Modern Environmental Science and Engineering (ISSN 2333-2581)
July 2019, Volume 5, No. 7, pp. 590-595
Doi: 10.15341/mese(2333-2581)/07.05.2019/005
Academic Star Publishing Company, 2019
www.academicstar.us

Determination of the Factors That Can Influence Rehabilitation of Caretta in the Lampedusa Sea Turtle Rescue Center Between 2001-2016

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Abstract: Over the last decades, the status of sea turtles and the need for their protection have increasingly captured the interest of citizens, and the number of sea turtle rescue centers is generally increasing in all the world, especially in Italy, where we count more than 25 first aid stations. The Lampedusa Sea Turtle Rescue Center started its activity since 1990, and in this paper we analyze data from 2812 *Caretta*, rescued until 2016. Here we analyze which factors may affect the rehabilitation success of injured sea turtles hosted in our Center. We underline the following factors: type of clinical case, animal's health condition and the presence of a qualified surgeon. For the first factor we estimated the percentage of survival animals with the following clinical cases (n = 928): infections, fin/carapace/head fractures, fin/carapace/head wounds, hook in esophagus/intestine/stomach/mouth, fishing line from mouth/cloaca, fishing line from mouth and cloaca; 5 of the analyzed clinical cases show a % of rehab success inferior to the 50% (head fracture, fishing line from cloaca/mouth/mouth and cloaca, hook in intestine). For the second factor we estimated the outcome of therapies (recovery achieved/death) and health condition (good health condition/depressed/comatose) using Fisher exact test. The Fisher's test confirmed how health condition can significantly affect sea turtles rehabilitation success (Fisher test = 369,894; d.f. = 2; $P < 0.001$; n = 967). For the last factor, we divided the study period in five subperiods (2001-2003, 2004-2006, 2007-2009, 2010-2012, 2013-2016) based on the evolution of surgical techniques and the presence of an expert surgeon with direct experience on sea turtle surgery; with ANOVA investigation, we confirm significantly the value of the experience of professionals involved (univariate ANOVA = 4.953; d.f. = 4; $P = 0.016$; n = 1011). Bycatch and health condition appear to be significantly influencing the rehab success and the presence of a competent surgeon radically determine an increase in the survival of sea turtles, as expected.

Key words: marine turtles, rehabilitation success, clinical cases, survival, Lampedusa

1. Introduction

Over recent decades, the status of sea turtles and the need for their protection have increasingly become topics of public interest, accompanied by a global rise in the number of sea turtle rescue centers. This is particularly true in Italy, where more than 25 of these rehabilitation centers operate.

Unfortunately, the loggerhead is endangered because of the progressive reduction in areas suitable for nesting and because of an increase in incidental catch. This situation has prompted a series of legal measures designed to protect the turtle. A law passed on 21 May 1980 forbids the capture, transport, housing, and trade of loggerhead turtles [1].

How our rescue center works: Upon arrival to the rescue center, turtles are weighed, standard morphometric measures and collected and a body condition score is assigned. A unique file is also created for each ndividual turtle and updated daily with treatments and lab results. All wounds are assessed based on the depth and the extent of damage and subsequently debrided and disinfected. Fractures or deep lesions are given first priority [2]. All the data collected in this way, has been used for the statistical

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analysis in order to identify the factors that can influence rehabilitation of *Caretta*, taking Lampedusa Sea Turtle Rescue Center as a case study (Fig. 1). Data was collected between 2001 and 2016 (n = 2812) and upon analysis it was determined that the most crucial factors for the outcome of their rehabilitation are the type of clinical case presented, health condition of the animal, and the presence of a experienced surgeon.

2. Material and Methods

The overall rehabilitation success for all cases presented at the rescue centre was assessed quantitatively by the following formula:

Overall rehabilitation success (%) = (NrecoveredYr / NtreatedYr) × 100

Where Nrecovered Yr = number of recovered turtles after medical treatment per year; NtreatedYr = number of turtles with medical treatment per year. Fig. 2 shows the percentage of rehabilitation success during the years.

Fig. 1 Study area.

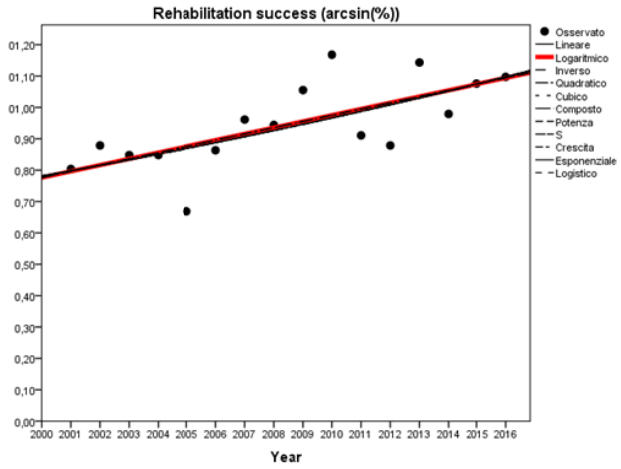

Fig. 2 Rehabilitation success during years between 2001 and 2016 (n = 795).

Sea turtles are caught by most types of fishing gear to a greater or lesser degree, and although information is not yet adequate for all types of gear, at least two are responsible for a high number of deaths: bottom trawl and drifting longline [3]. In our study area we have observed, through the data on clinical cases, that the injuries caused by drifting longline are more common. Each clinical case was first assigned a category, based on its primary manifestation, the criteria for which is represented in Table 1. The rehabilitation success for each of these was then calculated to determine which injuries are the most dangerous for sea turtles, using the following formula:

Case-specific rehabilitation success (%) = Number of turtles that survived a particular case / Total number of turtles presenting that case

Statistical analysis was performed to compare the result of the treatment (recovery or death), against the health condition of each animal (good, depressed or comatose) by means of the Fisher's exact test. The study period was also divided into five subperiods (2001-2003, 2004-2006, 2007-2009, 2010-2012 and 2013-2016) to account for the evolution of surgical techniques and the presence of an expert surgeon with specific experience in sea turtle surgery. A univariate ANOVA was then used to identify the periods with a significant increase in rehabilitation success.

Table 1 Assestment criteria for categorizing each clinical case.

Hook	Line	Fracture	Lesion	14. Infection
1. Mouth	5. From mouth	8. Flipper	11. Flipper	
2. Esphagus	6. From cloaca	9. Carapace	12. Carapace	
3. Stomach	7. From mouth to cloaca	10. Head	13. Head	
4. Intestine				

3. Results and Discussion

We divided the primary factors that can influence rehabilitation in three areas: clinical case, health condition and presence of an expert surgeon.

Clinical case: Through analysis of the rehabilitation success for each case, it is evident that the presence of a fishing line from the mouth (5), from the cloaca (6, Fig. 3), and from the mouth to cloaca (7) were the most dangerous injuries, with less than a 50% survival rate. This is shown above in Fig. 4. It can also be noted that most turtles show injuries due to the interaction with the drifting longline, in fact this fishing tool is the most used in our study area (Fig. 5) [5].

Fig. 3 Line from cloaca.

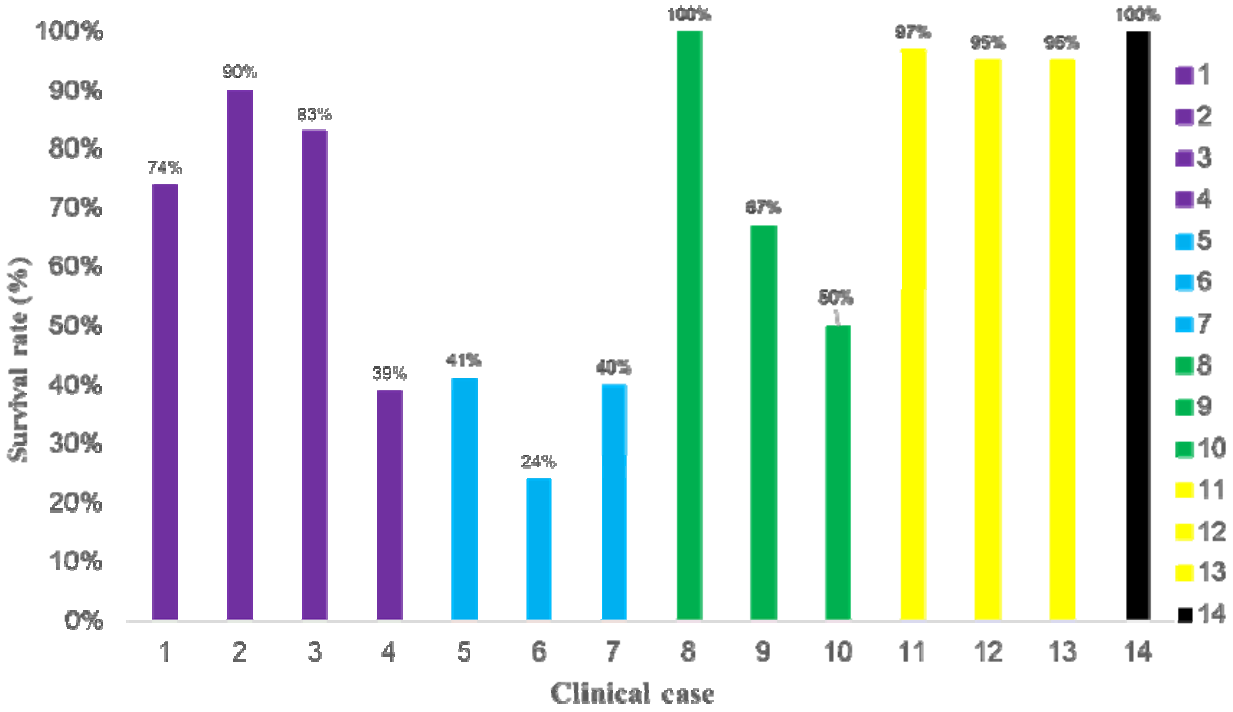

Fig. 4 Survival rate of eachcase (%). The redline remarck the 50% (n = 928).

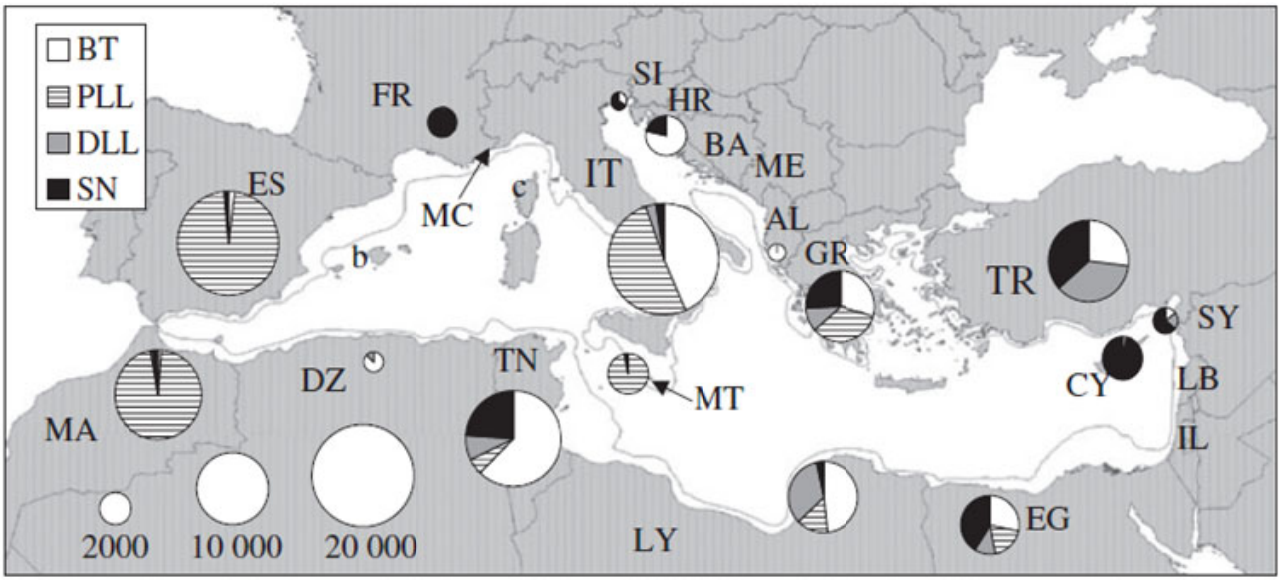

Fig. 5 Proportions of turtles captured annually in the Mediterranean by country, and fishing gear estimated from fishery statistics and catch rates. BT, bottom trawl; PLL, pelagic longline; DLL, demersal longline; SN, set net. Country codes according to the International Organization for Standardization (ISO). AL, Albania; DZ, Algeria; BA, Bosnia, and Herzegovina; HR, Croatia; CY, Cyprus; EG, Egypt; FR, France; GR, Greece; IL, Israel; IT, Italy; LB, Lebanon; LY, Libya; MT, Malta; MC, Monaco; ME, Montenegro; MA, Morocco; SI, Slovenia; ES, Spain; SY, Syria; TN, Tunisia; TR, Turkey. Islands: b Balearic; c Corsica. The 200-m bathymetry line is shown. No data available for BA, LB, MC and ME [4].

Health condition: Health condition was also shown to strongly influence the success of treatments (Table 2). The Fisher exact test proves that turtles in bad health conditions have a lower probability of survival ($P < 0.001$; $n = 967$), as expected.

Presence of an expert surgeon: The success of rehabilitation between the 5 periods identified was evaluated, and revealed a significant increase in success after 2006 (ANOVA = 4,953; d.f. = 4; $P = 0.016$; $n = 1011$) (Fig. 6, Table 3). The success rate continued to rise over the last 3 periods, when there was the presence of an experienced surgeon, thus suggesting that this factor is of great importance to rescued sea turtle survival (Fig. 7).

Table 2 Contingency Table: Results of treatment and health condition.

		Health condition			Total
		Good	Depresse	Comatose	
Results of treatment	Recovery	776	44	2	822
	Death	36	53	56	145
Total		812	97	58	967

Table 3 Logistic generalized linear model between periods, health condition, clinical case and CCL.

	Type III		
	Chi-square di Wald	df	Sig.
(Intercept)	.000	1	1.000
Period	9.971		.002
CCL	3.241		.072
Health condition	.000		1.000
Clinical case * Health condition	14.021		.946
Clinical case	1.073		1.000
Depend variable: Health condition Model: (Intercept), Period, CCL, Health condition, Clinical case*Health condition, Clinical case			

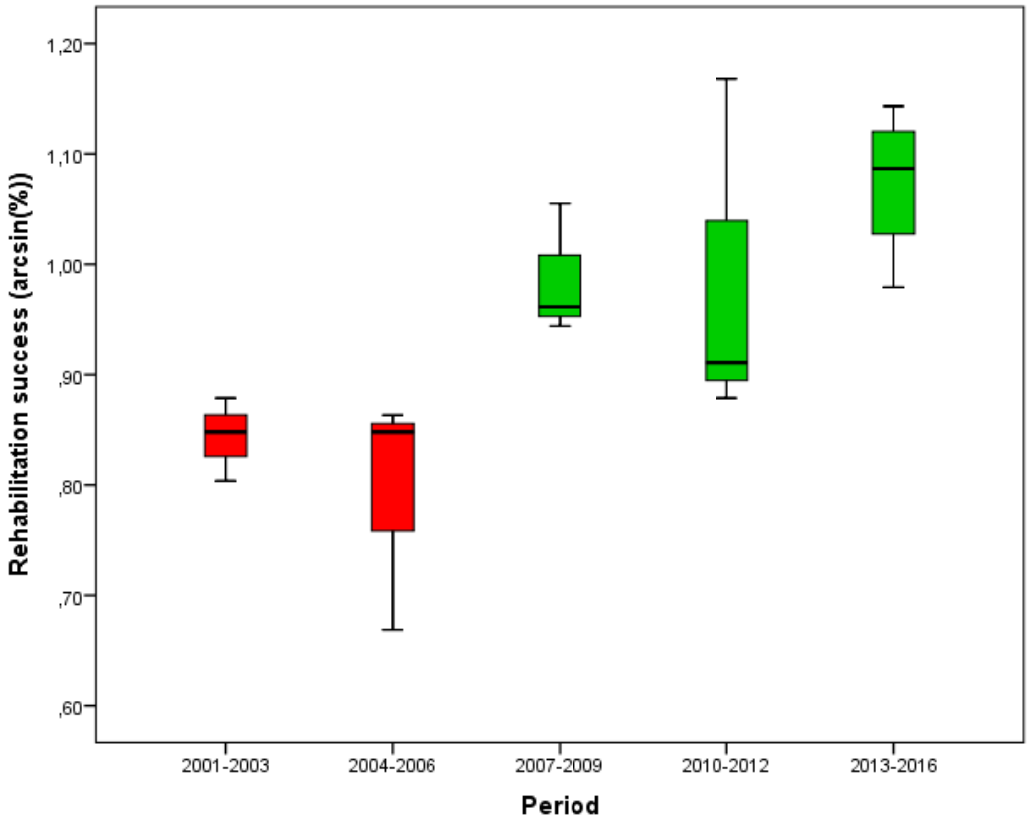

Fig. 6 Rehabilitation success during 5 subperiods (n = 1011).

Fig. 7 Specialist veterinarians giving treatment.

4. Conclusion

The present study represents a first attempt to combine rehabilitation success and rescue center's activity. The mortality rate induced by hooks and branchlines, suggests that turtles caught by drifting longlines had less possibility to survive [4, 6] instead of lesion or fracture. Infact, this study confirms that lines inside turtle's body determines high mortality compared to the presence of hooks and this is evident from Fig. 4. Moreover, health condition can have a great influece in the rehabilitation success, like we expected (Table 2). Finally, we noticed that the presence of an expert surgeon can definitively determine an increasing success on turtles rehabilitation, also beacause turtles have a complex anatomy and all surgical operations must required a lot of experience (Fig. 6, Table 3).

TAKE HOME MESSAGE: The status conservation of sea turtles is steadly decreasing during the last ten years, for this we have witnessed an increase in activities aimed at safeguarding and protection of these species. The role of rescue centers for sea turtles should be to rise public awarness, and therefore tourism, to the issues concerning the possible extinction of *Caretta* (Linnaeus, 1758) in particular.

Acknowledgement

I want to thank UNEP's RAC/SPA, the Bern Convention, IUCN AND the 6th Mediterranean Conference on Marine Turtles for give me the possibility to take part at the conference and for the travel grant opportunity. I want also to thank Daniela Freggi for instilled in me the love for sea turtles, Alberto Colombo for the beautiful pictures and for the friendship, Sofia Zanotti for giving me a different point of view about how to do a poster. Finally, I want to thank all my family because they never stop believe in me, and Alessio for the infinite Love between us.

References

[1] F. Bentivegna, P. Cirino and A. Toscano, Care and treatment of loggerhead sea turtles from the Gulf of Naples, Italy, *Marine Turtle Newslettel* (1993) (61) 6-7.

[2] Y. Kaska, B. Sahin, E. Baskale, F. Sari and S. Owczarczak, Sea turtle research and rehabilitation center (Dekamer), Dalyan, Mugla, Turkey, *Marine Turtle Newsletter* (2011) (131) 16-17.

[3] P. Casale, D. Freggi and M. Rocco, Mortality induced by drifting longline hooks and branchlines in loggerhead sea turtles, estimated through observation in captivity, *Aquatic Conservation: Marine Freshwater Ecosystem* 18 (2008) 945-954.

[4] P. Casale, Sea turtle by-catch in the Mediterranean, *Fish and Fisheries* 12 (2011) 299-316.

[5] P. Casale, D. Freggi, V. Paduano and M. Oliverio, Biases and best approaches for assessing debris ingestion in sea turtles, with a case study in the Mediterranean, *Marine Pollution Bulletin* (2016) 1-12.

[6] A. Di Bello, D. Freggi and C. Valastro, Surgical extraction and treatment of injuries caused by fishing hooks and lines in the digestive tract of sea turtles: case histories from 2005 to 2009, in: *Proceedings of 30° Annual Symposium on sea Turtles Biology and Conservation*, Goa (India), April 2010, pp. 27-29.