SITE ASSESSMENT REPORT OF THREATS AND RECREATIONAL ACTIVITIES IN THE LASTOVO ARCHIPELAGO

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Front cover illustration: Kremena bay in Nature Park Lastovo Archipelago. Ante Gugić

This report comprises two deliverables as part of Action A.3: Field surveys to assess and quantify all relevant threats operating at seabird colonies.

Contents

1. Introduction

By the latest assessment of the IUCN Red List, 31% of seabird species are globally threatened and almost half of all species (47%) have declining population trends (Dias et al., 2019). They are threatened for a number of reasons, such as invasive mammals, bycatch, climate change, disturbance, light pollution, overfishing, diseases, hunting and trapping (Dias et al., 2019). These threats are negatively affecting the breeding success, adult mortality and nesting habitat quality.

During the LIFE Artina project, one of the aims is to detect the threats which could negatively impact the breeding colonies of three species of seabird in Croatia: Audouin's gull (*Larus audouinii*), Yelkouan (*Puffinus yelkouan*) and Scopoli's shearwater (*Calonectris diomedea*). The study area is the Lastovo Archipelago, because all three species have more than 50% of their Croatian breeding population on these islands. Although globally, threats for these three seabirds are well known, in Croatia their impact is still poorly studied.

One of the threats we focus on through the project is predation by invasive mammals, such as rats and cats, which have been introduced on seabird breeding colonies. In France for example, Yelkouan shearwater is highly impacted by feral cats who can kill hundreds, even thousands of adult birds yearly (Bonnaud et al., 2012). As shearwaters only lay maximum one egg per year, and usually need up to 7 years before they start breeding (Jenouvrier et al., 2008), any loss of a mature bird has a severe impact on the breeding population. Also, the impact of rats on the breeding success by predating on the eggs and chicks has been well documented for both shearwater species (Thibault, 1995; Ruffino et al., 2009; Bourgeois & Vidal, 2008), as well as Audouin's gull (Gallo-Orsi, 2003).

As of more recently, both species of shearwater face another threat by being increasingly exposed to light pollution by settlements and ships. Especially young birds who are about to fledge are most vulnerable because they cannot fly properly yet and get disorientated because of the strong light which makes them end up on land (Raine et al., 2007). Once the birds are on land, they face additional threats like predation by pets, or collisions with buildings or traffic. Longer periods of exposure to light pollution has also led to adult birds abandoning their nests (Raine et al., 2007).

For the Audouin's gull one of the major threats, next to overfishing and changes in fishing activities, is interspecific competition with Yellow-legged gulls (*Larus michahellis*) (Lambertini, 1996; Arcos et al., 2001). However, the impact of this threat is dependent on the ratio of both species in a breeding colony. Kleptoparasitism and predation on eggs and chicks by Yellow-legged gull will happen less if the ratio of breeding pairs is higher for Audouin's gull and if there is enough food for both species (Martínez-Abraín et al., 2003).

One last threat affecting seabird colonies today is human disturbance, which is especially impacting colonies in the polar regions. Visiting nesting areas in some places is becoming unsustainable and proper management is needed to deal with tourism (Yorio et al., 2001). Disturbance can lead to egg and chick failure and eventually to adult birds leaving the nesting site. Since Lastovo Archipelago is quite a popular place for tourists, there are possible threats

for seabird colonies, especially when the number of tourists continues to grow. For that reason, we decided to include the assessment of the impact of recreational activities on seabirds in this overall report about the threats to seabird colonies.

2. Methods

Threat assessments were done on breeding sites of the three target seabird species during 2019 and 2020. Parallel with the seabird breeding monitoring on 13 islands with shearwaters and 7 islands with Audouin's gull we also collected information about the threats these birds are exposed to on their colonies. Invasive mammal presence on islands was mostly confirmed by finding their faeces, as well as olive seeds with typical rat bitemarks on them (Figure 1) and on some island using fake bait – wax blocks with cacao. Because of the remotness, the island Palagruža was not included in the assessment. Rat presence is confirmed during previous years outside the scope of this project but no data was collected about the effect they have on shearwaters.

Figure 1. Olive seeds gnawed by rats (left) and rat faeces (right).

Camera traps were used in order to assess the direct threats on seabird nests more specifically, in particular rat predation and interspecific competition. In total we placed ten camera traps in nests of Yelkouan and eight of Scopoli's shearwater, distributed across nine different breeding colonies. For Audouin's gull, eight camera traps were installed on three different colonies during the breeding season, from April until the end of July, both in 2019 and 2020. In total 226 758 photos was recorded during the monitoring of Audouin´s gull nests and 180 799 videos on shearwater nests. The videos and photos provided us with more specific information about the threats these seabirds are dealing with during the (pre-) incubation and chick rearing phases. Although we did not manage to analyse all videos and photos yet, we managed to get a good impression of the overall threats on the breeding colonies.

To limit the interspecific competition and prevent the predation of chicks, egg piercing of Yellow-legged gull eggs was carried out on the biggest Audouin's gull colony, Donji Vlašnik, in 2019. Eggs were not destroyed, but only punctured (to kill the embryo) and then placed back in the nest. This way, Yellow-legged gulls will continue with incubation instead of making another brood. The theory is that as long as Yellow-legged gull are incubating they will disturb the Audouin's gull less as their need for food decreases with no chicks to feed (Jurinović, 2019). Also, in the long term, this method should decrease the number of breeding pairs of Yellow-legged gull, which would benefit the Audouin's (Martínez-Abraín et al., 2003). As Donji Vlašnik is close to two other big Yellow-legged colonies, on Srednji Vlašnik and Gornji Vlašnik, egg piercing was also conducted on these 2 islands in 2020.

Finally, to get a better overview of light pollution and human disturbance on the islands around Lastovo information was collected with the help of the project partner Nature Park Lastovo and talking with local people on the island. Island Palagruža does not fall into the jurisdiction of Nature park Lastovo and only few visits were made outside the main touristic season so it is not possible to make threats assessment in regards to light pollution.

3. Threats

3.1. Rat predation

Ship rat (*Rattus rattus*) is the only mammal predator observed on the breeding colonies of all three target species. Signs of rats were found on all islands with shearwater nests, and on most of the islands with Audouin's gull, except for: Veli Tajan, Pod Mrčaru, Crnac and Obrovac. Actual rats were also seen during night visits to some of the islands and they were regularly recorded on camera traps.

By analysing camera trap footage, we noticed that rats spend a lot of time near and inside the shearwater nests but they usually do not enter when there is an adult bird inside. There was, however, one recording where an adult Scopoli's shearwater was disturbed in the nest while resting (Figure 2A). The rat tried to bite its tail, but as soon as the bird turned around the rat ran away. Apart from this, we did not find any evidence that rats are a direct threat to adult shearwaters. This is likely because both shearwater species are bigger than rats and have a strong beak to defend themselves. Rats pose a much greater threat to shearwater eggs and chicks. During nest searches we found predated eggs on several colonies of both shearwater species (Figure 2C). We also found a few dead chicks, half eaten by rats (Figure 2B). One of the camera traps even recorded a rat killing and eating a few days old chick of Scopoli's shearwater (Figure 2D). Chicks are helpless because they cannot defend themselves in any way and they are left alone in the nest during the day when the parents are at sea searching for food.

Figure 2. Scopoli's shearwater disturbed by rat in the nest while resting (A); predated egg of Yelkouan shearwater (B); predated Yelkouan shearwater chick (C); Scopoli's shearwater chick predated by a rat (D).

Although the analyses of camera trap footage from Audouin's gull nests showed that rats were present on all their nests as well and that adult birds were disturbed in the nest (Figure 3), actual predation of the eggs or chicks was never observed.

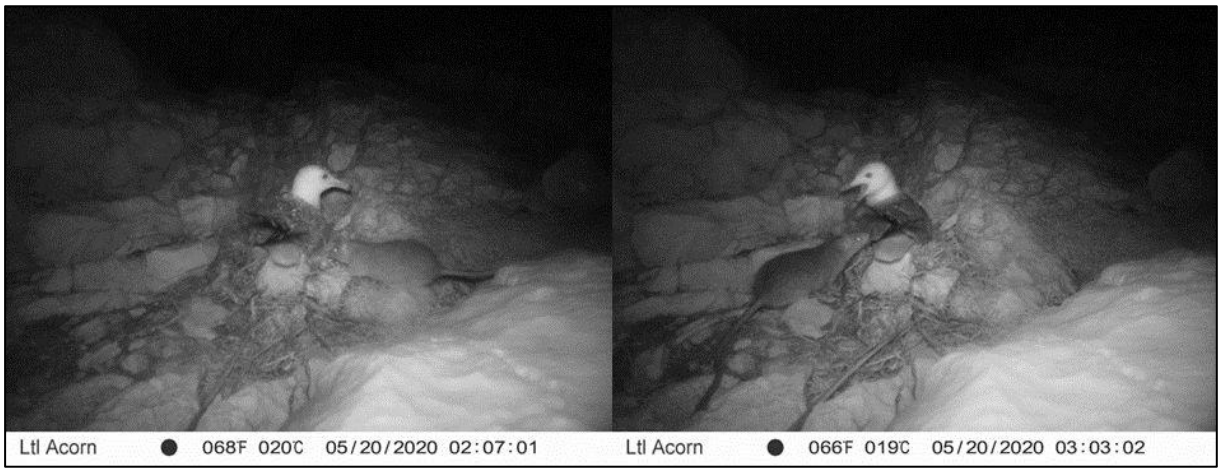

Figure 3. Audouin's gull on the nest disturbed by ship rat, recorded using camera traps.

3.2. Competition

Competition between Audouin's and Yellow-legged gull was observed on breeding colonies. Both species breed together which is inevitable because of the high number of breeding pairs and occupancy of every suitable island by Yellow-legged gull. The direct impact of Yellow-legged gulls on the reproductive success of Audouin's was recorded by camera traps. On 2 nests, out of 16 monitored during the 2019 and 2020 breeding season, chicks were predated by Yellow-legged gulls (Figure 4A, 4B). Chicks from another nest, on island Petrovac, were attacked but they manage to defend themselves because they were bigger (Figure 4C). Also, one adult Audouin's gull was found dead at the colony next to a predated nest. Although we cannot be sure about the actual cause of death, it was possibly attacked by the same Yellow-legged gull that killed its chicks. Death of adults was observed during the kleptoparasitic chases in Ebro delta colony (Oro and Martínez-Vilalta, 1994). Later, on one of the nests, Yellow-legged gull was observed taking Audouin´s gull egg from the nest that failed to hatch (Figure 4D).

Figure 4. Yellow-legged gull predating Audouin´s gull chicks in the nest, in 2019 on the island of Donji Vlašnik (A) and 2020 on the island of Veli Tajan (B); Audouin´s gull chicks attacked by Yellow-legged gull in the nest on the island of Petrovac in 2020 (C); Yellow-legged gull taking and Audouin´s gull egg that failed to hatch.

In 2019, a total of approximately 388 Yellow-legged gull eggs belonging to 151 nests was pierced on Donji Vlašnik (Table 1). Although the island had 23 nests of Audouin's gull as well,

the egg piercing had no positive effect on them, because all of their broods failed in the end with no chicks fledged. In 2020, a total of 1373 Yellow-legged gull eggs was pierced of 528 nests on all 3 Vlašnik islets (Table 1). This was again to no effect, however, as Audouin's gulls did not end up breeding on these 3 islets at all that year.

Table 1. The number of pierced eggs and nests of Yellow-legged gull on the Vlašnik islets in the Lastovo Archipelago in 2019 and 2020.

Island name	No. of pierced eggs (2019)	No. of nest (2019)	No. of pierced eggs (2020)	No. of nest (2020)
Donji Vlašnik	≈ 388	151	590	225
Srednji Vlašnik	0	0	407	155
Gornji Vlašnik	0	0	376	148

Since Yelkouan and Scopoli's shearwater both breed on the same islands, competition between them was also occasionally observed. In 2020, 2 nests on Mali Maslovnjak and 1 nest on Veli Rutvenjak with incubating Yelkouans were later found occupied by Scopoli's shearwater. Because Scopoli's is a bigger and stronger bird it can easily push out Yelkouan from the nest. As this was only observed in 3 out of 312 Yelkouan nests that year, it does not seem to be a serious threat to them. More so, because both shearwater species are separated by the timing of their breeding season and also because they generally prefer slightly different nesting holes. The plan is to further study their interspecific competition by placing a camera trap on at least one of these 3 nests during the next breeding season in 2021.

3.3. Light pollution

The islet of Zaklopatica has the biggest colony of Yelkouan shearwaters known in Croatia. It is located next to the settlement Zaklopatica, which is on the main island of Lastovo, and is only separated from it by 20 meters of sea. Shearwaters on the island are jeopardized by light pollution coming from the settlement, mostly coming from three big restaurants, but also from many tourist boats that are anchored in front of the island in the bay during the summer months (Figure 6A, 6B).

In 2019, inhabitants of Zaklopatica reported several Yelkouan shearwaters flying into their restaurants and houses during the summer season, when the young birds fledge. A few of them even said that this has been happening already for several years. During the summer of 2020 it happened again, but this time we were prepared and had been in contact with the restaurant owners prior to the fledging. We managed to rescue 4 juvenile Yelkouans and put them back on the colony or into the sea. Unfortunately, others were less lucky as at least one bird died because it flew too hard into the windows of a restaurant and at least three more birds died because of a dog which was catching them in the water when the birds came close to the shore. As 207 Yelkouan nests were found on Zaklopatica in 2020, of which maximum 172 were successful, these 8 chicks account for 5% of the breeding output of the island. Furthermore, it is likely that not all incidents with fledging Yelkouans are reported, so the actual percentage could very well be higher. The impact of light pollution on the islet of

Zaklopatica will probably increase during the coming years as the settlement keeps on expanding, as also shown by the developments during the last 50 years (Figure 5). The location is very popular with tourists, expecting to result in more apartments being built and more boats mooring in the bay, which will lead to an increase in light and noise pollution.

Figure 5. Satellite images showing the development of settlement Zaklopatica between 1968 (up) and 2018 (down).

Another possible source of light pollution are the big sailing boats and yachts which anchor in the different bays around Lastovo. This was noticed for instance in July 2020 near the islands of Veli and Mali Maslovnjak where a big, completely lit up sailing boat anchored nearby, around 300 and 400 meters away from the islands. Another example comes from August in the same year, when on the remote island of Sušac, a cruise boat was making a light show on the cliffs where Scopoli's shearwaters breed (Figure 6C). However, for these locations more

data is needed about the intensity and frequency of such events to better assess the impact on breeding colonies.

Figure 6. Light pollution coming from a restaurant (A) and anchored tourist boat (B) in Zaklopatica; Light show coming from a cruise boat, illuminating the cliffs of Sušac island where Scopoli's shearwater breeds (C).

3.4. Other possible threats

One additional possible threat that was observed on the seabird colonies is the amount of marine litter or plastics in some of their nests, specifically on island Srednji Lukovac and Pod Kopište, and sometimes on their breeding cliffs in general (Figure 7). No direct impact was observed, but there is a possibility that birds can get entangled or suffocated because of it. The plan is to monitor some of these littered nests with camera traps in 2021.

Figure 7. Plastic found inside a nest of Scopoli´s Shearwater.

4. Tourism and recreational activities impact

Tourism is a very important sector of economic development on the island of Lastovo. Many inhabitants are providing apartments and there are several restaurants that are open only during the tourist season from May to September. Lastovo is a popular place for boat tourism, especially in the summer months (Table 2).

Table 2. Number of boats during the main season for tourism from 2017 to 2020. * the lower number of boats in 2020 was due to the COVID-19 pandemic.

	May	June	July	August	September	October	Total
2017	264	835	1499	2085	387	154	5224
2018	497	981	1720	2286	807	189	6480
2019	210	1133	1968	2527	986	190	7014
2020*	-	529	1640	1806	481	39	4515

Anchored boats are a big problem near the seabird colonies because some of them emit a lot of light and produce a lot of noise during the night. These problems were observed especially

in Zaklopatica bay. In this very small bay, next to the biggest colony of Yelkouan shearwater 50 boats can be anchored in a single night. Boats were also observed in Borova bay near the shearwater colonies on Mali and Veli Maslovnjak, as well as the Konopljica and Sito bays near the colonies on Veli Rutvenjak (Figure 8). Because the fledging time of Yelkouan chicks is during July and August, it coincides with the peak of the tourist season and young birds can experience serious negative impacts from the light and noise pollution produced by the tourist boats.

Zaklopatica, Pasadur and Prehodišće are settlements that are under a pressure of building more houses for tourist that will potentially disturb birds on the nearby colonies because of the light and noise pollution.

Among the recreational activities organized for tourists are short trips around the Lastovo Archipelago. There are 4 operators from Lastovo providing day tours around the island, and 1 more from Korčula. During those trips, they are visiting one beach on the island of Saplun. Although there are no seabirds breeding near this beach, Audouin's gull colonies have been observed on the western tip of the island in 2005 (Jurinović, personal communication). Furthermore, in Zaklopatica and Pasadur tourists can rent kayaks, sup boards and jetskis. Mostly they visit the islands of Makarac or Mrčara (which has a restaurant) and a few beaches on the main island of Lastovo.

Due to the proximity of the islet of Zaklopatica to the shore people are often seen paddling or swimming there and visiting the island. Luckily, no impact on birds was observed. Another popular island for visiting is Kručica, because there is a small hut and a nice bay to anchor the boat and swim. People have even been seen here with their pets. However, considering how big and generally inaccessible the island is and the fact that the colony of Scopoli's shearwaters is on the opposite side the risk of disturbing the birds is very low. Local people are also walking on the islands Veli and Mali Rutvenjak, mostly while collecting capers at the end of May and in June. Although this overlaps with the breeding time of shearwaters on those islands, no effects were observed.

During 2019 and 2020 we observed people doing recreational fishing (with fishing rod) from the shores of several small islands in the Lastovo Archipelago. Although these specific islands did not have seabird colonies on them, this activity could easily happen on islands with seabird colonies as well, and should just be kept an eye on. Especially when it involves islands with colonies of Audouin's gull, as this species is easily disturbed, because it breeds in the open.

Finally, the island of Sušac, the second biggest island of the archipelago, is also getting increasingly popular with tourists and boats. Although the number of boats here is still low compared to other places around Lastovo, the island is far from the main island and therefore difficult to monitor by the Nature Park staff. From June to September, the average number of tourist boats mooring near the island is 2 – 3 per day, but during peak days in August it can be up to 8. The most important threat at the moment is light pollution and noise coming from anchored boats around the island, particularly when close to the shearwater colonies (Figure 6C). Tourists have also been observed walking their dogs on the island, but as the accessible paths don't get close to the seabird colonies, this should generally not pose a problem.

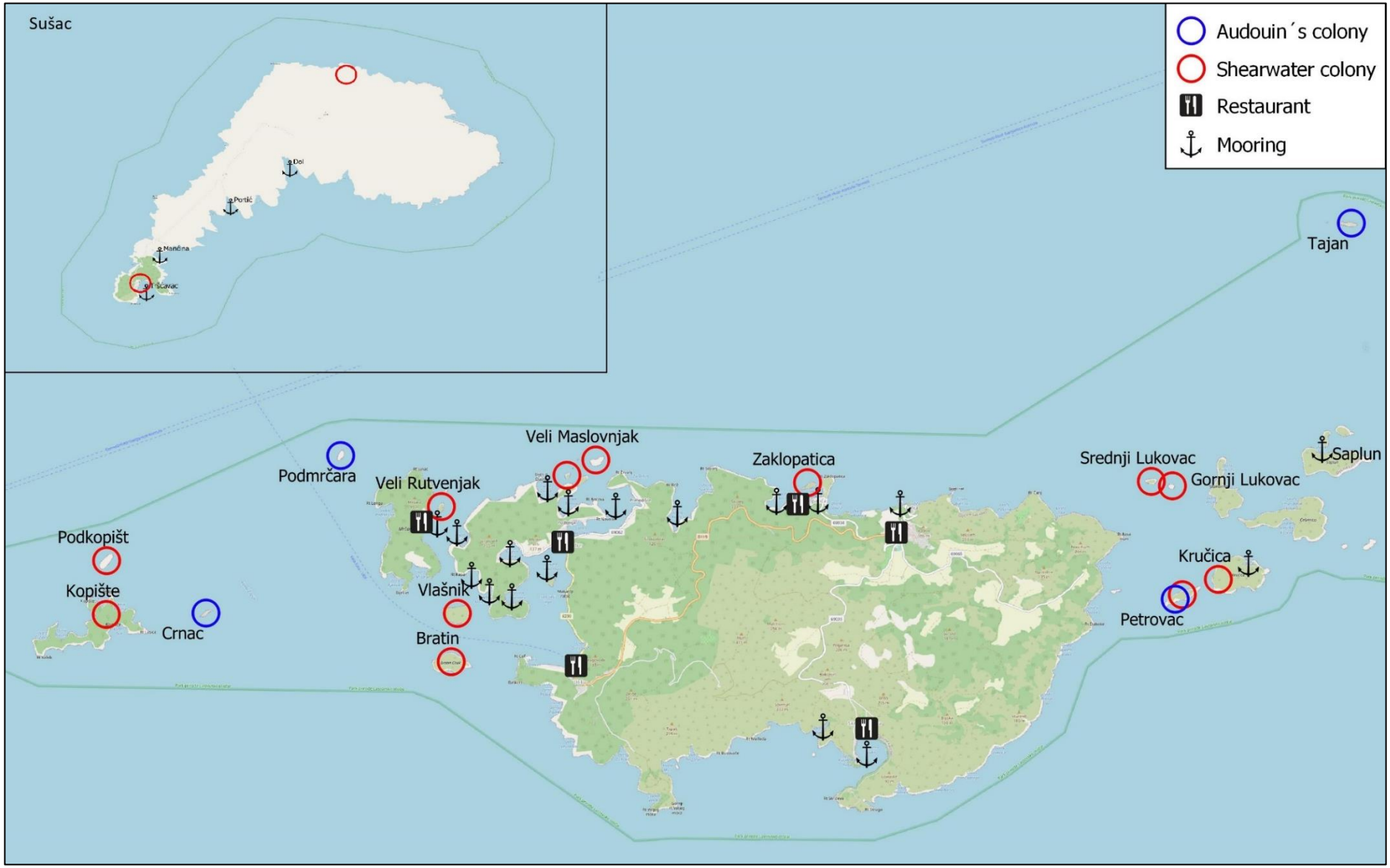

Figure 8. Map of Lastovo and Sušac showing the locations of boat mooring sites and restaurants at the sea coast, as well as the nearest islands with shearwater and Audouin's gull colonies.

5. Recommendations

It is recommended to continue studying the threats at seabird colonies by developing a proper methodology that will gather high quality data. Collected data can be quantified in order to estimate the impact of the different threats on seabirds. Camera traps are a useful tool to monitor direct threats in and around the nest and it is, thus, advisable to continue using them. In 2021 two camera traps will be placed on nests with a lot of marine litter to monitor the effect of this on the breeding behaviour of the Scopoli's shearwater. Additionally, ten cameras will be used to continue monitoring threats at Audouin's gull nests. Whereas shearwaters show strong site fidelity, dealing with threats at their breeding colonies is quite straightforward and will more quickly result in long lasting solutions. Audouin's gull on the other hand changes its breeding location every year and is generally a species that is easily disturbed. Although the interspecific competition with Yellow-legged gull at their breeding colonies is obviously a problem for them, there is still a lot of information lacking about other possible threats that have an impact on their well-being and breeding success in Croatia (also outside their breeding colonies).

For shearwaters, one of the main threats is rats being present at their breeding colonies. During 2020, rat eradication work was successfully carried out on 7 islands in the Lastovo Archipelago. Rat eradication is planned for 4 more islands during 2021. However, as many of the eradicated islands are close to rat-infested islands, the possibility that they will stay rat-free is small. Therefore, it is important that each island has a biosecurity border set up and is regularly checked for rat reinvasions. As soon as rat presence is detected, eradication work should be set up again to keep the island clean. On the island of Zaklopatica it is necessary to keep the rat population under control by means of mechanical trapping and with the help of the Nature Park staff with the aim of Park staff taking full control of this activity after the end of LIFE Artina project. Also, it is important to inform the local community about this issue and raise awareness on the impact of rats on seabirds.

Although the effects of light pollution have been observed in Zaklopatica, more information is needed to really assess the impact on the breeding success and survival of shearwaters around Lastovo. In order to get a more complete picture of the situation, it would also be good to focus on other colonies which are close to the main island (such as Veli Rutvenjak and Mali & Veli Maslovnjak) and to assess the impact on Scopoli's shearwater as well. It is recommended to have public outreach about this matter, particularly in Zaklopatica, and try to convince the local community to change their ways of using lights. Also, as long as lights from the shore of Zaklopatica attract juvenile Yelkouans to the village, it is strongly recommended that all dogs are kept on a leash during each night of the fledging period (roughly the first 3 weeks of July).

Furthermore, studies are needed to assess the impact of boat mooring on seabird colonies around Lastovo. Currently, data about how many boats are mooring per night near each seabird colony, how much light and noise they produce and if they disturb the birds in some other way are completely lacking. Although this kind of information is more difficult to gather

for distant seabird colonies (e.g. on Sušac and Palagruža), it would be a good start to find out how many people visit these islands each season.

Finally, revision and improvement of maritime policy and legislation is needed to address the recognized threats. Examples include clear jurisdiction on eradication techniques and the use of rodenticides, regulation of mooring, regulation of light pollution, additional authority for park rangers, etc. The Lastovo Nature Park staff should not only be informed about the threats to seabirds in general, but also about the existing policies and legislation with regard to the topic, which will enable them to improve their efforts to tackle the different issues. However, many of the issues cannot be tackled at the Park level and they need to be addressed at relevant levels (national, regional, local).

6. Literature cited

Arcos, J.M., Oro, D., Sol, D. (2001): Competition between Yellow-legged gull *Larus cachinnans* and Audouin's gull *Larus audouinii* associated with commercial fishing vessels: the influence of season and fishing fleet. Marine Biology, 139, 807 – 816.

Bannaud., E., Berger, G., Bourgeois, K., Legrand, J., Vidal, E. (2012): Predation by cats could lead to the extinction of the Mediterranean endemic Yelkouan Shearwater *Puffinus yelkouan* at a major breeding site. Ibis, 154, 566 – 577.

Bourgeois, K. and Vidal, E. (2008): The endemic Mediterranean Yelkouan shearwater *Puffinus yelkouan*: distribution, threats and a plea for more data. Oryx, 42, 187 – 194.

Dias, M. P., Martin, R., Pearmain, E. J., Burfield, I. J., Small, C., Phillips, R. A., Yates, O., Lascelles, B., Borboroglu, P. G., Croxall, J. P. (2019): Threats to seabirds: A global assessment. Biological Conservation, 237, 525 – 537.

Gallo-Orsi, U. (2003). Species Action Plans for the conservation of seabirds in the Mediterranean Sea: Audouin's gull, Balearic shearwater and Mediterranean shag. Scientia Marina, 67 (Suppl. 2), 47 – 55.

Jenouvrier, S., Tavecchia, G., Thibault, J.-C., Choquet, R., Bretagnolle, V. (2008): Recruitment processes in long-lived species with delayed maturity: estimating key demographic parameters. Oikos, 117, 620 – 628.

Jurinović, L. (2019): Report with analysis of recommended measures for the prevention of nesting of Yellow-legged Gulls. LIFE Artina - LIFE17 NAT/HR/000594. Gregula - obrt za savjetovanje i prstenovanje ptica. 4 pp.

Lambertini, M. (1996): International Action plan for Audouin's gull (*Larus audouinii*). 26 pages.

Martínez-Abraín, A., Gonazáles – Solis, J., Pedrocchi, V., Genovart, M., Abella, J. C., Ruiz, X., Jiménez, J., Oro, D. (2003): Kleptoparasitism, disturbance and predation of Yellow-legged gulls on Audouin's gulls in three colonies of the western Mediterranean. Scientia Marina, 67 (Suppl. 2), 89 – 94.

Oro, D. and Martínez-Vilalta. A. (1994): Factors affecting kleptoparasitism and predation rates upon a colony of Audouin's Gull (*Larus audouinii*) by Yellow-legged Gulls (*Larus cachinnans*) in Spain. Colonial Waterbirds, 17, 35 – 41.

Raine, H., Borg, J. J., Raine, A., Bairner, S., Cardona, M. B. (2007): Light pollution and its effect on Yelkouan shearwaters in Malta; causes and solutions. EU LIFE Yelkouan shearwater project. BirdLife Malta.

Ruffino, L., Bourgeois, K., Vidal, E., Duhem, C., Paracuellos, M., Escribano, F., Sposimo, P., Baccetti, N., Pascal, M., Oro, D (2009): Invasive rats and seabirds after 2,000 years of an unwanted coexistence on Mediterranean islands. Biol Invasions, 11, 1631 – 1651.

Thibault, J.-C. (1995): Effect of predation by the Black rat *Rattus rattus* on the breeding success of Cory's shearwater *Calonectris diomedea* in Corsica. Marine Ornithology, 23, 1 – 10.

Yorio, P., Frere, E., Gandini, P., Schiavini, A. (2001): Tourism and recreation at seabird breeding sites in Patagonia, Argentina: current concerns and future prospects. Bird Conservation International, 11, 231 – 245.