

## Short Note

### Presence of the Mediterranean Monk Seal (*Monachus monachus*) in the Croatian Part of the Adriatic Sea

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The Croatian portion of the Adriatic Sea (31,757 km<sup>2</sup> and 6,278 km of shore line) currently does not host a Mediterranean monk seal (*Monachus monachus*) population. Historically, the species was distributed throughout the Adriatic Sea but was considered extinct in this region in the second half of the 20th century. Still, occasional sightings suggest the presence of individual monk seals in this area. In this paper, we review the status of monk seals in the Croatian portion of the Adriatic Sea since 1984 and, more specifically, over the last 5 y since the last published report (Đuras Gomerčić et al., 2005).

A team from the Faculty of Veterinary Medicine of the University of Zagreb has been monitoring for the presence of the Mediterranean monk seal in our study area (the Croatian portion of the Adriatic Sea) since 1984 (Gomerčić & Huber, 1984; Gomerčić et al., 1984, 2006a; Antica et al., 1994; Antica, 1999; Đuras Gomerčić et al., 2005). During the same period, this team has led various projects on marine mammals of the Adriatic Sea that includes monitoring all confirmed/present cetacean and pinniped species, with an emphasis on mortality and causes of death (Gomerčić et al., 1998, 2000, 2006b; Šeol et al., 2006; Đuras Gomerčić et al., 2009). Related specifically to monk seals, in addition to status surveys, details have been published on craniometric characteristics (Gomerčić & Huber, 1987, 1989; Gomerčić et al., 2009), on options for semi-captive breeding (Gomerčić et al., 1997), and on sex determination by polymerase chain reaction from museum skull tissues (Cafuk et al., 2009).

Since 1984, information folders have been printed and distributed to local inhabitants and to tourists (mostly to yacht owners) with appeals for reporting all relevant events related to monk seal sightings. Public awareness grew over time, and a network of local contacts (mostly harbor masters, fishermen, and nature protection state agencies)

was established. That was believed to afford documentation of sightings that allowed records to become increasingly more complete. Recently, the media are also assisting in the coverage of monk seal sighting details. All collected information on the presence of Mediterranean monk seals in the region was classified into the following five categories:

*Category 1* – Physical evidence of a carcass or remains of it

*Category 2* – Sightings recorded on a photograph and/or video

*Category 3* – Sightings by a group of people and/or repeated sightings followed by interview

*Category 4* – Sighting by a single person that was contacted directly

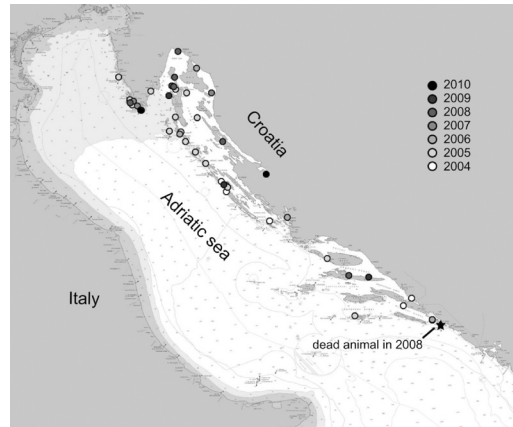
*Category 5* – Sightings where the observer was not contacted directly

We considered information from the first three categories as unequivocal evidence of the presence of the species in the area. To validate the fourth category, the arguments that we considered during the interview were the description of the animal's physical appearance and behavior, and all details about the observer and his or her activities. Information from this category that failed to be convincing was eliminated, while the accepted sightings were considered as valid. We assume that we avoided any bias because the possible error was equally likely in both directions (i.e., that we accepted false sightings or rejected true ones). Information from the fifth category was used only as a guide for further enquiries, but it was not considered a valid sighting and was not included in this review.

In 2005, we reported on 17 confirmed sightings of monk seals from 2004 and 2005 (Đuras Gomerčić et al., 2005). From 1 August 2005 to 31 July 2010, a total of 31 new sightings of

Mediterranean monk seals were recorded in our study area (Table 1). Spatial distribution of sightings is presented on the map (Figure 1), and temporal distribution is graphed (Figure 2). Both the map and graph include all 48 records (Figures 1 & 2). From the 31 new records, nine were recorded with a still or video camera, and one included the remains of a dead animal (Figure 3). The dead animal was found in an advanced stage of decomposition, with its head missing. Species identification was based on the morphological features of the body parts present, whereas the cause of death could not be determined.

These 31 reported and confirmed records of monk seals in the Croatian part of the Adriatic Sea yielded an average of 6.2 (range 3 to 11) sightings during each 12-mo period (1 August to 31 July the next year): 8, 3, 3, 11, and 6 in 2005/2006, 2006/2007, 2007/2008, 2008/2009, and 2009/2010,



**Figure 1.** Locations of sightings of Mediterranean monk seals (*Monachus monachus*) in the Croatian part of the Adriatic Sea in the period 2004 to 2010 (N = 48)

**Table 1.** Registered records of Mediterranean monk seal (*Monachus monachus*) presence in the Croatian part of the Adriatic Sea from 1 August 2005 to 31 July 2010

No.	Observation date	Latitude N (°)	Longitude E (°)	Animal observer distance (m)	Duration of observation	Note
1	1 August 2005	44.96666667	14.38333333	8	5 s	
2	? August 2005	44.70222222	14.38055556	5	20 s	
3	25 August 2005	43.33277778	16.42416667	?	?	
4	7 October 2005	42.76916667	16.79666667	?	15 min	
5	4 November 2005	42.72741667	17.84038889	?	> 1 h	
6	29 January 2006	45.16666667	14.66666667	20	4-5 min	
7	26 March 2006	44.53861111	14.44000000	10	10 min	
8	21 July 2006	43.73388889	15.88875000	20	5 min	
9	? October 2006	42.73161111	17.84091667	?	?	
10	19 May 2007	44.93333333	14.86666667	3	10 s	
11	? September 2007	44.46755556	15.01827778	3-4	4-5 min	
12	21 September 2007	44.80750000	13.86752778			photo
13	14 October 2007	44.85305556	13.81622222	15	15 s	
14	2 January 2008	45.32652778	14.41644444	15	3-4 min	
15	9 February 2008	44.83583333	13.82722222	?	?	photo
16	14 August 2008	45.00000000	14.33333333	5	5 min	photo
17	? October 2008	43.16666667	16.71666667	?	?	
18	3 November 2008	45.08111111	14.36947222	?	?	
19	10 November 2008	42.67972200	17.95163900			carcass
20	23 November 2008	44.99222222	14.35972222	10	3 min	
21	15 February 2009	44.76788219	13.91336917	?	?	photo
22	20 February 2009	44.76513889	13.92402778	20	30 min	photo
23	8 March 2009	44.76666667	13.91666667	?	2 h	photo
24	29 June 2009	43.15000000	16.98333333	30	6-7 s	
25	10 July 2009	44.05144444	15.03352778	20	10 s	
26	28 September 2009	44.90561667	14.29330000	10	?	
27	31 October 2009	44.76844444	13.91141667	20	?	photo
28	31 October 2009	44.76666667	13.91666667	50-100	?	photo
29	24 January 2010	44.76844444	13.91141667	20	1 h	photo
30	27 February 2010	44.76844444	13.91141667	< 10	few hours	photo
31	30 July 2010	44.15209758	15.60350418	50	5 min	



respectively. During these 5 y, monk seal sightings were well-distributed over all months, with only April and December presenting zero sightings and with one to six sightings during other months. One could speculate that more sightings would be expected during summer months when many people are out on boats or on shore potentially leading to disturbance, but this is also the period when the monk seals are the least coastal before the pupping season. At other times of each year, there are fewer potential observers, but also potential disturbance is less intensive. Still, the 4 mo most favorable to tourists—June, July, August, and September—received a total of 12 sightings in 5 y, which represents slightly more than one-third (38.7%) of all sightings, or approximately equal distribution.

The distribution map shows that almost the whole surface of the study area has been visited by monk seals. Based on information regarding the current distribution of the species, it was expected that most monk seal sightings should occur towards the Otrant—that is, the southeast part of the Adriatic Sea that is the closest to the established population nuclei in Greece. This expectation corresponds to the fact that in the 1970s, the last reported monk seal sightings were recorded near to the outermost islands of the Adriatic Sea, in the archipelagos of Vis and Lastovo (Gomerčić et al, 1984; Antica et al., 1994). Surprisingly, however, most recent sightings were concentrated in the Northern Adriatic, around the tip of the Istria peninsula (Kamenjak) and Lošinj and Dugi otok islands (Figure 1). Several sightings were mutually close in time and space (Figure 2), which suggests observation of the same individual. The gathered data are not adequate to confirm different individuals nor to make the count, but the space and time between other sightings allows an assessment that there was likely more than one animal. Finding one dead animal and recording a number of individual sightings after that carcass was found support the assessment of multiple individuals in the area at least over time. No sighting included more than one animal at a time. Hence, we never confirmed a breeding group nor even a breeding female.

All findings and observations included in this note suggest that monk seals can easily reach all parts on the Croatian side of the Adriatic Sea. We assume that the food base is adequate, at least for a limited number of monk seals, and that water quality is fully satisfactory. The coastline provides abundant caves, many with underwater entrances (Antolović & Huber, 1997). No confirmed breeding may be the consequence of only individual animals coming at a time or that the disturbance was over an acceptable threshold. As one of the conservation actions to promote the establishment

of a resident colony of Mediterranean monk seals in Croatia, we propose the protection of selected microlocalities of repeated sightings. This measure regrettably failed to be properly applied in the case of recent grouped observations (Kamenjak case: Table 1, Record Nos. 23, 27 & 29; Figures 3c-e). The full legal protection that the monk seal has had here for over half of the century is certainly not a satisfactory measurement alone; however, as a part of comprehensive conservation management plan, it may help to facilitate the full return of the species.

### Acknowledgments

Professor Dr. Hrvoje Gomerčić passed away on 1 August 2010. He was a marine mammal researcher and conservationist, our teacher and mentor. Professor Gomerčić is very much missed, but his contributions to marine mammal science and conservation will live on.

### Literature Cited

- Antica, G. (1999). *Stanje sredozemne medvjedice u hrvatskom dijelu Jadrana* [Monk seal population status in the Croatian part of Adriatic Sea] (Diploma thesis). Faculty of Veterinary Medicine, University of Zagreb, Zagreb, Croatia.
- Antica, G., Huber, Đ., & Gomerčić, H. (1994). *Public survey on the state of Mediterranean monk seal (Monachus monachus, Hermann) in the Croatian part of the Adriatic Sea*. Proceedings of Abstracts of the Papers of the Fifth Congress of Croatian Biologists, Pula, Croatia.
- Antolović, J., & Huber, Đ. (1997). *The Mediterranean monk seal (Monachus monachus Hermann) habitats in Vis archipelago*. Proceedings of Abstracts of the Papers of the Sixth Congress of Croatian Biologists, Opatija, Croatia.
- Cafuk, T., Gomerčić, T., Čurković, S., Đuras Gomerčić, M., Galov, A., Huber, Đ., . . . Gomerčić, H. (2009). *Sex determination by polymerase chain reaction in a museum Mediterranean monk seal (Monachus monachus) skull from the Adriatic Sea*. Proceedings of Abstracts of Tenth Croatian Biological Congress, Osijek, Croatia.
- Đuras Gomerčić, M., Gomerčić, T., Huber, Đ., & Gomerčić, H. (2005). Recent sightings of the monk seal in the Croatian areas of the Adriatic. *The Monachus Guardian*, 8(2), 17-18.
- Đuras Gomerčić, M., Galov, A., Gomerčić, T., Škrtić, D., Čurković, S., Lucić, H., . . . Gomerčić, H. (2009). Bottlenose dolphin (*Tursiops truncatus*) depredation resulting in larynx strangulation with gill-net parts. *Marine Mammal Science*, 25, 392-401. doi:10.1111/j.1748-7692.2008.00259.x
- Gomerčić, H., & Huber, Đ. (1984). *Presence of the Mediterranean monk seal (Monachus monachus) in eastern part of the Adriatic Sea*. Proceedings of

- Abstracts of the Papers of the Second Congress of Croatian Biologists, Zadar, Croatia.
- Gomerčić, H., & Huber, Đ. (1987). *Craniometric characteristics of the Mediterranean monk seal (Monachus monachus Herman 1779) from the Adriatic Sea*. Proceedings of Abstracts of the Papers of the Third Congress of Croatian Biologists, Mali Lošinj, Croatia.
- Gomerčić, H., & Huber, Đ. (1989). Craniometric characteristic of the Mediterranean monk seal (*Monachus monachus* Hermann 1779) from the Adriatic Sea. *Periodicum Biologorum*, 91, 132.
- Gomerčić, H., Huber, Đ., & Gomerčić, V. (1997). *Semicaptive breeding of Mediterranean monk seal—Probably the only chance for avoiding its extinction*. Proceedings of Abstracts of the Papers of the Sixth Congress of Croatian Biologists, Opatija, Croatia.
- Gomerčić, H., Huber, Đ., & Ronald, K. (1984). *A note on the presence of the Mediterranean monk seal (Monachus monachus) Herman 1779 in the eastern part of the Adriatic Sea*. Proceedings of meeting in La Rochelle, France.
- Gomerčić, H., Đuras Gomerčić, M., Gomerčić, T., Huber, Đ., & Gomerčić, V. (2006a, June). *Mediterranean monk seal in the northern Adriatic Sea?* Abstract Book of Second Meetings – Natural Research of the Rijeka Area, Rijeka, Croatia.
- Gomerčić, H., Huber, Đ., Gomerčić, V., Škrtić, D., Gomerčić, A., & Vuković, S. (1998). Dolphin morbilliviral infection from the Mediterranean Sea did not spread into the Adriatic Sea. *Acta Veterinaria Hungarica*, 46, 127-134.
- Gomerčić, H., Đuras Gomerčić, M., Gomerčić, T., Lucić, H., Dalebout, M., Galov, A., . . . Huber, Đ. (2006b). Biological aspect of Cuvier's beaked whale (*Ziphius cavirostris*) recorded in the Croatian part of the Adriatic Sea. *European Journal of Wildlife Research*, 52, 182-187. doi:10.1007/s10344-006-0032-8
- Gomerčić, H., Huber, Đ., Gomerčić, V., Vuković, S., Škrtić, D., Gomerčić, T., . . . Kardoš, L. (2000). Fatty liver and subcutaneous edema in a free-living bottlenose dolphin (*Tursiops truncatus*, Montagu 1821) from the Adriatic Sea; light- and electron-microscopical study. *Veterinarski Arhiv*, 70(5), 259-277.
- Gomerčić, T., Farkaš, V., Đuras Gomerčić, M., Huber, Đ., & Gomerčić, H. (2009, June). *Cranial morphometry of adult Mediterranean monk seal (Monachus monachus) from the Adriatic Sea*. Proceedings of the International Scientific Meeting of Anatomy and Physiology Fundamentals of Medicine, Zagreb, Croatia.
- Šeol, B., Đuras Gomerčić, M., Naglič, T., Gomerčić, T., Galov, A., & Gomerčić, H. (2006). Isolation of *Clostridium tertium* from a striped dolphin (*Stenella coeruleoalba*) in the Adriatic Sea. *Journal of Wildlife Diseases*, 42, 709-711.