

Supplementary Material

Reliability of data collected by volunteers: a nine-year citizen science study in the Red Sea

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HOW YOU CAN HELP TO DEFEND CORAL REEFS

THE DIVE

Buoyancy

- Keep checking your buoyancy. Much damage is done to the coral reefs when divers go down too fast and "crash" into the reef. The right amount of weight and good buoyancy control are essential to safe diving and environmental protection. To find out more, take a course on neutral buoyancy diving techniques.

While swimming

- Always maintain a distance of at least 2 meters from the sea bottom and sea walls.
- Maintain a gentle movement with your fins: the more fragile marine organisms may be damaged even without direct contact; sometimes stirring up the water around them is enough to harm them.
- When swimming on sandy bottoms, be careful not to stir up the sand – this could suffocate organisms.

What to, and what not to, hold on to

- Do not hold on to live corals. If you are swimming against the current and are having a hard time moving forward, grab on massive dead corals only: they are easy to recognize, they are colorless and look like rocks (if you are not sure, ask your dive master to point them out to you).

Meeting up with corals and other life forms

- Never touch corals: some may look tough but they are really very fragile and pieces break off easily even if you just touch them lightly, you could even damage the delicate polyps.
- Do not collect corals, shells, or anything else: chances are you'll throw them away before leaving for home because they start to smell once they're out of the water and if you should decide to take something home with you, you may get stopped at customs and have to pay a heavy fine – it is illegal to take anything collected from the reef or sea out of the country.
- Do not feed the fish: you can get close enough to take pictures but please do not give them anything to eat as this changes their behaviour and upsets the natural balance in the food chain.

At the end of the dive

- Once you are back on the surface and you are sure your boat has seen you, move away from the reef to avoid damaging the coral and so you can get back on to the boat more easily and safely.

ALWAYS

- Remember to take your garbage with you: trash is harmful to life. Many marine animals take plastic bags for prey and die from suffocation after they've swallowed them. If possible, collect trash you see during the dive and throw it away when you get to the surface.

BEHAVE RESPECTFULLY: OUR OCEANS' DWELLERS WILL THANK YOU FOR IT

Equipment

- Never dive alone and never push yourself beyond safety limits: prepare all your diving equipment and go through the safety checklist with your diving partner before the diving.

BEFORE DIVING

Boats

- Ask your tour operator, diving school, tour leader, and/or dive master which is the best boat available and rent that one: avoid boats that pollute the waters because they have engines that leak oil, diesel, or gasoline; remember that the cheapest package deal does not usually correspond to safety for you or for the environment.

BEFORE LEAVING HOME

- Choose tour operators and diving schools that honor the environment and that teach respect and safety for human life and nature: refer to associations and agencies that vouch for their affiliated members (www.astoi.com, www.projectaware.org, www.snsi.it, www.ssi-italy.org, www.underwaterlifeproject.it, www.msgassociation.net).

The Weather

- Find out about the local weather conditions, currents and underwater visibility where you are planning your dive: for your own safety, seek advice from local certified diving instructors.
- Do not go out to sea until you have become acquainted with the safety precautions specifically related to where you are planning to dive.

Land Access

- If your dive starts on land, it is best to enter the water from a platform or gangway: the better hotels and diving centers provide these platforms so that tourists and divers do not step on and harm the coral reefs.
- Support this and do not enter the water directly from the shore trampling on corals but use gangways.

DO NOT FEED THE ANIMALS

DO NOT CAST ANCHORS

DO NOT COLLECT CORALS OR SHELLS AND DO NOT BUY THEM AS SOUVENIRS

BE CAREFUL WHEN YOU TAKE PICTURES: DO NOT LIE DOWN ON THE SEA FLOOR

TAKE YOUR TRASH WITH YOU

LOOK FOR QUALIFIED TOUR OPERATORS ONLY: READ UP ON THE CULTURE AND ECOLOGY OF THE PLACE YOU PLAN TO VISIT

USE GANGWAYS WHEN ENTERING THE WATER FROM LAND

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Supplementary Figure 1. Section one of the STE project questionnaire with some suggestions for volunteers to reduce human impact on the environment and to promote a more sustainable behaviour increasing volunteer awareness.



Supplementary Figure 2. Section two of the project questionnaire with photos to be used by non-professional volunteers in taxa identification.

Please, send this questionnaire to: STE project, Marine Science Group - Department of Evolutionary and Experimental Biology, University of Bologna, Via F. Selmi 3, I-40126 Bologna Italy
www.STEproject.org

Surname	Name
Complete address	
E-mail	Dive Certification (level and training organization)
Dive site	Nearest town
Diving Center	
Dive date	Maximum depth (m)
Depth where yuo spent most of your dive (m)	Water temperature (°C)
Actual bottom time (minutes)	Dive starting time (0-24)

Environment where yuo spent most of your dive (choose one) ☐ coral reef ☐ sandy bottom ☐ other _____

Please select the organisms you have seen in the checklist below estimating the frequency of their occurrence. Your instructor can help you!

	RARE	FREQUENT	VERY FREQUENT
SPONGES			
1 - tube sponge (<i>Siphonochalina</i> sp., Demospongiae)	<input type="checkbox"/> 1-2	<input type="checkbox"/> 3-10	<input type="checkbox"/> more than 10
Other sponges	<input type="checkbox"/> 1-2	<input type="checkbox"/> 3-10	<input type="checkbox"/> more than 10
COELENTERATES, CORALS			
2 - fire coral (<i>Atillepora</i> sp., Milleporina, Hydrozoa)	<input type="checkbox"/> 1-10	<input type="checkbox"/> 11-100	<input type="checkbox"/> more than 100
3 - leather coral (<i>Sarcophyton</i> sp., Alcyonacea, Anthozoa)	<input type="checkbox"/> 1-5	<input type="checkbox"/> 6-15	<input type="checkbox"/> more than 15
4 - soft tree coral (<i>Dendronephthya</i> sp., Alcyonacea, Anthozoa)	<input type="checkbox"/> 1-10	<input type="checkbox"/> 11-100	<input type="checkbox"/> more than 100
5 - sea fan (<i>Subergorgia hicksoni</i> , Gorgonacea, Anthozoa)	<input type="checkbox"/> 1-3	<input type="checkbox"/> 4-10	<input type="checkbox"/> more than 10
6 - red sea fans (<i>Melithaeidae</i> , Gorgonacea, Anthozoa)	<input type="checkbox"/> 1-5	<input type="checkbox"/> 6-15	<input type="checkbox"/> more than 15
7 - sea whips (<i>Ellisellidae</i> , Gorgonacea, Anthozoa)	<input type="checkbox"/> 1-2	<input type="checkbox"/> 3-6	<input type="checkbox"/> more than 6
8 - sea carpet host anemones (<i>Stichodactylidae</i> , Actiniaria, Anthozoa)	<input type="checkbox"/> 1-3	<input type="checkbox"/> 4-10	<input type="checkbox"/> more than 10
9 - plating acropora (<i>Acropora</i> sp., Scleractinia, Anthozoa)	<input type="checkbox"/> 1-2	<input type="checkbox"/> 3-6	<input type="checkbox"/> more than 6
10 - porcupine coral (<i>Sceriatopora hystrix</i> , Scleractinia, Anthozoa)	<input type="checkbox"/> 1-5	<input type="checkbox"/> 6-15	<input type="checkbox"/> more than 15
11 - bubble coral (<i>Pterogyra</i> sp., Scleractinia, Anthozoa)	<input type="checkbox"/> 1-5	<input type="checkbox"/> 6-15	<input type="checkbox"/> more than 15
12 - mushroom corals (<i>Fungiidae</i> , Scleractinia, Anthozoa)	<input type="checkbox"/> 1-5	<input type="checkbox"/> 6-15	<input type="checkbox"/> more than 15
13 - lettuce coral (<i>Turbinaria</i> sp., Scleractinia, Anthozoa)	<input type="checkbox"/> 1-5	<input type="checkbox"/> 6-15	<input type="checkbox"/> more than 15
14 - pineapple corals (<i>Favidae</i> , Scleractinia, Anthozoa)	<input type="checkbox"/> 1-2	<input type="checkbox"/> 3-6	<input type="checkbox"/> more than 6
15 - black coral (<i>Antipathes</i> sp., Antipatharia, Anthozoa)	<input type="checkbox"/> 1-2	<input type="checkbox"/> 3-6	<input type="checkbox"/> more than 6
Other corals	<input type="checkbox"/> 1-5	<input type="checkbox"/> 6-25	<input type="checkbox"/> more than 25
ANNELIDA, SEDENTARY WORMS			
16 - Christmas tree worm (<i>Spirobranchus</i> sp., Polychaeta)	<input type="checkbox"/> 1-5	<input type="checkbox"/> 6-15	<input type="checkbox"/> more than 15
Other sedentary worms	<input type="checkbox"/> 1-5	<input type="checkbox"/> 6-15	<input type="checkbox"/> more than 15
MOLLUSCS, GASTROPODS (SEA SLUGS)			
17 - cowries (<i>Cypraeidae</i> , Prosobranchia)	<input type="checkbox"/> 1	<input type="checkbox"/> 2-3	<input type="checkbox"/> more than 3
18 - spanish dancer (<i>Hexabranchus sanguineus</i> , Opisthobranchia)	<input type="checkbox"/> 1	<input type="checkbox"/> 2-3	<input type="checkbox"/> more than 3
19 - coriacea (<i>Chromodoris quadricolor</i> , Opisthobranchia)	<input type="checkbox"/> 1-2	<input type="checkbox"/> 3-4	<input type="checkbox"/> more than 4
Other sea slugs	<input type="checkbox"/> 1	<input type="checkbox"/> 2-3	<input type="checkbox"/> more than 3
MOLLUSCS, BIVALVES			
20 - tridacnae (<i>Tridacna</i> sp.)	<input type="checkbox"/> 1-2	<input type="checkbox"/> 3-6	<input type="checkbox"/> more than 6
21 - wing oyster (<i>Pteria</i> sp.)	<input type="checkbox"/> 1-5	<input type="checkbox"/> 6-15	<input type="checkbox"/> more than 15
Other bivalves	<input type="checkbox"/> 1-4	<input type="checkbox"/> 5-10	<input type="checkbox"/> more than 10
MOLLUSCS, CEPHALOPODS			
22 - squids (<i>Sepidae</i>)	<input type="checkbox"/> 1-2	<input type="checkbox"/> 3-4	<input type="checkbox"/> more than 4
23 - bigfin reef squid (<i>Sepioteuthis</i> sp.)	<input type="checkbox"/> 1	<input type="checkbox"/> 2-3	<input type="checkbox"/> more than 3
Other cephalopods	<input type="checkbox"/> 1-2	<input type="checkbox"/> 3-4	<input type="checkbox"/> more than 4
ARTHROPODS, CRUSTACEANS, DECAPODS			
24 - banded boxer shrimp (<i>Stenopus hispidus</i>)	<input type="checkbox"/> 1	<input type="checkbox"/> 2-3	<input type="checkbox"/> more than 3
25 - hermit crabs (<i>Diogenidae</i>)	<input type="checkbox"/> 1	<input type="checkbox"/> 2-3	<input type="checkbox"/> more than 3
Other decapods	<input type="checkbox"/> 1	<input type="checkbox"/> 2-3	<input type="checkbox"/> more than 3

	RARE	FREQUENT	VERY FREQUENT
ECHINODERMS, CRINOIDS (SEA LILIES)			
26 - sea lilies (Crinoidea)	<input type="checkbox"/> 1-5	<input type="checkbox"/> 6-15	<input type="checkbox"/> more than 15
ECHINODERMS, HOLOTHURIANS (SEA CUCUMBERS)			
27 - sea cucumbers (Holothuroidea)	<input type="checkbox"/> 1-2	<input type="checkbox"/> 3-10	<input type="checkbox"/> more than 10
ECHINODERMS, ASTEROIDS (STARFISHES)			
28 - pearl red star (<i>Fromia</i> sp.)	<input type="checkbox"/> 1	<input type="checkbox"/> 2-3	<input type="checkbox"/> more than 3
29 - spiny starfish (<i>Acanthaster planci</i>)	<input type="checkbox"/> 1-2	<input type="checkbox"/> 3-6	<input type="checkbox"/> more than 6
Other starfishes	<input type="checkbox"/> 1-2	<input type="checkbox"/> 3-5	<input type="checkbox"/> more than 5
ECHINODERMS, ECHINOIDS (SEA URCHINS)			
30 - fire urchin (<i>Asthenosoma</i> sp.)	<input type="checkbox"/> 1-2	<input type="checkbox"/> 3-4	<input type="checkbox"/> more than 4
31 - pencil urchin (<i>Phyllocanthus</i> sp.)	<input type="checkbox"/> 1-3	<input type="checkbox"/> 4-10	<input type="checkbox"/> more than 10
Other sea urchins	<input type="checkbox"/> 1-3	<input type="checkbox"/> 4-7	<input type="checkbox"/> more than 7
VERTEBRATES, BONY FISHES			
32 - giant moray (<i>Gymnathorax javanicus</i> , Anguilliformes)	<input type="checkbox"/> 1	<input type="checkbox"/> 2-3	<input type="checkbox"/> more than 3
33 - needlefishes (<i>Syngnathidae</i> , Syngnathiformes)	<input type="checkbox"/> 1-2	<input type="checkbox"/> 3-4	<input type="checkbox"/> more than 4
34 - squirrelfish (<i>Sargocentron</i> sp., Beryciformes)	<input type="checkbox"/> 1-5	<input type="checkbox"/> 6-15	<input type="checkbox"/> more than 15
35 - groupers (<i>Epinephelinae</i> , Perciformes)	<input type="checkbox"/> 1-5	<input type="checkbox"/> 6-15	<input type="checkbox"/> more than 15
36 - blackspotted rubberlip (<i>Plectorhynchus gaterinus</i> , Perciformes)	<input type="checkbox"/> 1-3	<input type="checkbox"/> 4-10	<input type="checkbox"/> more than 10
37 - humpback batfish (<i>Platax</i> sp., Perciformes)	<input type="checkbox"/> 1-10	<input type="checkbox"/> 11-100	<input type="checkbox"/> more than 100
38 - red bass (<i>Lutjanus bohar</i> , Perciformes)	<input type="checkbox"/> 1-10	<input type="checkbox"/> 11-100	<input type="checkbox"/> more than 100
39 - glassfishes (<i>Pempheridae</i> , Perciformes)	<input type="checkbox"/> 1-100	<input type="checkbox"/> 101-1000	<input type="checkbox"/> more than 1000
40 - goatfishes (<i>Mullidae</i> , Perciformes)	<input type="checkbox"/> 1-10	<input type="checkbox"/> 11-100	<input type="checkbox"/> more than 100
41 - map angel (<i>Pomacanthus maculosus</i> , Perciformes)	<input type="checkbox"/> 1	<input type="checkbox"/> 2-3	<input type="checkbox"/> more than 3
42 - butterflyfishes (<i>Chaetodontidae</i> , Perciformes)	<input type="checkbox"/> 1-5	<input type="checkbox"/> 6-15	<input type="checkbox"/> more than 15
43 - longnose hawkfish (<i>Oxyurichthys typus</i> , Perciformes)	<input type="checkbox"/> 1	<input type="checkbox"/> 2-3	<input type="checkbox"/> more than 3
44 - Red Sea clownfish (<i>Amphiprion bicinctus</i> , Perciformes)	<input type="checkbox"/> 1-3	<input type="checkbox"/> 4-15	<input type="checkbox"/> more than 15
45 - humphead wrasse - Napoleon fish (<i>Cheilinus undulatus</i> , Perciformes)	<input type="checkbox"/> 1	<input type="checkbox"/> 2-3	<input type="checkbox"/> more than 3
46 - parrotfishes (<i>Scaridae</i> , Perciformes)	<input type="checkbox"/> 1-5	<input type="checkbox"/> 6-25	<input type="checkbox"/> more than 25
47 - barracuda (<i>Sphyraena</i> sp., Perciformes)	<input type="checkbox"/> 1-5	<input type="checkbox"/> 6-25	<input type="checkbox"/> more than 25
48 - Sohal surgeonfish (<i>Acanthurus sohal</i> , Perciformes)	<input type="checkbox"/> 1-5	<input type="checkbox"/> 6-15	<input type="checkbox"/> more than 15
49 - caranxes (<i>Carangidae</i> , Perciformes)	<input type="checkbox"/> 1-5	<input type="checkbox"/> 6-15	<input type="checkbox"/> more than 15
50 - lionfish (<i>Pterois</i> sp., Scorpaeniformes)	<input type="checkbox"/> 1-5	<input type="checkbox"/> 6-15	<input type="checkbox"/> more than 15
51 - spotted flatheads (<i>Platycephalidae</i> , Scorpaeniformes)	<input type="checkbox"/> 1-2	<input type="checkbox"/> 3-4	<input type="checkbox"/> more than 4
52 - titan triggerfish (<i>Ballistodes viridescens</i> , Tetraodontiformes)	<input type="checkbox"/> 1-2	<input type="checkbox"/> 3-4	<input type="checkbox"/> more than 4
53 - boxfishes (<i>Ostraciidae</i> , Tetraodontiformes)	<input type="checkbox"/> 1-2	<input type="checkbox"/> 3-4	<input type="checkbox"/> more than 4
54 - blowfishes (<i>Tetraodontidae</i> , Tetraodontiformes)	<input type="checkbox"/> 1-3	<input type="checkbox"/> 4-10	<input type="checkbox"/> more than 10
55 - porcupinefishes (<i>Diodontidae</i> , Tetraodontiformes)	<input type="checkbox"/> 1	<input type="checkbox"/> 2-3	<input type="checkbox"/> more than 3
Other bony fishes	<input type="checkbox"/> 1-10	<input type="checkbox"/> 11-65	<input type="checkbox"/> more than 65
VERTEBRATES, CARTILAGE FISHES, SHARKS			
56 - sharks (<i>Squaliformes</i>)	<input type="checkbox"/> 1	<input type="checkbox"/> 2-3	<input type="checkbox"/> more than 3
VERTEBRATES, CARTILAGE FISHES, RAYS AND TORPEDOS			
57 - blue-spotted stingray (<i>Taeniura lymna</i>)	<input type="checkbox"/> 1-2	<input type="checkbox"/> 3-6	<input type="checkbox"/> more than 6
58 - manta (<i>Manta</i> sp.)	<input type="checkbox"/> 1	<input type="checkbox"/> 2-3	<input type="checkbox"/> more than 3
59 - torpedo (<i>Torpedo</i> sp.)	<input type="checkbox"/> 1	<input type="checkbox"/> 2	<input type="checkbox"/> more than 2
Other rays and torpedos	<input type="checkbox"/> 1	<input type="checkbox"/> 2-4	<input type="checkbox"/> more than 4
VERTEBRATES, REPTILES, TURTLES			
60 - turtles (<i>Cheloniidae</i>)	<input type="checkbox"/> 1	<input type="checkbox"/> 2-3	<input type="checkbox"/> more than 3
VERTEBRATES, MAMMALS, CETACEANS			
61 - dolphins (<i>Delphinidae</i>)	<input type="checkbox"/> 1-2	<input type="checkbox"/> 3-6	<input type="checkbox"/> more than 6
Attention: please indicate the possible presence of the following negative conditions			
62 - PARTIALLY OR TOTALLY DEAD CORALS	<input type="checkbox"/> 1-10	<input type="checkbox"/> 11-100	<input type="checkbox"/> more than 100
63 - BLEACHED CORALS	<input type="checkbox"/> 1-10	<input type="checkbox"/> 11-100	<input type="checkbox"/> more than 100
* - BROKEN CORALS	<input type="checkbox"/> 1-10	<input type="checkbox"/> 11-100	<input type="checkbox"/> more than 100
* - SEDIMENT COVERED CORALS	<input type="checkbox"/> 1-10	<input type="checkbox"/> 11-100	<input type="checkbox"/> more than 100
* - LITTER	<input type="checkbox"/> 1	<input type="checkbox"/> 2-10	<input type="checkbox"/> more than 10
Attention: please give information about snorkelers and scuba divers behaviour			
How many snorkelers and scuba divers were present on the dive site?	<input type="checkbox"/> 1-25	<input type="checkbox"/> 26-50	<input type="checkbox"/> more than 50
How many snorkelers and scuba divers contacts with the reef did you see during your dive? (both voluntary or involuntary contacts)	<input type="checkbox"/> 1-5	<input type="checkbox"/> 6-10	<input type="checkbox"/> more than 10

Supplementary Figure 3. Section three of the project questionnaire with the form for data collection.