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Review Article

Underwater Photography: A Potential Tool for Human and Oceans Well-Being

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Abstract

Who care the oceans? Thousands of scientists have been working on studying and understanding the planet ocean, but there are millions of people who are aware of the importance of the ocean to humankind and have a feeling with aquaticenvironment. Among them there are the underwater photographers, professionals, in limited numbers, and amateurs in huge quantity, but all of them can be considered ambassadors of ocean realm thanks to their shots from all the seas, from coral reefs to polar environments. Their picture can become a valuable help for research, as demonstrate by diving activity related with several citizen science projects which help scientists in collecting data, photographing specimens or what is happening under the surface of the seas. In addition, underwater photography, through its beautiful images, has not only aesthetic purposes, but, as psychological research suggests, it also has positive benefits on human well-being. If watching aquariums is relaxing, there is a great deal of people who can be positively affected by images of tropical fishes, underwater landscape and various type of marine life and biodiversity. After the first attempts to record underwater images using the photographic camera of William Thompson in 1856 and the experiments of Louis Boutan, considered the father of underwater photography, at the end of 19th century, diving and photography evolved together and currently the most of divers have their own underwater camera no matter if sophisticated or not.

Thanks to the passionate work of many underwater photographers a great number of people may know how fantastic the undersea world may be and benefit of the sharing of the beauty beneath the ocean's surface thanks the new web media and social media contributing to the development of ocean literacy. Photography is one of the most powerful tools in communication to convey a message and a feeling. Take picture and sharing beautiful images can create emotions in people who will never get the opportunity to dive and amaze and inspire them to save our ocean and our well-being at the same time. And while it is true that "people protect what they love" who we love more than ourselves?

Keywords: Citizen science; Environmental communication; Human well-being; Ocean health andliteracy; Underwater photography

Introduction

"Why is it that scuba divers and surfers are some of the strongest advocates of ocean conservation? Because they have spent time in and around the ocean, and they have personally seen the beauty, the fragility, and even the degradation of our planet's blue heart." "There's something missing about how we're informing the youngsters coming along about what matters in the world. We teach them the numbers and the letters, but we fail to communicate the importance of our connection to the living world."

These two quotes of the famous and well known oceanographer Sylvia Earle are perfect to introduce this short paper, no more than a reflection about one of the multiple ways to protect the oceans and to enjoy of the contributions of nature to a better quality of life for human beings. When we examine nature's contributions to people or NCP [1], we can note that in the 18 categories reported by these authors there are two "non-material NCP" which are more relevant than others to the purpose of this work: i) Learning and inspiration; ii) Physical and psychological experiences. These non- material NCP will be the background topics of the following discussion.

Materials and Methods

The preliminary idea for this research was born during a discussion between the authors on occasion of a course for divers concerning the Mediterranean Sea organized by ISM (Institute for the Studies of the Sea). Sharing our experiences with the participants and

taking advantage of the presentation of the book "AQUA-Mysteries of the underwater world", written by [2] with the scientific collaboration of Emilio Mancuso, we opened a debate about the value of underwater photography for knowledge and protection of the marine environment. Later we decided to try to deepen the theme researching papers and opinions via electronic archives and through general web searches transforming these inputs in this preliminary and certainly not exhaustive article.

Discussion

Let's we start with this question: Who care the oceans? Thousands of scientists have been working on studying and understanding the planet ocean, hundreds of associations and organizations all around the world are actively engaged in marine wildlife conservation, but there are also millions of people aware of the importance of the ocean to humankind and with a feeling for aquatic environment. Among them there are the underwater photographers both professionals, limited in numbers, and amateurs in huge quantity; all of them may be considered as ambassadors of ocean realm because of their shots coming from all the seas, from coral reefs to polar environments. Typically during a dive session they are looking for beautiful photos and the submarine world is full of stunning opportunities, but today they have a new task, not so pleasant but anyway important: show picture of the environmental changes of the oceans. For example, photographer Justin Hoffman's image of a small estuary seahorse swimming with a discarded cotton swab in the water, a finalist in the 2017 Wildlife Photojournalism category, became rapidly viral and has been shared tens of the thousands of times across social media channels and had a great influence on views of society about plastic pollution. We can remember incidentally that social media like Facebook, Instagram, Flickr, Google plus (the list goes on), where photo sharing is probably the most common activity, has amplified the significance of photography in today's modern world.

After the first attempts to record underwater images with a photographic camera from William Thompson in 1856 [3] and the experiments of Louis Boutan [4], considered the father of underwater photography, diving and photography at the end of 19th century started to evolve together and currently the most of divers have their own underwater camera no matter if sophisticated or not. Thanks to their passionate work of underwater photographers a great number of people may know how fantastic the undersea world may be and benefit of the sharing of the beauty beneath the ocean's surface thanks the new web media and social media contributing to the development of a more widespread and popular ocean literacy.

Human beings as species are terrestrial. They have evolved for living on land, adapting themselves to the constraints imposed by the terrestrial environment and ecosystems: forests, savanna, grassland, desert, plans and mountains, tropical and polar regions. For centuries, the seas were our natural boundaries, an aquatic world inhabited by monsters living in the abyss and useful animal like fishes and cetaceans and so on or a place to sail to discover new lands to colonize and exploit. The underwater part of oceans remained off limits, an enchanted realm visible only through the surface or during ebb-tides. It wasn't until divers entered the waters and began to tell what they saw and show their pioneering black and white photographs, the sea became a real world, the equivalent of the outer space of present days. In about 100 years scuba diving has evolved and transformed in a well-regulated activity, characterised by an important recreational component as well as a professional one including commercial and scientific diving and, what is most important, literature demonstrates how diver specialisation is characterised by its improvement of skills and self-confidence, and by positive attitudes towards conservation [5].

Thanks to technology the exploration of the seas became one of the most fascinating and important activity of the 20th century, increasing more and more the relationship between man and oceans. Despite the growing importance of the seas, to this day many people have no concept of how amazing the ocean is or how essential its health is to our own future.

As marine biologists and professionals' photographers we have the opportunity to meet not only colleagues, but also all fans and curious who want to see and admire the world beneath the sea. During these meetings we can test the reaction to images of living and colourful scenery and animals or, in contrast, scenes of pollution, altered ecosystems and direct damages to underwater fauna and flora; this is of course positive in the first case and negative in the other. Both reactions to these visual stimuli (Figure 1 & 2) are important and, despite their antithetical messages, they usually stimulate a debate and achieve the goal of increasing awareness of participants toward the blue part of the planet, so huge and, at the same time, increasingly fragile because is facing various threads as climate change, pollution, plastic, overfishing. The ability to transmit knowledge and information by images it's even more important because whatever happens underwater usually remain out of sight. In this regard it is essential that underwater photographers are able to reinforce the sense of connection with ocean because, as write [6] in his interesting thesis: "If the complexity of the ocean is reduced and all people can think about are the dangers that the ocean presents to a human life, then the ability for people to treat the ocean with respect is less likely."

In 2008 Hélène Joffe of the University College of London wrote [7], in a better way than we could, that: "Visual material appears to be especially memorable and the salience that this confers may make it particularly forceful. […] Where once the mass media relied heavily on textual information they have shifted, increasingly, to the use of visual material. This is highly apparent not only in the news media but in health, safety and charity campaigns that attempt to socially engineer change in people's beliefs, attitudes and behaviours." Of course, her statements concern the general use of photography, but in our opinion they are also properly applicable to at least one of the finality of underwater photography.

Figure 1: PIETRO_FORMIS_D4A1318-Modifica.

Figure 2: PIETRO_FORMIS_D4A9122.

As many scientific papers demonstrate, underwater images also are a valuable help for research, as demonstrate by several citizen science projects in which divers or snorkelers support scientists in collecting data, photographing specimens or what is happening under the seas. In this regard [8] wrote: "Thus, resources can become knowable and systematised through being photographed, something becomes part of a system of information, fitted into schemes of classification and storage as Susan Sontag states in his collection of essays [9].

In addition, underwater photography, through its beautiful images, have not only aesthetic purposes, but, as psychological research suggests, it may have positive psychological and physiological benefits on human well-being, even just watching aquariums. In the home context, some authors [10,11] in found that 70% of aquaria owners described their fish as calming and stress reducing. Indeed, the assumption that fish tanks are often present in health care settings because of their potentially relaxing and calming properties has already prompted research in this area. there is a great deal of people who can be positively affected by images of tropical fishes, underwater landscape and various type of marine life and biodiversity.

And now another question: Photography may be an agent of change? We believe so. The thousands of underwater photographers have in their image library a huge quantity of shots. Based on our experience on social groups in Facebook we may mention as examples some italian and not italian public groups open to underwater photographers, but also to fans and curious like "Quelli che fotografano il Mediterraneo (Those who photograph

the Mediterranean Sea) which has 4331 members, Scubashooter.net with 21.094 members or Wetpixel Underwater Photography, another public group with 37.069 members. It will be impossible to organize and systematize all images only for a single objective, but this capillarity and easy accessibility of these images through social media contain in itself a great strength and may have an unsuspected capacity to induce awe [12], creating an impact and a connection between simulated nature and a huge number of people on a peer to peer basis. This has been proved by various studies carried out during the recent worldwide COVID 19 lockdown. For example, [13] have demonstrated that when direct access to real nature, the interaction with virtual nature viewed via television or computer may also have a mood-related benefits reducing boredom and negative affect. These studies have had a rapid development during pandemic lockdown and now we have the possibility to analyse the conclusions of a large body of research [14,15].

Conclusion

This paper was conceived with the intent to stimulate a debate about underwater photography whose applications outside of scientific fields (e.g. marine biology, underwater archaeology etc.) are rarely discussed at least on the subject of the capacity of marine biota and its images to convey messages and feelings. This is despite the fact that aquatic environments have the capacity to promote the mental well-being of people and that Blue Space [16] is often associated with higher preferences and more positive subjective reactions. Certainly, is not a coincidence if in the titles of psychological literature we find direct links between benefits and interaction with nature or the restorative effects of natural environments.

Probably many of the 12 benefits of scuba diving, for instance "increase emotional well-being, helps to relieve stress, connection with nature", may be extended to non-diving people and mediated by underwater photography. This is one of the most powerful tools in communication to convey a message and a feeling and is probably the best practice to transmit the sensorial experience of water lived by scuba divers to non-divers [17,18] or what call "sensorium", i.e. the sum of a person's perceptions, or 'the seat of sensation'.

Sharing images of ocean beauty or of the impact of man on aquatic world [19] can create emotions in people who will never get the opportunity to dive and amaze and inspire them to save our ocean and our well-being at the same time and promote a more diffused perception of our importance as singles persuading all of us to act. We like remember also that in 2008, the United Nations General Assembly decided that, as from 2009, June 8 would be designated by the United Nations as "World Oceans Day" to raise global awareness of the current challenges faced by the international community in connection with the oceans-and be part of the solutions. Among the many initiatives related to this event there is a global photographic contest thus presented: "Photography is a powerful medium to convey a feeling or a message. This open and free photo competition seeks to inspire the creation and dissemination of imagery capturing the beauty and importance of the ocean and humankind's relation to it, hoping to contribute to actions to preserve it.

Underwater photography may have a great impact and importance in development of ocean literacy, much more than today. Even if in "Ocean Literacy for All-A toolkit", [20] underwater photography in itself do not have much space, a few words from the foreword written by Vladimir Ryabinin ES/IOC-UNESCO and QianTang ADG/ED could be adapted to photography: "We hope that this publication will inspire the readers-scientists, educators and learners - to take greater personal responsibility for the ocean, as well as to enable them to act as citizens, working through partnerships and networks, sharing ideas and experiences and developing new approaches and initiatives in support of ocean literacy". If we change "this publication" with "photography" we will find that it is a perfect plan for the future of our passion for shooting photos beneath the seas. As many say for a long time, and we too, "people protect what they love." But love may contain a potential risk in naturalistic photographs we must remark that the power of underwater photography carries with it also the weight of a big responsibility. Nowadays the rush of be the first reporting on social media impressing pictures about some special biological event or about a rare animal could leads the photographer to put in danger that rare and special encounter. This is an issue rarely discussed when it comes to defend the oceans, but as recommended by Brett Blignaut in an article (2013) published in Earths Touch News Network.

There are certain precautions we can take:

i. don't mention the animal's location,

ii. rename files,

iii. strip location metadata.

We just happened to see that posting immediately the image of the rare Sea Lamprey (*Petromyzon marinus*), a fish listed in the IUCN red list of threatened species and protected by the Bern Convention (Appendix III), telling exactly the place, has the unintentional result of giving detailed information to poachers. Underwater photographers must remember that, in such interconnected world, the informations they share with pictures are important tools people can use to be "part of the solution, or part of the problem"; so it is always recommended to share it first with researchers and conservationist, and later on with social media.

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