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Marine Science Group
Citizen Science Lab
www.marinesciencegroup.org

STE

SCUBA TOURISM FOR THE ENVIRONMENT

RED SEA BIODIVERSITY MONITORING PROGRAM

Annual Report 2016

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www.steproject.org

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ETA
Egyptian Tourist Authority
www.egypt.travel



**Ministry of the Environment
and Land and Sea protection
of Italian Republic**



www.settemari.it



**Ministry of Tourism of
the Arab Republic of
Egypt**

STE TOURIST AWARDS 2016

Sponsors that reward clubs and diving centers which completed more questionnaires in 2015 (see Appendix A).



www.edenviaggi.it



www.nicolaus.it



www.settemari.it

INTRODUCTION

Although coral reefs only spatially represent 0.2% of the marine environment, they are the most biodiverse ecosystems of the ocean and are estimated to harbour around one third of all described marine species. Moreover, coral reefs have a key role for human activities. Coral reefs provide critically important goods and services to over 500 million people worldwide, such as: recreational opportunities, thus supporting the industry of tourism which is the main economic source for many third-world countries; coastal protection and habitat/nursery functions for commercial and recreational fisheries; and welfare associated with the diverse natural ecosystems. Despite the provision of multiple valuable services, coral reefs are facing a number of direct anthropogenic threats. Environmental change is threatening the survivorship of coral reefs on a global scale. The consequences of coral reef degradation would not be related solely to the loss of the goods and services they provide, but would also result in the extinction of a major component of the Earth's total biodiversity. Broad conservation efforts and large-scale monitoring are needed for effective management to prevent biodiversity loss and the impacts of climate change, yet governmental agencies are often under-funded. In some cases, citizen science can overcome economic constraints on data collection, by using the skills of non-specialist volunteer researchers, collecting reliable data and, in addition, increasing the environmental awareness and public education.

The last two decades have seen a rapid increase in recreational diving activity that prompted researchers to involve recreational divers as volunteers, making use of their interest in marine diversity. Many works use formal methods of data collection, requiring intensive training and asking volunteers to perform surveys on specific sites according to strict protocols may ensure uniform data collection. This method can reduce project appeal, thus reducing the number of volunteers, and also it can affect the data accuracy. The project "SCUBA Tourism for the Environment" (STE) uses a survey protocol based on casual diver observations. This method allows divers to carry out normal recreational activities during their reef visits and ensure the reliability of collected data through standardized data collection.

RESEARCH OBJECTIVE

"STE - Scuba Tourism for the Environment" aims primarily to the obtainment of information on the Egyptian Red Sea marine biodiversity, by collaborating with volunteer dive tourists. In this way the research can provide to the local institutions with tools to implement conservation and preservation measures. At the same time it contributes to the development of ecotourism in the area, providing tourists with a discerning, active and useful way to increase their naturalistic awareness and the recreational value of their holidays.

This study is based on the cooperation between professional researchers and volunteer citizens. It represents the prosecution of researches originated by the excellent results and international credits obtained by "1999-2001: Mediterranean *Hippocampus* Mission" (S. Goffredo, C. Piccinetti, F. Zaccanti, *Conservation Biology* 18: 1492-1503, 2004) and successively developed with "2002-2005: Divers for the environment - Mediterranean Underwater Biodiversity Project" (S. Goffredo, F. Pensa, P. Neri, A. Orlandi, M. Scola Gagliardi, A. Velardi, C. Piccinetti, F. Zaccanti. *Ecological Applications*, 20: 2170-2187, 2010). Both

monitoring programs have been developed by the Marine Science Group (www.marinesciencegroup.org) in the Mediterranean Sea, and their results have been published in important international scientific journals.

MATERIALS AND METHODS

A special survey questionnaire has been designed. The questionnaire is the reference tool of the research. It contains three sections: the first part is about environmental education, the second is for the identification of surveyed organisms, the third is used for data recording. Surveyed organisms were selected according to the following main characteristics:

- ease of recognition by non-professionals;
- expected frequency: common in the whole Red Sea.

These characteristics should ensure that the investigation method is suited to the actual capabilities of the volunteers involved and that the state of the surveyed biodiversity is correlated to local stress factors. The presence of dead, bleached, broken, sediment covered corals and the presence of litter are recorded as negative environmental conditions. The number of divers present on the dive site and the number of contacts with the reef are recorded as diver behaviour features.

“STE – Scuba Tourism for the Environment ” is supported by the Egyptian Ministry of Tourism - ETA (Egyptian Tourism Authority), Settemari Tour Operator. The project is under the aegis of the Ministry of the Environment, Land and Sea Protection of Italian Republic.

The role of tour operators and diving agencies is fundamental for involving SCUBA tourists. Through a “pyramid system”, trained operators (tour leaders, divemasters and instructors) sensitize thousands of dive tourists with briefings and by assisting them with completing the questionnaires. Some students, who spend their thesis internship in the Marine Science Group, are present in loco. They support the resorts and diving centers’ staff in the activities of project diffusion. Tourists are also encouraged to participate during public events, where questionnaires and informative material are distributed.

Volunteer dive tourists are asked to complete the survey questionnaire soon after the end of their dive. Data are aggregated according to habitat type and “survey station” (diving site where at least ten questionnaires have been correctly completed, during the year) and are elaborated by the researchers of the Marine Science Group of the University of Bologna to obtain a marine biodiversity index. An agreement is also made with Neos Air to distribute the questionnaires inside inflight magazines. To sensitize and involve the highest number of tourist divers in the research, local, Italian, and international mass-media are contacted for public dissemination of project goals and methods (Table 1). Real-time updates on research progress and relevant initiatives are published on the project website (www.STEproject.org) and sent to volunteer tourists by email.

RESULTS AND DISCUSSION

During nine years of data collection (2007-2015) 34,871 survey questionnaires were completed, corresponding to 29,166 diving hours (Table 2). The most common depth range was between 0 and 20 m (93.7% of the survey stations had a mean survey depth within this range). The highest survey effort was in summer-autumn (78,8% of the survey stations had a mean survey date between June and November) and late morning (the mean survey time in 70,7% of the stations is between 10.00 and 14.00). This sampling distribution reflects the typical pattern of the usual touristic diving activity in Egypt. The first recreational diving licence allows a maximum depth of 18-20 metres. Divers prefer summer, when water temperature is higher, and the daytime, since night-dives requires particular devices and advanced training. An uneven distribution of the type of explored environment was also found (91,5% of the questionnaires concern the coral reef environment; Table 2). This unevenness is certainly due to the divers' preference for coral reefs, which are nicer to visit since they have more species compared with sandy beds and are accessible also to less experienced divers compared to other dive sites/environment, such as wrecks or blue-dives. The spatial comparison of the marine biodiversity index was made only for the coral reef environment, because sandy beds and the other environments have not reached a sufficient number of survey stations to allow a significant statistical elaboration. For the reef environment, a total of 125 survey stations were identified. The marine biodiversity index calculated in the survey stations was homogeneous among the nine years and seemed to show some pattern on the spatial scale (Fig. 3-5). Fifty stations (40%) had a "mediocre" marine biodiversity. Twenty-two stations (17,6%) differed positively from the mean value showing a "good" marine biodiversity. The fifty-three stations (42,4%) that differed negatively showed a "low" biodiversity (Figs. 3-4-5). Comparing the different zones of the Sharm el-Sheikh area, Tiran Island and Ras Mohammed reefs result better preserved than the coasts of the residential center ("Local Dives"). There were a greater number of scored "good" biodiversity stations near the Ras Mohammed National Park. The presence of the marine protected area has certainly a role in the detected patterns. The protection measures and the controls on recreational and commercial activities implemented by the Egyptian Government appear efficient. Examples of these measures are regulations on new buildings (to prevent sedimentation on coral reefs), and the installation of access points to the sea by piers (to prevent divers walking on the reef).

The conditions of the Local reefs are relatively good compared to Hurgada area, where the survey stations on coral reefs are damaging because of the anthropogenic use. A possible explanation could be that Local reefs are located between Ras Mohammed and Tiran Island, which may act as biodiversity reservoirs, providing a larval flow on local reefs. In Marsa Alam several resorts were built close to the coast but the environmental conditions are good. This situation could be explained by the fact that tourist activities in the area began only few years ago.

CONCLUSION

This recreational monitoring method assure a significant amount of data with an acceptable level of reliability because: (1) volunteers are trained and assisted during data collection in the field by dive guides and instructors who had previously been trained by professional researchers; (2) the method is suitable for amateurs, i.e., user-friendly questionnaire and taxa that are easily recognizable by recreational divers; (3)

the tasks selected for volunteers during project planning are appropriate, since volunteer skills and abilities vary, and we only want volunteers to collect data for which they could be trained quickly and reliably. This project confirms that “recreational” and “easy and fun” citizen science is an efficient and effective method to recruit a large number of volunteers and can be reliable if well designed.

“STE – Scuba Tourism for the Environment” project describe the status of biodiversity of the Egyptian coral reefs and its spatial variations, providing important indications to the local authorities on the current health status of the Egyptian coastlines and on the effectiveness of the environmental management. Each year the project results are presented to the Egyptian Tourism Minister and his staff, with the aim of integrating the projects finding in future environmental management actions and contribute to the development of wide conservation plans. For instance, the encouraging findings for the Sharm el-Sheikh area are an example of effective management in that area, which may serve as a model to establish new marine protected areas in other Egyptian regions.

This project presents a successful case study of collaboration among researchers, local authorities and the public, showing that with appropriate recruitment and training, volunteer-collected data are qualitatively equivalent to those collected by professional researchers and useful for resource management. This work fortifies the effectiveness of citizen science projects as fundamental tools to provide robust, objective and repeatable data for large-scale and long term monitoring, which can be used to inform marine management. This method could be applied in different countries by local governments and marine managers to achieve large-scale and long-term conservation and management actions, required in a fast-changing world where climate change and anthropogenic uses of natural resources are determining fast environmental changes worldwide.

ACKNOWLEDGEMENTS

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Villaggio Settemari Club Resort (Marsa Alam – Egypt; www.settemari.it)

Holiday Service Diving Center (Sharm el-Sheikh – Egypt; www.holidaydiving.org)

► TIP: Are you a diving center/resort interested in hosting students at your resort in for STE project? Write to students@steproject.org

Table 1. Public dissemination. Number of contacts (readers, audience) produced by the Public Relations Office of the Marine Science Group (www.marinesciencegroup.org).

Total 2006-2015		Total readers	74.485.790
		Total audience	24.647.550
		TOTAL CONTACTS	99.133.340
	PRESS & WEB		
2015			
Date	Name		Readers
27 November	lsw.n.it		
10 June	TURISMOITALIANEWS.it		
	Total 2015		
2014			
Date	Name		Readers
December	ATMOSPHERE		400.000
22 May	Turismo italia news		\
2 April	Corriere.it		1.035.081
4 February	ANSA.IT		689.519
23 January	Turismo italia news		\
2 January	Il Resto del Carlino - BOLOGNA		441.000
	Total 2014		2.565.600
2013			
Date	Name		Readers
9 July	Il Resto del Carlino - BOLOGNA		418.000
21 June	Corriere della Sera.it		1.020.190
	Total 2013		1.438.190
2012			
Date	Name		Readers
21 October	Il Corriere di Bologna		94.000
5 June	Il Resto del Carlino		1.314.000
	Total 2012		1.408.000
2011			
Date	Name		Readers
17 July	Il Resto del Carlino		1.296.000
17 July	Corriere Adriatico		318.000
17 July	La Gazzetta del Mezzogiorno		745.000
9 July	Milano Finanza		308.000
July	Atmosphere		588.500
13 May	Il Venerdì di Repubblica		2.291.000
8 March	Il Sole 24 Ore		1.015.000
12 February	L'Unione Sarda		461.000
4 February	La Repubblica		3.250.000
January	Natura		25.000
	Total 2011		10.297.500

Table 1 continued

2010		
Date	Name	Readers
7 December	Il Resto del Carlino	\
9 September	Sette - Corriere della Sera	3.056.000
9 August	Il Corriere dell'Umbria	380.000
10 June	Metro	1.776.000
10 June	City	1.698.000
10 June	Leggo	1.780.000
18 May	City	2.036.000
17 May	La Stampa	1.693.000
17 May	Il Giornale	767.000
17 May	Il Resto del Carlino	\
17 May	Libertà	164.000
16 May	L'Unità	359.000
May	Natura	25.000
19 March	Trend	24.000
24 January	Il Resto del Carlino	1.330.000
24 January	La Nazione	865.000
	Total 2010	15.953.000
2009		
Date	Name	Readers
22 December	La Repubblica	3.069.000
Settembre	Corriere della Sera	2.871.000
September	Mete	105.000
September	Dove	388.000
8 August	Il Sole 24 Ore	1.122.000
31 July	Il Venerdì di Repubblica	2.252.000
6 June	Il Bologna	90.000
6 June	Mondo Sommerso	\
June	Subaqua	60.000
June	Ambiente Europa	90.000
1 May	Trend	24.000
May	Mondo Sommerso	144.000
14 April	Leggo	81.000
	Total 2009	10.296.000
2008		
Date	Name	Readers
September	Tuttoturismo	\
August	Mondo Sommerso	\
July	Ambiente Europa	90.000
20 July	Corriere della Sera	2.615.000
17 July	Panorama	2.829.000
09 July	Oggi	3.209.000
19 June	Leggo	90.000

Table 1 continued

19 June	Il Resto del Carlino	1.197.000
18 June	La Repubblica	\
10 June	MF/Milano Finanza	383.000
7 June	Gioia	545.000
30 May	Italia Oggi	188.000
15 May	Neos In-Flight Magazine	400.000
2 May	Trend	24.000
23 April	L'Espresso	2.287.000
23 April	La Repubblica	2.944.000
23 April	La Stampa	1.378.000
23 April	AGI	250.000
March	Tuttoturismo	\
March	Mondo Sommerso	144.000
January	Tuttoturismo	236.000
	Total 2008	18.809.000
2007		
Date	Name	Readers
September	SubAqua	60.000
August	Tuttoturismo	\
June	Parchi e Riserve	36.000
22 June	Il Resto del Carlino	1.180.000
19 June	Il Resto del Carlino	1.168.000
May	Neos in-flight magazine	400.000
22 February	Il Giornale del Turismo	31.500
February	Tuttoturismo	233.000
12 January	MF/Milano Finanza	456.000
January	Speciale Qui Touring	\
January	Qui Touring	626.000
January	Mondo Sommerso	144.000
	Total 2007	4.334.500
2006		
Date	Name	Readers
29 December	Il Resto del Carlino - La Nazione - Il Giorno	\
December	Sub	\
November	Studenti Magazine	90.000
11 October	L'Agenzia di Viaggi	30.000
September	Mythos	90.000
September	Mix	27.000
September	Il Subacqueo	111.000
September	Sub	\
9 August	Il Resto del Carlino - La Nazione - Il Giorno	2.379.000
5 August	La Repubblica - Bologna	390.000
4 August	Leggo	150.000
July	Deep	6.000

Table 1 continued

July	Tempo Libero	30.000
29 July	Il Venerdì di Repubblica	2.713.000
June	Sub	75.000
May	Quark	695.000
April	TuttoTurismo	219.000
April	Quark	800.000
2 March	Il Resto del Carlino	1.579.000
	Total 2006	9.384.000
	RADIO & TELEVISION	
2015		
Date	Name	Audience
9 October	RAI 3 - Buongiorno Regione Emilia Romagna	722.000
1 August	Radio 24	1.962.000
30 July	RAI 3 - TGR Emilia Romagna	1.110.000
19 Aprile	Radio Itaila	4.527.000
	Total 2015	8.321.000
2012		
Date	Name	Audience
6 August	InsidER	
	Total 2012	
2010		
Date	Name	Audience
21 August	Radio 24 - Moebius, con Federico Pedrocchi	2.371.000
	h 20.00	
28 July	Radio Studio Più - La Carovana On the road h 20.00	222.000
23 July	RadioStudioPiù	
14 July	RTL 102.5 - Protagonisti, con Francesca Cheyenne e Roberto Uggeri	5.533.000
	h 19.00	
13 April	Radio Televisione Svizzera in lingua Italiana - Lo sciamano in bicicletta - Rete Uno h 09.30	300.000
28 January	Rai tre - Tg3 h 14.00	1.227.775
26 January	Rai tre - TGR Leonardo h 14.50	1.227.775
	Total 2010	10.881.550
2009		
Date	Name	Audience
16 July	Radio Montecarlo - Anteprima News, condotto da Maurizio di Maggio h 20.26	1.653.000
	Total 2009	1.653.000
2008		
Date	Name	Audience
22 July	Radio Televisione Svizzera in lingua Italiana - Lo sciamano in bicicletta - Rete Uno h 15.55	300.000
23 April	Radio Capital h 15.55	1.671.000
	Total 2008	1.971.000

Table 1 continued

2007		
Date	Name	Audience
18 February	RadioRai - Radio2 Strada facendo h 18.20	1.032.000
Total 2007		1.032.000
2006		
Date	Name	Audience
8 January	Rete 4 - Pianeta Mare h 11.00 (replica)	789.000
Total 2006		789.000

Table 2. Distribution of the survey effort performed by the volunteer dive tourists in the nine years of research.

Year	Total recorded questionnaires	Coral reef questionnaires	Sandy bottom questionnaires	Other environment questionnaires
2007	3249	2976	129	144
2008	4870	4656	109	105
2009	4120	3031	928	161
2010	5671	5137	358	176
2011	5539	5279	146	114
2012	3746	3343	299	104
2013	2381	2308	40	33
2014	2659	2585	15	59
2015	2636	2530	12	36
Total	34871	31903	2036	932

Geographical distribution of recorded questionnaires

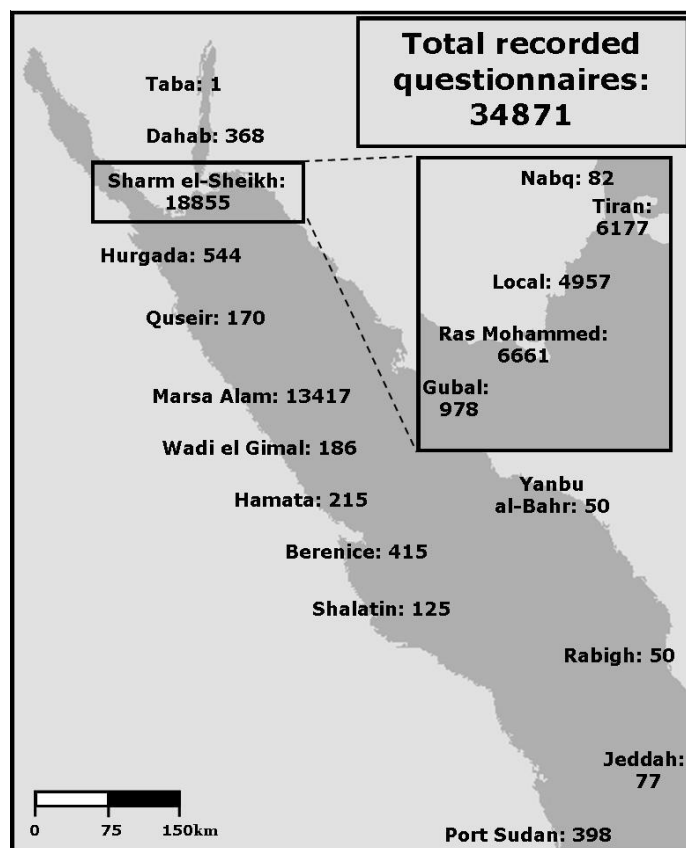


Figure 1. Geographical distribution of the surveys recorded over the research period (2007 – 2014). Sharm el-Sheikh area was divided into 5 zones: Gubal, Ras Mohammed, Local, Tiran and Nabq.

Marine Biodiversity

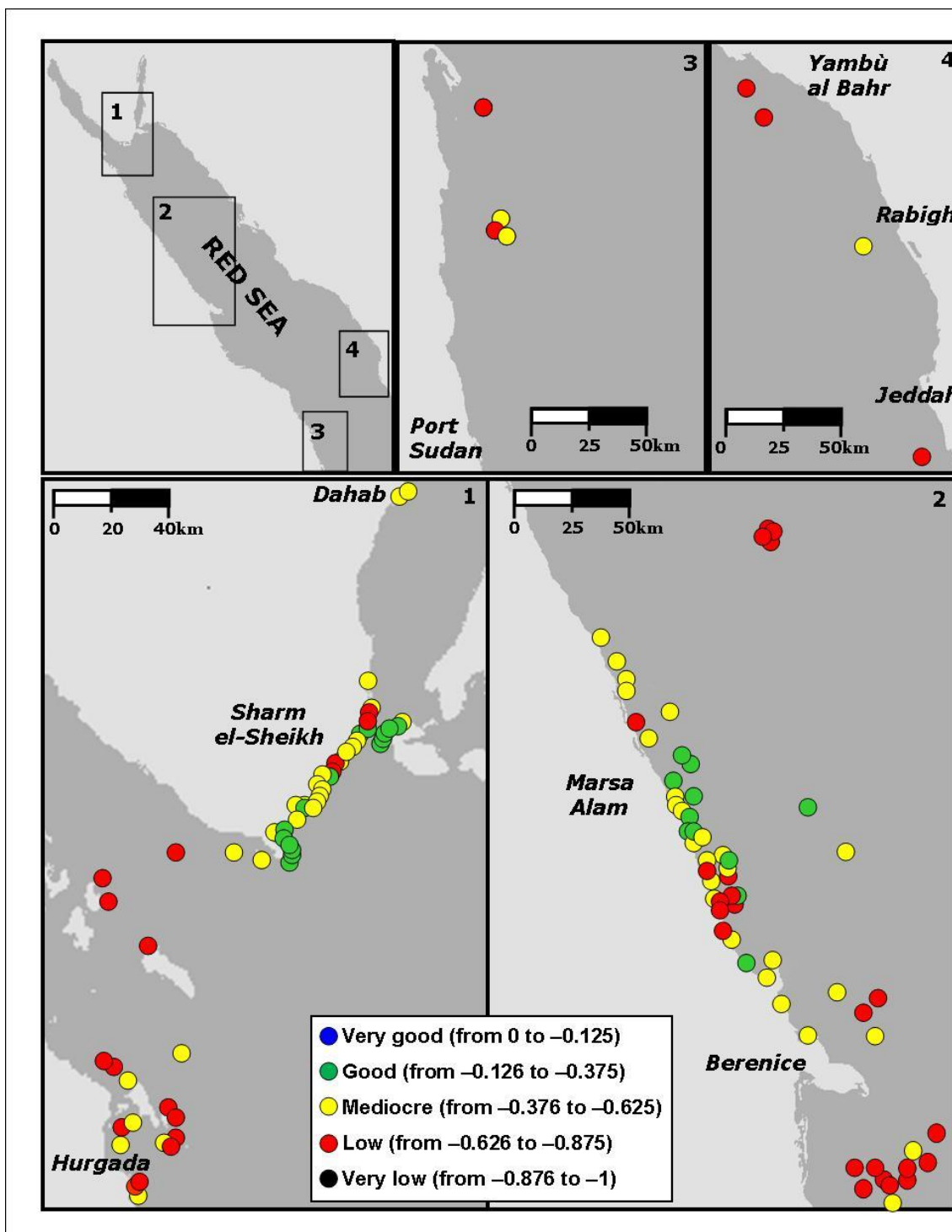


Figure 2. Marine Biodiversity Index in survey stations on coral reefs over the period 2007 - 2015.

Marine Biodiversity: Sharm el-Sheikh

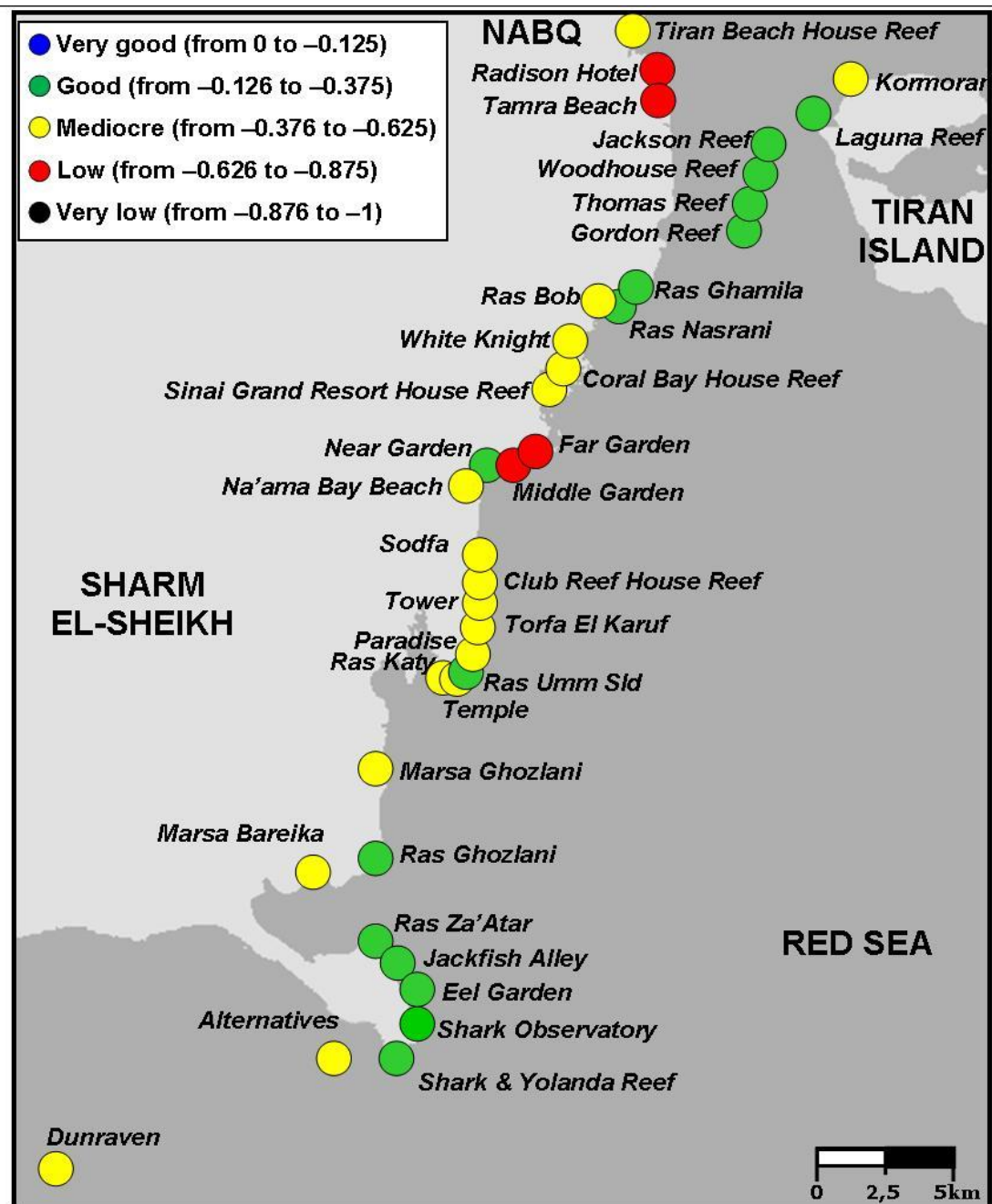


Figure 3. Marine Biodiversity Index in survey stations on coral reefs of Sharm el-Sheikh area over the period 2007-2015.

Marine Biodiversity: Hurgada

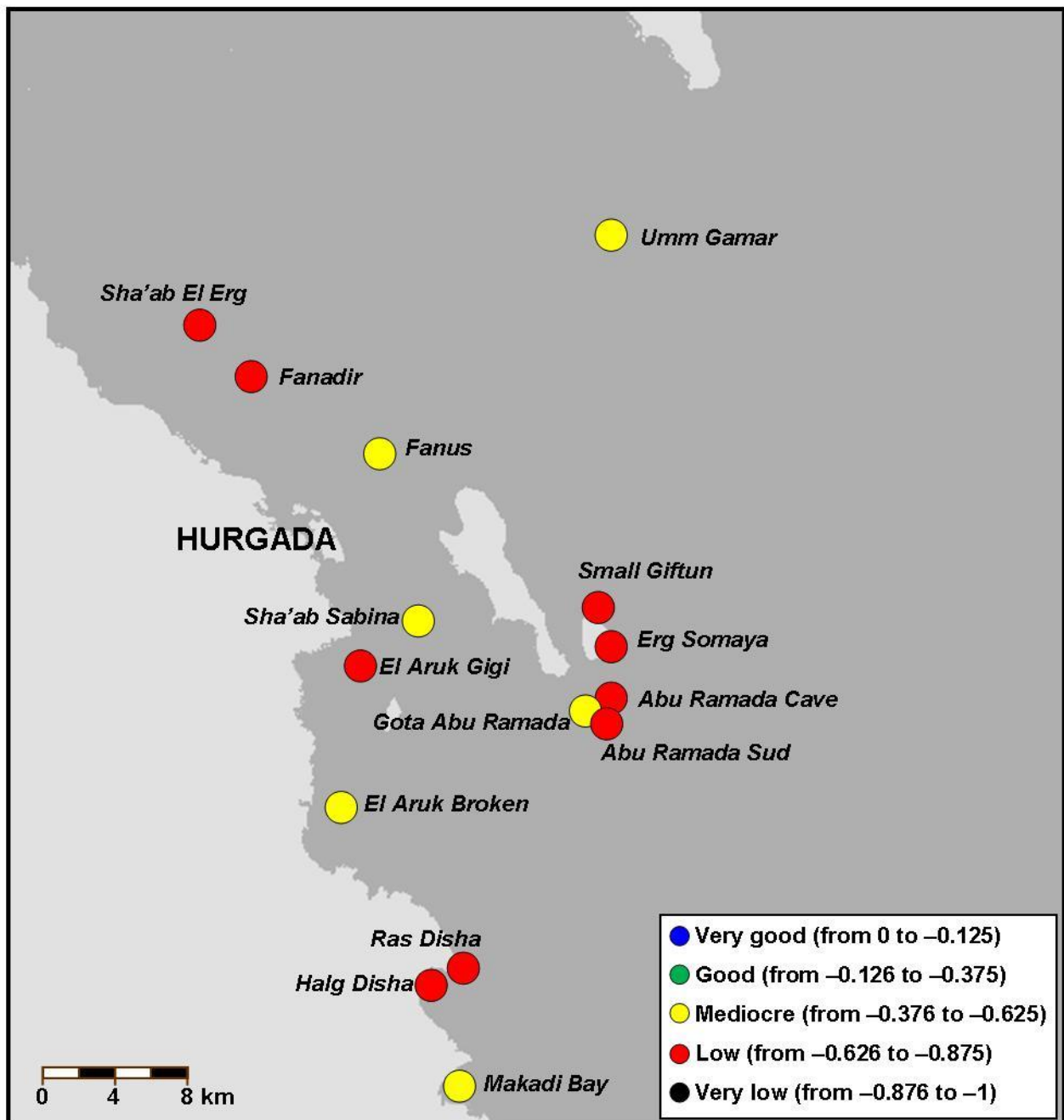


Figure 4. Marine Biodiversity Index in survey stations on coral reefs of Hurgada area over the period 2007-2015.

Marine Biodiversity: Marsa Alam

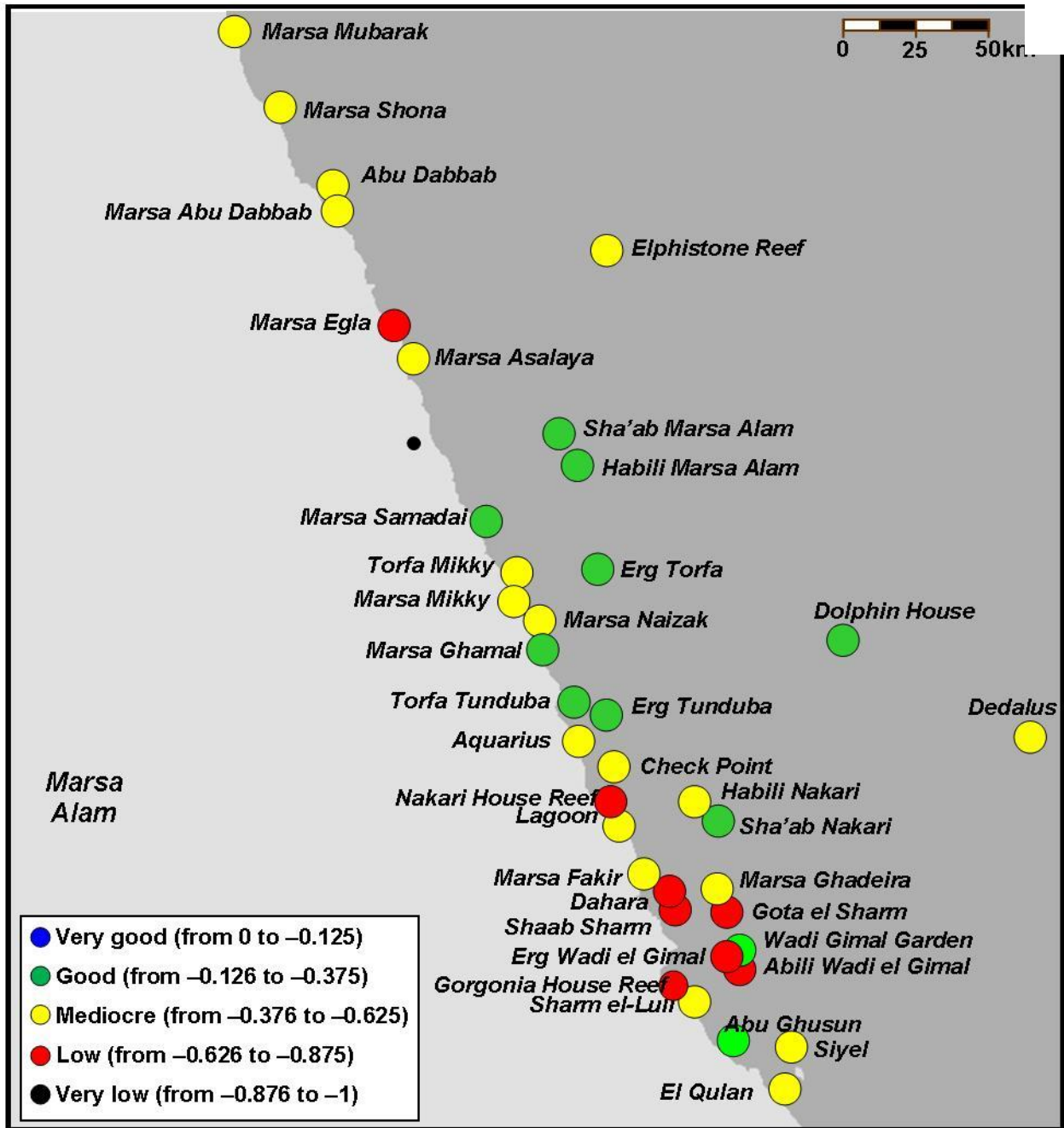


Figure 5. Marine Biodiversity Index in survey stations on coral reefs of Marsa Alam area over the period 2007-2015.

Appendix A: 2015 ranking

Table A1. Ranking of the diving agencies based on the number of recorded questionnaires.

n.s. = not specified

Diving Agencies	Web	Recorder questionnaires	%
SNSI	www.scubasnsi.com	254	9.8
PADI	www.padi.com	138	5.4
CMAS	www.cmas.org	35	1.4
PSS	www.pssworldwide.org	27	1.0
Other		47	1.8
n.s.		2077	80.6
Total		2578	100.0

Table A2. Ranking of clubs, diving centers and resorts according to the number of recorded questionnaires. The centres that completed the greatest number of questionnaires in 2015 will be rewarded by Settemari (www.settemari.it). n.s. = not specified

Diving Center– Club	Town	Web	Recorder questionnaires	%
Grand Blue Diving Center – Settemari	Marsa Alam (EG)	www.granblue.net	840	32.6
TGI Marsa Alam	Marsa Alam (EG)	www.tgidiving.com	408	15.8
SDS	Bologna (IT)	www.sdseducational.org	290	11.3
Effetto Martini	Bologna (IT)	www.scuolasubeffettomartini.it	27	1.0
Red Sea Yatching and Diving		www.redsea-direct.com	10	0.4
Other			7	0.3
n.s.			996	38.6
Total			2578	100.0

Appendix B: total ranking (over all years 2007-2015)

Table B1. Ranking of the diving agencies based on the number of recorded questionnaires according to the number of recorded questionnaires over the period 2007 - 2014.

n.s. = not specified

Diving Agencies	Web	Recorder questionnaires	%
SNSI	www.scubasnsi.com	5953	17.1
PADI	www.padi.com	4729	13.5
SSI	www.cmas.org	2259	6.5
CMAS	www.cmas.org	1635	4.7
FIPSAS-CMAS (FIPSAS)	www.portale.fipsas.it	743	2.1
PSS	www.pssworldwide.org	520	1.5
Other		1070	3.1
n.s.		17962	51.5
Total		34871	100.0

Table B2. Ranking of clubs, diving centers and resorts according to the number of recorded questionnaires over the period 2007 - 2015. n.s. = not specified

Diving Center-Club	Town	Web	Recorder questionnaires	%
Holiday Service Diving Center	Sharm el-Sheikh (EG)	www.holidaydiving.org	9130	26.2
Grand Blue Diving Center-Settemari	Marsa Alam (EG)	www.granblue.net	8072	23.2
Viaggio nel Blu Diving Center	Sharm el-Sheikh (EG)	www.viaggionelblu.org	3003	8.6
Deep Vibration	Sharm el-Sheikh (EG)	www.deepvibration.com	1759	5.0
Scientific Diving School	Bologna (IT)	www.sdseducational.org	1159	3.3
Delfino Bianco	Oriago di Mira - VE (IT)	www.delfinobianco.it	796	2.3
Diving & Discovery	Sharm el-Sheikh (EG)	www.divingdiscovery.it	739	2.1
Others			6343	18.2
n.s.			3870	11.1
Total			34871	100.0

