Project Update: January 2021

FIELD EXPEDITIONS IN 2020

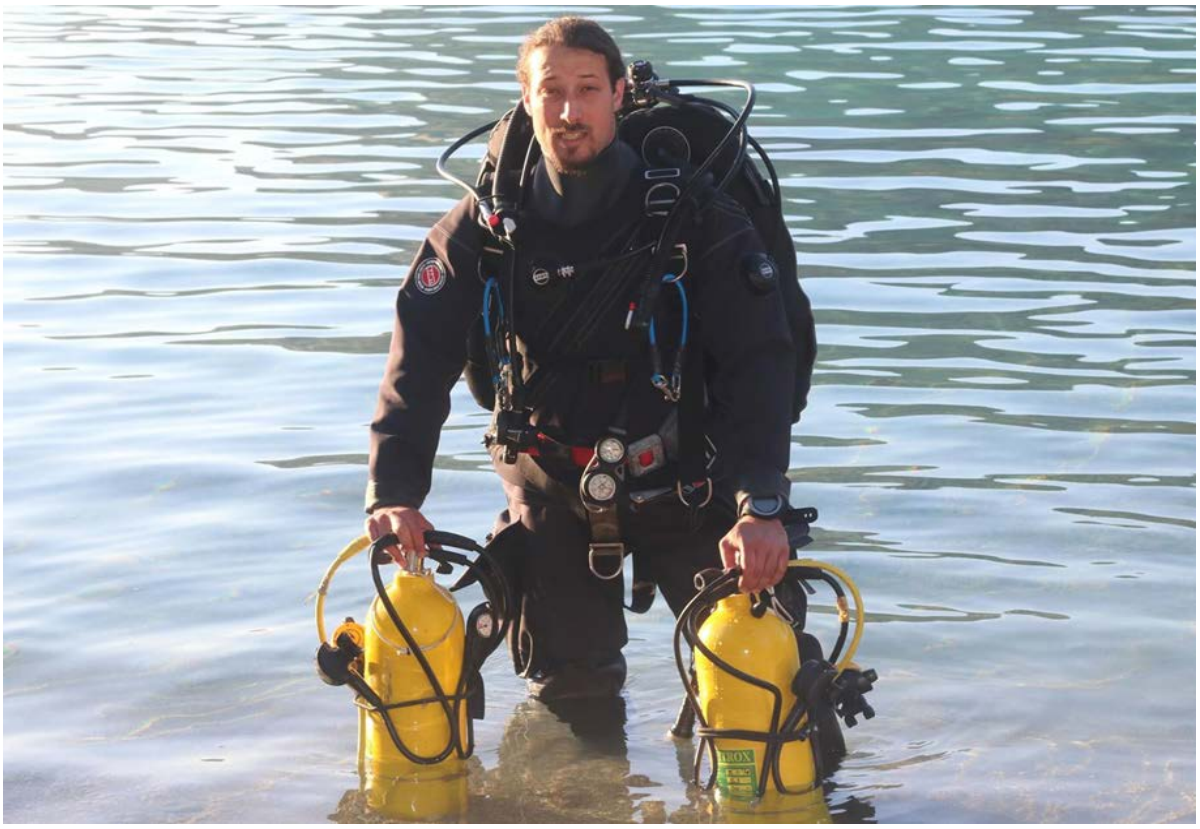
As the project had regional character with four countries with different socio-political context included the outbreak of SARS-CoV-2 and following restrictions has significantly affected the project activities and timeline. Although not a single event happened in 2020 as planned, with great efforts and reliable partners, yet I managed to fulfil far more activities than expected in the original project proposal.

FIELD WORK IN CROATIA

Despite the difficulties faced we managed to explore the waters off Cirkvenica, but without planned trips to Kvarner and waters surrounding the islands of Krk and Rab. An additional extensive field study was conducted in Murtersko more – in direct partnership with the Foundation Ensemble. Murtersko more proved to be a highly important habitat for certain critically endangered shark species and the mentioned studies resulted in two original scientific papers that are currently under review and will provide a whole new insight into the understanding of Adriatic elasmobranchs and their long-term conservation. Our research crew spent total of 43 days at the field (instead of 20 days as planned).

Technical research diving off the continental shelf of the middle Adriatic, realized by DC Bosna and Sharklab ADRIA, with direct support from the Rufford Foundation and Foundation Ensemble.

Two additional small field trips were organised in the waters off the island of Korčula and Pelješac peninsula. The research crew conducted dives using technical diving configurations. Volunteers from the DC Bosna and have assisted at all the field expeditions and have additionally observed the field sites and recorded photo/video material necessary for further detailed analysis.



Project principal investigator A. Gajić preparing his NITROX side mount configuration for a research dive in the well-studied site in Pelješac peninsula (Croatia).

Field expedition in Croatia organized by DC Bosna and Sharklab ADRIA included species and habitat mapping, pollution assessment and sampling of biological samples, water and sediment.

FIELD WORK IN SLOVENIA

Due to the epidemiological restrictions, almost all planned activities were rescheduled or cancelled. Although I was unable (as a principal investigator) to travel to Slovenia for the fieldwork, colleagues from the Sharklab ADRIA led by our fellow colleague Adla Kahrić MSc spent 5 days on the coast of Slovenia in order to interview fisherman, analyse fish markets and key habitats in the shallow waters.

Adla Kahrić analysing the small-scale fisheries and by-catch for further pathological studies during the trip to the Slovenian part of the Adriatic Sea, March 2020.

Unlike the studies conducted in Croatian territorial waters, the field trip to Slovenia was less successful but with extraordinary efforts, Adla has finished the necessary activities that will empower us to begin and continue the species monitoring – as well as the better cooperation with the public and governmental institutions in Slovenia.

Let's create better future for sharks, skates and rays in the eastern Adriatic: towards the unique regional protection.

WORKSHOP & LECTURES: TESTIMONIALS

During the course of the project, I held 25 lectures and workshops for the 70 students at the University Department of Marine Studies, University of Split (Croatia), Faculty of Science and Mathematics and Faculty of the Veterinary Medicine, University of Sarajevo (Bosnia and Herzegovina), Faculty of Natural Sciences and Mathematics, University of Tuzla (Bosnia and Herzegovina). Unfortunately, the vast majority of events happened online due to the restrictions caused by the ongoing pandemic.

The most important results of our activities are definitely reflected in the testimonials – read some of them below.

University Department of Marine Studies, University of Split (Croatia)

"Enrolling in the workshops was one of the wisest decisions that I have made since I have become a student of Marine Sciences at the University of Split. Unlike at the university where you are going to be normally, unfortunately, asked to learn definitions by heart rather than using your brain to solve a problem. Andrej and the Sharklab ADRIA, have exactly done the opposite, they are here to challenge your ideas so that you can develop a critical mindset. I have been asked questions, not for the sole reason to be correctly answered, but so that I become an active participant in the discussions among my peers. You will not be given a predefined answer that will solve your conundrum, because they want you to develop an inquiring, philosophical and critical mindset. I only became aware of that on our last session and it left me in a stunned silence since I do not remember the last time that I had a similar experience. It left me with the desire to learn and to dive deeper into the pool of science".

Andro RUDAN, B.Sc., graduate student

"Online workshops that we had with Sharklab ADRIA was beyond any expectations! We fulfilled time with new knowledge and great people that share it so unselfishly. The online workshop is a good example of new learning methods where you can always learn something new and that is why we love it so much! Tutors have a lot of experience and just listening to them makes you wanna be in their team, encourage you to learn more and to be more, and that is important especially for young people. I'm just thrilled, and I really hope to hear more stuff in the future!".

Kristina ODŽAK, M.Sc., alumni

"I was most impressed with the first online workshop on anatomy and histology. I am a second- year marine biology and technology student and during this lecture, I was introduced to many new and interesting things concerning the subject of research. The lecture provided an insight on how to conduct a more detailed observation of the subject being researched. Furthermore, it showed how to think critically, carry out a detailed analysis of the given subject of study, and many more insights into that particular scientific area that is necessary for further progress in this profession. I was also thrilled that the workshop encourages teamwork as well as collaboration between participants".

Vanesa BEGURA, undergraduate student

"I really enjoyed the online course with Andrej and the rest of Sharklab ADRIA. I have gained a lot of new knowledge, but two things that I would highlight the most are the importance of the basics and gaining self-confidence. It really helped me both with my self-confidence and learning how to think outside the box. Thus, I am so glad that I have participated in the workshops, as it is an effective way of teaching students and everybody should learn like this or at least try – really!".

Nina ROGLIĆ, undergraduate student University Department of Marine Studies,
University of Split, Croatia

Faculty of Science and Mathematics, University of Sarajevo (Bosnia and Herzegovina)

"I have no other words, but pure praise. I have realized that the previously possessed knowledge was only superficial and thanks to the lecturer and his commitment I have learned a lot and got far more motivation which will open new paths for me - new paths of greater knowledge and success. I am so sorry that the workshops didn't last an entire year! But, thanks to the professional and very cordial team I have gained sufficient knowledge even in this short period of time. Participating in this course taught me that not everything in my country is dark and that there is hope for young professionals".

Melisa FEJZIĆ, graduate student

"I am happy and honored that I had an opportunity to participate in the various interactive activities within the Sharklab ADRIA. Andrej and his team encouraged me to work and taught me many useful techniques in a very short period of time, from just a few months. Besides, I gained a lot of experience and good work habits by working with this team. Most of all, I was thrilled that all members are always available and willing to help in all areas, not just biological. Through working with this team, I realized that what I was studying was for me, and I fell in love with scientific research even more".

Vojo MILANOVIĆ, undergraduate student

Faculty of Natural Sciences and Mathematics, University of Tuzla (Bosnia and Herzegovina)

"During both workshops and lectures, and especially in conversations and further work with Andrej, I got the impression for the first time that my ideas were understood, and that there are opportunities and space for me to achieve something with my work. This gave me a huge motivation to study and to work even harder. During our work together, I gained a lot of knowledge that I did not have the opportunity to acquire while studying. Thus, although being a biologist myself, with field experience, I gained a lot of knowledge about the field research. Andrej selflessly shares his knowledge and gives valuable advice from various fields of science and applied biology".

Marija VUČIĆEVIĆ, B.Sc., graduate student

"During the workshops with Andrej, we learned a lot about SCUBA diving field techniques and heard dozens of interesting experiences that Andrej had while diving. The most interesting workshop was one where we learned more about effective fieldwork. We've learned how to organize our first aid kit at the field, how to take effective photos during fieldwork, and also how to properly take different types of samples. Learning more about ROV features and understanding how to operate one was also really important for our future studies. It was really interesting to learn more about endangered species such as Angel sharks and their conservation. Andrej also described to us his contacts with sharks and rays in the open waters but also during his work in the aquarium which was really fascinating to hear about. Besides, we learned how to write scientific papers and how to publish them. We also had an opportunity to learn more about project applications. Andrej thought us how to write an effective application and also how to find an appropriate foundation to fund our projects".

Selma MURATOVIĆ, B.Sc., graduate student

LIST OF PUBLICATIONS

Project activities resulted in six original papers, one conference proceeding, and one book. One of the papers got published in December 2020, two other papers are currently under review in the eminent peer-review journals, while three manuscripts are being finalized at the moment. Despite the significant issues and restrictions caused by the ongoing pandemic, our team has managed to complete all proposed research activities beyond the expectations stated in the project proposal.

1 Original Scientific Paper

Melanomacrophage centres and diseases occurring in lesserspotted catsharks, *Scyliorhinus canicula* (L.), from the southern Adriatic Sea - importance for monitoring

Andrej GAJIĆ [1,2*], Amer ALIĆ [3], Adla KAHRIĆ [1], Nurija BILALOVIĆ [4], Jovana ŠUPIĆ [3] and Hajrudin BEŠIROVIĆ [3]

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[2] Shark Tales funded by National Geographic, Washington D.C.
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ABSTRACT
Melanomacrophages of fish are commonly explored as biomarkers of water pollution and are considered to be sensitive albeit non-specific health indicators in water ecosystems. Sharks as long living marine species are good sentinel species. This study presents morphometric data for splenic and hepatic melanomacrophages (MMC), and observed histopathology in ten lesser-spotted catsharks, *Scyliorhinus canicula* (L.), one of the most abundant shark species in the eastern Adriatic Sea. At necropsy, we collected random tissue samples from liver, brain, gallbladder, pancreas, spleen, kidney, gills, entire digestive system, thyroid gland, rectal gland, entire urogenital (male samples) and genital system (female samples). Collected tissue samples were routinely processed and stained with haematoxylin-eosin, Periodic Acid-Schiff, and Masson Trichrome for microscopic examinations and morphometry. There was a minimal number of histopathological lesions in the examined sharks, but morphometric values reported herein were three folds higher than in previous studies in free- ranging sharks. Studies on larger numbers of sharks are needed to elucidate the biological significance of our finding in the context of population decline of the lesser-spotted catshark.

Keywords: Adriatic, catshark, diseases, melanomacrophage, monitoring

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Download paper in PDF: 61_2_5.pdf (izor.hr)

2 Original Scientific Paper

New hope for the critically endangered common angel shark, *Squatina* (Linnaeus, 1758), in the eastern Adriatic Sea

Andrej GAJIĆ [1,2*]

[1] Sharklab ADRIA: Center for marine and freshwater biology
[2] Shark Tales funded by National Geographic, Washington D.C. ABOUT THE PAPER
This paper is describing new findings of the critically endangered *S. squatina* – which thought to be extinct from certain parts of the Mediterranean – whit notes on potential nursery ground important for further revitalization and long-term in-situ conservation in both the Adriatic and Mediterranean Sea.

Currently under review

3 Original Scientific Paper

Let's create a better future for sharks, skates and rays in the eastern Adriatic: towards the unique regional protection

Andrej A. Gajić [1,2]

[1] Sharklab ADRIA: Center for marine and freshwater biology
[2] Shark Tales funded by National Geographic, Washington, D.C. ABOUT THE PAPER
There are significant disagreements in the legal acts across the eastern Adriatic countries resulting that certain highly threatened and migratory species are often unprotected among the neighbouring countries. Further, some Red lists are missing the key endangered species and require an urgent review.

Manuscript finalization

4 Original Scientific Paper

Chaperoning neurological disorders in sharks: reporting a new case and discussing their plausible role in aggressive behaviour

Andrej A. Gajić [1,2], Joanna Borucinska [3], Miłosz A. Zajączkowski [4], Adla Kahrić [1], and Hajrudin Beširović [5]

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ABOUT THE PAPER
This paper is chaperoning all known neurological disorders in sharks, together with the original description of the case study from the eastern Adriatic. The study aims to link certain sorts of pollution with the development of neurological diseases which may furthermore cause increased aggressive behaviour in sharks.

Manuscript finalization

5 Original Scientific Paper

Contemporary records and biological traits of the rare critically endangered angular rough shark, *Oxynotus centrina* (Linnaeus, 1758), from the eastern Adriatic Sea

Andrej A. Gajić [1,2], Suvad Lelo [1,3], Aleksandar Joksimović [4], Ana Pešić [4], Jovana Tomanić [4], Hajrudin Beširović [1,5], and Branko Dragičević [6]

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[6] Institute for oceanography and fisheries, Split, Croatia

ABOUT THE PAPER

Although it was thought to be extinct, this paper is describing 15 new records of angular rough sharks from Croatia and Montenegro and brings the novel insight into the species' biology, reproduction, and inner ear functional morphology studied by x-ray and axial computed tomography.

Manuscript finalization

6 Original Scientific Paper

The morphology, anatomy and histology of the blackspotted smoothhound shark embryos (*Mustelus punctulatus* A. Risso, 1827) from the eastern Adriatic Sea

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ABOUT THE PAPER

This paper aims to fill the significant gap in the understanding of the Mediterranean smoothhound sharks by bringing the very first insight into the morphology, anatomy, and functional histology of the final stage embryos accidentally caught by small-scale fisheries in Bosnia and Herzegovina.

Manuscript finalization