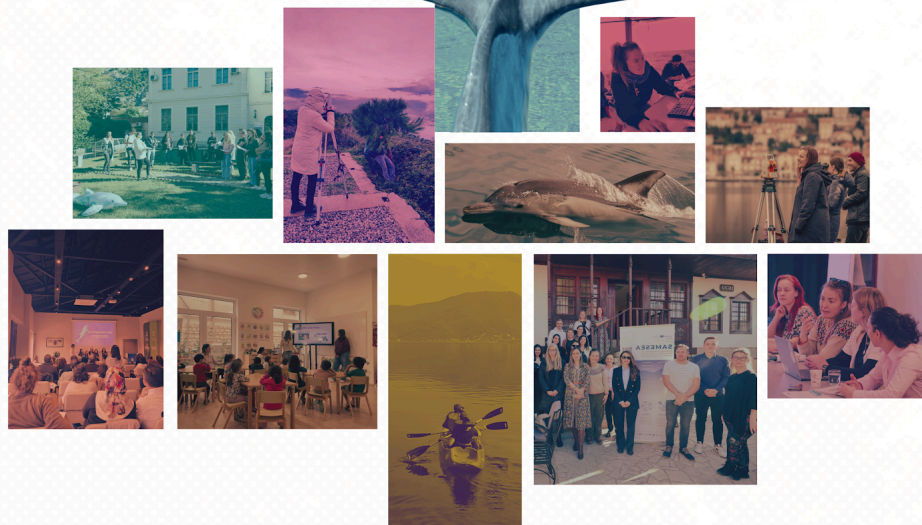


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# 20 ANNUAL 25 REPORT



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DOLPHIN RESEARCH**  
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ISTRAŽIVANJE DELFINA CRNE GORE



<b>PREWORD.....</b>	<b>3</b>
<b>INTRODUCTION.....</b>	<b>5</b>
<b>METHODS.....</b>	<b>7</b>
Scientific Research.....	7
LAND SURVEY.....	7
BOAT SURVEY.....	11
KAYAK SURVEY.....	13
Data analysis.....	15
Public Outreach.....	16
<b>RESULTS.....</b>	<b>17</b>
Scientific Research.....	17
1. Survey Effort.....	17
2. Species Sighting.....	18
3. Sighting distributions.....	19
4. Behaviour of Bottlenose Dolphins.....	23
5. Photo-identification of bottlenose dolphins.....	25
6. Whistle characteristics of bottlenose dolphins.....	26
Citizen-science data.....	28
Public Outreach.....	29
EU Projects.....	30
<b>DISCUSSION.....</b>	<b>32</b>
<b>ACKNOWLEDGMENTS.....</b>	<b>35</b>
<b>REFERENCES.....</b>	<b>36</b>

## PREWORD

MDR – Montenegro Dolphin Research has successfully completed its decade of work to provide the necessary knowledge on science as well as conservation for the protection of marine sentinel species in Montenegro. We have built a team where different backgrounds, occupations, nationalities, and knowledge became one and simultaneously worked together for the protection of the marine heritage of Montenegro. Recognising the importance of bringing science, communities, and decision-makers together, we followed inclusive approaches at every step, where each person’s knowledge contributed to the bigger picture in reaching our ultimate goal: resilient waters where dolphins, turtles, fish, corals, and seagrass, along with overall biodiversity, can thrive, and where ecological protection supports the economic sustainability of local communities.

During our research efforts in 2025, we completed 169 days of survey effort, compiling a total of 289 surveys. These surveys covered the entire Montenegrin coastline, from the southern boundary to the northern limits, providing a clearer picture of the species’ distribution. With this level of effort, the MDR team was scanning the waters of Montenegro for sentinel species almost every second day, on both weekdays and weekends. Nevertheless, our effort was not limited to the scientific surveys, we have organised 7 presentations in local schools, hotels and restaurants, joined 6 beach clean-ups, volunteered at the Kotor Carnival 2025, hosted an Arts & crafts workshop to upcycle marine litter into art and established the start of a Geocache network across our land survey stations. In addition to this, we organised 4 local community meetings and 2 media interviews. We have also run monthly workshops to enhance scientific knowledge of students and early-career researchers.

We were awarded two EU projects in 2024, that were still ongoing in 2025, ENGAGE and SAMESEA, through which our team went above and beyond to deliver every activity. We also received important support from the Kotor Municipality, Tivat Municipality, and the French Embassy, helping us advance our goal of bringing community and science together for marine protection. Our efforts have never been limited to project timelines or specific activities. Our team approaches every task with passion, enthusiasm, and dedication. Rather than pausing when a project ends, we continue to push forward, ensuring that each activity creates a lasting impact beyond the project itself.

For the community and with the community, we have established “Wave Watch Montenegro” with 132 active participants, each member is able to share their sightings as well as their

thoughts and approach on sentinel species protection and necessary in-situ protection measures. In addition, we have started to empower local youth as “Wildlife Watch Guides”, in which young people within the community are active within marine tourism and act as a pillar to inform tourists on the importance of Montenegro’s sentinel species. Further, we have worked together with local oyster farms to install our acoustic devices to monitor the dolphin presence not only during the day but also at night hours. Additionally, MDR started a partnership with Ecoboats, allowing researchers aboard their ferries to monitor sentinel species and bring awareness to the passengers on board.

In 2025, MDR became a symbol of collaboration, dedication, and hard work, where everyone is welcomed to contribute to building a shared awareness by using sentinel species as a flag for marine protection. Although ten years have passed, our dedication to research and conservation continues. We began as an initiative in 2016, were established as an NGO in 2019, and have now grown into a family. The MDR Team’s dedication will continue in 2026, and its doors will remain open to all who share the goal of protecting these threatened species.

## INTRODUCTION

The Adriatic Sea is home to different cetacean species. During the last year, bottlenose dolphins (*Tursiops truncatus*), striped dolphins (*Stenella coeruleoalba*), and fin whales (*Balaenoptera physalus*) were seen in these waters. The most famous and best-known to people is the bottlenose dolphin (*Tursiops truncatus*). People have always known that dolphins live in the Adriatic Sea and admired them, but they were not studied in greater depth. A deeper interest in dolphins began in 1987, when a dolphin appeared in the Bay of Kotor that behaved in a very unusual way and became close to the local community. This individual was frequently observed approaching both the shore and people, allowing them to touch, feed, and swim with them. Even though the sex of the animal was in question, the locals gave it the name Joca. Joca lived in this area for five years and then suddenly disappeared, with some claiming that this well known individual was killed. Joca was a major tourist attraction and was even more popular than Brad Pitt, who filmed the movie *The Dark Side of the Sun* with this dolphin in 1988. In 1987, the Municipality of Kotor passed a decision declaring the animal species protected. Currently the IUCN Red List has classified bottlenose dolphins in the Mediterranean Sea as "Least Concern" (Natoli et al. 2021).

MDR – Montenegro Dolphin Research, from now on referred to as MDR, has been conducting research on cetaceans in Montenegrin waters for over ten years, using various survey techniques from land surveys to boat surveys. While both land and boat surveys assess key behaviors, land surveys focus more on the spatial distribution of cetaceans. Whereas, boat surveys are conducted for individual recognition through photo identification. In 2025 the kayak surveys were first introduced as a research method, focussing on key behaviours and acoustic data collection.

The current report summarizes the information gathered within 2025. Overall, 190 land, 29 boat and 70 kayak surveys were conducted in Montenegro. Cetaceans were encountered in 51 out of 169 days of survey effort. Bottlenose dolphins were by far the highest sighted species with 61 encounters. In addition to this, a single encounter of striped dolphins and a solitary fin whale were recorded within the Boka Kotorska Region. The highest survey effort was within the northern waters, although southern and central waters of Montenegro were also surveyed in each season. While land surveys revealed that Boka Kotorska holds year round importance for bottlenose dolphins, the coastal waters of Utjeha also hold importance for species distribution. Photo-identification recaptured 4 existing individuals previously identified in Montenegro, with a maximum resighting range of 8 years. In addition to this, 3 new individuals were photo-identified and added to the existing database. Furthermore, through citizen-science

activity, an additional 81 sightings of bottlenose dolphins and 18 reports of sea turtles were shared. A video of the rare fin whale sighting as well as a GPS location was also reported through citizen science.

Striped dolphins are classified as “Least Concern” within the Mediterranean Sea (Lauriano, 2022). In contrast to bottlenose dolphins, the main coastal delphinid species of the Adriatic, the striped dolphins distribution is documented within deeper waters of the Adriatic, with sporadic encounters reported within coastal regions (Bonizzoni et al., 2024). Therefore, the observed encounter of striped dolphins in the summer of 2025 in Boka Kotorska, reinforces the need to further understand this species’ use of coastal environments. Fin whales are the largest baleen species found in the Mediterranean and are classified as “Endangered” by the IUCN red list within this region (Panigada et al., 2021) Although rare, its encounter in the Boka Kotorska Bay in the summer of 2025, has been reported in the past in 2011 in the same region (Joksimović et al. 2013).

In 2025, the existing citizen science platform ‘Montenegro Sighting Network’, founded in 2016, was rebranded and relaunched as ‘Wave Watch Montenegro’ with the support of the Tivat Municipality. In 2018, MDR joined the research initiative of ACCOBAMS with the aim to try to develop sustainable tourism in the field of observation and conservation in Montenegro. This initiative is still ongoing through the project “Silent Seas, Strong Voices” that is supported by the French Embassy and Environmental Protection Agency of Montenegro. Since 2024 MDR has focused on existing data for sentinel species in the Adriatic-Ionian region through the projects SAMESEA and ENGAGE. Such projects have enabled MDR to delineate key habitats and their existing threats, and integrate knowledge from both scientific research and local communities.

The presence of dolphins and whales carries profound importance for marine ecosystems. As indicator species, dolphins serve as a living measure of environmental health, their presence can signal a thriving ecosystem, an undegraded habitat, and an abundant prey base. Beyond their role as indicators, dolphins are apex predators, sitting at the pinnacle of the marine food web. In this capacity, they play a pivotal role in regulating the populations of smaller fish, ensuring that ecological balance is maintained and that no single species overwhelms the system. This brings us to one common understanding that forms the basis of our motto:

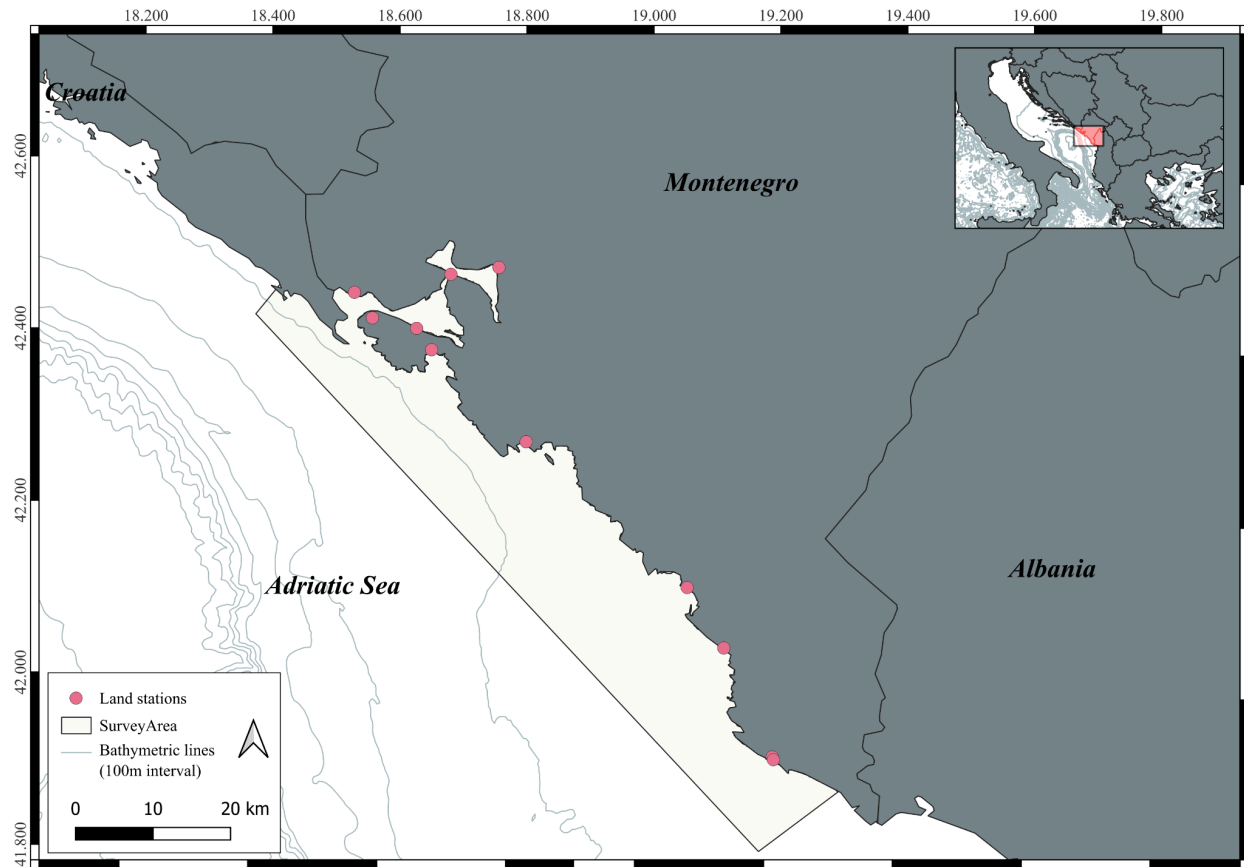
***"When dolphins thrive, the ocean survives."***

## METHODS

### *Scientific Research*

#### LAND SURVEY

In 2025 a total of 11 stations were used for land surveys, covering the coast line from Ulcinj to Herceg Novi (Figure 1). Land surveys were conducted either at sunrise or sunset, when dolphins are found to be most active, for durations of 3-6 hours. Tasks were divided between four people and rotations took place every hour in order to avoid fatigue. Before going to the station of the day, environmental data for swell, tide, air temperature, wind speed and wind direction for each survey hour was recorded using the websites Tide T@bles (<https://tides.oceanography.me/tides/>), Sea Temperature Info (<https://seatemperature.info/montenegro-water-temperature.html>) and Windy ([www.windy.com](http://www.windy.com)). In addition, sea surface temperature, moon phase and moon illumination was noted from the websites Sea Temperature Info and Moongiant ([https://www.moongiant.com/calendar/#google\\_vignette](https://www.moongiant.com/calendar/#google_vignette)). Sea state (Beaufort scale), cloud coverage and glare were taken in the field every hour and additional environmental rows were created in the case of sudden changes in weather.



**Figure 1.** Survey stations and survey area of 2025

Once calibrated with a designated station marker and reference point, a Sokkia DT5A theodolite was used to record the horizontal and vertical angles of any cetacean or marine vessel within the study area. Using the software Pythagoras 1.2.0.15, these angles were converted to geographical coordinates at the specific moment the cross of the theodolite was locked onto the animal or the point where the marine vessel touched the water. Pythagoras would then produce an estimated speed in the event of managing to collect two geographical points of the same target. In the event a land survey took place closer to shore, photos were taken of the animals for confirmation of the sighting (Picture 1).





**Picture 1.** Example of a land survey setup

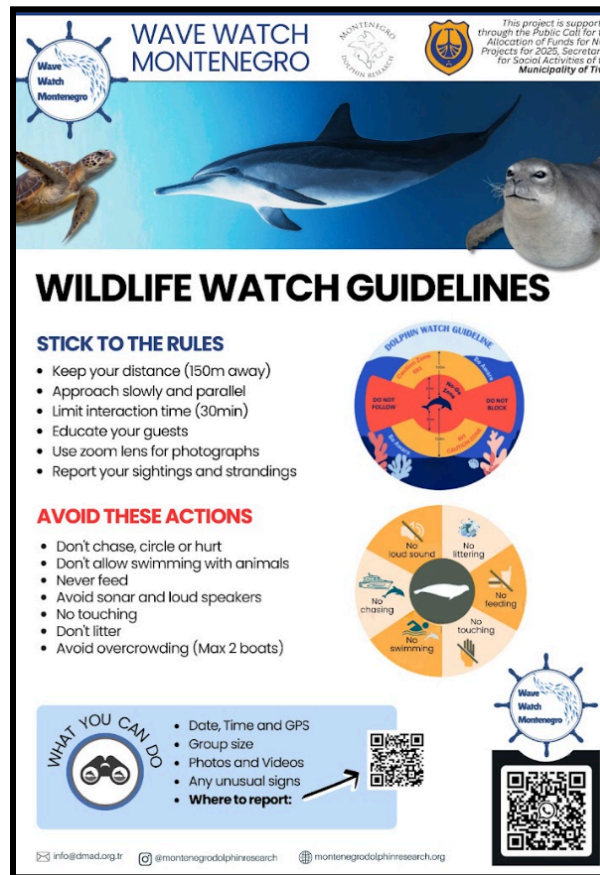
Data collection for behavioral analysis was the same across all surveys. Cetacean species, group size, group type, swim cohesion and behavior was recorded every five minutes, as well as the presence and total number of any sub-adults (Table 1). For every line of data taken at the five-minute interval, the activities and distances of surrounding marine vessels were written down. When a marine vessel found itself within 400 meters of a cetacean, the reaction of the animal (positive, negative, or neutral) was recorded as well as any changes in group type, swim cohesion and behavior. Data was collected using both a physical data sheet and logged in Pythagoras software.

**Table 1.** The definition of the behavioural states

<b>Behavioural States</b>	<b>Definition</b>
Travel (TR)	Dolphins move at least 200 meters in 1 minute. They move with a constant speed (around 4 knots) in a certain direction from A to B (no zigzagging), with diving intervals between 3 and 5 seconds.
Travel Fast (TR-F)	Dolphins move more than 200 meters in 1 minute. They move more than 4 knots.
Travel Diving (TR-DV)	Dolphins swim underwater at least 400 meters from where they were originally spotted. They move with a constant speed of around 4 knots.
Stalling (ST)	Dolphins move 100 meters in 1 minute, with a diving interval of more than 3 seconds. Their speed is between 2-4 knots. They zigzag within the survey range and could be linked to foraging.
Diving (DV)	Dolphins stay in a 100-metre radius within 1 minute. The majority of the time is spent under water. Their speed is less than 2 knots.
Surface Feeding (SU-FE)	Dolphins move with lots of splashes in the same area. There is likely to be birds and fish present.
Follow (FOL)	Dolphins travel behind a fishing vessel/boat feeding off of the vessel.
Socialising (SOC)	Dolphins are making contact with one another. Lots of surface active behaviour with the absence of fish bubbles on the surface or birds actively foraging.
Resting (RE)	Dolphins travel very slowly, less than 100 metres in 1 minute. Their speed is less than 1 knot.
Milling (MI)	Dolphins are close to each other lingering, between two other behaviours (they meet to coordinate their next actions). Their speed is less than 2 knots.
Bow-Riding (BOW)	The dolphins swim in front of the boat.
Interacting with boat (IN)	The dolphins swim behind or at the sides of the boat, playing at its wake.
Surfing (SRF)	Dolphins are surfing the waves.

## BOAT SURVEY

Boat surveys were conducted in and around Boka Kotorska and Bar in 2025. The aim was to conduct a minimum of one boat survey per month throughout the year. Due to limitations, only opportunistic boat surveys were conducted in which MDR team members were able to scan for dolphins on existing boat tours cruising at 6-10 knots. During each survey, a minimum of three researchers were on the boat with assigned responsibilities of photo-identification, acoustic data collection and behavioural data collection. None of the approaches employed during the survey interfered with the daily life of the dolphins and a strict protocol was followed in each survey with a minimum distance of 100m and speed limitation of less than 4 knots within the 400m radius of the dolphin group (Picture 2). These guidelines encourage responsible tourism approaches within close proximity of sentinel species and tour boat crews were informed about all of the techniques that are used by the MDR team.



Picture 2. Wildlife Watch Guidelines

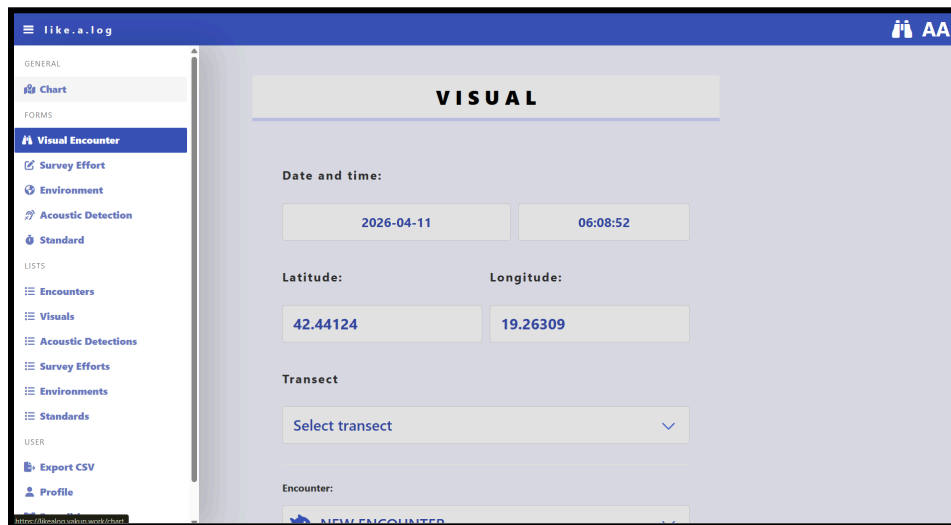
Photo-identification was conducted using a simple DSLR camera, targeting the dorsal fin of the individual as well as any unique marking throughout the body for the purpose of recognizing individuals. Several photographs were taken from each side of the animal so as to avoid missing any important details. Once each member of the dolphin group was photographed, the boat moved away from the group. Strict time limitations of 30 minutes within 400m radius of dolphins were followed. After 30 minutes, even if the individuals were not effectively photographed, the group was left alone to avoid a possible negative impact .

Acoustic data is collected by a dropdown hydrophone of HTI-96-Min. The hydrophone had a twenty meter cable and was recorded by a ZOOM H5 Handy Recorder. The sampling rate was up to 48kHz. The hydrophone was dropped on the side of the boat within the 400m radius of the dolphin groups and was only used when the boat was either idle speed or stationary. Recordings were listened to live in the field in order to assess the potential visual behaviour in the area, while post-acoustic analysis was completed later (Picture 3).



**Picture 3.** Example of photographic and acoustic data retrieved from the opportunistic boat surveys

Visual and acoustic behavioural data was collected through our self-developed app, LikeALog (Picture 4).



**Picture 4.** Example of LikeALog App that is used during data collection

## KAYAK SURVEY

Kayak surveys were conducted by four researchers with a maximum of two hours effort (Picture 5). Two researchers (sea observers) were actively on board while the other two researchers (land observers) were stationed at a viewing point to scan the survey area for dolphins as well as to monitor the safety of the sea observers. Land and sea observers were equipped with binoculars and radio communication systems to provide uninterrupted communication. The sea observers were responsible for dropping the hydrophone to collect acoustic recordings of the focal group and record behavioural data using the LikeALog app. The land observers were responsible for making sure the sea observers maintained the minimum distance of 400m from the focal dolphin group, ensuring the kayak never purposefully approached the animals.

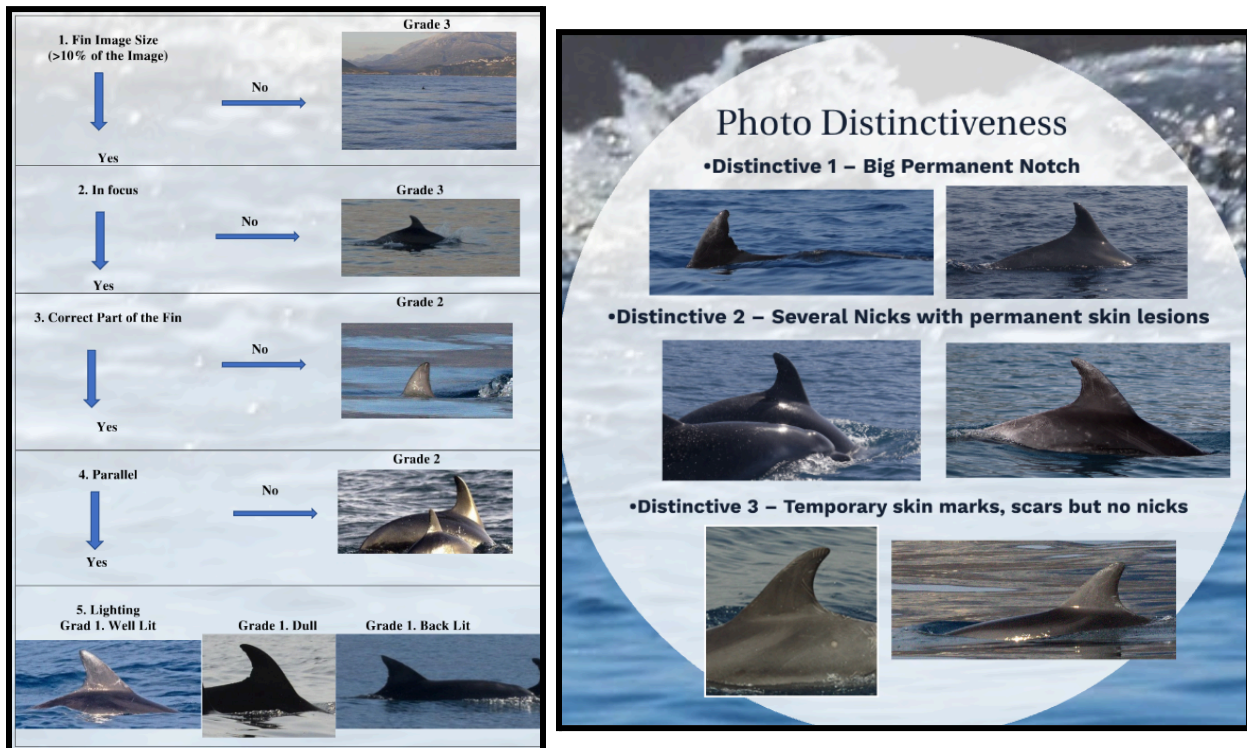


**Picture 5.** Example of the sea observers during a kayak survey



## Data analysis

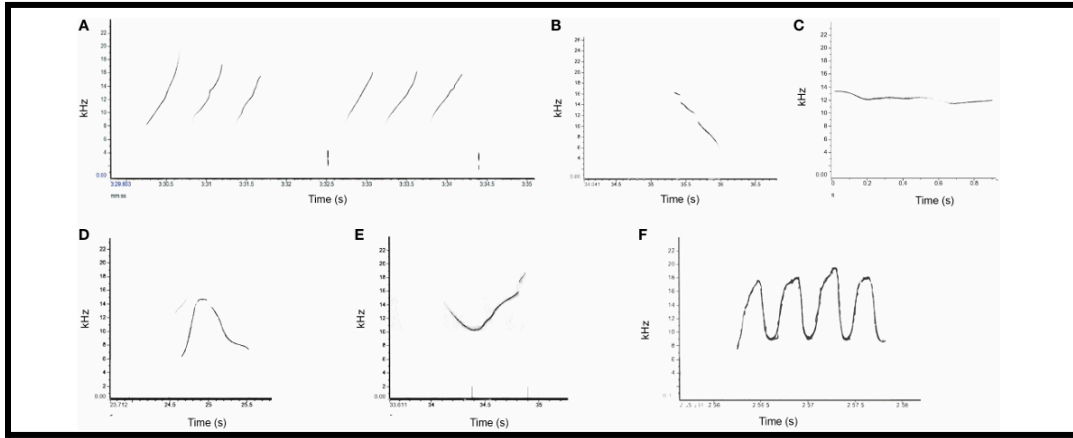
Descriptive statistics have been used to summarise the survey effort and sighting rate. Statistical analysis on sighting proportion between seasons and the variation on sighting rate between seasons were completed using RStudio (version 4.3.2). Spatial mapping of species distribution was conducted using QGIS Desktop 3.36.0 and 5km spacing hexagon grids were fitted to the survey area to delineate the high density of bottlenose dolphins throughout Montenegro. All the maps are produced in EPSG:32634 - WGS 84 / UTM zone 34N - Projected Coordinate System. The photo-identification process followed a strict protocol to assess the qualitative and distinctive features of the photographs and individuals (Picture 6). Photographs were assessed based on the combined score of image quality and distinctiveness, and those scoring above four were discarded from further analysis. Only photographs meeting the protocol threshold ( $\leq 4$ ) were retained for further analysis using FinFindR (version 0.1.10). The individuals have also been uploaded to a semi-automated tool, Flukebook (<https://www.wildme.org/flukebook.html>) for online viewing and matching.



Picture 6. Photo Quality and Individual Distinctiveness Protocol



The acoustic analysis was only preliminary and carried out using RAVEN Pro 1.6 software (Conservation Bioacoustics at the Cornell Lab of Ornithology, 2022). Whistles were manually cropped from the spectrogram and were classified according to their whistle contour to identify the frequency ranges as well as the dominant whistle type of 2025 (Picture 7).



**Picture 7.** Whistle contour categories recorded in the study area: A) Upsweep, B) Downsweep, C) Flat, D) Convex, E) Concave, and F) Multiwave (adapted from (Akkaya et al. 2023))

### *Public Outreach*

Public outreach was conducted through a variety of channels, including public talks, school and university presentations, formal and informal stakeholder meetings, art gallery exhibitions, and beach clean-ups. In 2025, outreach efforts targeted a diverse range of stakeholders, including fishers, tour boat operators, sailors, primary and secondary school students, university students, non-governmental organisations, decision and policy makers, as well as local citizens and expatriate communities residing in Montenegro. Beyond direct engagement, our outreach extended to social media platforms and local media appearances, broadening the reach of our message to a wider audience both within and beyond Montenegro.

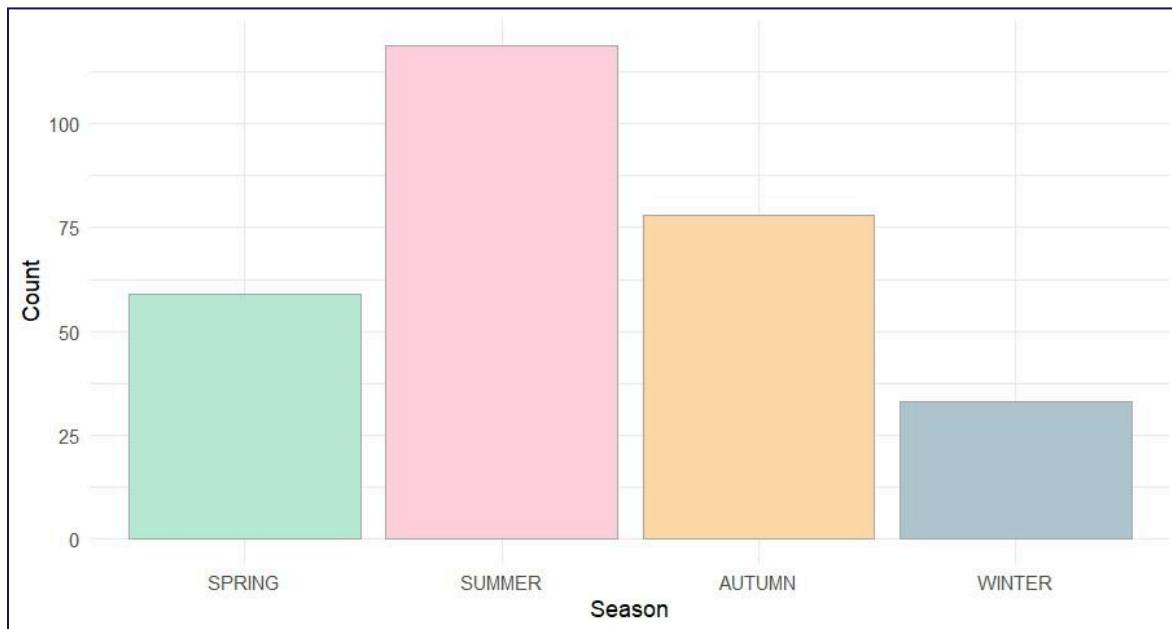
## RESULTS

### *Scientific Research*

#### 1. Survey Effort

The MDR team conducted surveys across the Adriatic Sea of Montenegro throughout 2025, completing 289 surveys over 169 days, with a total of 753.12 hours (31.37 days) spent in the field. The majority of the effort was carried out through land-based surveys, which accounted for 190 surveys (66% of total effort), utilizing a theodolite as the primary data collection equipment. Kayak surveys contributed 70 surveys, while boat-based surveys comprised the remaining 29 surveys, representing only 10% of the total effort. The boat survey mainly relied on opportunistic surveys, made possible through the valuable collaboration of local tour boat owners.

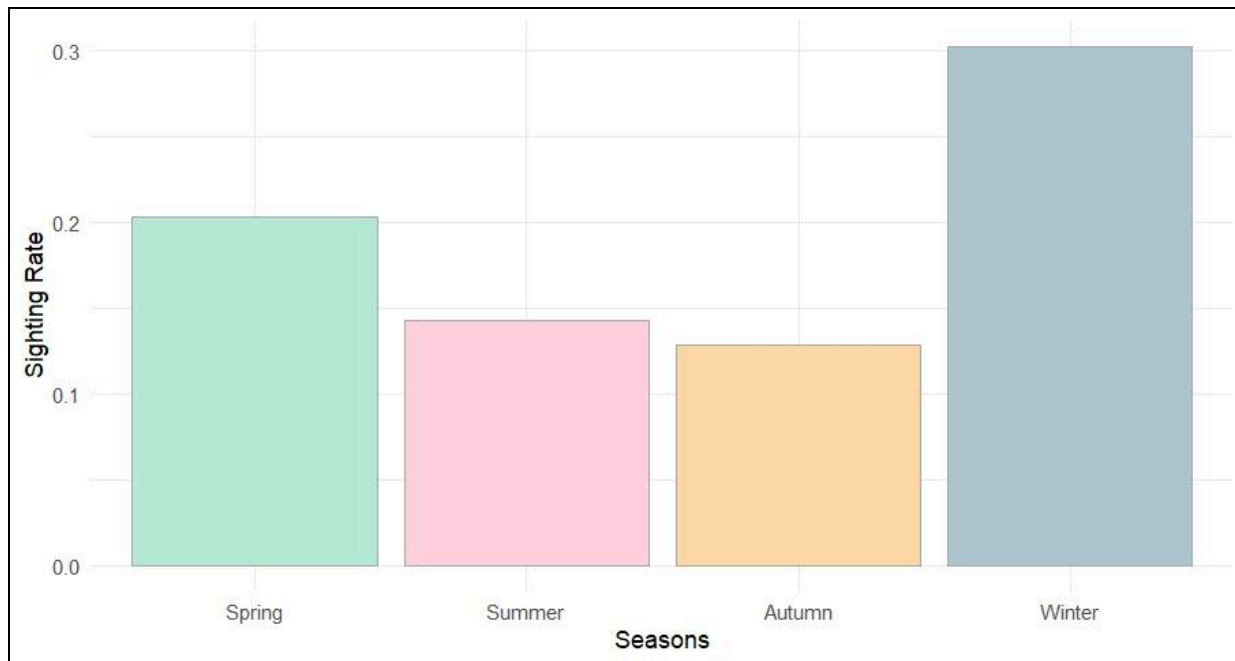
Seasonal effort was highest in summer (119 surveys) followed by autumn (78 surveys) while the effort was lower in spring (50 surveys) followed by winter (33 surveys) (Figure 2). When the season is combined under cold (autumn and winter) and warm seasons (spring and summer), there was a significant difference where warm seasons surveyed significantly higher than the colder ones ( $\chi^2=15.53$ ,  $df=1$ ,  $p < 0.0001$ ).



**Figure 2.** Number of surveys conducted per season

## 2. Species Sighting

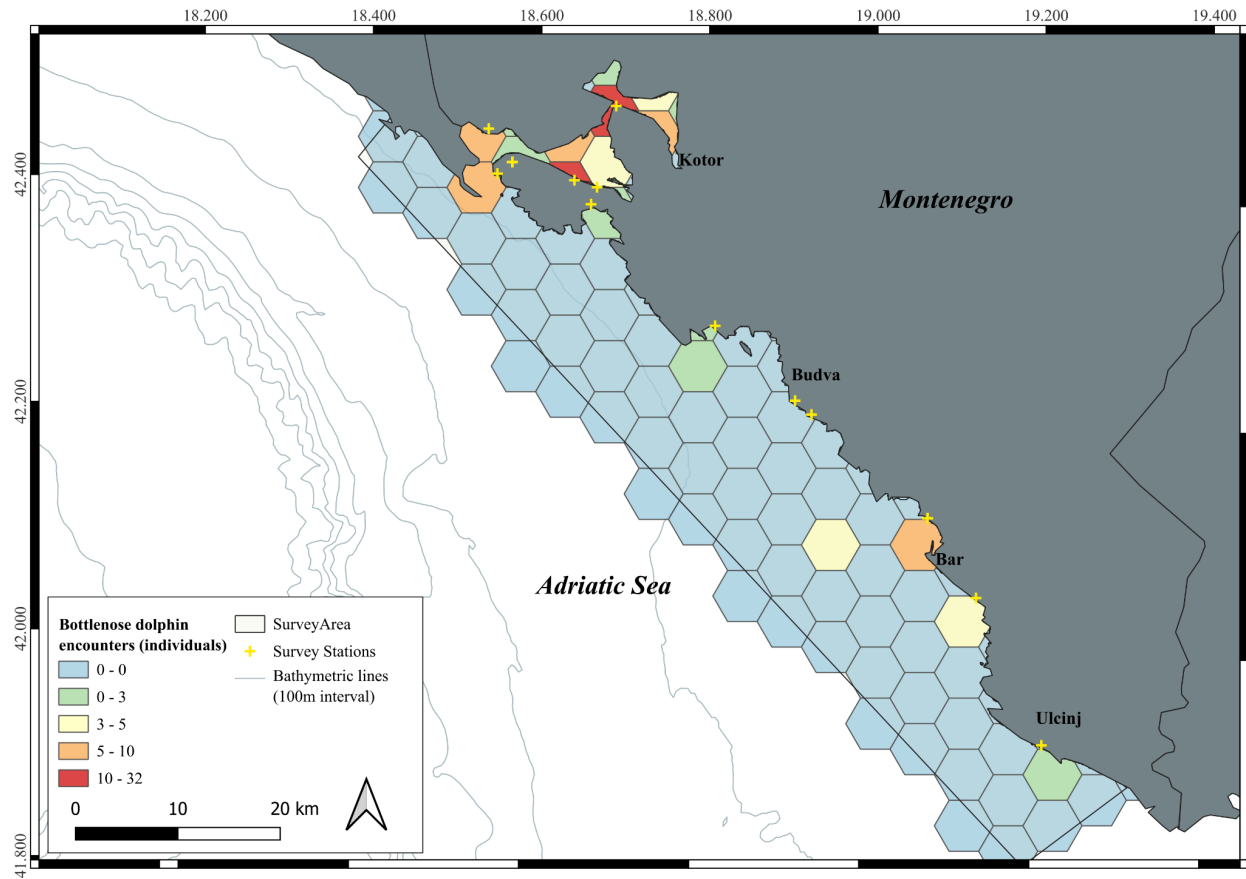
In 2025, bottlenose dolphins were the most frequently encountered cetacean species, recorded on 49 occasions. Striped dolphins and fin whales were each encountered on two separate occasions, exclusively during the summer season. Due to the single encounters of other species, only bottlenose dolphins were assessed for their sighting rates and the potential impact of season on sighting probabilities. Analysis of bottlenose dolphin sighting rates (sightings/survey effort) revealed a mean rate of 19% across 2025. Seasonal sighting rates varied, with the lowest recorded in autumn (13%), followed by summer (14%) and spring (20%), while winter yielded the highest sighting rate (30%). However, a chi-square goodness of fit test revealed no significant difference in bottlenose dolphin sightings across seasons when accounting for survey effort ( $X^2 = 5.15$ ,  $df = 3$ ,  $p = 0.16$ ), suggesting that seasonal sighting counts were proportional to the survey effort conducted in each season rather than reflecting true seasonal variation in dolphin presence. Later, to investigate the actual seasonal effect on species distribution, GLM with binomial distribution has been modelled where summer revealed a significantly low probability of sighting (14%) with similar low sighting probability (12% lower odds) in Autumn seasons. Whereas Spring holds a higher sighting probability (53% higher odds) than summer, although not significant. Winter was expected to hold significantly higher sighting probabilities (over 100% higher odds) than summer in 2025 (Figure 3). Therefore, 2025 data revealed notably higher sighting probabilities for winter season (December, January, February) whereas summer (June, July, August) and autumn (September, October, November) hold the least.



**Figure 3.** Sighting rate of bottlenose dolphins per seasons

### 3. Sighting distributions

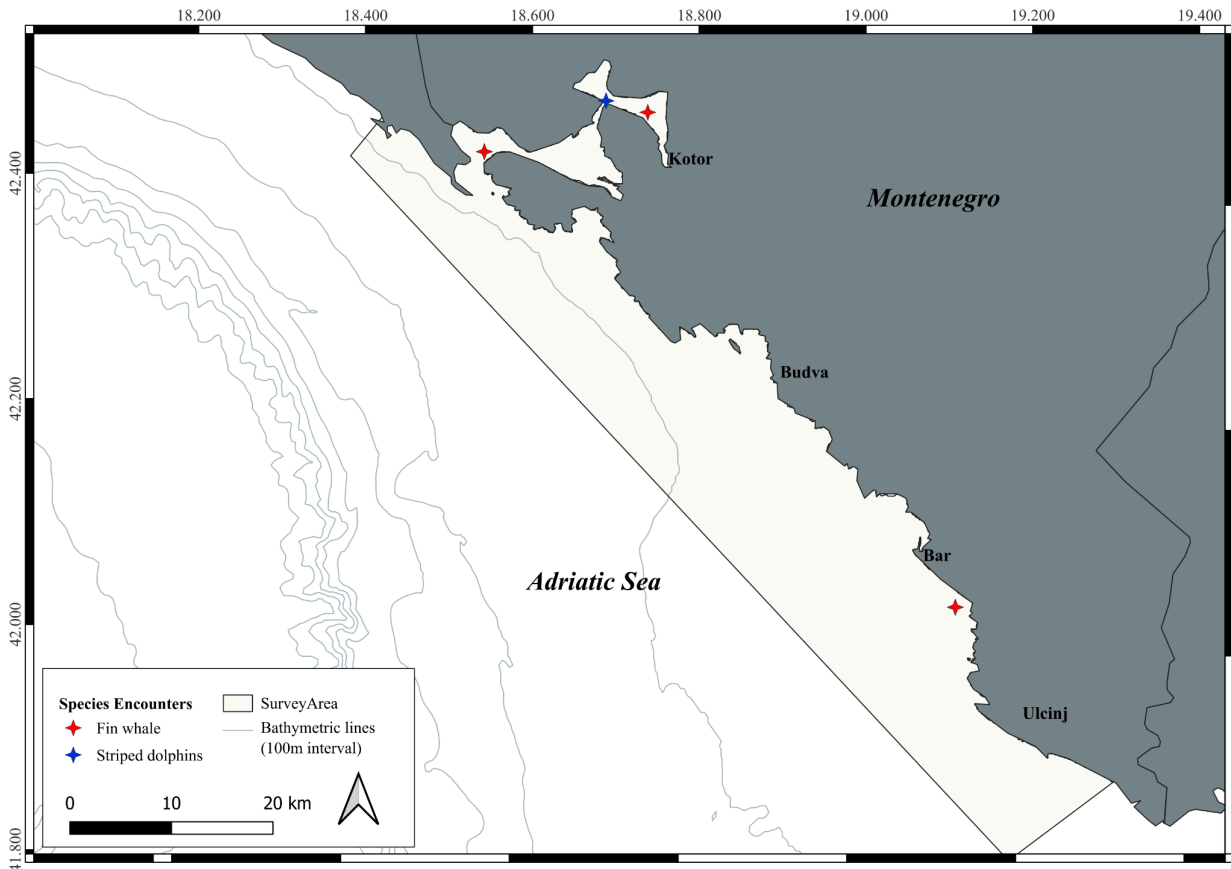
Bottlenose dolphins were encountered throughout the coastline from the southern to the northern boundaries of Montenegro. The highest number of encounters took place within the Boka Kotorska Region, where an overall of 32 individuals were recorded in a grid in 2025. The highest numbers were recorded close to Verige and Rose within the Boka Kotorska, followed by neighbouring waters of Herceg-Novi and coastal waters of Bar (Figure 4). Sightings were highly concentrated within the coastal waters below 100m depth contour, however the surveys were also highly coastal.



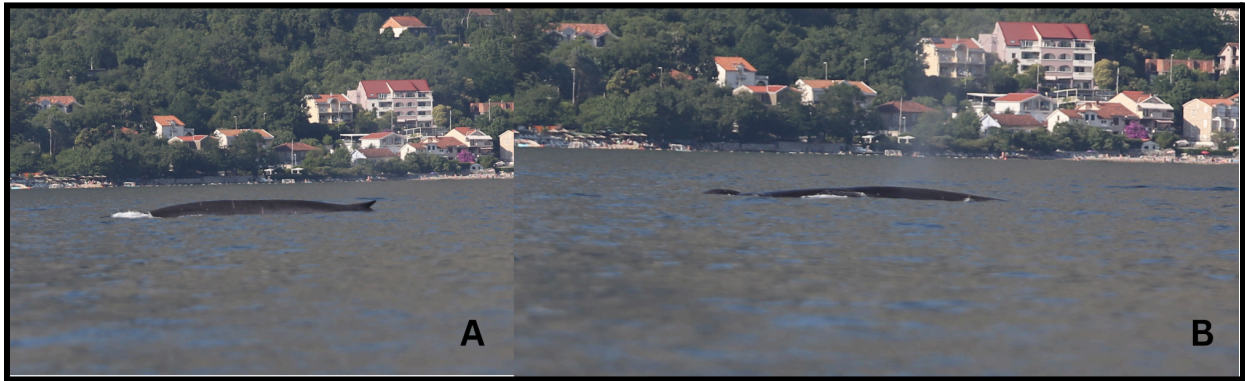
**Figure 4.** Bottlenose dolphin encounters in 2025



In addition to the bottlenose dolphins, two other cetacean species were sighted in 2025. Two individuals of striped dolphins (*Stenella coeruleoalba*) were sighted off Verige on the 19th of June, 2025. The sighting took almost three hours, starting from 17:43 local time. The main behaviour was recorded as stalling with tight swimming formation (Figure 5, Picture 8). Only a week later, a solitary fin whale (*Balaenoptera physalus*) was first reported via social media in Bar on 25 June 2025, and subsequently sighted in Herceg Novi the following day within our citizen-science network, followed by an additional sighting in Ljuta by our MDR Team (Figure 5). The individual showed no visible signs of injury, although observations were conducted from a boat at distance.



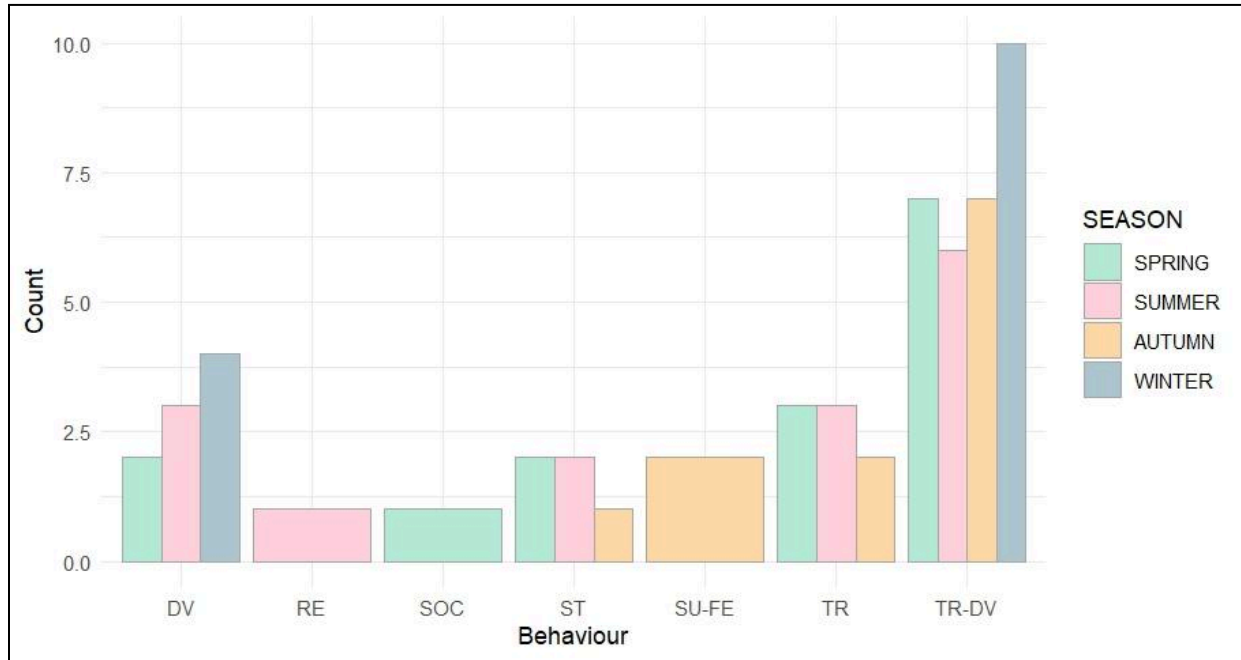
**Figure 5.** Species sightings of 2025 (while blue star represents striped dolphin encounter, red star represents the fin whale sighting of the same individual)



**Picture 8.** Striped dolphins and the solitary fin whale sighted in June 2025

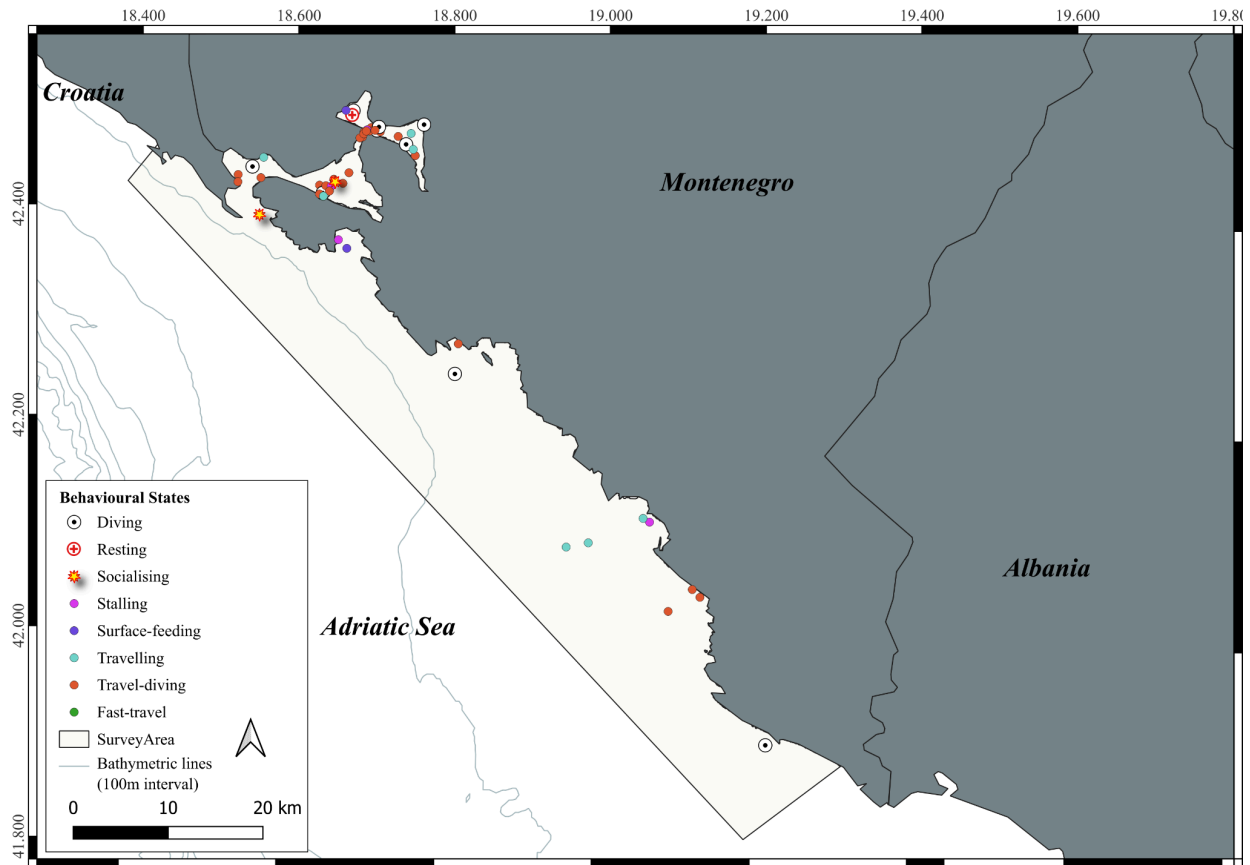
#### 4. Behaviour of Bottlenose Dolphins

Overall, 56 behavioural states of bottlenose dolphins were recorded in 2025 throughout Montenegro. The most recorded behaviour was travel-diving, while resting, socialising and surface-feeding recorded the least (Figure 6). Each season travel-diving was the most repeated behaviour (Figure 6).



**Figure 6.** Recorded behavioural states in each season (DV=Diving, RE=Resting, SOC=Socialising, ST=Stalling, SU-FE=Surface-feeding, TR=Travelling, TR-DV=Travel-diving)

Spatial distribution of behavioural states revealed that northern waters of Montenegro holds multiple behavioural activities, while southern waters had mainly travelling and diving (Figure 7).



**Figure 7.** Spatial distribution of bottlenose dolphin behaviour in 2025

## 5. Photo-identification of bottlenose dolphins

Photographs of bottlenose dolphins were processed for photo-identification and revealed seven individual identifications in 2025, of which three of the individuals were recorded for the first time while the other four were previously sighted. Maximum re-sighting had an eight year interval (Picture 9).



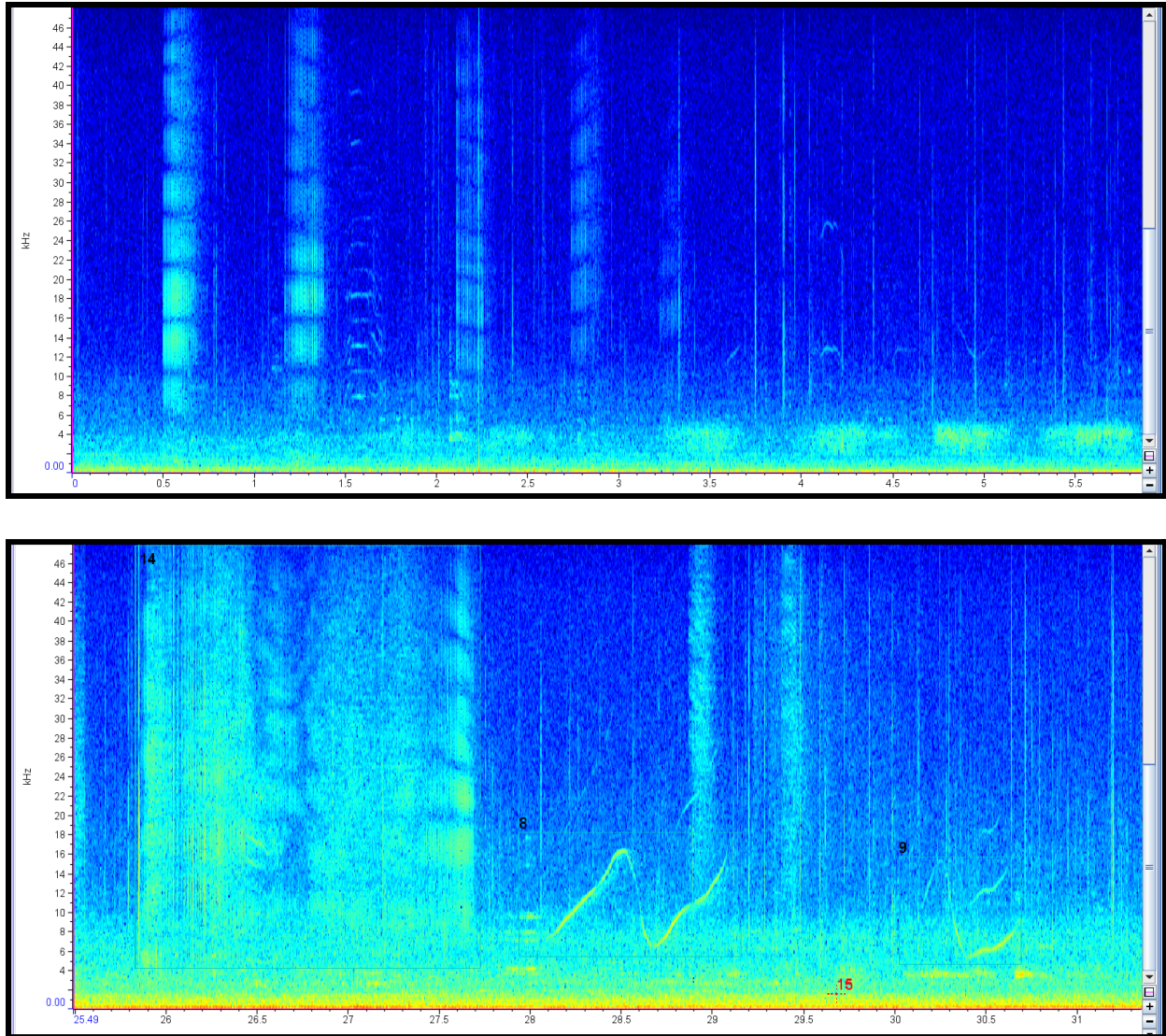
**Picture 9.** Photo-identified individuals

## 6. Whistle characteristics of bottlenose dolphins

Overall, four days of acoustic data comprising 15 WAV recordings were analysed in Raven Pro, of which two days revealed high acoustic activity encompassing buzzes, burst-pulses, echolocation clicks, and whistles (Picture 10). A total of 45 vocalisations were detected across all recordings, consisting of 28 whistles, 10 burst-pulses, and 7 buzzes (Picture 10). Of the 28 whistles, 16 were classified as harmonic whistles. The most frequently recorded whistle contour types were Sine (n=10) and Wave (n=9), followed by upsweep, concave, and convex contours, each recorded on three occasions. Fundamental whistles ranged in frequency from 6 to 20 kHz, with a mean peak frequency of 8 kHz, and varied in duration from 0.12 to 2.00 seconds, with a mean duration of 0.7 seconds (Table 2).

**Table 2.** Descriptive statistics of analysed whistle parameters

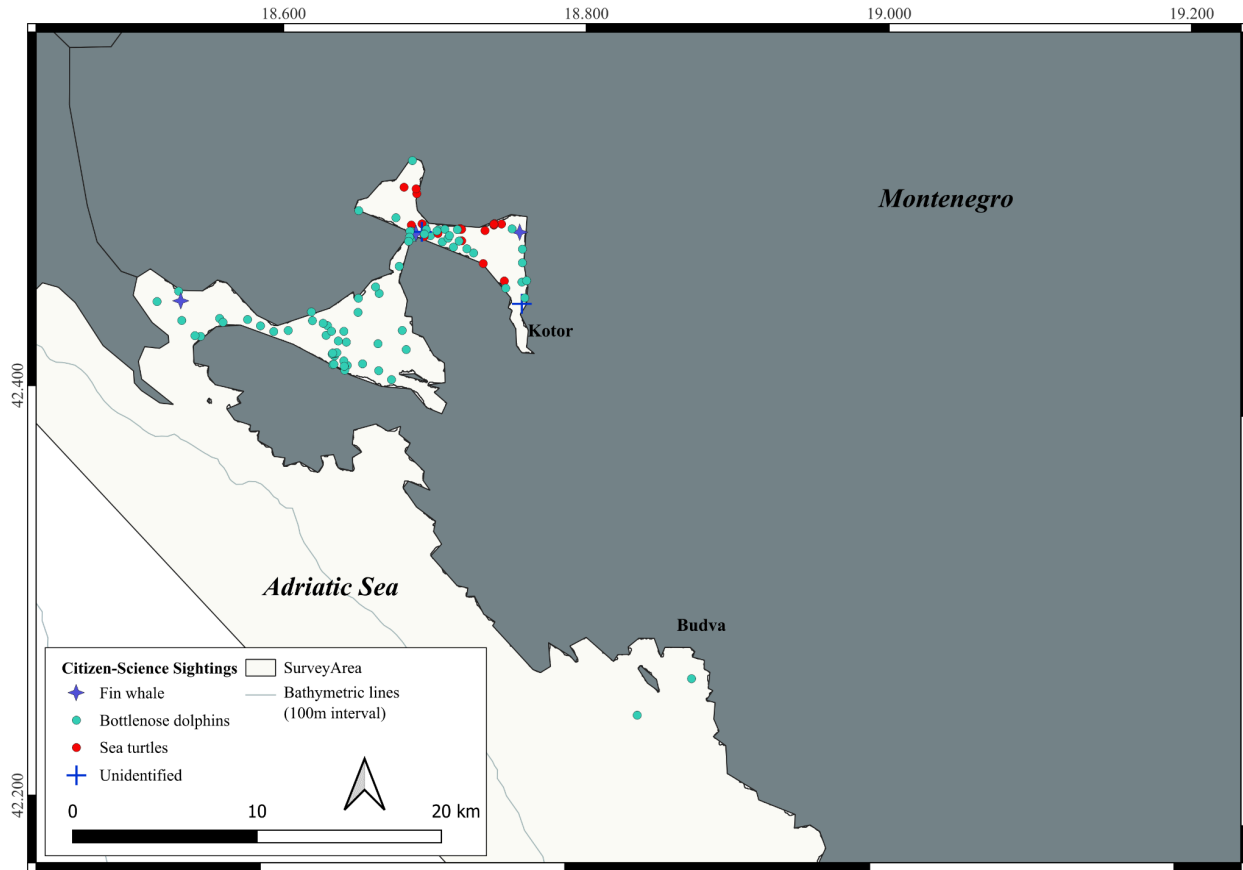
Variable	Min	Max	Mean
Low Freq (Hz)	4129.213	9887.64	5973.359
High Freq (Hz)	6235.112	20067.98	13618.23
Delta Freq (Hz)	743.258	13048.32	7644.876
Peak Freq (Hz)	4134.375	13312.5	8314.307
Delta Time (s)	0.126	2.017	0.698



**Picture 10.** Examples of recorded buzzes, burst pulses and whistles during the surveys in 2025

### *Citizen-science data*

MDR has received 111 reports from the citizen-science network (Wave Watch Montenegro) in 2025. The reports were concentrated in the Boka Kotorska Region with few records from Budva. There were no reports coming from the southern waters of Montenegro in 2025. Bottlenose dolphins were the most reported species by the citizens, followed by sea turtles with 18 reports. The fin whale was also reported by the five different observers to the sighting network. Only on three occasions, the species couldn't be identified on the species level (Figure 8).



**Figure 8.** Citizen-science reports of 2025 to the Wave Watch Montenegro

## Public Outreach

During 2025, MDR was actively engaged in a wide range of community and outreach activities that reflected its commitment to environmental awareness and collaborative conservation. These included ten local community involvement events, among them six beach cleanups along the Montenegrin coastline, as well as four local community meetings and two media interviews. On the public outreach side, eight events were organised, including seven school presentations aimed at inspiring younger generations to connect with their marine environment, alongside participation in the Kotor Carnival 2025 (Picture 11). Adding a creative dimension to the work, MDR hosted an Arts & Crafts workshop that upcycled marine litter into art, and kicked off an exciting Geocache network across its land survey stations. Beyond local efforts, MDR also took part in eight further activities spanning national and international projects and workshops, reinforcing its broader dedication to conservation collaboration across the region.



Picture 11. Examples of the events of MDR run in 2025

## EU Projects

Our NGO had run two European Union Projects in 2025 with its full commitment:

**ENGAGE-Enhancing protection and nature** is a one-year Interreg IPA South Adriatic funded project that builds on the results of the Interreg Mediterranean Biodiversity Protection Community, with a specific focus on the South Adriatic Ionian Strait Ecologically or Biologically Significant Area (SAIS-EBSA), shared by Italy, Albania, and Montenegro. The project works to bring together stakeholders and decision-makers around the SAIS-EBSA process, building capacity to better understand the region's economic value through the lens of ecosystem services, while identifying the key governance bodies and incentives needed for meaningful participation. To make this happen, ENGAGE organises a range of cross-border activities, including a 30-hour training in Albania, three workshops across Albania, Montenegro, and Italy, and an incoming event in Montenegro (Picture 12). The project's flagship outcome is the adoption of a Memorandum of Understanding that sets out a coordinated action plan for conservation measures, a tangible step toward the EU Biodiversity Strategy 2030 target of protecting 30% of EU marine and terrestrial areas, with a particular emphasis on transboundary Marine Protected Areas in the South Adriatic. MDR has played an active role throughout the project, supporting stakeholder engagement, contributing to capacity building efforts, and helping to drive forward the governance processes that sit at the heart of ENGAGE.



Picture 12. Example of ENGAGE events run in Italy and Podgorica



**SAMESEA-SustainAble Management of marinE Sentinel spECies and human Activities interaction** is a three-year Interreg IPA-ADRION funded project running until 2027, focused on marine mammals and sea turtles and aims to bring greater harmony to maritime monitoring and coordination across the Adriatic-Ionian macro-region, while fostering better dialogue between economic activities and marine biodiversity conservation. The project tackles pressing challenges by uniting national and regional authorities, research centres, NGOs, and sectoral agencies around a shared strategy, one that includes monitoring sentinel species, testing pilot actions on the ground, and developing a concrete action plan for sustainable basin management. At its heart, SAMESEA recognises that without genuine cooperation and sustainable management, both marine ecosystems and the communities that rely on them, through fishing, tourism, and beyond, will suffer in the long run. MDR has been an active partner throughout the project, contributing across all work packages and helping to shape monitoring methodologies, promote co-existence practices, and build a stronger network of stakeholders who share a commitment to the health of the macro-region's marine environment (Picture 13).



**Picture 13.** Examples from our SAMESEA project events

## DISCUSSION

Montenegro Dolphin Research had completed another successful year with its research and conservation effort in 2025. MDR Team was out in the survey almost every second day of the year (169 survey days of effort) throughout the year and managed to complete 289 surveys to understand the ecology, population dynamics, site fidelities as well as existing threats on the bottlenose dolphins in Montenegro. Although survey effort was distributed as evenly as possible throughout the year, challenging sea state conditions during the colder seasons resulted in a higher number of survey days being concentrated in the spring and summer months of 2025.

During our research effort, we followed three main data collection approaches; land surveys through theodolite surveys, opportunistic data collection platforms through boat surveys, and kayak surveys. Land surveys formed the majority of the survey effort in Montenegro by forming 66% of the total effort. Opportunistic surveys formed approximately 10% of the research effort where a tourist boat has been used as the platform to collect the behavioural as well as photo-identification data; while kayak surveys constituted the remaining 24%.

Overall, 51 encounters were recorded in 2025, all of which involved bottlenose dolphins, with the exception of two rare encounters that occurred within a single month. These included a group of two striped dolphins and a solitary fin whale, both sighted in Boka Kotorska. While bottlenose dolphins are the resident species of the coastal Adriatic waters, striped dolphins typically inhabit offshore deep waters, and the current sighting represents, to our knowledge, the first record of this species within the coastal waters of Boka Kotorska. Notably, fin whales have previously been recorded in the same area (Joksimović et al. 2013), suggesting that the reoccurrence of this species may reflect an emerging pattern worthy of further investigation. Montenegro is one of the closest countries in proximity to the deepest region of the Adriatic Sea, South Adriatic Pit which reaches over 1000m depth and known to hold an important habitat for the several deep-sea cetaceans (Bearzi et al. 2024). These encounters of rare species in Montenegro may be linked to its close proximity to the South Adriatic Pit and future research is critical to assess the reasons behind the occurrence of these species in the very shallow waters of Boka Kotorska.

The mean sighting rate of bottlenose dolphins was 19% across all seasons. When accounting for seasonal variation, sighting rates were proportional to survey effort per season. However, sighting probability varied considerably across seasons, with winter recording the highest probability (30%), followed by spring (20%), while summer (14%) and autumn (13%) recorded comparably lower probabilities. This pattern reveals a striking contrast between winter and summer, suggesting that bottlenose dolphin detectability or presence in the area may be

seasonally influenced. Tourism is one of the main economical pillars of Montenegro and it generates 20% of GDP with a strong tendency to the growth (Cerović Smolović et al. 2018). While coastal tourism is a dominant and strategic sector along the coast of the Adriatic, currently it falls under a mass tourism destination where the majority of the tourism activities are concentrated in summer and autumn months (between June and September) (Ratković et al. 2021, 2016; “Montenegro Tourism Development Strategy,” n.d.). Boka Kotorska Bay, Budva, Bar and Ulcinj were described as under the pronounced negative pressure of tourism and its related development (Ratković et al. 2021, 2016; “Montenegro Tourism Development Strategy,” n.d.). The overlapping negative trend between dolphin sighting probability and the increase in mass tourism activities raises the question of whether the decline in sightings during summer and autumn is directly linked to increased pressure on the marine environment due to the mass tourism activities. Summer months through September are characterised by intense tourism activities, ranging from high cruise ship densities to recreational speedboats, accompanied by increased marine debris and coastal destruction. While a causal relationship cannot be confirmed from the current data alone, these findings highlight the urgent need for regulated tourism activities and targeted monitoring efforts during peak tourism seasons to better understand and mitigate the impact of anthropogenic pressures on bottlenose dolphin presence in the area. Current study pinpointed Boka Kotorska as an important bottlenose dolphin habitat throughout the year, including summer-despite the observed decline in sightings, therefore the area fulfills the necessities of a protected area and should be protected with in-situ conservation tools.

Regarding the acoustic aspect of 2025, bottlenose dolphins produced a high number of wave and sine whistle contour types, with a notable amount of buzzes and burst pulses present, specifically within the Boka Kotorska Region. Whistles are known to be emitted in social context and with the increased number of inflection points, as in the case of wave and sine type, it likely indicates the complexity of the social context (Hernandez et al. 2010). These types of whistles were predominantly recorded in Boka Kotorska, pinpointing the importance of the area for the social complexity of the bottlenose dolphins. The fundamental whistle frequencies recorded in the current study (6–20 kHz, mean peak frequency 8 kHz) broadly overlap with those reported by (Akkaya et al. 2023) for bottlenose dolphins in Boka Bay, Montenegro (7–14 kHz, mean peak frequency 10 kHz), although the current study recorded a slightly wider frequency range and lower mean peak frequency. A similar pattern was observed for the whistle duration between the current study and previous study. The median duration was previously recorded at 0.5 sec (Akkaya et al. 2023) while the current study reports a mean of 0.7 sec duration. Considering the limited sample size of 2025, the overlapping results confirm the general whistle frequencies of

bottlenose dolphins in Montenegro. To build on this, the presence of buzz and burst pulse also indicates a potential foraging habitat and strong social context, respectively.

To strengthen our scientific research efforts, the MDR team adopted an inclusive approach bringing together researchers, local communities, students, fishers, and decision-makers for the research and conservation of keystone species in Montenegrin waters. Within a single year, our Wave Watch Montenegro citizen science network received over 100 records, with dolphins and sea turtles forming the reported species. Although the network is active along the entire Montenegrin coastline, the majority of reports originated from Boka Kotorska Bay, highlighting the need to expand outreach efforts to other coastal cities and towns. Notably, the number of reports received through this network doubled what MDR had previously achieved independently in a single year; these single results underscore the invaluable role of community engagement in advancing both research and conservation outcomes. To encourage community involvement, the MDR team runs consistent activities where each and all of us can speak our point of view with mutually respectful manners. For the goal of united effort and knowledge, we had run 30 community events in a single year of 2025, equaling a minimum of two events per month, which highlights our dedication to community involvement.

We therefore present our work not merely as a research team, but as an integral part of the Montenegrin community, united in our dedication to cetacean research and conservation. We emphasise the importance of dedicated research efforts in identifying best practices that serve both the ecological integrity of these waters and the long-term economic wellbeing of local communities.

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# ANNUAL 2025 REPORT



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