberg, K., Franks, P., Jones, N., Booker, F., Lambini, C., Pinto, R., Cely-Gómez, A., Chaukura, I., Chikumbi, D.C, Chou, P., Christopoulou, I., Colegado, R.P., Echeverri, J., Hachoofwe, E.M., Hou, K., Julie, C.S., Lendira, R., Lubilo, R., Mayen, B., Mbataru, J.N., Morales, T., Dung, N.V., Oluoch, V.O., Razafindra-Paul, J-A., Robinson, N.J., Schéré, C.M., Shaba, S. and Twinamatsiko, M. (2025). Insights from equitable governance assessments in conservation areas around the world. Conservation Biology Article e70101.

Abstract: Global policy commitments to ensure that protected and conserved areas (PCAs) are equitably governed have increased interest in empirically assessing and analyzing social equity. Although numerous assessments have been conducted in individual PCAs, there is limited empirical insight into equity as a multidimensional concept beyond the site level. We investigated the distributional, procedural, and recognitional equity challenges associated with the governance of PCAs and determined whether the identified challenges differed according to governance type and actor group. We conducted a meta-level analysis of equitable governance assessments conducted at 37 PCAs in 19 countries that form part of the new SAGE (Site-level Assessment of Governance and Equity) database. SAGE is a participatory tool for site-level actors to systematically discuss and assess equity dynamics at their PCAs. We found a large variation in assessment results across the sites. Mitigating the negative impacts of conservation on local communities was most often identified as the biggest challenge. In general, equity assessments tended to be slightly more positive for PCAs governed by and with Indigenous Peoples and local communities than those governed purely by government agencies. Evaluations of different actors often revealed substantial differences in opinion on specific governance issues. In particular, evaluations of PCA decision-makers tended to be more positive than those of PCA users. As an early-stage exploration of the growing SAGE database, our findings provide proof of concept that tools for assessing and improving PCA governance gain value from taking multidimensional approaches and need to consider different actors' views. Although the growing SAGE database holds potential for further insights on how equity is perceived across governance types, ecosystems, and geographical regions, the primary objective of SAGE needs to remain understanding and advancing equity at the site level.

Resume: Información de las evaluaciones de gobernanza equitativa en áreas de conservación de todo el mundo Resumen Los compromisos políticos mundiales para garantizar que las áreas protegidas y conservadas (APC) se gobiernen de forma equitativa han aumentado el interés por evaluar y analizar empíricamente la equidad social. Aunque se han llevado a cabo numerosas evaluaciones en áreas protegidas y conservadas individuales, la comprensión empírica de la equidad como concepto multidimensional más allá del nivel del sitio es limitada. Investigamos los problemas de equidad distributiva, procedimental y de reconocimiento asociados a la gobernanza de las APC y determinamos si los problemas identificados diferían según el tipo de gobernanza y el grupo de actores. Realizamos un metaanálisis de las evaluaciones de gobernanza equitativa llevadas a cabo en 37 APC de 19 países que forman parte de la nueva base de datos SAGE (evaluación a nivel de sitio para la gobernanza y la equidad). SAGE es una herramienta participativa para que los agentes locales debatan y evalúen sistemáticamente la dinámica de la equidad en sus APC. Los resultados de las evaluaciones varían mucho de un lugar a otro. Identificamos con mayor frecuencia a la mitigación de los efectos negativos de la conservación en las comunidades locales como el mayor reto. En general, las evaluaciones de equidad tendieron a ser ligeramente más positivas para las APC gobernadas por y con pueblos indígenas y comunidades locales que para las gobernadas

puramente por organismos gubernamentales. Las evaluaciones de los distintos actores revelaron a menudo diferencias sustanciales de opinión sobre cuestiones específicas de gobernanza. En particular, las evaluaciones de los responsables de la toma de decisiones de las APC tendieron a ser más positivas que las de los usuarios de las APC. Como exploración inicial de la creciente base de datos SAGE, nuestros hallazgos proporcionan una prueba de concepto de que las herramientas para evaluar y mejorar la gobernanza de las APC obtienen valor al adoptar enfoques multidimensionales y necesitan considerar los puntos de vista de los diferentes actores. Aunque la creciente base de datos SAGE tiene potencial para obtener más información sobre cómo se percibe la equidad en los distintos tipos de gobernanza, ecosistemas y regiones geográficas, el objetivo principal de SAGE debe seguir siendo comprender y promover la equidad a nivel de sitio.

Cooper, R.L., Jahanbakhsh, E. and Milinkovitch, M.C. (2025). Chemical and mechanical patterning of tortoise skin scales occur in different regions of the head. iScience 28(6): 112684.

Abstract: Vertebrate skin appendages are diverse micro-organs such as scales, feathers, and hair. These units typically develop from placodes, whose spatial patterning involves conserved chemical reaction-diffusion dynamics. Crocodile head scales are a spectacular exception to this paradigm, as they instead arise from a mechanically dominated process of compressive folding driven by constrained skin growth. Here, we reveal that chemical versus mechanical processes pattern tortoise scales in different regions of their head. Indeed, we show that placode-derived scales emerge across the peripheral head surfaces while remaining absent from the central dorsal region where scales subsequently form through a mechanical folding process. Using light sheet microscopy, we build a three-dimensional mechanical model that qualitatively recapitulates the diversity of scale patterns observed in this central head region in different tortoise species. Overall, our analyses indicate that mechanical head-scale patterning likely arose before the divergence between Testudinata and Archosauria, and was subsequently lost in birds.

Huang, Y., Zheng, X., Ming, X., Jiao, Q., Xiao, W., Wu, Q., Zheng, L., Zeng, Y., Cheng, S., Wang, R., Yang, J., Bian, Y. and Yao, J. (2025). Recent advances in crocodilian oil research: Bioactive components and potential therapeutic applications. Frontiers in Medicine 12: 1573925.

Abstract: The economic value of crocodilian farming has risen substantially in recent years, drawing increasing attention to crocodilian oil as a traditional natural remedy rich in diverse bioactive constituents. Despite its therapeutic potential, crocodilian fat remains underutilized, and its nutritional and medicinal properties have not been widely recognized. This review provides a bibliometric analysis of past research trends and highlights current developments related to crocodilian oil. Recent advances in the characterization of its physicochemical properties and health-related applications are summarized. The primary biological activities of this oil are attributed to its high unsaturated fatty acid and stearic acid contents. Emerging evidence supports its anti-inflammatory, antimicrobial, and scar-reducing effects mediated through key signaling pathways, including p38 mitogen-activated protein kinase, transforming growth factor-β1/Smad3, and AMP-activated protein kinase. Reported benefits include improvements in skin conditions and the modulation of energy metabolism. Potential applications encompass adjunctive treatment for *Candida albicans* infections, topical anti-inflammatory agents, moisturizers, and permeability enhancers in cosmetic formulations, and dietary oil substitutes for managing hypertriglyceridaemia and metabolic disorders affecting the liver and brain. Challenges and future research directions in this field are also discussed.

Testin, J.J. and D'Amore, D.C. (2025). Clustering crocodylian dental morphology: Insights into functional adaptations, diet, and ontogeny. Journal of Anatomy (doi: 10.1111/joa.70014).

Abstract: Crocodylians have often been grouped into ecomorphological categories based on snout characters and diet, but quantitative dental morphology has rarely been used for this purpose. We collected Euclidean measurements from the teeth of 18 extant crocodylian species spanning a range of sizes and snout ecomorphotypes, normalized the data for size heterodonty using regression analyses, grouped the crowns into eight dental sections along the arcade, and ran a K-means cluster analysis to cluster individuals based on shape heterodonty. Five clusters emerged, each reflecting different degrees of gracility or robustness of crowns and their variation along the jaw arcade. These morphological clusters showed a connection to snout shape, prey preference, and feeding ecology, particularly prey size and the degree of processing necessary. Cluster assignments were, for the most part, not taxon specific; multiple families and subfamilies were found in most clusters, and members of the same species were often found in more than one cluster. For species with members in multiple clusters, the larger individuals typically were in the cluster with more robust crowns. This supports prior suggestions that dental morphotype coincides with ontogenetic niche shifts. This approach demonstrates the potential for using dental morphology to infer ecological roles in both extant and fossil crocodylians, paving the way for future comparative analyses of archosaur dentition.

Dubansky, B.H., Raney, J., Bordelon, S., Black, K., Cagle, P. and Dubansky, B. (2025). Mechanical stress may initiate osteoderm development in the American alligator (*Alligator mississippiensis*). Anatomical Record (doi: 10.1002/ar.70015).

Abstract: Osteoderms are bones that form in the dermis of several species, but their development and function are not well understood. Comparing cellular and molecular events that initiate and drive pathologies similarly characterized by ossification of soft tissues (heterotopic ossification) may provide insight into how osteoderms develop. It is thought that the origin of some heterotopic ossification lesions is mediated through mechanotransduction, or the conversion of mechanical forces on the extracellular matrix (ECM) to biochemical signals that initiate bone formation. Discrete osteoderm developmental stages in alligators were previously established based on morphology; however, questions remain regarding the type of collagen, the identity of cell precursors, and factors that initiate their development. In this study, we investigated changes in the ECM in different stages of osteoderm development. We found that in dorsal cervical scales, an organized reticulin fiber scaffold precedes bone formation, and that before and during ossification, collagen fibers are under tension in specific planes of the body. These tensed collagen fibers correspond to attachments of the superficial and deep cervical fasciae and the tendons of some muscles of the jaws, neck, and shoulders. Osteoderms are therefore exoskeletal elements that likely distribute mechanical forces to the skin during normal body movements, and we hypothesize that these mechanical forces play a role in stimulating ossification at these sites via mechanotransduction. This developmental mechanism may be comparable to the development of some trauma-induced heterotopic ossification lesions that are similarly initiated by mechanotransduction.

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