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E-B
Environment - Behaviour
Proceedings Journal

CSSR2022

<https://cssr.uitm.edu.my/2022/index.php>

9th International Conference on Science & Social Research 2022

Universiti Teknologi MARA (UiTM), Shah Alam, Malaysia (Online), 14-15 Dec 2022

Organiser: Office of Deputy Vice-Chancellor (Research & Innovation), UiTM, Malaysia



Digital Documentation through Underwater Photography Method

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Abstract

This study focuses on the educational value of photographs and investigates discursive methods for employing underwater photography in environmental education. This research will examine the effectiveness of the relationship between photography and the environment using a qualitative methodology. The results indicate that data collection and photographic documentation might be very valuable, and understanding the fundamentals and techniques will greatly enhance the use of underwater photography. To sum up, research has shown that underwater photography can generate a distinctive dynamic and concept that can be used in a Public Service Announcement (PSA) to educate the public about the condition of the coral reef.

Keywords: Underwater Photography; Scuba Diving; Coral Reef Conservation

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DOI: <https://doi.org/10.21834/e-bpj.v8iS116.5248>

1.0 Introduction

Underwater photography is a captivating and challenging field that has captured the imaginations of photographers and scientists alike. It involves capturing images and videos of the unique and often mysterious world beneath the water's surface. Since water makes up the majority of our planet, it is crucial to understand and preserve aquatic ecosystems, marine life, and the dynamic processes that take place in this hidden realm by exploring and documenting the underwater environment.

In this research endeavour, we will delve into the fascinating world of underwater photography, examining its historical evolution, technological advancements, and the essential role it plays in marine biology, oceanography, and environmental conservation. We will explore the challenges and techniques associated with underwater photography, including the effects of water on light, the selection of appropriate equipment, and the creative considerations that come into play when capturing captivating underwater imagery. Ultimately, this research aims to shed light on the vital role of underwater photography in increasing our understanding of the oceans and inspiring a greater appreciation for these dynamic and fragile ecosystems. Underwater images are perfect in today's world when photographers' talent is growing and technology is becoming more advanced to support that capability. Paul Messaris (1994) recommended studying visual activity to comprehend the nature of picture-based media as a means of communication. When photographing underwater, it's not always the subject that needs to be focused on, but also the environment. However, there are several common problems and challenges that underwater photographers may encounter, such as limited visibility and colour loss.

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2.0 Literature review

Scientific research in marine biology, geology, and oceanography benefits from digital documentation through underwater photography. Researchers can observe marine species, geological formations, and environmental changes with precision. Previous studies have laid the groundwork for using underwater photography as a non-invasive method to gather data for scientific analysis and conservation efforts. According to the PADI Manual 2022, most scientists believe they are the most taxonomically diverse ecosystems in the ocean.

According to the Professional Associate Dive Instructor (PADI), it is a worry that global warming might cause temperatures to rise above what coral can tolerate. Another threat comes from sedimentation resulting from coastal dredging and construction. The coral reef is composed of numerous corals of different families and species. To protect our coral reef, it is important to educate society on the importance of our underwater ecosystem. Oceans cover more than 70% of the Earth's surface. Consider the marine conditions, which are mainly unknown to people. The presence of such stunning marine life can elicit a strong desire to share it with others. Photography is one of the simplest ways to communicate stories about underwater aquatic life.

Diseases can affect corals, especially if they are under stress. For instance, corals that survive heat stress-induced bleaching are more vulnerable to disease. With the rise of environmental awareness among the public, we can see there are a lot of campaigns from the government and NGOs through the media today. Therefore, this campaign serves as a public service announcement (PSA) to generate social awareness about the state of the coral reef and what we can do to reduce its impact and implement positive actions. Based on the article in Dimensions Educational Research Foundation, 2004, in addition to helping coral ecosystems through photography, it is important to use an interesting visual to help the researcher understand the content of the photograph. Visuals can educate divers and non-divers to appreciate more about our sea heritage, especially the coral reef ecosystem. Rich visual images expose others to layers of knowledge, including aesthetics, features, characteristics, and historical perspectives. With this, they would have the opportunity to learn about and understand coral conservation and viewpoints.

Underwater photography provides a systematic and detailed means of data collection. Previous research has shown that high-quality images and videos can be used to document marine ecosystems, the behaviour of marine life, and underwater geological formations. This data helps researchers track changes over time, understand ecosystems, and make informed decisions regarding conservation and management. This study asks the question of how underwater photography images can be utilised in documenting and collecting visual data for coral reef conservation and how underwater photography can be used to estimate the different stages of coral bleaching and recovery, allowing the collection of data to be used to track the condition of reef locations over time. This method can contribute to conserving the underwater environment through photography and public awareness.

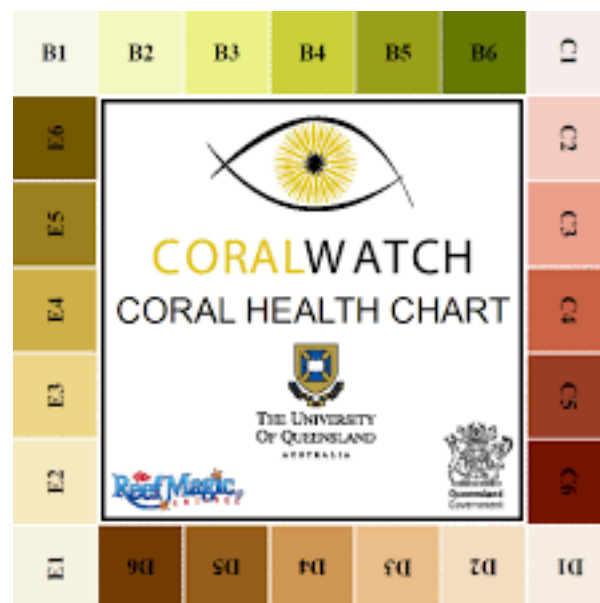


Fig. 1: Coral Health Chart

In 2002, Coral Watch developed the coral health chart to make it easy for anyone to collect information on the health of corals in a standardised way. The entire collection of data is accessible to everyone online. By using an underwater camera, it is easier to collect the information required and can be used as a teaching tool and for scientific analysis.

Underwater photography has become more accessible to most divers thanks to technological advancements in recent years, allowing members of the public to contribute to scientific initiatives and research. Photo identification, a very significant idea that allows us to distinguish and then track individual aquatic species, is perhaps the most widespread usage of underwater photography as a data-collecting tool. When obtaining good underwater photography photographs, there are three essential factors to consider. Pictures, according to Goodman (1971), are symbols that differ from other representations not because they are visually appealing but because

they are structured differently. When photographing underwater, it's not always the subject that needs to be focused on, but also the environment. Underwater photographers must comprehend the science of light and colour, as well as what can be done to compensate for the problems they face, even under ideal conditions. It's also critical to find the right dive site to obtain ideal photography conditions, with visibility and depth being critical issues for colour quality underwater.

2.1 Underwater Light

The key to taking amazing underwater photos is to understand how light interacts with camera equipment while underwater. In underwater photography, light is the most crucial factor. The amount of light available underwater is most affected by depth and visibility. When light goes through water rather than air, underwater photography involves the use of special techniques and equipment since water has quite different qualities than air. The lighter the water accessible underwater, the more visibility there is. Underwater photographers can use natural light in their images if they understand and work with these aspects.

According to Edge (2006), the sun's angle also affects the amount of light that is accessible underwater. When the sun is directly overhead, the majority of the sun's rays will enter the water. There is a large loss of light due to the angle of reflection against the water's surface at times of the day when the sun is closer to the horizon, such as in the morning or evening. This produces softer, more diffused light, which may appeal to some underwater photographers. The first thing to consider when planning an underwater photography shoot is that, as we dive, we lose light. According to the Professional Associate Diving Instructor's (PADI Digital) Underwater Photography Manual, the surface refracts light, forcing it to bend, while water absorbs light wavelengths, changing the colour spectrum. Red is the first colour to fade, followed by orange and yellow.

Many underwater cameras are now equipped with color-correcting firmware. They are sensitive to light and are equipped with simple set-up menus that allow them to adapt automatically while submerged. To achieve the finest colour outcome when shooting underwater images without a strobe or light, keep the sun directly on the subject.

2.2 Colour in Underwater Photography

Colour is a term that relates to reflected light in the context of art. To put it another way, colour has an impact on the items around us. Understanding three main areas: the colour wheel, colour value, and colour schemes, is required to use colour effectively in the creation of art. (A principle of art and design element.)

Underwater photographers, according to Antony (2007), experience a severe loss of colour as they go deeper. With increasing depth, seawater absorbs the colours of the visible light spectrum at various rates. Reds and oranges are the first colours to absorb, then yellows, greens, and finally blues. At different depths, colour absorption happens regardless of the available light. The use of a light strobe is one of the strategies that can be used to avoid colour loss.

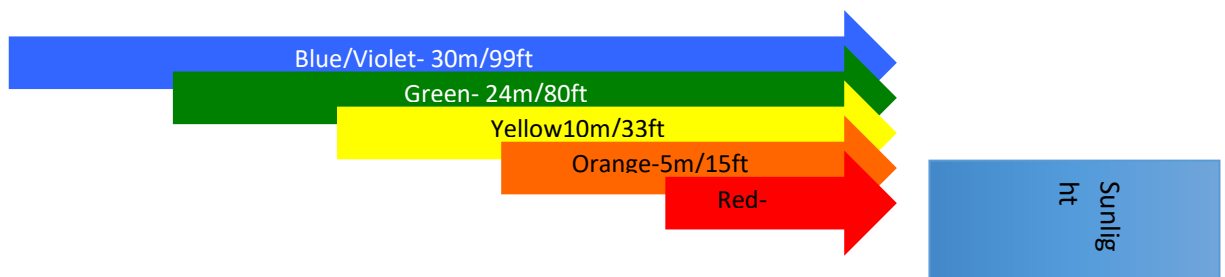


Fig. 2: Distance color loss underwater by depth.

In the context of photography, understanding the concept of colour is critical since the effect of colour may produce something beautiful. Colour has the ability to convey emotional aspects as well as their social significance. Colour, according to Agnes, can be employed as the main focus on how colours affect the overall image. Every colour, for example, can influence the human vision and trigger taste. Colour can also elicit emotional responses, allowing each person to convey feelings differently while remarking colour. Colour became a common symbol of or used to identify something, as well as a symbol of or used to symbolise a purpose.

Colour can be divided into three groups based on the colour wheel chart: primary colours, secondary colours, and tertiary colours. A photographer may easily resolve and manage all difficulties when taking a photo shoot if they grasp colour theory. To create anything as lovely as this in photography, the photographer must overcome unfavourable lighting conditions. Photographers must grasp how colours function beneath the sea and use all strategies and ideas to counter all color-related circumstances while on site. Colour also has a monetary value. The value of a colour is a metric that specifies how light or dark it is. The color's proximity to white defines it. Mastering colour value and terminologies can help us grasp photographic quality as well as the emotional and psychological influence of photos on viewers. Colour temperature describes how we experience a colour, whether it is warm or cool.



Fig. 3: Colour Value

On the colour wheel, warm hues go from red to yellow, while cool colours extend from blue to green and violet. Annie Leibovitz (2020) claims that when establishing the white balance on their camera, photographers who want complete control over the colour temperature of their photos use the Kelvin scale. The Kelvin scale imparts temperature gradations to the colour white, which then informs the temperature of all other colours (since white is the synthesis of the entire colour spectrum reflecting back to our eyes).



Fig. 4: Colour Temperature Wheel

Cameras, on the other hand, have superior technology that enables photographers to adjust colour casts by choosing the optimum colour temperature mode for the scenario. The white balance choice merely informs the camera about the type of illumination present in the picture (daylight, shade, tungsten, etc.), and the camera will use the appropriate colour temperature. Understanding and managing colour in underwater photography is a skill that requires knowledge of water's optical properties, the use of appropriate equipment and techniques, and creative choices by the photographer. The goal is to capture the underwater world in all its vibrant beauty while compensating for the natural colour shifts that occur beneath the surface.

2.3 White Balance

To ensure that the final image can be turned into pleasing designs, capturing photographs on the seabed demands a high level of expertise. While this process is in place, a photographer must concentrate on numerous areas of photography in addition to their scuba diving skills. Colour, lighting, composition, and, of course, correct white balance can all help to make a work more engaging to watch. White balance is the term used to describe the colour temperature of a photograph. Colour temperature refers to the ratio of blue to red light in an image. A light with a higher colour temperature (more blue) will have a higher Kelvin value, while a light with a lower colour temperature (more red) will have a lower Kelvin value. The colour temperature of average daylight is 5500–6500 K. White balance, to put it another way, is a camera setting that adapts to actual lighting conditions to make white objects seem white in images (PADI 2019).



Fig. 5: PADI white slate digital underwater photography.

2.4 Coral Reef

Coral reefs are one of the most diverse ecosystems on the planet. Coral polyps, the invertebrates that build reefs, exist in a wide range of shapes and sizes, including massive reef-building colonies, beautiful flowing fans, and even tiny, lonely species. The coral reef is made up of a variety of corals from various families and species. Coral reefs support marine life by providing a reef system in which life can thrive while also relieving strain on natural reefs that have been overfished and over-visited. These corals come in a variety of shapes and architectural designs, which can be linked to the crab's living environment, such as the ability to hunt for food.

This ability is based on the present pattern that surrounds them, as well as the competition for space and sunlight. The aesthetic value of this arrangement of many natural shapes and designs in the surrounding environment is that it has the power to attract not only other marine life but also human interest. Divers thought they were breathtakingly gorgeous. The vast diversity of species that rely on coral reefs for reproducing and feeding is similarly astonishing, as is their value to their natural ecosystem.

However, according to a report by Reef Check Malaysia (2019), the Malaysian coral reefs examined had a respectable amount of surviving coral, with an average of 41.32 percent. While the average covers a broad range, the data has shown a persistent reduction in total coral reef health since 2015.

Percentage of live coral cover	Rating
0-25	Poor
26-50	Fair
51-75	Good
76-100	Excellent

Fig. 6: Coral Reef Criteria Table, developed by Chou et al., 1994.

3.0 Methodology

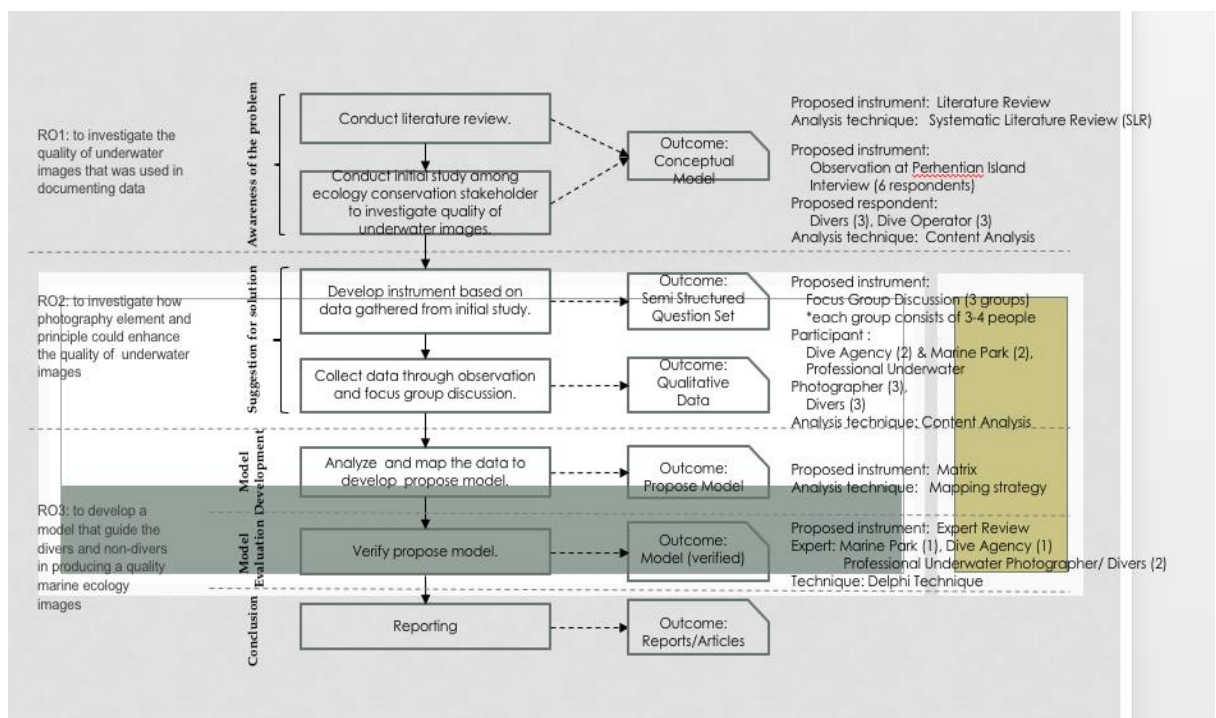


Fig. 7: Research Objective.

The methodology for conducting research on the "Digital Documentation Through Underwater Photography Method" involves a systematic approach to capturing and analysing underwater images for documentation purposes. This study will be carried out using a

multidisciplinary method and a wide photographic technique, such as underwater photography, to collect the data needed for the research purpose. The qualitative research involved the use of data, observation, and analysis of documents and material.

According to H. Sidky, utilising this methodology makes it much easier to research people in their own context using methods like observations and interviews. Under the correct circumstances, the participant could utilise their scuba diving expertise and knowledge in a way that is relevant to this study. Photographing this incredible underwater panorama necessitated a wide range of photographic approaches. The goal of this study is to figure out how a scuba diver can take a high-quality underwater photograph. However, from an educational standpoint, the findings of this study can be used as instruments for future data collection.

It is critical to select a specific sampling method to analyse all the collected data to answer the research topic. Non-probability sampling is typically associated with qualitative research and case study research design. Case studies, on the other hand, appear to concentrate on small samples and are intended to investigate a real-life occurrence rather than make statistical assumptions about the general population (Yin, 2003). The researcher will initially investigate the study's variation before composing an intensity sample. The researcher will subsequently be able to sample appropriate intensive care cases because of this method. To assess scuba diving skills and playboating knowledge, the researcher will pick a sample of participants and interview them to acquire all the data needed to complete the study. This sampling method can be used to investigate distinct aspects of a case, occurrence, scenario, or behaviour with varying degrees of intensity.

Research in the field of digital documentation through underwater photography faces several limitations and challenges. Factors such as water clarity, depth limitations, equipment costs, and diver expertise can pose obstacles to effective documentation. Yet, continuous advancements in technology, interdisciplinary collaboration, and innovative methodologies are addressing these challenges and expanding the possibilities of underwater photography.



Fig. 8: Image result by participant on a healthy coral.

4.0 Findings

At long last, the researcher will provide a recommendation that is based on the results of the investigation. Nevertheless, in terms of educational practise, the results of this research may be used in the future as tools for reference. According to the findings of the research, underwater photography has the potential to be a significant tool for recording and collecting visual data for the purpose of coral reef conservation. Because of this study, a novel approach and concept to underwater photography have been uncovered, both of which have potential applications in further research.

5.0 Discussion

Digital documentation through underwater photography is a valuable and multifaceted method that plays a significant role in marine science, archaeology, and environmental conservation. The discussion surrounding this method often encompasses various aspects, including its applications, challenges, and prospects. Suppose we have a good understanding of the situation. In that case, we may be able to determine whether it presents an opportunity for us to enhance the quality of the material being discussed. It is about working together to create changes and concentrating on major topics to generate demonstrably beneficial results for a better future via collaborative effort. To put it another way, become involved in the spreading of information about education and awareness, as well as the organising of conservation efforts. According to the Dimensions Educational Research Foundation (2004), a good visual should have an aesthetic value, including the characteristics and context of the images.

6.0 Conclusion and Recommendations

In the realm of digital documentation through underwater photography, it is evident that this method holds immense potential for advancing our understanding of underwater environments and marine life. The advancement of technology, particularly in the last few years, has made underwater photography accessible to most divers. This has opened the door for members of the public to participate in scientific endeavours and research by contributing their own photographs. The review of literature and research in this field underscores its diverse applications, technological advancements, and contributions to marine biology, conservation, and environmental monitoring.

Technical considerations, including camera equipment, settings, and post-processing techniques, have improved the quality and precision of underwater images. Nevertheless, challenges persist, such as low light conditions and colour distortion, demanding ongoing innovation and adaptation. For the recommendation, the researcher would explain suggestions for future research. The recommendation for future research is:

- a) to promote educational programmes and training opportunities for underwater photographers, divers, and researchers. This will help ensure that the field maintains a high level of professionalism and adherence to ethical and conservation principles.
- b) The underwater photographer must collaborate closely with a lighting specialist. It will make the process of gathering data more efficient. Due to water's characteristics and its impact on light, underwater photography presents a unique set of difficulties. It is crucial to comprehend the implications of this information in order to make adjustments and take effective underwater photos.
- c) The study strongly suggests using software programmes, digital cameras, and color-correcting tools to develop colour reproduction solutions. With the use of digital cameras and computer software, photographers are now able to attain colour quality more quickly and effectively because of the digital revolution. This implies that the colour values of the underwater camera and the computer display should be the same.

Its importance in our efforts to understand, document, and preserve underwater environments cannot be overstated, and its potential for discovery and education is boundless.

Acknowledgement

Praise to the Almighty Allah for the blessing that was given to me in completing this report. Many people helped me while I was working on this project. I express my gratitude to Assoc. Prof. Dr. Adzrool Idzwan Ismail and Dr. Siti Salmi Jamali for their kind and able guidance for the completion of the research. Their consistent support and intellectual guidance made me energise and innovate new ideas. The enthusiasm, inspiration, and great efforts to explain things clearly and simply helped to make things easier for me. I would also like to thank all my family members, especially my wife, son, and daughter, for all their love and support over the years, which has been a source of encouragement and inspiration to me throughout my life. Without them, I would not have completed this research. Finally, special thanks to all faculty members (Visual Art Department) for all the help and continuous support. To all my friends for being such supportive and wonderful company, which played such important roles along the journey.

Paper Contribution to Related Field Study

Underwater photography stands as an invaluable tool in various fields, offering a window into the mesmerising and complex underwater ecosystem. Its contribution to digital documentation is multifaceted and far-reaching, impacting disciplines such as marine biology, oceanography, underwater archaeology, environmental studies, and conservation efforts.

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