



Editorial

This issue of *Geologija* focuses on new discoveries in the field of extinct decapod crustaceans, a group that evolutionarily ranks amongst the most successful multicellular organisms. They form a diverse assemblage of arthropods that are found in different habitats: shallow areas of continental shelves to deep ocean floors, but also occurring in rivers, lakes and cave systems; several species are even adapted to life on land. Due to their great economic importance, modern decapods have received more attention than other crustaceans within the biological sciences, while global palaeontological research into this group has never attained the high level of stratigraphical importance of other biota, such as molluscs. Fossil decapods were studied in detail during the first decades of the twentieth century, but after that the interest waned. Only from the 1970s, has there been a steady growth of scientific research in this field and there has been a remarkable increase in the activity of palaeontologists from the 1990s and continuing to the present day.

Currently, about 40 to 50 researchers from around the world, study fossil decapods. A small team of palaeontologists is responsible for the rapid advancement of our knowledge of the evolution of decapods. In spite of the good online connections amongst these researchers, the regular organisation of Symposia on Mesozoic and Cenozoic Decapod Crustaceans, every three years, is also crucial for sharing experiences and comparing research outcomes. The first meeting of the Working Group on Fossil Decapods was thus held at Montecchio Maggiore (Vicenza, Italy) in 2000 (First Workshop on Mesozoic and Tertiary Decapod Crustaceans, October 6–8, 2000). Subsequent symposia were then staged at Bortol, the Netherlands (2003), Milan, Italy (2007), Eichstätt, Germany (2010), Kraków, Poland (2013) and Villers sur Mer, France (2016).

From the 17th to 21st of June 2019 we organised the 7th Symposium on Mesozoic and Cenozoic Decapod Crustaceans in Ljubljana, with the assistance of the Geological Survey of Slovenia, the Museum of Natural History of Slovenia and the Department of Geology at the Faculty of

Uvodnik

Tokratna številka *Geologije* je posvečena novim dognanjem v raziskavah izumrlih fosilnih rakov deseteronožcev, ki so evolucijsko ena od najbolj uspešnih skupin večceličnih organizmov. Tvorijo zelo raznoliko skupino členonožcev, ki naseljujejo različna bivalna okolja: plitva območja kontinentalnih polic in globoka morska dna oceanov, najti jih je moč v rekah, jezerih in jamskih sistemih, več vrst pa je prilagojenih tudi življenju na kopnem. Zaradi njihove velike ekonomske pomembnosti so sodobni deseteronožci znotraj bioloških znanosti deležni več pozornosti kot ostali raki. Kljub temu paleontološke raziskave deseteronožcev v svetovnem merilu nikoli niso dosegle pozornosti stratigrafsko pomembnih skupin kot so mehkužci. Fosilni deseteronožci so bili sicer deležni večje pozornosti raziskovalcev v prvih desetletjih dvajsetega stoletja, kasneje pa le redko. Od sedemdesetih let dalje lahko opazimo povečanje zanimanja znanosti na tem področju, izjemen porast aktivnosti paleontologov pri preučevanju fosilov deseteronožcev pa se je zgodil šele v devetdesetih letih prejšnjega stoletja in traja še danes.

Trenutno se s preučevanjem fosilnih deseteronožcev ukvarja okoli 40 do 50 raziskovalcev z vsega sveta. Majhna skupina paleontologov in dobra komunikacija je zaslužna za hiter napredek znanja o evoluciji deseteronožcev. Kljub dobri povezanosti teh raziskovalcev preko spleta, pa je za izmenjavo izkušenj in primerjavo zadnjih izsledkov ključna tudi redna organizacija tematskih simpozijev o fosilnih deseteronožcih (Symposium on Mesozoic and Cenozoic Decapod Crustaceans / simpozij o mezozojskih in kenozojskih rakah deseteronožcih), ki jih organiziramo vsaka tri leta. Prvo srečanje delovne skupine o fosilnih deseteronožcih je tako potekalo leta 2000 v Montecchio Maggiore – Vicenza v Italiji (Prva delavnica o mezozojskih in terciarnih rakah deseteronožcih, 6. – 8. oktober 2000). Ostali simpoziji so bili nato organizirani še v Bortolu na Nizozemskem (2003), Milanu v Italiji (2007), Eichstättu v Nemčiji (2010), Krakovu na Poljskem (2013) ter v Villers sur Mer v Franciji (2016).

Med 17. in 21. junijem 2019 smo v Ljubljani organizirali že sedmi simpozij o mezozojskih in ke-

Natural Sciences and Engineering, University of Ljubljana. At the symposium, 44 researchers from as many as 17 countries presented scientific discoveries in the form of lectures and posters, and the meeting was held in a relaxed informal atmosphere. The participants left Slovenia armed with new ideas and new ties and greatly impressed, after having done fieldwork, with the geological diversity available in such a small area as Slovenia. After the presentation of preliminary data on the palaeobiological diversity of Slovenia's fossil decapods, it would appear almost unlikely that in Slovenia one can study fossil decapods from Late Triassic lagoons, across Jurassic coral reefs and into coastal environments of the Miocene Paratethys, and all of this within a distance of merely 100 km. Sometimes even Slovenian palaeontologists do not grasp the whole fossil diversity that lies within the country's sedimentary rocks.

In the present issue of *Geologija*, we are excited to present some of the research discussed at the symposium. Fraaije et al. record remains of hermit crabs of Tithonian to early Berriasian age from Štramberk, Czech Republic, which is one of the more diverse fossil paguroid faunas. New representatives of five families and five genera of hermit crabs are represented, including a species named after the singer/songwriter Janet Jackson and featured on the cover of this issue.

Late Jurassic decapods are also described in contributions by Schweigert et al. and Gašparič et al. The first focuses on two new types of erymid lobster from lagoonal limestone in Bavaria, Germany, and the second paper discusses a new type of squat lobster from reef olistolith in Slovenia. Mesozoic contributions are completed by González-León et al., who, based on the cuticle structure of the Early Cretaceous lobster *Atherfieldastacus magnus* from Mexico, have recognised differences between fossil corpses and moults of these.

In the following, Jakobsen et al. describe two new types of hermit crabs from Lower Paleocene levels at Faxe, Denmark. The only known example of a raninid crab from the renowned Eocene site 'Pesciara di Bolca' (Verona, Italy) is presented by Busulini et al., and De Angeli and Garassino describe a new species of *Neoliomera* from the Lower Eocene of northeastern Italy. Ossó and Domínguez, based on a new specimen of the species *Pyreneplax basaensis* from the Upper Eocene of Spain, revise its description and confirm placement in the family Vultocinidae. Decapods of Oligocene age are described by Marangon and

nozojskih rakih deseteronožcih (7th Symposium on Mesozoic and Cenozoic Decapod Crustaceans). Srečanje je potekalo s pomočjo Geološkega zavoda Slovenije, Prirodoslovnega muzeja Slovenije in Oddelka za Geologijo, Naravoslovnotehniške fakultete Univerze v Ljubljani. Na simpoziju je znanstvene izsledke v obliki predavanj in plakatov predstavilo 44 raziskovalcev iz kar 17 držav, srečanje pa je potekalo v sproščenem neformalnem vzdušju. Udeleženci so Slovenijo zapustili oboroženi z novimi idejami in stkanimi novimi vezmi ter navdušeni nad geološko pestrostjo, ki se skriva na tako majhni površini. Po predstavljenih predhodnih izsledkih o biološki pestrosti in raznolikosti fosilnih deseteronožcev Slovenije, se marsikomu zdi skoraj neverjetno, da lahko v Sloveniji na razdalji le nekaj 100 km raziskujemo fosilne deseteronožce od zgornjetriasnih lagun, preko jurskih koralnih grebenov pa vse do priobalnih okolij miocenskega morja Paratetide. Marsikje še ne poznamo fosilne pestrosti, ki se skriva v sedimentnih kamninah Slovenije.

V tokratni številki *Geologije* vam navdušeno predstavljamo nekatere izsledke raziskav, ki so bile predstavljene na simpoziju. Fraaije s sod. predstavlja ostanke rakov samotarjev tithonijske do spodnjeberrasijske starosti iz Štramberka na Češkem, ki se uvršča med najbolj raznolike fosilne paguroidne faune. Predstavljeni so novi predstavniki petih družin in petih rodov rakov samotarjev. Med njimi je tudi vrsta, ki so jo avtorji poimenovali po pevki Janet Jackson in krasi tudi naslovnico tokratne številke.

Zgornjejurske deseteronožce v svojih prispevkih predstavljata tudi Schweigert s sod. in Gašparič s sod. Prvi opisujejo dve novi vrsti erymidnih jastogov iz lagunskih ploščastih apnencev z Bavarske v Nemčiji, drugi prispevek pa obravnava novo vrsto raka skakača iz grebenskega olistolita v Sloveniji. Mezozojske prispevke zaključuje González-León s sod., ki so na podlagi strukture kutikule spodnjekrednega jastoga *Atherfieldastacus magnus* iz Mehike, prepoznali razlike med trupli in levi fosilnih deseteronožcev.

V nadaljevanju Jakobsen s sod. opiše dve novi vrsti rakov samotarjev iz spodnjepaleocenskih plasti v Faksu na Danskem. Edini do sedaj znani primerek raninidne rakovice iz znanega eocenskega nahajališča 'Pesciara di Bolca' (Verona, Italija) predstavlja Busulini s sod., De Angeli in Garassino pa v prispevku opišeta novo vrsto *Neoliomere* iz spodnjega eocena severovzhodne Italije. Ossó in Domínguez na podlagi novega primerka vrste *Pyreneplax basaensis* iz zgornjega eocena Španije dopolnjujeta opis vrste in

De Angeli, who introduce a new genus and a new species of homolid crustacean from Lower Oligocene strata in the Ligurian-Piedmont Basin in northern Italy, while Hyžný et al. revise the crab *Plagiolophus sulcatus* and record a new specimen of this taxon from the Upper Oligocene of Trbovlje in Slovenia.

The paper by Wallaard et al. presents the first find of a Miocene age hermit crab shield from the Upper Miocene reefal limestones in Cyprus, on the basis of which they erect a new species that they name after Joe Collins, a prolific decapod crustacean workers from London, who passed away in 2019. Ossó et al. present new specimens of the Middle Miocene leucosoid crab *Iphiculus eliasi* from Catalonia, while the paper by Pasini et al. records new decapods from Lower Pleistocene levels at Poggi Gialli in Tuscany: two new species and a new genus are described, and an updated list of all fossil decapods from the site is added as well.

This issue on fossil and recent decapod crustaceans is completed by Spiridonov with a neontological contribution to an update of the phylogenetic reconstruction, classification and morphological characters of extant crabs of the superfamily Portunoidea. The paper combines the classification of extant and extinct material and introduces new subfamilies within the Carcinidae and Portunidae.

With the present issue of Geologija, the guest editors hope to bring as many readers as possible closer to the wonderful world of decapod crustaceans. There are still many challenges out there and ample room for passionate research by an increasing number of researchers around the world. A final word of thanks to all colleagues who assisted with the peer reviews of the various submissions.

Rok Gašparič, John W. M. Jagt,
Andreja Žibrat Gašparič & Luka Gale
(guest editors)

uvrstitev v družino Vultocinidae. Med fosilnimi deseteronožci oligocenske starosti Marangon in De Angeli predstavita nov rod in novo vrsto homolidnih rakov iz spodnjeoligocenskih plasti v Ligursko-piemontskem bazenu na severnu Italije, Hyžný s sod. pa revizijo rakovice *Plagiolophus sulcatus* in novi primerek iz zgornjega oligocena iz Trbovelj.

Wallaard s sod. v prispevku predstavlja prvo najdbo štita raka samotarja miocenske starosti iz zgornjemiocenskih grebenskih apnencev na Cipru, na podlagi katere je opisana nova vrsta, poimenovana po leta 2019 preminulem raziskovalcu fosilnih rakov Joe Collinsu. Ossó s sod. predstavlja nove primerke leukosoidnih rakov *Iphiculus eliasi* srednjemiocenske starosti iz Katalonije. V prispevku Pasini s sod. pa beremo o novih deseteronožcih iz spodnjepleistocenskih plasti nahajališča Poggi Gialli v Toskani. Med najdbami sta opisani dve novi vrsti in nov rod, prispevku pa je dodan tudi posodobljen seznam vseh fosilnih deseteronožcev iz nahajališča.

Prvo letošnjo številko, posvečeno fosilnim in recentnim rakom deseteronožcem, zaključuje Spiridonov z neontološkim prispevkom o posodobitvi filogenetske rekonstrukcije, klasifikacije in morfoloških znakov recentnih rakovic iz družine Portunoidea. Prispevek združuje klasifikacijo neontološkega in paleontološkega materiala in predstavi novo poddružino Parathranitiinae znotraj družine Carcinidae in novo poddružino Achelouinae znotraj Portunidae.

Gostujoči uredniki upamo, da bomo s predstavljenimi prispevki v tej številki Geologije čim večjemu številu bralcev približali čudovit svet rakov deseteronožcev. Pri raziskavah le-teh nas še vedno čakajo številni izzivi in dovolj priložnosti za raziskovalno strast vedno večjega števila raziskovalcev po svetu. Na koncu bi se želeli zahvaliti vsem kolegom, ki so pomagali pri recenzijskih postopkih posameznih člankov.

Rok Gašparič, John W. M. Jagt,
Andreja Žibrat Gašparič & Luka Gale
(gostujoči uredniki)