

Patrick L. Jambura

VERTEBRATE PALEONTOLOGIST · EVOLUTIONARY BIOLOGIST

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Profile

I am a dedicated vertebrate paleontologist specialising in the evolutionary history of chondrichthyans, particularly modern sharks. My research is primarily specimen-based, utilising advanced techniques such as µCT scanning and phylogenetic comparative methods to investigate shark evolution and extinction. My publications include work in a variety of fields, including anatomy, taxonomy, systematics, and (paleo)ecology. Since 2019, I have managed the collection of the EvoMoRG research group at the Department of Palaeontology in Vienna. Beyond academia, I engage in science communication, citizen science projects, and public outreach to promote shark conservation and highlight the relevance of paleontology today.

Key Terms: Chondrichthyes; Elasmobranchii; Evolutionary History; Anatomy; Morphology; µCT-Scanning; Phylogenetics; Geometric Morphometrics; Trait Evolution; Taxonomy & Systematics; Cenozoic; Mesozoic; Vertebrate Paleontology; Citizen Science

Education

University of Vienna

Vienna, Austria

ASPIRED TITLE: DR. RER. NAT. IN EARTH SCIENCES

Oct. 2018 - Oct. 2024

- **Thesis title:** Evolutionary history and macroevolutionary dynamics in sharks and rays (Elasmobranchii)
- **Supervisor:** Univ.-Prof. Dr. Jürgen Kriwet

University of Vienna

Vienna, Austria

M.Sc. IN ZOOLOGY

Mar. 2012 - Sep. 2017

- **Thesis title:** Evolutionary significance of tooth mineralization and development in carcarhiniform sharks, with special focus on the rare snaggle-tooth shark, *Hemipristis elongata* (Carcharhiniformes: Hemigaleidae)
- **Supervisor:** Univ.-Prof. Dr. Jürgen Kriwet

University of Vienna

Vienna, Austria

B.Sc. IN BIOLOGY

Oct. 2008 - Feb. 2012

- **Thesis title:** Vehicles on a Turkish nesting beach for loggerhead sea turtles
- **Supervisor:** Dr. Michael Stachowitsch

Work Experience

University of Vienna

Vienna, Austria

SCIENTIFIC ASSISTANT (FWF PROJECT P33820 "EVOLUTION AND EXTINCTION RISKS OF SHARKS, RAYS, AND SKATES")

Sep. 2020 - present

University of Vienna

Vienna, Austria

TECHNICAL ASSISTANT

Mar. 2019 - Aug. 2020

- Operated the µCT-device Bruker SkyScan1173.
- Collection manager for the Evolutionary Morphology Research Group collection (**ongoing**).

House of the Sea, Aqua Terra Zoo

Vienna, Austria

TICKET SALES ASSOCIATE

Dec. 2016 - Feb. 2019

ARGE Papageinschutz (Working Group for Parrot Protection)

Vienna, Austria

ANIMAL CARE ATTENDANT

Nov. 2012 - Nov. 2016

Natural History Museum Vienna

Vienna, Austria

RESEARCH ASSISTANT

Jan. 2015 - Oct. 2015

- Assisting Dr. Matús Hyzný in his FWF Project M1544-B25: "Cenozoic biogeography of Western Tethys decapod crustaceans".
- Assisting in the curation of Cenozoic decapod crustaceans.
- Assisting the Production Editor of the scientific journal "Annalen des Naturhistorischen Museums in Wien - Serie A (Mineralogie, Petrologie, Geologie, Paläontologie, Archäozoologie, Anthropologie und Prähistorie)".

Korallionlab

RESEARCH OFFICER

- Managing and maintaining the wet lab inventory.
- Assisting external researchers in the lab and in the field.
- Organizing outreach activities, including giving public lectures and offering guided snorkelling tours.

Vavvaru island, Maldives

Sep. 2014 - Oct. 2014

Technical Office for Biology Gaviria

RESEARCH ASSISTANT

- Sampling zooplankton in the Fontana lake.
- Identifying the zooplankton of the Fontana lake.
- Calculating the water quality based on the species composition.

Vienna, Austria

Apr. 2014 - Jul. 2014

Student Co-Supervision

Pia Balàka

UNIVERSITY OF VIENNA, ASPIRED TITLE: M.SC.

Oct. 2023 - present

- **Topic:** Taxonomic revision of the Duhamel's catshark *Scyliorhinus duhameli*.

Kim Stroben

UNIVERSITY OF VIENNA, COMPLETED TITLE: M.SC.

Oct. 2021 - Dec. 2022

- **Topic:** Evolutionary history of somniosid sharks (Chondrichthyes, Squalomorphii).

Pia Balàka

UNIVERSITY OF VIENNA, COMPLETED TITLE: B.SC.

Oct. 2021 - Jun. 2022

- **Topic:** Updated checklist of chondrichthyan species in the Croatian Sea.

David Offenberger

UNIVERSITY OF VIENNA, COMPLETED TITLE: B.ED.

Mar. 2021 - Oct. 2021

- **Topic:** Dental morphologies and taxonomic identity of the prehistoric shark, "*Isurus*" *hastalis*.

Elisabeth Meneweger

UNIVERSITY OF VIENNA, COMPLETED TITLE: B.ED.

Nov. 2020 - May. 2021

- **Topic:** Body size of the extinct sandtiger shark, †*Striatolamia macrota* in the Eocene of Antarctica.

Teaching Activities

Comparative Morphology and Evolution of basal Vertebrates

UNIVERSITY OF VIENNA

Feb. 2019 - Mar. 2019

- 5 ECTS
- Dissection course of various vertebrates (Chondrichthyes, Osteichthyes, Tetrapoda).

Field & Lab Experience

FIELD EXPERIENCE

2024	Field work in middle Miocene marine Sediments near Kühnring.	Austria
2023	Field research to analyze the population structure of tiger sharks (<i>Galeocerdo cuvier</i>) in Fuvamulah. Field work in middle Miocene marine Sediments near Kaisersteinbruch.	Maldives Austria
2022	Field work in lower Miocene marine Sediments near Prambachkirchen. Field research to analyze the ethology of white sharks (<i>Carcharodon carcharias</i>) in Gansbaai.	Austria South Africa
2021	Field work in lower Miocene marine Sediments near Wartberg.	Austria
2019	Field work in middle Miocene marine Sediments near Kaisersteinbruch.	Austria
2018	Field work in lower Miocene marine Sediments near Plesching. Field work in middle Miocene marine Sediments near Kaisersteinbruch.	Austria Austria
2014	Field work in marine Sediments in the Lhaviyani Atoll.	Maldives
2012	Field work in recent and fossil coral reefs near El Qoseir.	Egypt
2011	Monitoring of loggerhead sea turtles (<i>Caretta caretta</i>) at a nesting site near Fethiye.	Turkey

LAB EXPERIENCE

2022	Morphological analyses of white sharks (<i>Carcharodon carcharias</i>), KwaZulu-Natal Sharks Board.	South Africa
2021	Phylogenetic analyses with ancient DNA (aDNA), Natural History Museum Vienna.	Austria
2012	DNA Barcoding, University of Vienna.	Austria

Publications

JOURNAL ARTICLES

- 2024 **Jambura PL**, Solonin SV, Cooper SLA, Mychko EV, Arkhangelsky MS, Türtscher J, Amadori M, Stumpf S, Vodorezov AV, Kriwet J. Fossil marine vertebrates (Chondrichthyes, Actinopterygii, Reptilia) from the Late Cretaceous of Akkermanovka (Orenburg Oblast, Southern Urals, Russia). *Cretaceous Research*. 2024. 155: 105779. <https://doi.org/10.1016/j.cretres.2023.105779>
- Balàka PF, Ugarković P, Türtscher J, Kriwet J, Niedermüller S, Krstinić P, **Jambura PL** (2024). Reply to Soldo, A.; Lipej, L. Comment on "Balàka et al. Updated Checklist of Chondrichthyan Species in Croatia (Central Mediterranean Sea). *Biology* 2023, 12, 952." *Biology*, 13(3), 136. <https://doi.org/10.3390/biology13030136>
- Sternes PC, **Jambura PL**, Türtscher J, Kriwet J, Siversson M, Feichtinger I, Naylor GJP, Summers AP, Maisey JG, Tomita T, Moyer JK, Higham TE, da Silva JPCB, Bornatowski H, Long DJ, Perez VJ, Collareta A, Underwood C, Ward DJ, Vullo R, González-Barba G, Maisch IV HM, Griffiths ML, Kim SL, Becker MA, Wood JJ, Shimada K. White shark comparison illuminates slimmer Megalodon body. *Palaeontologia Electronica*, 2024. 27(1): a7. <https://doi.org/10.26879/1345>
- Türtscher J, **Jambura PL**, Villalobos-Segura E, López-Romero FA, Underwood CJ, Thies D, Lauer B, Lauer R, Kriwet J. Rostral and body shape analyses reveal cryptic diversity of Late Jurassic batomorphs (Chondrichthyes, Elasmobranchii) from Europe. *Papers in Palaeontology*, 2024, 10(2), e1552. <https://doi.org/10.1002/spp2.1552>.
- 2023 **Jambura PL**, Villalobos-Segura E, Türtscher J, Begat A, Staggl MA, Stumpf S, Kindlimann R, Klug S, Lacombat F, Pohl B, Maisey JG, Naylor GJP, Kriwet J. Systematics and phylogenetic interrelationships of the enigmatic Late Jurassic shark *Protospinax annectans* Woodward, 1918 with comments on the shark-ray sister group relationship. *Diversity*. 2023. 15(3). <https://doi.org/10.3390/d15030311>
- Balàka PF, Ugarković P, Türtscher J, Kriwet J, Niedermüller S, Krstinić P, **Jambura PL**. Updated checklist of chondrichthyan species in Croatia (Central Mediterranean Sea). *Biology*. 2023. 12(7). <https://doi.org/10.3390/biology12070952>
- Villalobos-Segura E, Stumpf S, Türtscher J, **Jambura PL**, Begat A, López-Romero FA, Fischer J, Kriwet J. A Synoptic review of the cartilaginous fishes (Chondrichthyes: Holocephali, Elasmobranchii) from the Upper Jurassic Konservat-Lagerstätten of Southern Germany: Taxonomy, diversity, and faunal relationships. *Diversity*. 2023. 15(3). <https://doi.org/10.3390/d15030386>
- 2022 Ćetković I, **Jambura PL**, Pešić A, Ikica Z, Joksimović A. Observations of juvenile sandbar sharks *Carcharhinus plumbeus* (Nardo, 1827) around the Bojana River delta (Southern Adriatic Sea). *Mediterranean Marine Science*. 2022. 23(4). <https://doi.org/10.12681/mms.30166>
- Türtscher J, **Jambura PL**, López-Romero FA, Kindlimann R, Sato K, Tomita T, Kriwet J. Heterodonty and ontogenetic shift dynamics in the dentition of the tiger shark *Galeocerdo cuvier* (Chondrichthyes, Galeoceridae). *Journal of Anatomy*. 2022. 241:372–392. <https://doi.org/10.1111/joa.13668>
- 2021 **Jambura PL**, Stumpf S, Kriwet J. Skeletal remains of the oldest known pseudocoracid shark *Pseudocorax kindlimanni* sp. nov. (Chondrichthyes, Lamniformes) from the Late Cretaceous of Lebanon. *Cretaceous Research*. 2021. 125: 104842. <https://doi.org/10.1016/j.cretres.2021.104842>
- Jambura PL**, Türtscher J, Kriwet J, Al Mabruk SAA. Deadly interaction between a swordfish *Xiphias gladius* and a bigeye thresher shark *Alopias superciliosus*. *Ichthyological Research*. 2021. 68: 317-321. <https://doi.org/10.1007/s10228-020-00787-x>
- Jambura PL**, Ćetković I, Kriwet J, Türtscher J. Using historical and citizen science data to improve knowledge about the occurrence of the elusive sandbar shark *Carcharhinus plumbeus* (Chondrichthyes – Carcharhinidae) in the Adriatic Sea. *Mediterranean Marine Science*. 2021. 22(1): 169-179. <http://dx.doi.org/10.12681/mms.24624>

- Jambura PL**, Türtscher J, De Maddalena A, Giovos I, Kriwet J, Rizgalla J, Al Mabruk SAA. Using citizen science to detect rare and endangered species: New records of the great white shark *Carcharodon carcharias* off the Libyan coast. *Annales, Series Historia Naturalis*. 2021. 31(1), 51–60. <https://doi.org/10.19233/ASHN.2021.08>
- Sternes PC, **Jambura PL**. Sightings of a White Shark (*Carcharodon carcharias*) with a significantly deformed pectoral fin off the coast of Southern California. *Bulletin, Southern California Academy of Sciences*. 2021. 120(2), 59–63. <https://doi.org/10.3160/0038-3872-120.2.59>
- Türtscher J, López-Romero FA, **Jambura PL**, Kindlimann R, Ward DJ, Kriwet J. Evolution, diversity, and disparity of the tiger shark lineage *Galeocerdo* in deep time. *Paleobiology*. 2021. 47(4), 574–590. <https://doi.org/10.1017/pab.2021.6>
- 2020 **Jambura PL**, Kriwet J. Articulated remains of the extinct shark, *Ptychodus* (Elasmobranchii, Ptychodontidae) from the Upper Cretaceous of Spain provide insights into gigantism, growth rate and life history of ptychodontid sharks. *PloS ONE*. 2020. 15(4): e0231544. <https://doi.org/10.1371/journal.pone.0231544>
- Jambura PL**, Türtscher J, Kindlimann R, Metscher B, Pfaff C, Stumpf S, Weber GW, Kriwet J. Evolutionary trajectories of tooth histology patterns in modern sharks (Chondrichthyes, Elasmobranchii). *Journal of Anatomy*. 2020. 236: 753–771. <https://doi.org/10.1111/joa.13145>
- 2019 **Jambura PL**, Kindlimann R, López-Romero F, Marramà G, Pfaff C, Stumpf S, Türtscher J, Underwood CJ, Ward DJ, Kriwet J. Micro-computed tomography imaging reveals the development of a unique tooth mineralization pattern in mackerel sharks (Chondrichthyes; Lamniformes) in deep time. *Scientific Reports*. 2019. 9, 9652. <https://doi.org/10.1038/s41598-019-46081-3>
- 2018 **Jambura PL**, Pfaff C, Underwood CJ, Ward DJ, Kriwet J. Tooth mineralization and histology patterns in extinct and extant snaggletooth sharks, *Hemipristis* (Carcharhiniformes, Hemigaleidae) - evolutionary significance or ecological adaptation?. *PloS ONE*. 2018. 13(8): e0200951. <https://doi.org/10.1371/journal.pone.0200951>
- 2017 Steger J, **Jambura P**, Mähnert B, Zuschin M. Diversity, size frequency distribution and trophic structure of the macromollusc fauna of Vavvaru Island (Faadhippolhu Atoll, northern Maldives). *Annalen des Naturhistorischen Museums in Wien*. 2017.119a: 17–54.

PUBLISHED ABSTRACTS

- 2019 **Jambura PL**, Türtscher J, Kindlimann R, Marramà G, Metscher B, Pfaff C, Stumpf S, Underwood CJ, Ward DJ, Kriwet J. Evolutionary trends and the phylogenetic relevance of tooth mineralization patterns in sharks (Chondrichthyes; Elasmobranchii). *Journal of Morphology*. 280, 145. 2019.
- Türtscher J, **Jambura PL**, López-Romero FA, Marramà G, Kindlimann R, Kriwet J. The origin and evolution of the tiger shark genus *Galeocerdo* (Elasmobranchii, Carcharhiniformes) revisited. *Journal of Morphology*. 280, 231. 2019.
- 2018 **Jambura PL**, Pfaff C, Türtscher J, Underwood CJ, Ward DJ, Kriwet J. The phylogenetic relevance of the unique tooth histology in lamnid sharks (Elasmobranchii). In: Pfaff, C., & Kriwet, J. (eds): 19. Jahrestagung Gesellschaft für Biologische Systematik, Abstract volume: 22; Verlag Dr. Friedrich Pfeil, Munich.
- Türtscher J, Pfaff C, **Jambura PL**, Kriwet J. Using tooth histology to distinguish morphologically similar shark teeth. In: Pfaff, C., Zimmermann, D. & Kriwet, J. (eds): 19. Jahrestagung Gesellschaft für Biologische Systematik, Abstract volume: 51; Verlag Dr. Friedrich Pfeil, Munich.

Grants & Awards

- | | | |
|------|---|-------------------|
| 2024 | Emil Boral Scholarship , University of Vienna (25.000€) | Vienna, Austria |
| 2021 | Student Award , for best talks at the 26. Annual meeting of the Austrian Paleontological Society (100€) | Salzburg, Austria |
| 2021 | Travel Grant , University of Vienna for my expedition to South Africa (2.000€) | Vienna, Austria |
| 2020 | FWF Project P33820 , led by Prof. Dr. Kriwet, the application was prepared together (285.000€) | Vienna, Austria |
| 2019 | Grant for Conference Participation , University of Vienna (250€) | Vienna, Austria |
| 2019 | Open Access Funding , University of Vienna (1.500€) | Vienna, Austria |
| 2018 | Open Access Funding , University of Vienna (1.500€) | Vienna, Austria |
| 2014 | Performance Scolarship , University of Vienna (1.500€) | Vienna, Austria |
| 2013 | Performance Scolarship , University of Vienna (1.500€) | Vienna, Austria |

Conferences & Symposia

PRESENTATIONS

2023	48th Meeting of the German Working Group “Vertebrate Paleontology” Talk: Revised phylogenetics of the enigmatic elasmobranch <i>Protospinax annectans</i> and its implications on tree-calibration.	Berlin, Germany
2022	82nd Annual Meeting of the Society of Vertebrate Paleontology (SVP) Talk: Reconciling genetics and morphology: A revised phylogenetic analysis of the enigmatic elasmobranch <i>Protospinax annectans</i> from the Late Jurassic Lagerstätte of Solnhofen, Germany.	Toronto, Canada
2021	26th Annual Meeting of the Austrian Paleontological Society (ÖPG) Talk: On the origin of the great white shark <i>Carcharodon carcharias</i> .	Salzburg, Austria
2020	Young Researcher Meeting Morphology Talk: Hidden diversity - on the plethora of tooth mineralization patterns in modern sharks.	Vienna, Austria
2019	23rd Annual Meeting and Scientific Conference of the European Elasmobranch Association (EEA) Talk: On the origin of the great white shark <i>Carcharodon carcharias</i> . Poster: Micro-CT imaging reveals the origin of the lamniform sharks.	Rende, Italy
	12th International Congress of Vertebrate Morphology (ICVM) Talk: Evolutionary trends and the phylogenetic relevance of tooth mineralization patterns in sharks (Chondrichthyes; Elasmobranchii).	Prague, CZ
	46th Meeting of the German Working Group “Vertebrate Paleontology” Poster: Micro-CT imaging reveals the origin of the lamniform sharks.	Vienna, Austria
2018	22nd Annual Meeting and Scientific Conference of the European Elasmobranch Association (EEA) Talk: The potential fate of the thresher shark - a fossil tale of an alopaid like shark.	Peniche, Portugal
	45th Meeting of the German Working Group “Vertebrate Paleontology” Talk: Tooth histology in basal neoselachian sharks and its implications on tooth morphology and feeding ecology in extant groups.	Magdeburg, DE
	19th Annual Meeting of the Society of Biological Systematics Talk: The phylogenetic relevance of the unique tooth histology in lamniform sharks (Elasmobranchii).	Vienna, Austria
2017	21st Annual Meeting and Scientific Conference of the European Elasmobranch Association (EEA) Poster: Tooth mineralization and histology in the rare snaggletooth shark, <i>Hemipristis elongata</i> (Hemigaleidae; Carchariniformes) - evolutionary significance or an ecological adaptation?	Amsterdam, NL

OTHER CONTRIBUTIONS

2023	Organizer of the Thematic Session “Biology and Ecology of Chondrichthyans: From the Past to the Present” and member of the Scientific Committee at the 4th Paleontological Virtual Congress (PVC).	online
2021	Member of the Organizing Committee for the 92nd Annual Meeting of the Paläontologische Gesellschaft (German Paleontological Society).	Vienna, Austria
2019	Staff at the 46th Annual Meeting of the German working group for Vertebrate Paleontology and chair of two sessions (session I and IV).	Vienna, Austria

Public Outreach

2024	Skype a Scientist: Lecture about shark evolution for 2nd grade students of the La Rosa Elementary School, CA.	online
2023	Interview for the podcast SaveSharks.io about the MECO project and my research. Skype a Scientist: Lecture about shark evolution for 2nd grade students of the La Rosa Elementary School, CA. Press Release “Jurassic shark – Shark from the Jurassic period was already highly evolved”.	online
2022	Skype a Scientist: Lecture about shark evolution for 2nd grade students of the La Rosa Elementary School, CA.	online
2021	Skype a Scientist: Lecture about shark evolution for 2nd grade students of the La Rosa Elementary School, CA. Invited Talk: “The evolution of the white shark <i>Carcharodon carcharias</i> : from cat sharks to megalodon and back to small species” at the Paleontological Museum of the University of Zurich.	online
	Interview for the article ”The myths of Megalodon and how it became a hot topic for conspiracy theorists” in the German magazine Natur.	online
2020	Public Speaker at the open forum “Sharks in the Mediterranean - threat or threatened?” Interview about a deadly interaction between a Swordfish and a Thresher Shark with the Forbes magazine.	online

	Interview about a White Shark sighting off the Italian coast with the Daily Mail.	<i>online</i>
	Press Release "Giant teenage shark from the Dinosaur-era".	<i>online</i>
2019	Citizen Science & Advent Event at the University of Vienna presenting "Shark Watch: The M.E.C.O. Project".	<i>Vienna, Austria</i>
	Press Release "The ancestor of the great white shark".	<i>online</i>
	MECO project (Mediterranean Elasmobranchs Citizen Observations) : Co-founding of the German branch of the MECO project.	<i>Vienna, Austria</i>
	Invited Talk "Evolution of Body Shapes in Sharks (and Rays)" at the "Conference of Sharks in Israel".	<i>Tel Aviv, Israel</i>
2018	Press Release "The snaggletooth shark: mystery about its unique tooth structure has been solved".	<i>online</i>
	Co-organizer of the exhibition "About the time when Megalodon swam through Vienna" at the "Long Night of Research"-Event.	<i>Vienna, Austria</i>
2016	Public Relations Work at the local Dive Club i.e., blogging and giving lectures about coral reef conservation.	<i>Vienna, Austria</i>
2014	Outreach Work at the Korallionlab giving lectures about coral reef ecology and offering snorkelling tours.	<i>Maldives</i>
2011	Outreach Work at a nesting site for loggerhead turtles e.g., providing information for tourists and locals.	<i>Fethiye, Turkey</i>

Additional Activities & Memberships

Editorial Member	Review Editor for Frontiers in Ecology and Evolution (since 2023)
Reviewer	Acta Adriatica; Acta Biomaterialia; Annales, Series Historia Naturalis; Arabian Journal of Geosciences; Austrian Journal of Earth Sciences; Biology; Croatian Journal of Fisheries; Diversity; Ecology and Evolution; Historical Biology; Journal of Anatomy; Journal of Morphology; Journal of the Royal Society of New Zealand; Palaeontoogia Electronica; PeerJ; PLoS ONE; Proceedings of the Royal Society B; Scientific Reports; Thalassas; Zoodiversity; Zoologica Scripta; Zoomorphology
Memberships	Sigma Xi – The Scientific Research Honor Society SVP (Society of Vertebrate Paleontology) PalGes (German Paleontological Society) ÖPG (Austrian Paleontological Society) The MECO (Mediterranean Elasmobranchs Citizen Observations) Project

Skills

Imaging Tools	Bruker SkyScan1173 µCT, Keyence Digital microscope VHX-6000, JEOL-JSM-6400 Scanning Electron Microscope
Software	Adobe (Photoshop, Illustrator, InDesign), Amira 3D Software, MS Office (Word, Excel, Access, PowerPoint), Mendeley, Zotero, Zoom, SPSS, SkyScan Software Package (Recon, DataViewer, CTVox), Mesquite, PAST, PAUP, TNT, IQ-TREE, BEAST, MrBayes, tpsDig, tpsRelw, tpsUtil
Programming	R, LaTeX
Web Development	TYPO3
Languages	German, English, Latin
Additional Skills	PADI Assistant Instructor (Scuba Diving), European Driving License, Salt- and Freshwater Aquaristics