Project Update: November 2020

Reseach and conservation during the COVID-19 pandemic

The outbreak of the SARS-CoV-2 and following pandemic remarkably affected global health, various socio-economic conditions and has significantly reduced possibilities for research and conservation. Despite that, endangered animals do not understand any sort of crisis and their vulnerability is still increasing day by day, as pressures such as uncontrolled fisheries, lack of inspections and accumulation of the waste (especially sanitary-medical waste nowadays) also increasing daily. Due to the bad epidemiological situation in the Balkans for the past 6 months, most of our planned activities were cancelled. Thus, our team was forced to quickly adapt as much as possible to the dramatic changes and to continue the full efforts to establish the unique regional protection, as a major long-term goal. We have continued to work both in the field and labs, together with our partners in a different way than planned but still highly successful. Besides, during the lockdown we have focused on the raising the awareness, different media campaigns and government/stakeholder engagement.

New records in the Croatia, and Bosnia and Herzegovina in April – November 2020

Despite that the pandemic significantly reduced the possibilities for the field studies and direct engagement in the fisheries across the eastern Adriatic, our team has continued efforts to conduct planned research expeditions together with our friends and partners. Through the past 6 months we have encountered 13 species, with several extremely important findings (Tab. 1.).

Tab. 1. Elasmobranch species encountered through April – November 2020.

#	English name	Species (latin) name	IUCN status		Country(es)
			CRO	MED	
1	Common smoothhound	*Mustelus mustelus* (L.),	NT	VU	CRO
2	Blackspotted smoothhound	*Mustelus punctulatus* Risso, 1827	DD	VU	CRO
3	Small-spoted catshark	*Scyliorhinus canicula* (L.)	LC	LC	CRO
4	Nursehound / BullHuss	*Scyliorhinus stellaris* (L.)	NT	NT	CRO
5	Rough shark	*Oxynotus centrina* (L.)	EN	CR	CRO
6	Angel shark	*Squatina squatina* (L.)	CR	CR	CRO
7	Thresher shark	*Alopias vulpinus* Bonnaterre, 1788	VU	EN	CRO
8	Marbled electric ray	*Torpedo marmorata* Risso, 1810	LC	LC	CRO, BH
9	Common stingray	*Dasyatis pastinaca* (L.)	VU	VU	CRO, BH
10	Brown ray	*Raja miraletus* Linnaeus, 1758	LC	LC	CRO, BH
12	Thornback ray	*Raja clavata* Linnaeus, 1758	NT	NT	CRO
13	Common eagle ray	*Myliobatis aquila* (L.)	NT	VU	CRO

New hope for critically endangered angel sharks in the Adraitic

Foundation Ensemble has supported activities on the ongoing RSG project and partnered with us in order to put additional focus on the critically endangered angel sharks through the project „Éviter l'extinction des anges de mer en Adriatique". During the planned research activities (Fig-1-4) in the Murtersko more, in direct cooperation with local fisherman, we managed to identify the new records of subadult female – which is the first known record in the Adriatic since 2017. Besides, we have managed to describe two additional subadult individuals from the same area and proposed a possible nursery ground, which further might play a crucial role for long-term conservation. A paper titled „New hope for critically endangered angel sharks, Squatina squatina (Linnaeus, 1758), in the eastern Adriatic sea" has been submitted and is currently under peer-review. Such findings and science-based conclusions present one of the most important project results. More information, together with photos and maps, comping as soon as the paper is published!

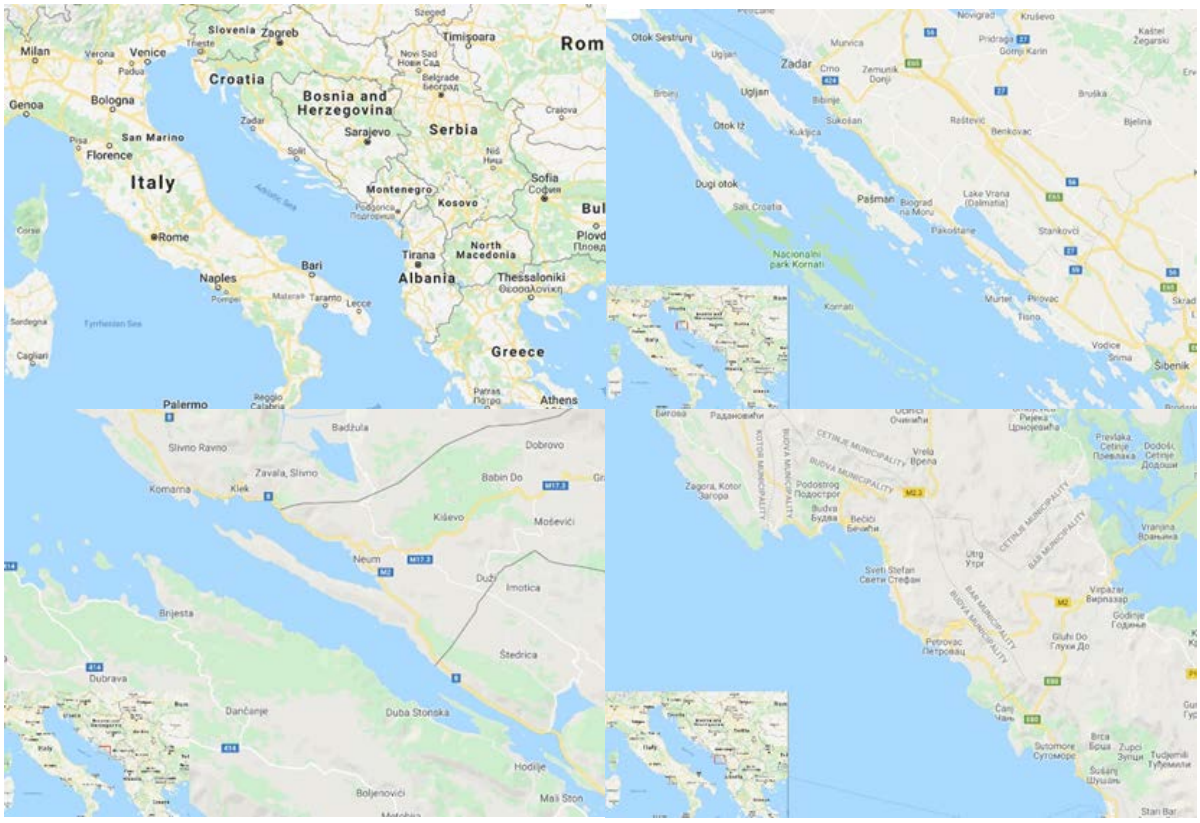


Fig. 1-4: Most important study areas: Physical-political map of the Adriatic region (upper left), Murtersko more in Croatia with confirmed juvenile angel sharks in the last three years (upper right), Neum bay with numerous records from the second half of last century (lower, left) and study locality in Montenegro (lower right). Credits: Google maps.

Mediterranean Angel Shark Action Plan

I have been invited to fully participate in the development of the Sub Regional Angel Shark Action Plan for the Adriatic sea (GMFC geographic subareas 17 and 18). Falling under the umbrella of the Mediterranean Angel Sharks: Regional Action Plan, Sub Regional Action Plans (SubRAPs) are being developed to facilitate a tailored approach to angel shark conservation in priority regions of the Mediterranean. The subgroup will engage regional stakeholders and will identify threats at the sub regional level and considering existing conservation measures. Such an important document

will further serve to support the vision to restore angel sharks to robust populations in the Mediterranean.

Understanding the effects of pollution on disease development - Croatia
The inability to perform originally planned activities in the field forced us to to turn to enthusiastic programmes together with our friends and partners in Croatia. Together with our friend P. Ugarković and our friends at the Fish Markets in Split we have started an enthusiastic programme on the understanding of the negative effects of pollution on sharks, skates and rays in the Croatian waters of the Adriatic sea.

Histological analyses will precede macroscopic patomorphological analysis, while dissection will be performed according to the standardised protocols (BEŠIROVIĆ et al., 2017; GAJIĆ, 2015; GAJIĆ et al., 2020). Initially, all tested tissue samples will be stained using HE (hematoxylin-eosin staining), while the further special staining will be used if needed.

Planned research expeditions in the Cirkvenica (Kvarner, Croatia) have been modified due to the pandemic. Extensive research has been conducted in partnership with Aquarium Pula. Through this study, we have encountered over 50 elasmobranchs and obtained samples from thresher sharks, smooth-hounds, catsharks, eagle rays and a few species of skates.

Joined forces with Explorer Club and Discovery Channel
Another great example that we are on the right track for the establishment of the unique regional protection based on the original scientific evidences is reflected in our partnership with the ultra-elite Explorers Club (New York) and famous Discovery Channel. The partnership has recognised and supported all the efforts from three RSG grants among thousands of other applicants for the role of the expedition leader. This is on of the very first awards through The Explorers Club Discovery programme. More about the **PLASTIC SHARKS** programme (2020 – 2021) is given below:

In the era of plastics, our seas face daily excessive pollution, thus many species are being affected, resulting in dramatic declines in certain populations and specific, so far unknown, disease development. So far no attention is given to the better understanding of the effects of (micro)plastic and the possible mitigation of pollution. We aim to contribute to such understanding and revitalisation of the affected species/habitats. The programme will uniquely combine the extensive field expeditions with precise laboratory analysis and further education. In the field expeditions our team will study the sharks, skates and rays inhabiting the continental shelf of the northern part of the eastern Adriatic Sea in order to analyse the current state, frequency and behaviour of species and to map, sample and quantify the (micro)plastic waste. Expeditions will combine the technical research diving and ROV operations. In the field, we will analyse the by-catch of the small-scale fisheries in order to obtain biological samples without killing or harming the animals. After the expeditions, in the labs we will conduct the quantitative and qualitative studies on the microplastic from the digestive system. Gathered results will further serve for education and developing long-term in-situ conservation strategies/plans.

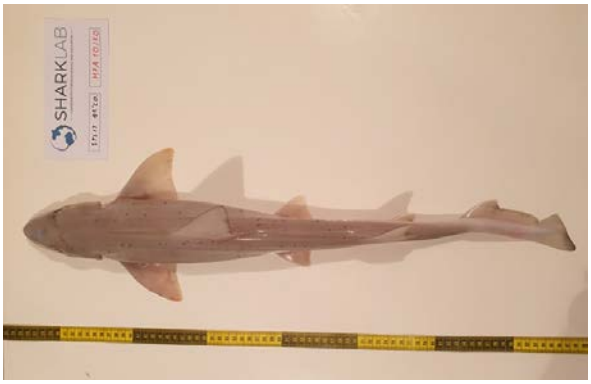
More information: Andrej Gajic | Discovery

Media campagins and wider public education

Since the last update in April 2020, I have made over 50 media appearances, including regional television channels and CNN affiliates, as well as newspaper, radio and portal shows. An announcement about the appearance in the show „Sunday afternoon“ in Hayat TV, discussing the basic biology of sharks, skates and rays from the Neum and Malostonski bay is given in the link below:
ANDREJ GAJIĆ: U NEUMU SE NALAZE MORSKI PSI 'PENE' SA ZARAVNJENIM ZUBIMA - YouTube

A guest appearance on the N1, the regional CNN affiliate channel, at the show „Izvan okvira“ discussing the efforts towards the unique regional protection of the elasmobranch species, urgency of proper long-term conservation, the effects of the pandemic on the research and conservation, and much more:
Izvan okvira: Gost Andrej Gajić - YouTube

Improvised home wet lab designed during the COVID-19 pandemic to research the pathology of sharks, skates and rays from the eastern Adriatic. © E. Karalić / Sharklab ADRIA.



Left: Adult Blackspotted smooth-hound, *Mustelus punctulatus* Risso, 1827, from the Split,

Croatia prior to the autopsy and further laboratory analysis. ©A. Gajić / Sharklab ADRIA. Right: Total of 30 specimens of the less known Blackspotted smooth-hound, *Mustelus punctulatus* Risso, 1827 have been analyzed during September – November. ©A. Gajić / Sharklab ADRIA.


Left: Taking blood samples in the improvised home wet lab for the very first hematological analysis of the smooth-hound sharks, skates and eagle rays in the Adriatic. © A. Gajić / Sharklab ADRIA. Right: Measuring, fixing and storage of the biological samples from the territorial waters of Croatia, prior to detailed pathological studies. © A. Gajić / Sharklab ADRIA.

Left: Guest appearance on the regional CNN affiliate, discussing the efforts towards the unique regional protection of the elasmobranch species. © S. Mustafić / N1. Right: Guest appearance on the Hayat TV show „Sunday Afternoon“ discussing the diversity and major threats for sharks, skates in rays in Neum and Malostonski bay. © Hayat TV.

Sadržaj s potpisom

Ljubo Jurčić

Rajko Grlić

Maja Car

Denis Romac

Večernji list

SUBOTA I NEDJELJA, 21. I 22. STUDENOGA 2020. // 1,5 KM // BIH

Danas se navršava 25 godina od potpisivanja mirovnog sporazuma

Dayton zaustavio rat i donio nepravedan mir str. 3

KOLUMNA DOMINICA RAABA, BRITANSKOG MINISTRA VANJSKIH POSLOVA: UJEDINJENO KRALJEVSTVO DAJE 80 MILIJUNA FUNTI GODIŠNJE ZA PODRŠKU MIRU I STABILNOSTI REGIJE str. 2

Intervju: Andrej Gajić

Jajčanin osnivač međunarodne institucije za istraživanja i zaštitu morskih pasa i raža na Malti str. 11

U Neumu žive raže koje mogu producirati struju do čak 200 volti, ali su miroljubive

str. 49 Darko Rundek: Ovo više nije vrijeme ideologija, one pripadaju industrijskoj civilizaciji koja se raspada

str. 10 Vojna industrija u BiH Granate za ručni bacač iz Bugojna koriste se za slanje prijetećih poruka i politički marketing

str. 12 Smrt srpskog patrijarha: Odlaskom Irineja papi Franji otvorena vrata za dolazak u Srbiju

Za Večernji list pišu

DENIS ROMAC, MARINKO JURASIĆ, SILVIJE TOMAŠEVIĆ, DARKO PAVIČIĆ, BRANIMIR POFUK, GORAN GEROVAC, SUZANA LEPAN ŠTEFANČIĆ, MILAN IVKOŠIĆ, LANA KOVAČEVIĆ, MARINA BOROVAC, DRAŽEN BRAJDIĆ, DENIS DERK, VALENTINA RUPČIĆ, ZORAN KREŠIĆ, ŽELJKO ANDRIJANIĆ, OLIVER CVITKOVIĆ, IVANA BRKIĆ-ČUBELA, DARIO PUŠIĆ, GORAN SUDAR, LILJANA VIDAČAK, MATEJ DAMJANOVIĆ, MARKO KNEZOVIĆ, FRANJO PUŠIĆ, FRANO VUKOJA...

Večernji list

Research efforts trough the RSG project made to the cover of the Weekend two issues of one of the most read regional newspaper „Večernji List“.

DISCOVERY CHANNEL I EXPLORERS CLUB MEĐU DESECIMA TISUĆA ZNANSTVENIKA IZABRALI NJIH ŠEST, MEĐU NJIMA ANDREJA GAJIĆA IZ JAJCA I NJEGOV PROJEKT "PLASTIC SHARKS"

U Neumu žive raže koje mogu producirati struju do čak 200 volti, ali su miroljubive

Sa samo 17 godina osnovao je međunarodnu instituciju za istraživanja i zaštitu morskih pasa i raža na Malti, danas je jedan od najutjecajnijih istraživača

Željko Andrijanić

Bob Ballard koji je otkrio olupinu Titanika

Osnivanje Sharklaba

Sharklab smo kolega Greg i ja osnovali na Malti još 2008. godine, a danas, prema National Geographicu, važi za jednu od utjecajnijih institucija u svijetu vezanih za istraživanje i zaštitu morskih pasa i raža - priča nam Gajić, tako su im u fokusu vrste Mediterana, nerijetko rade na projektima diljem planeta. - Danas, kao šef rukovoditelj "Shark Taleu" u National Geographicu i tematični rukovoditelj "Plastic Sharkua" za Discovery Channel radim na mehanizmima razvoja obolijenja uzred mikroplastike i ratnog otpada te na uspostavi dugoročne zaštite vrsta i/ili staništa. Autor sam više od 70 visoko citiranih radova i dvije knjige. Predavao sam na više od 40 konferencija u šljedećim državama, Engleskoj, Gruziji, Španjolskoj - kaže nam ovaj istraživač morskih dubina koji je i autor nekolika dokumentarca. O njegovu radu redovito izvještavaju bivši Geo WILD, National Geographic, Discovery, FOX, BBC, Deutsche Welle i više od 200 regionalnih medija. - Moja višegodišnja istraživanja financirala Rufford, National Geographic, Explorers Club, Discovery Channel, Foundation Ensemble, PADI i mnogi drugi (nevladina i/jela regije i svijeta, na čemu sam uvijek beskrajno zahvalan - naglašava.

Sa samo 17 godina osnovao je međunarodnu instituciju za istraživanja i zaštitu morskih pasa i raža na Malti, danas je jedan od najutjecajnijih istraživača

Jedan ste od šest znanstvenika čiji projekti "Plastic Sharks" podržavaju čuvari Discovery Channel i Explorers Club iz New Yorka. Ako se uzme u obzir da su deseci tisuća znanstvenika kandidirali svoje projekte, onda je ovo utoliko impresivno. Možete li pobliže objasniti o čemu se radi?

Na poziv sam se odlučio prijaviti s programom "Plastic Sharks" koji sam razvio tijekom svog rada u National Geographicu, točnije bazirano na iskustvima s terena i rezultatima preliminarnih studija u bliski srodnim disciplinama. Istina, program je bio izvorno namijenjen za SOS!, koji ga je dva puta odlično iako je ulazio u najuži krug, što mi je danas posebno drago, moram naglasiti.

U okviru ovog programa planirane su opsežne terenske studije na sjevernom Mediteranu, praćene vrlo detaljnim laboratorijskim studijama u cilju kvalitativno-kvantitativnih analiza mikroplastike u mreži ishrane, kao i razumijevanju mikroplastike i POPs (perzistentnih organskih zagađivači, koji se na isti vrlo često vezuju, na razvoj bolesti. Konačno, program će rezultirati jedinstvenim preporukama za mitigaciju (mikroplastičnih kontaminacija, ali i uspostavu dugoročne konzervacije ciljanih vrsta.

U ljeto 2019. pisalo se o morskim psima na Jadranu, pa su se izvlačile priče kako su u tom moru u povijesti ubili 13 ljudi. Ove godine su zbog pandemije takve priče zapostavljene. Što reći o psima koji obitavaju u Jadranu? Jesu li miroljubivi?

Pažljivo analizirajući povijesne zapise, svu dostupnu literaturu i desetogodišnja vlastita istraživanja, zaključujem da do danas postoje pisani navodi o susretima s 62 vrste elasmobranhija. Oduzevši dva pogrešna navoda, to je 60 vrsta, od čega 36 vrsta morskih pasa i 24 vrste raža. Popis se sastoji od svih onih koje su, barem jednom, zabilježene u posljednjih 200 godina - ne onih koje stalno tu obitavaju. Od ukupno 36 vrsta morskih pasa zabilježenih do danas u vodama Jadranskog mora, svega pet vrsta smatra se potencijalno opasnim za čovjeka. Ipak, u posljednjih 120 godina u istočnom Jadranu zabilježeno je 19 napada, od čega velika većina od velike bijele pjine. Da usporedimo, u istom razdoblju na Malti, u sretu Mediterana, zabilježena su samo dva. Ipak, ni u kojem slučaju ne treba postojati strah za kupače, no trebamo biti svjesni uvijek da ulazeći u vodu ulazimo i remetimo stanište mnogih životinja.

Neum je jedini bh. jadranski biser. I tu ste istraživali određene posebnosti, pa što biste posebno izdvojili?

Zaljev Neum - Klek predmet je sistematskih istraživanja našeg Centra u posljednjih deset godina. Spomenute studije rezultirale su monografskim originalnim i prvim nalazima, više od 35 znanstvenih radova, prijedlozima za zakonsku zaštitu te prijedlozima za uspostavu zaštićenih područja. Jasno, većina naših programa ticala se morskih pasa i raža, primarno pena, sklatova, drhtulja, žutulja, golubova i raževki - koje su u Malostonskom zaljevu široko rasprostranjene. Kroz ove studije, koje su financirali Rufford, National Geographic, Walti Foundation, IDEA WILD, PADI Foundation, Fond za zaštitu okoliša FBiH i drugi, dobili smo prve podatke o diverzitetu vrsta, arealu (mrijestilišta i/ili kotilišta, rastilišta i hranilišta), kao i utjecaju zagađenja na razvoj bolesti (prenatalno i adulti). Osim podataka o morskim psima i ražama, tu su svakako i bogati podaci o fauni žarnjaka, bodljokožaca, rakova, mekušaca i drugih morskih skupina. U Neumu bih svakako istaknuo vrlo zdravu populaciju dupina, koje su vrlo često i miroljubive naše. Odlikuje se time da imaju električne organe, koji su u «stanju producirati struju napona» (ime 70 - 80 volti, dok u ekstremnim slučajevima ove vrijednosti idu i do 200 volti.

Pravite taj morski svijet, pa na koji način na njega utječe pandemija koronavirusa? Netko je nedavno komentirao kako smanje ove crnkopljevi i zrak se pobolišan, pa kakvo je situacija u vodi?

Da budem iskren, nisam pretjerano optimističan kada su u pitanju kratkoročna poboljšanja uvjeta u okolini. Više se treba da prirodnom smanjenje onečišćenih antropogenih aktivnosti uvezu tek ljudi u izvanredno stanju pripade, koje i dosadašnja svakidi dimenzi ove više i više narušena. Povratak nekih vrsta u zekada uništavana i gnusna područja često je rezultat samo nedostatka intenziviranja, nikako namaka pozitivnih promjena kako to pojedini hrabro pokušavaju prezentirati. Znate, za većinu ugroženih vrsta izvanredno stanje, nažalost, traje već godinama, a njihova ranjivost zaigurno raste iz dana u dan, bez obzira na aktualni pandemiju. Pomislite samo na enormne količine sredstava za dezinfekciju, higijensko-medicinskih i drugih preparata pomnožena na milijarde i milijarde malih i rizikavica, koje će nakon upotrebe naći svoje mjesto nigdje drugo nego kao zagađivači u prirodi. Još stvarno, znanstveno zanimljive, studije trebaju pokazati kakvo je stanje tijekom/nakon pandemije. Što će, prema svemu sudeći, biti još samo gore.

Što kažu istraživanja, pojavljuju li se možda neke ekzivene vrste u podmorju za koje nismo čuli?

Vjerovali ili ne, svakog dana u znanosti se opiše nešto više od 50 vrsta. Na ježiću čovjek 21. stoljeća smatra da gospodari svemirom, dakako je više toga što ne znamo o svijetu koji nas okružuje. Ovo je posebno slučaj kada je u pitanju more, tako ocjenjuje pokrivaju više od 70 posto planeta, ili 10 posto svih taloženih voda nije adekvatno istraženo i moćemo reći da je nepoznato. Štiga, ne možemo ni zamišliti kakve se još tajne krije. Ipak, moramo biti svjesni da se tu ne radi o nevjerovatnim čudovištima iz dubina, ogromnim živim fosilima i megapredatorima. Da se podsjetimo da ti ovakvim životinjama trebale tone hrane na tjednoj bazi, što u surovim uvjetima koji vladaju na dubinama nije moguće prenaći. Upravo iz tog razloga, glavninu recentne megafaune nasušenemo do 100 (200) m dubine gdje se i odvija primarna produkcija i gdje obiluje životom, a samim time i hranom.

Uz znanost, zaljubljenik ste i u adrenalinske aktivnosti. Ronite, obožavate podmornu fotografiju, skačete padobranom... Koliko vas to sve ispunjava i stižete li se do posla posvetiti takvim aktivnostima onoliko koliko biste željeli?

Dobra organizacija ključ je balansa privatnog i poslovnog života. Jasno, u mom poslu dio života morate potpuno žrtvovati, to to se višestruko isplati.

Za krvi, jedan ste od onih koji su morali napustiti BiH i ostvariti već sada impresivnu karijeru koja je, gledajući prema vašim godinama, tek na početku. Koju biste poruku poslali ljudima u ovoj zemlji koja je, nažalost, upala u letargiju?

Letargično stanje u Bosni i Hercegovini, nažalost, počelo se podrazumijevati, dok bez stanačkog sudjelovanja gotovo da je nemoguće bilo što ostvariti svojim trudom i zalaganjem, što svi svjedočimo čak i na svakodnevnoj bazi. Sasvim mi je jasno da se mladim ljudima nerijetko gubi volja i motivacija. Međutim, ono što uvijek preručim je da imaju vizu, entuzijazma i ustrajnosti. Uspjeh nije nikada drugo nego ustati i nakon svakog pada, tada će kapitalni rezultati sigurno doći, ako ne sad, onda u neko vrijeme.

One of the many newspaper articles with insight on diversity, threats and protection of sharks, skates and rays of the eastern Adriatic.

Creating a better future for sharks, skates and rays in the eastern Adriatic sea: towards the unique regional protection

Andrej A. GAJIĆ, B.Eng, M.Sc.

Head scientist, Shark Tales, funded by **National Geographic** (Washington, D.C.)
Expedition scientific coordinator at Plastic Sharks, **Discovery channel** (New York)
Chief executive officer, **Sharklab ADRIA**: Center for marine and freshwater biology (Sarajevo, BH)

According to the latest regional assessment, 51% percent of the elasmobranchs within the Mediterranean basin are in the risk of extinction. It's worrisome that over 26% of the species is considered as critically endangered (CR), while there is no assessment of 21% of the total diversity of the studied taxa. Uncontrolled overfishing, unselective fishing tools, slow reproduction rate and long generation periods further contribute to dramatic declines in certain population(s). Furthermore, in the era of plastics, our seas face daily excessive pollution, thus many species are being affected, resulting in dramatic declines in certain populations and specific, so far unknown, disease development. Besides, massive quantities of chemical warfare agents (CWAs) comprising both munition and storing chemicals were dumped into the Adriatic sea in the years following the Word War II. Up to date, minor attention was given to the assessments of the negative effects of pollution and warwaste on the tangible marine ecosystems and charismatic megafauna species – elasmobranchs. For the past three years, we are conducting extensive field expeditions, fisheries analysis, laboratory studies, stakeholder engagements and wider public education/raising awareness. At the fields, we are combining technical research diving with ROVs (Remotely operated underwater vehicles) in order to understand patterns in the chosen populations, map the areal and potential nursery grounds. At the laboratories we are combining unique approach in the histopathology, immunohistochemisty and axial tomography in order to understand mechanisms of disease outbreak and development caused by pollution. Together with our observations from the fisheries, gathered results are used to develop the species-specific unique regional measures for the revitalization and the establishment of the long-term in-situ conservation of the affected species. Such measures were discussed at the EEA (European Environmental Agency) meeting in Copenhagen and are currently supported by the ministries of Slovenia, Croatia and Bosnia and Herzegovina – which present a firm step toward the unique regional protection of those highly threatened and misunderstood creatures.

***Keywords**: sharks, skates, ray, adriatic, research, conservation*