Skill Development Course

Underwater Photography

Instructor Manual

BSAC
Dive with us

Contents

Issue 1.3, January 2009

Published in the United Kingdom

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BSAC is grateful to the members of the BSAC Diver Training Group and others for their contributions to the development of this course and its supporting materials. In particular:

Charles Hood www.charleshood.com

Richard Scarsbrook

Special thanks to the following organisations and people for their help and co-operation in the production of this course:

Mat Trim -– Fujifilm

Olympus Cameras

Peter Rowlands - UWP magazine

Gavin – www.photonhead.com

Course Aim

The aim of the course is to teach the basic use of a compact digital camera and housing to students with little or no knowledge and experience of underwater photography.

Duration

One day plus. The course requires half a day of theory instruction and dry practical, followed by an underwater practical, followed by a dry session to review the results. The duration of the underwater practical will depend on numbers and location.

The course material may also be presented in a series of shorter theory and practical sessions, spread over several days or weeks.

Course Overview

Session	Contents	Mins
Introduction		5
Optics: camera basics	Issues specific to underwater photography: refraction, distortion, loss of colour, light, and contrast	30
Camera fundamentals	Resolution, memory, aperture, shutter speed, sensitivity; compact cameras and housings	30
Housings	Features, preparation & maintenance; dry practical	45
Camera functions	Typical shooting modes on compact cameras	30
Shooting techniques	Lighting, depth of field, composition	30
Photography underwater	Safety, skills, shooting tips, Code of Conduct	45
Practical	In sheltered water students take shots of other students and static objects provided by instructor, in a variety of lighting conditions. Surface and review shots. Submerge and have second attempt.	3-6 hrs
Downloading	Basic methods, introduction to photo-editing software, students download some of their shots, and review	75
Review	Summary and debrief	10
	Total theory duration	**5:00**

Entry Level

Sports Diver.

Because of the task loading imposed by operating an underwater camera, and the risk of damage to sensitive marine life, it is recommended that before attempting underwater photography in open water conditions, students should be able to control their buoyancy within ±1m or better, and that they should be totally familiar with their own diving equipment.

Qualifications Awarded

Qualification card confirming course attendance, supplied by BSAC HQ on payment of fees and confirmation of attendance on the course. There are no examinations or assessments.

Course Registration

Branches wishing to run a Skill Development Course must order the packs two weeks in advance from the BSAC Shop and pay the relevant course pack/registration fees for all students on the course. This can be done online via the BSAC website, by telephone, or by post.

Instructor Requirements

- Qualifications

  This course may be taught by any BSAC instructor. All instructors should ensure that they have knowledge of underwater photography at the level of these instructor notes, as a minimum. Assistant Diving Instructors, Theory Instructors, and Practical Instructors may require on-site supervision by an Open Water Instructor or above. Consult the BSAC website for current details of supervision requirements.

- Student:instructor ratio

  There are no absolute limits for this course, but organisers should note that some parts of the theory and dry practical course involve direct review of students' work. The timing for those lessons assumes 4:1.

Equipment

- Cameras

  Sufficient underwater compact digital cameras for the number of students. For the practical sessions, ideally there should be at least one camera for each pair of students. A lower ratio of cameras to students will lengthen the

practical sessions. Students with their own underwater camera should be encouraged to bring it. Students who own a digital camera but no housing may find it useful to have it to hand during some of the theory sessions.

Enough memory for 100 images per student

Enough batteries to last the entire course

- Computers

  Sufficient computers for the number of students. Each machine needs photo-manipulation software such as Adobe Photoshop, and memory card reader or download cable compatible with the camera being used. Ideally there should be a portable laptop per student, but sharing could be accommodated.

  Extension leads for power to laptop computers.

Venue Facilities

Classroom, and swimming pool or open water with clear visibility and no current or wave action.

Course Materials

The Instructor Manual for this course contains supplementary notes for instructors, in italics within square brackets. Such notes are provided to help instructors with their understanding of the material, and are not intended for presentation to students except at the instructor's discretion.

All Powerpoint visual aids supplied with BSAC courses are animated. This is done only as an aid to instructors. The animation schemes are not a mandatory part of the course.

Usually the animation consists of each bullet point appearing on click, together with any associated graphic. This course contains some complex diagrams and graphics, whose animation has been set to reveal them bit by bit. Instructors are advised to check these VAs carefully, and to amend the animation if necessary, to suit their own presentation style.

Administration

HQ will supply the appropriate course packs and a Course Report form, on receipt of an order. After the course the organiser should return the completed form without delay to BSAC HQ, who will issue qualification cards to students and record their course attendance on the membership database.

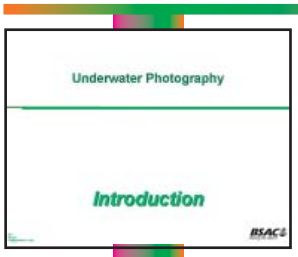
For regionally run courses: on completion of the course, outstanding fees, accounts and expense claims etc, should be forwarded to the course organiser

Costs

BSAC course fees cover the cost of course packs and qualification card, and must be paid in advance in order to register and to receive student packs.

For branch run courses, instructor expenses, venue fees, and any other costs are the responsibility of the students and their organisers.

For regionally run courses, students must pay the appropriate regional course fee to the Skill Development Course Organiser at time of booking.



INTRODUCTION

Guideline duration 5min

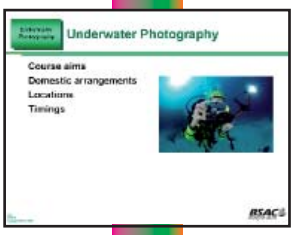
Lesson Objectives

This lesson sets the scene for the course overall. It briefly outlines the course content, domestic/logistics and timetable.

Achievement Targets

At the end of this lesson students should:

- understand the objectives and structure of the course.
- understand what is required of them during the course.
- understand the domestic and logistical arrangements for the course.
- understand the course timetable.



Basic underwater photography

Welcome the students to the course; introduce yourself and any other instructors; and if necessary cover domestic arrangements, fire exits, and so on. Tailor this VA to meet local requirements.

Course aims

The aims of the course are to teach the basic use of a compact digital camera and housing to students with little or no knowledge and experience of underwater photography.

A photograph provides a permanent record of an event. People use photography to share their experiences with others; as a means of identification; for educational purposes, such as teaching others about a particular subject; or simply for personal satisfaction. In what it enables, underwater photography is no different to the photography on land that most of us are familiar with, but it does pose extra challenges which must be overcome to ensure success, safety, and minimal impact to the environment.

Point out that this course alone will not turn students into award-winning underwater photographers. In particular there are some essential skills that the course does not teach: buoyancy control, knowledge of animal behaviour, and mastery of the particular set-up of students' own camera systems (although it will help with the latter).

Domestic arrangements

Locations

Timings

Course outline

Basic Theory

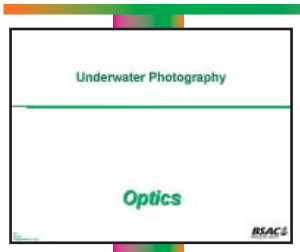
- **Optics**
- **Camera fundamentals**
- **Housings**

- **Camera functions**
- **Shooting techniques**
- **Photography underwater**

Practical

Downloading

Review



OPTICS

Guideline duration 30min

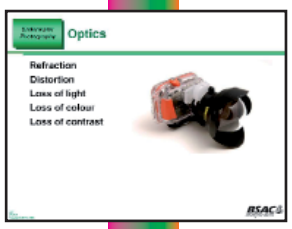
Lesson Objectives

This lesson is intended to help students understand how the way light behaves underwater gives rise to issues which are a problem for underwater photographers, making underwater photography different from land photography.

Achievement Targets

At the end of this lesson students should:

- have a basic understanding of how the behaviour of light underwater affects photography.



Optics

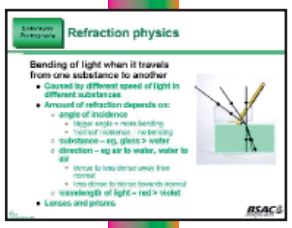
Refraction

Distortion

Loss of light

Loss of colour

Loss of contrast



Refraction physics

Bending of light when it travels from one substance to another

The effect can be seen when a pencil is placed in a glass of water.

The diagram illustrates what happens when a ray of light passes from air into a denser substance such as water or glass. The word ‘medium’ is sometimes used as an alternative to ‘substance’.

- **Caused by different speed of light in different substances**

  Light travels fastest in a vacuum, and slower in denser substances. [*Optionally, explain how this causes light in the diagram to be bent. The left hand edge of the ray reaches the dense medium first, and slows down. The right hand edge carries on at the original speed until it too meets the denser medium and slows down. The period while the left hand edge is moving more slowly than the right leads to bending. A familiar example of refraction is the way in which surf usually breaks parallel to the shore even though the waves offshore may be travelling towards the beach at an angle. The edge of the wave nearest a shelving beach feels the bottom, slows down and breaks first, while the parts of the wave further out carry on until they also feel the bottom and break.*]

- **Amount of refraction depends on:**
    - **angle of incidence**

      The angle of incidence, shown in yellow, is the angle between the ray of light and a line drawn at right angles to the boundary between the substances, known as the 'normal'.

        * **bigger angle = more bending**

          The larger the angle of incidence the more the light is bent. Light arriving at 90° will be bent the most.

        * **'normal' incidence = no bending**

          This does not mean there is no refraction - the light still slows down - but it is not bent [because both edges of the ray arrive at the boundary at the same time.]

    - **substance – eg, glass > water**

      The denser the substance, the more refraction it causes. Glass slows light down more than water, for example. [Scientifically, the amont of refraction caused is measured by a substance's *refractive index,* which is the ratio of the speed of light in the two substances. Glass = about 1.5, depending on the type of glass, water = 1.33.]. Seawater is more dense [has a different refractive index] than fresh water, which accounts for the swirly effect sometimes seen where there is a halocline.

    - **direction – eg air to water, water to air**

        * **dense to less dense - away from normal**

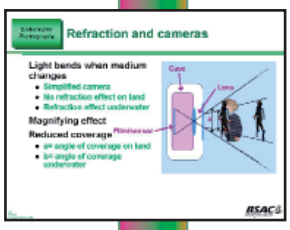
        * **less dense to dense - towards normal**

    - **wavelength of light – red > violet**

      Red light has the longest wavelenth of the colours of the rainbow and is bent the most. Violet has the shortest wavelength and is bent the least.

- **Lenses and prisms**

  Although refraction causes specific problems for underwater photographers it is also the basis of how lenses and prisms work, so modern cameras would not exist but for refraction.



Refraction and cameras

Light bends when medium changes

- **Simplified camera**

  We will use this simplified diagram of a camera throughout the course. It consists of a case which contains a hole fitted with a lens on one side, and a sensor or film on the other. Light from the subject enters the camera through the lens and is focused by it to form an image on the sensor or film.

- **No refraction effect on land**

  Light travels in a straight line from the subject to the sensor. The image of the little boy in the illustration just fills the frame. If the camera was any closer part of his head and feet would be chopped off in the photograph.

  If the camera is enclosed in an underwater housing, which allows light to enter the camera through a flat glass port, there is no effect as long as everything remains in air.

- **Refraction effect underwater**

  When the camera and its housing are immersed in water, the situation changes. Refraction takes place at the boundary between the housing and the water. The image of the subject still fills the frame, but light no longer travels in a straight line, because of refraction [*the on land subject and light rays are shown greyed out, for comparison*].

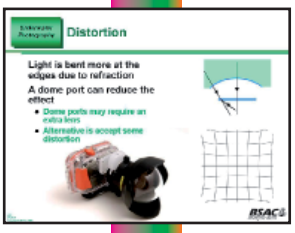
Magnifying effect

The dotted rays show the path light from the frame-filling subject would have taken had the camera and subject been on land. [*The two graphics of a diver on the VA are exactly the same size - any apparent difference is an optical illusion.*] The camera would have been closer to the subject, which demonstrates that underwater there is a magnifying effect such that the camera is further away from its subject [*The refractive index of water is 1.33 when compared with air. Thus objects underwater **appear** to be a third larger or to put it another way about 25 percent closer. Whether they appear larger or closer is a matter of the diver's perception and expectation: old shoes and boots always look big when you pick them up, but if you don't know how far away an object is, eg a fish, it may be further away than you think. Unlike divers, cameras do not perceive or expect anything, they just record the light falling on their sensors.*]

- **Reduced coverage**

  To the underwater photographer, refraction means that the angle of coverage of a lens is reduced.

- **a= angle of coverage on land**
- **b= angle of coverage underwater**



Distortion

Light is bent more at the edges due to refraction

Any straight lines at the edges and corners of the image will be bent. This is known as linear, pincushion or pillow distortion. Pillow distortion can be demonstrated by taking a picture of swimming pool tiles. Also at the edges of the frame there will be a shift in the colours within the light spectrum (chromatic aberration) which will soften the picture.

The ray diagram illustrates the effect.

A dome port can reduce the effect

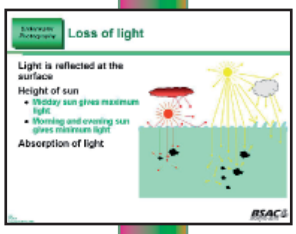
The photograph shows a compact camera fitted with a dome port. By using a curved lens on the housing light can pass through at right angles to the port rather than at an oblique angle, which eliminates refraction, as shown in the ray diagram.

- **Dome ports may require an extra lens**

  [The port behaves as a negative lens that forms an apparent image closer than the actual subject, thus you must focus on this image and not on the subject itself. A supplementary close-up lens may be required to focus on the apparent image.]

- **Alternative is accept some distortion**

  Extra lenses can be expensive and cumbersome. Many divers who do not want to get serious about underwater photography - entering competitions, having work published, maybe selling it, and so on - find they get acceptable results without buying extra lenses for their basic camera and housing. Those who do take photography further usually upgrade from their first camera and housing. So unless money is no object it makes sense not to rush into buying expensive extras for your first underwater camera.



Loss of light

In any given conditions there is always less natural light underwater than there is on land.

Absorption of light

- **By the water**

  Water is much denser than air and absorbs more light. The deeper you are, the more light has been absorbed. The light which produces the image in your camera is the light scattered from the subject.

  The surface of the water acts like a giant mirror and reflects sunlight back into the atmosphere. Any light that hits the water surface at an angle greater than 45 degrees will be totally reflected back. This phenomenon can clearly be seen underwater when the surface is flat calm, and is called Snell's window.

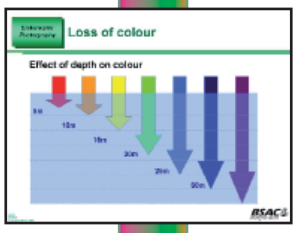
- **By clouds and waves**

  Light is also reflected off clouds, and scattered off surface waves.

Height of sun

- **Midday sun gives maximum light**
  At midday the sun is at its highest, so reflection from the surface is least. In addition the light is at its strongest because the path through the atmosphere is at its shortest.

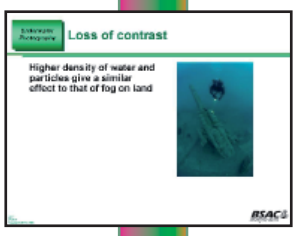
- **Morning and evening sun gives minimum light**
  Light levels are low anyway because of the longer path through the atmosphere, and reflection from the surface is high because of the low angle of incidence.



Loss of colour

Effect of depth on colour

As you increase in depth as previously mentioned water absorbs light. Some colours are absorbed more strongly than others, so they disappear at different depths. Red goes first, and by 25m everything looks blue.



Loss of contrast

Unless the water in which you are taking photographs in is absolutely clear loss of contrast will take place. Particles in the water scatter the light in all directions causing a fogging like effect.

Summary

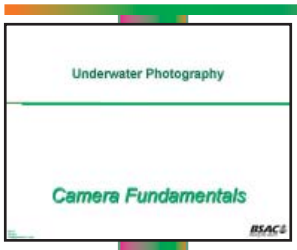
Refraction

Distortion

Loss of light

Loss of colour

Loss of contrast



CAMERA FUNDAMENTALS

Guideline duration 30min

Lesson Objectives

This lesson is intended to help students understand how cameras capture and store images, and to appreciate the capabilities and limitations of housed compact cameras for underwater photography.

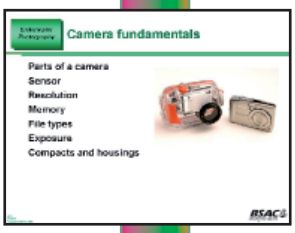
Achievement Targets

At the end of this lesson students should:

- understand how the way images are captured and stored relates to picture resolution
- understand that aperture, shutter speed, and sensitivity are the fundamental factors which govern exposure
- appreciate the capabilities and limitations of housed compact cameras for underwater photography

Additional visual aids

A variety of compact cameras, housings, and accessories



Camera fundamentals

Parts of a camera

Sensor

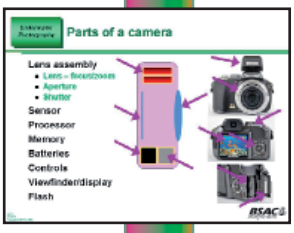
Resolution

Memory

File types

Exposure

Compacts and Housings



Parts of a camera

Lens assembly

- **Lens – focus/zoom**

  The lens focuses light to form an image inside the camera. An expensive lens may be composed of several individual precision-made components, capable of giving a much sharper image than a cheap lens moulded from plastic. Many cameras have an optical zoom feature which adjusts the lens between wide angle/lower magnification and narrow angle/higher magnification. Optical zoom is different from digital zoom, which applies computer processing to enlarge part of the image capured by the sensor. Digital zoom always leads to loss of picture quality. Neither optical nor digital zoom is very useful for underwater photography [*because you*

should always be as close to the subject as possible].

- **Aperture**

The aperture is a variable sized hole through which light enters the camera.

- **Shutter**

The shutter is a device which allows light to fall on the sensor for a brief, measured amount of time when you take a photograph.

Sensor

The lens focuses the image on the sensor, which converts it into an electronic form which can be digitally processed. In a film camera, a photographic film takes the place of the sensor.

Processor

Every digital camera contains a computer chip which manipulates the image obtained from the sensor, stores each image as a computer file, and provides all the camera functions. Usually, expensive cameras have faster and more powerful processors, running more complex software.

Memory

The memory is where the image files are stored. It is normally a removeable card, usually located behind an access door with the batteries.

Batteries

A camera's batteries may be either rechargeable or disposable, depending on the camera. Rechargeables are the norm, and are usually more economical, but you will need spare batteries unless you are sure of being able to recharge between each dive. Disposable batteries are generally more expensive to use than rechargeables, especially since you may decide to discard them before they are fully spent, to avoid running out of power underwater. However, disposables may be the only option if you are operating in remote locations without a reliable electricity supply.

Controls

The shutter release is normally located on top of the camera. The push buttons and dials required to operate the camera's other functions are normally located on the back, and on the top.

Viewfinder/display

When the camera is in shooting mode, the screen mounted in the back of the camera displays a colour image of the scene that is being registered by the sensor. It is the equivalent of the viewfinder in a film camera, but more useful underwater because you do not need to put it to your eye to use it. Various pieces of operational information will also be displayed on the screen, either overlaid on the picture, or on a blank screen, depending on the circumstances.

Flash

Most compact cameras are fitted with a flash, but the units fitted are often of limited use underwater.

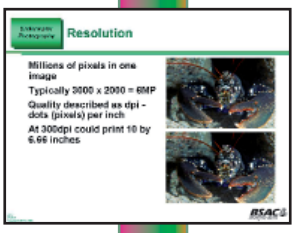
Sensor

Light enters the camera through the lens and is collected on a CCD (charge-coupled device) or CMOS (complementary metal oxide semiconductor) sensor. What these electrical sensors do is to convert light into an electronic signal that can be stored, retrieved and then converted back to light displayed on a computer screen or printed out onto paper.

Image made up of dots called pixels

The sensor is made up of millions of small receptors that individually collect light. These very small receptors or micro sensors, or pixels as they are often referred to, define the quality of the image. In general, the more of them there are, the greater the quality or resolution.

[*Resolution also depends on the quality of the optics and the size of the sensor. The more pixels there are on a sensor of a given size, the smaller each one must be, and the less light it will collect. Very small pixels are prone to interfere with their neighbours and generate noise.*]



Resolution

Millions of pixels in one image

Modern day consumer camera sensors typically have between 4 and 10 million pixels.

Typically 3000 x 2000 = 6MP

A million pixels is referred to as a megapixel, abbreviated MP. The upper picture of a lobster is at high resolution. The lower one is at a much lower resolution, and is less sharp even though both photographs are in focus.

Quality described as dpi - dots (pixels) per inch

This measure is used for deciding how an image will look when it is printed or displayed at different sizes. On BSAC SDCs we use 96dpi for display and 200dpi for printing.

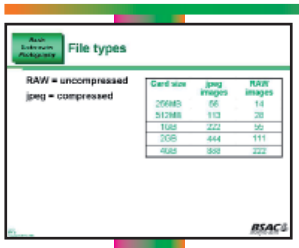
At 300dpi could print 10 by 6.66 inches

Memory

Memory cards come in various physical sizes and capacities

Each pixel is represented by small electronic pieces of information called bytes. These bytes contain all the information about the light they collected, including colour and brightness. Thus many millions of bytes – megabytes, will be required to save all the information of the complete image. This information is stored in the camera on a memory card in the same way as any image is stored on a computer. Various types of cards and capacities are in use.

Typically 512MB - 8GB



File types

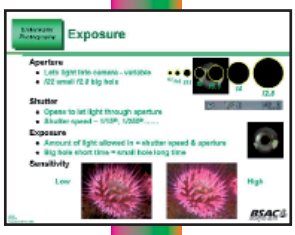
RAW = uncompressed

When cameras produce an image they can store the file in a number of different ways. If they store it as the raw data from the sensor then a huge amount of information has to be saved and the RAW file, as it is known, is correspondingly large. The advantage is that adjustments can be made to this file without any loss of quality, the disadvantage is that it takes up a lot of space on your memory card.

JPEG = compressed

To reduce memory usage camera manufacturers compress the files, dispensing with unwanted data and thus reducing the size of the file considerably. The file format used is known as a jpeg (joint experts photographic group). There are many debates as to which is the best way to store your pictures, but unless you are highly critical or using your images professionally then generally jpeg files are the best to use. Jpegs have different levels of compression, referred to as fine, medium or low (web) on most cameras. Unless you are purely shooting for web pictures or are restricted by your card size it is best to shoot on the fine setting.

Typical RAW file size: 18MB, the same file as a high (fine) resolution jpeg 4.5MB. The table illustrates the impact of this difference on how many photographs will fit on a memory card.



Exposure

The amount of light that is captured by the sensor is governed by three factors.

Aperture

This is the size of the hole at the centre of the diaphragm in the lens, similar to the iris in the eye. The size of the hole can be altered in discrete amounts and each step is referred to as a value called the f-stop. The wider the diaphragm opening, the smaller the f-stop number (eg f2.8) and the more light will enter the camera. The smaller the diaphragm opening, the larger the f-stop number (eg f22) and the less light will enter the camera. At a small f-stop (large opening) the range of subjects in the picture that will be in focus will be small. At a high f-stop (small opening) the range of subjects in the picture that will be in focus will be high.

- **Lets light into camera - variable**
- **f22 small f2.8 big hole**

Shutter

The shutter speed determines how long the light is allowed to enter the camera. A slow shutter speed of say 1/30th second will allow a relatively large amount of light to be collected by the sensor while a fast shutter speed of say 1/1000 second will allow only a small amount of light to be gathered by the sensor. At a slow shutter speed any non-stationary subjects may appear blurred, but at a fast shutter speed even fast moving objects will appear sharp.

- **Opens to let light through aperture**
- **Shutter speed – 1/15th, 1/250th.....**

Exposure

- **Amount of light allowed in = shutter speed & aperture**

- **Big hole short time = small hole long time**

Sensitivity

This is a measure of how much light is required to produce a detectable signal in the sensor. It is known as ISO (International Standards Organisation). A low sensitivity of say ISO 100 will require a lot of light to produce a detectable signal and will produce a detailed or fine grain image. A high sensitivity setting of say ISO 1600 will require a small amount of light to produce a detectable signal but will produce an image with less detail, or more 'grain' as it is commonly called. The photo on the left is low ISO while that on the right is high ISO.

Compacts and housings

Compacts

- **Inexpensive**
- **Many features**
- **Shutter lag**
- **Limitations underwater**

Compact digitals are by far the most common type of camera in use today, for general photography and for underwater photographic systems. They are relatively inexpensive and produce, with a little practice, excellent results. All of these cameras have a fixed zoom lens (the lens itself cannot be changed but its focal length can) , an internal flash, and they have a huge range of features and functions that remove the necessity for the user to be a photographic expert. Their disadvantage is that they have a relatively long response time (shutter lag): the time taken to obtain an image once you have depressed the shutter release may be anywhere up to two seconds. Also many of their automatic features do not work well underwater even if they have a 'sea mode' setting. In some housings the flash can be obstructed by the lens's port, resulting in shadows being cast over the image.

Housings

- **Predominantly made from inexpensive polycarbonate**
- **Specific to camera**
- **Supplementary lenses and strobes needed for optimum performance**

Housings for compact cameras are often made from transparent polycarbonate with buttons and levers arranged on the outside so you can access the functions through the housing. Because cameras come in different shapes and sizes, each housing is specific to one make and model of camera. If you replace your camera, even with simply a newer model of the one you already have, it is likely that you will need a new housing. These housings are relatively inexpensive but to get the most out of the system they require supplementary lenses and strobes to be attached.

Summary

Parts of a camera

Sensor

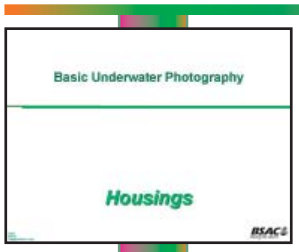
Resolution

Memory

File types

Exposure

Compacts and housings



HOUSINGS

Guideline duration 45min

Lesson Objectives

This lesson enables students to learn and practise the procedures for preparing a housing for use, and to learn about caring for it afterwards.

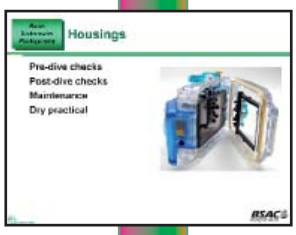
Achievement Targets

At the end of this lesson students should:

- be able to load a camera into a housing without supervision.
- know how to look after a housing.

Additional visual aids

A selection of cameras and housings.



Housings

Pre-dive checks

Post-dive checks

Maintenance

Dry practical

Pre-dive checks

Before the dive:

More cameras and flashguns are flooded by inadequate or rushed preparation than by any other way. Even the experts flood their equipment, usually because something has been overlooked in their haste to get wet. Always allow plenty of time for preparations. Find a clean dry area, decide what lens and settings combination to use, and then run through a set of routine steps.

O-ring

Remove the main O-ring/s. Clean their seats thoroughly with a cotton bud, toothbrush or the edge of a paper kitchen towel.

Clean each O-ring by wiping with the kitchen towel, and re-grease. Do not assume that more silicone grease will produce a better seal - it will only attract more dirt and debris. Lubricate the O-ring lightly until it shines, by putting a dab of grease between thumb and forefinger and gripping it as you pull it through.

Replace the O-rings.

Port

Give the lens or port one final polish with a lens cloth.

Controls alignment

Put the camera in the housing and ensure that all the controls on the camera line

up with the corresponding fittings on the housing, so that you will be able to operate everything through the housing.

Lanyard

It's a good idea to have a lanyard attached to the camera, either looped around your wrist, or an expandable one attached to your BC or harness, Check that it is securely attached to the camera.

Power

Make sure the camera will power up properly, and that the battery contains sufficient charge to last the dive. Prepare your flashgun or flash housing in the same way as the camera, fitting fresh batteries if necessary.

Settings

If using a strobe check at this point that it is working correctly. Connect flash arms, base plates and aiming torches and check their functions.

Close the housing checking that no debris or hairs obstruct the seals, with a final check that the O-ring is clean and seats properly as you close up and fasten the latch.

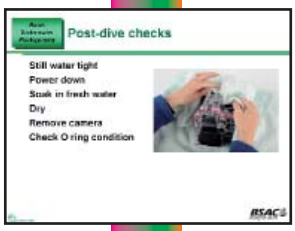
Set the flash and camera to the correct settings.

Take a test exposure

Take a test exposure before the dive.

Immerse the system briefly in fresh water – a rinse tank is ideal. Look to see if any water has got into the housing. Repeat the exercise immersing the housing in the water for longer periods until you are confident that the housing is watertight.

Avoid jumping into the water holding your camera – try and arrange to have it handed to you.



Post-dive checks

Underwater photographic equipment requires special care and maintenance. Although this equipment has been designed to be submerged the internal electronic mechanisms that drive the system are protected only if you look after the components that keep the water out.

Underwater camera systems are vulnerable to a host of natural enemies, these include, salt, sun, dirt, impact, corrosion, neglect and improper repair

Still water tight

Inspect the housing for any signs of water ingress. If you notice any moisture or water drops inside the housing do not re-enter the water or rinse. Try not to shake or rotate the housing. As soon as possible remove the camera and immediately wipe off any water drops from it. Dry inside the housing using kitchen roll. Close the housing and rinse with plenty of fresh water. Dry and examine to find the cause of the leak. Clean the O-ring and take the housing on a dive without the camera inside to establish it is watertight.

Power down

Soak in fresh water

The first procedure to carry out after a dive is to thoroughly rinse the system in fresh water. Salt is the underwater photographer's number one enemy. Salt water can dry

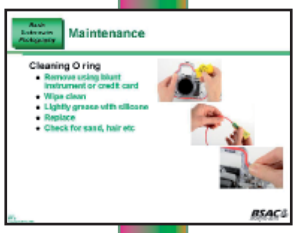
and form crystals within 10 minutes after removal from the sea. Submerge the housing and let it soak for at least 30 minutes. While the system is soaking, agitate gently and work all the controls at least once. This will help flush out any salt residue. Avoid rinsing your system with a hose. The high pressure may actually force salt crystals and sand into crevices.

Dry

Lay the housing on a clean towel and let it air dry; this allows water in inaccessible areas to evaporate. Then, using a clean, dry cloth, wipe excess moisture from the body, ports, levers, connectors, and so on. Do not wipe the lenses. Only lens tissues or photographic lens cloths should be used on lenses.

Remove camera

Check O-ring condition



Maintenance

Cleaning O-ring

Do this after every dive.

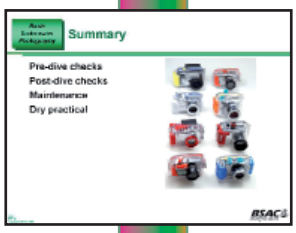
- **Remove using blunt instrument or credit card**
- **Wipe clean**

  Clean the O-ring and its seat.
- **Lightly grease with silicone**
- **Replace**
- **Check for sand, hair etc**

Housings dry practical

Get each student to remove, clean & grease O-ring and seat, replace O-ring, load camera into housing and take a photo, giving instruction and guidance where necessary.

Check the seal by placing the housing in a bucket of fresh water to leak test.



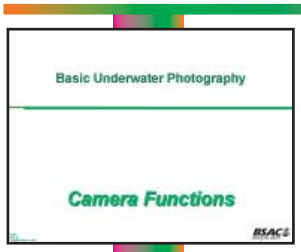
Summary

Pre-dive checks

Post-dive checks

Maintenance

Dry practical



CAMERA FUNCTIONS

Guideline duration 30min

Lesson Objectives

To understand how the camera records an image

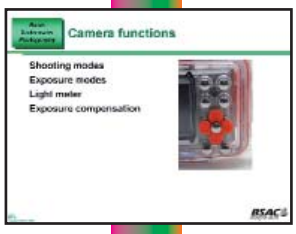
Achievement Targets

At the end of this lesson students should:

- be able to use and differentiate the various exposure options available

Additional visual aids

Camera



Camera functions

Shooting modes

Exposure modes

Light meter

Exposure compensation

Shooting modes

Virtually all digital cameras offer the same functions for taking different types of pictures but sometimes the terminology can differ between manufacturers.

Get the students to find the equivalent functions, if present, on their own cameras.

Auto

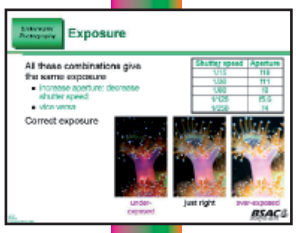
The camera will completely control flash and exposure. On most cameras this is labelled ‘auto’, on others simply ‘A’. Some cameras only have (P)rogram mode see below.

Program auto-assist

Program automatic-assist, just point and shoot. Unlike full auto mode, you can usually control flash and a few other camera settings.

Movie/video

In movie mode digital cameras can capture live video (compact cameras only). The result is of poor quality and is limited to record keeping only.



Exposure

Revise and extend the students’ understanding of exposure.

All these combinations give the same exposure

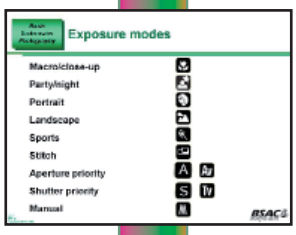
There will normally be several combinations of aperture and shutter speed which give the same exposure ie, allow the same amount of light to fall on the sensor.

- **increase aperture: decrease shutter speed**
- **vice versa**

The table shows that the same exposure obtained by using f8 at 1/60 can be obtained using different combinations of f-stop and shutter speed provided that faster shutter speeds are compensated by larger apertures and vice versa.

Correct exposure

The exposure itself can be varied, depending on the conditions and the desired results. Under-exposure will cause the image to be dark, and some parts of the subject may become invisible. [The rear tentacles of the jewel anemone are invisible]. Over-exposure results in a bleached appearance, with loss of fine detail in some areas. [The tentacles of the second anemone at the foot of the photograph have lost detail].



Exposure modes

While (P)rogram is most common for everyday use, most cameras have dozens more. It is like having an assistant photographer inside your camera who tries to figure out what settings you require to achieve the correct exposure.

Get the students to find the equivalent functions, if present, on their own cameras.

Macro/close-up

This mode is used for taking close-up pictures (compact cameras only).

Party/night

This mode uses longer exposures to capture darker scenes. Used with flash, to get a light background even in dark conditions.

Portrait

To attempt to blur out the background the camera will try to use the fastest available aperture or low f-stop number (wide diameter of the diaphragm), (compact cameras only).

Landscape

The camera will attempt to capture detail in foreground and background by using high f-stop number (small diameter of the diaphragm) settings, (compact cameras only).

Sports

To freeze motion the camera will use the highest shutter speed possible (compact cameras only).

Stitch

For creating multi-shot panoramas, this mode will help to combine several shots into one wide scene (compact cameras only) – limited use underwater.

Aperture priority

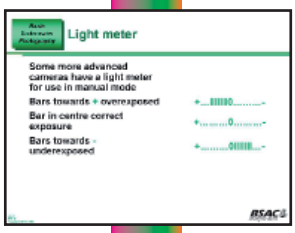
The photographer selects the aperture (f-stop) they require to achieve a particular effect and the camera will automatically select the shutter speed to achieve the correct exposure (assuming it is in its range). Some cameras use an ‘A’ symbol others ‘Av’

Shutter priority

The photographer selects the shutter speed they require to achieve a particular effect, and the camera will automatically select the aperture to achieve a correct exposure (assuming it is in its range). Some cameras use a 'S' symbol others 'Tv'

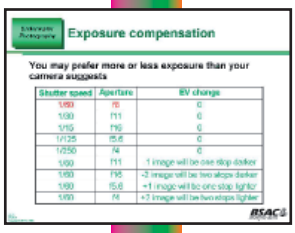
Manual

In full manual mode: the photographer must set both the shutter and the aperture to obtain the correct exposure. The majority of experienced underwater photographers favour this mode as they are in complete control over the exposure. All the results gained by using different exposure modes above can be achieved using manual mode, although it requires a lot more thought, knowledge and practice.



Light meter

The camera's light meter (more advanced compacts) informs the photographer of the correct exposure relative to the camera settings. For the correct exposure the '0' or centre point will be highlighted. If the highlighted segments fall to the + side the image will be over-exposed, the further to the left the more over-exposed it will be. If the highlighted segments fall to the – side the image will be under-exposed, the further to the right the more under-exposed it will be.



Exposure compensation

You may prefer more or less exposure than your camera suggests

Sometimes you will find that your images are consistently lighter or darker than you want for a given mode of shooting. One solution would be to change to a manual setting (if there is one on your camera) but if you require the automatic function then there is an alternative: using exposure compensation. Either set the camera to slightly over-expose (+) what it believes is correct to achieve a lighter image or to slightly under-expose (-) for a darker image. The amount of adjustment is measured in EV (exposure value). One EV is the equivalent to a two times shift in shutter speed or a full stop change in aperture.

The table on the Exposure slide seen earlier in this session showed that the same exposure obtained by using f8 at 1/60 can be obtained using different combinations of f-stop and shutter speed provided that faster shutter speeds are compensated by larger apertures and vice versa. Using exposure compensation is the equivalent of changing the aperture alone.

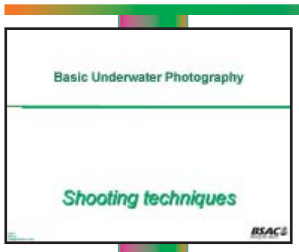
Summary

Shooting modes

Exposure modes

Light meter

Exposure compensation



SHOOTING TECHNIQUES

Guideline duration 30min

Lesson Objectives

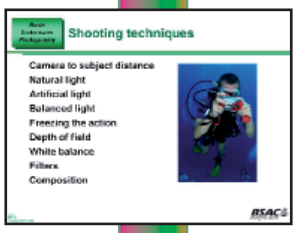
This lesson explains the significance of lighting, movement, depth of field, colour balance, and composition for underwater photographers, and introduces techniques to deal with them.

Achievement Targets

At the end of this lesson students should:

- be aware of the significance of the amount and colour of light available
- appreciate the methods available to deal with these factors.

Shooting techniques



Camera to subject distance

The most essential part of underwater photography is to plan the type of image you want to capture underwater before you even assemble your equipment. Otherwise you will come back with a series of snaps of very average quality, subject matter and appeal. Once you have planned the picture you wish to take, concentrate on that particular idea until the result is achieved.

Natural light

Artificial light

Balanced light

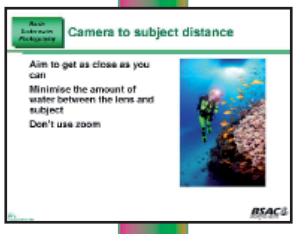
Freezing the action

Depth of field

White balance

Filters

Composition



Camera to subject distance

There is only one rule here, get as close as you can and then get closer.

Most compact cameras have a zoom control, which has the effect of increasing the magnification of the image and reducing the field of view. The mechanism may be optical, or digital, or both. The general rule is do not use the zoom, because it is likely to reduce the quality of the image.

Natural light

Due to the rapid absorption of light (especially red light) underwater, natural light photography is limited to either very shallow water, less than three metres, or to situations when monochromatic images will suffice.

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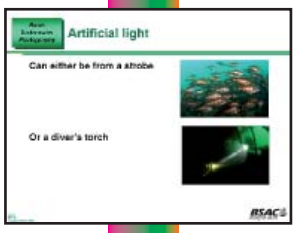
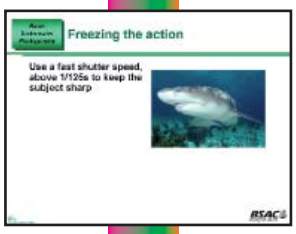


Artificial light

The majority of underwater photographers use flash to add light and colour to their images. The light can either be provided by the camera's internal flash or, on more complex compact cameras and housings, by external flash units called strobes. External strobes can be positioned away from the camera's view of the subject to provide creative lighting effects and to reduce backscatter. Backscatter is the 'snow effect' caused by the light emitted from the strobe illuminating suspended particles in the water and is more prevalent when the strobe is positioned close to the camera housing.

Balanced light

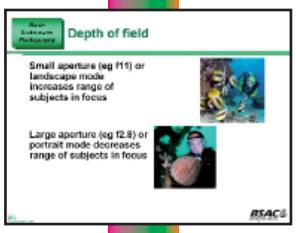
This is a technique whereby you choose an ambient light exposure similar to that of the strobe. This will produce for instance a blue background as well as a colourful foreground. In compact cameras try either 'night mode' or 'manual mode' to achieve this.



Freezing the action

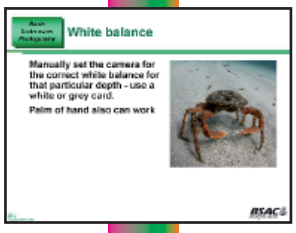
When shooting fast moving subjects, to freeze the image you can either have the subject illuminated by the strobe only or choose a fast shutter speed. Use sports mode, or a shutter speed of 1/125th or above in manual mode.

For fast moving subjects if you press the shutter release half way the camera can lock onto the subject before the shutter is fully pressed (ie image captured). This can help reduce the shutter delay.



Depth of field

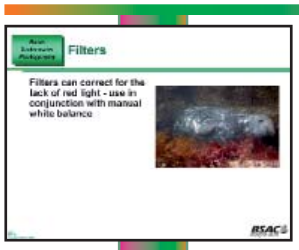
This is the range of subjects that will be in focus. To isolate the subject and have a blurry background (small or shallow depth of field) use 'portrait mode' or a wide aperture, small f-stop number eg f2. When both foreground and background need to be in focus use landscape mode or a small aperture, high f-stop eg f8. When shooting macro subjects generally a high f-stop is used to get as much of the subject as possible in focus – large depth of field.



White balance

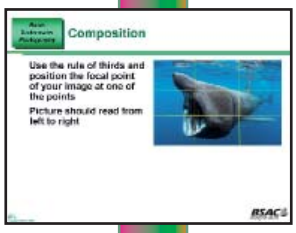
When shooting in ambient light only (no flash) it may be possible to bring back some of the lost colour by manually adjusting the camera's white balance. This in effect informs the camera that a blue/green object should really contain a range of colours. The camera then adds the lost colour to the image to correct for the loss. This generally only works down to about 10 metres but can produce some very pleasing and true to life images. Note, if you manually change the white balance you cannot use strobe lighting as well.

The effect is specific to the depth that you are at, because of the way different colours are absorbed by water. You can judge the effect by holding a white or grey card, or the palm of your hand, in front of the camera.



Filters

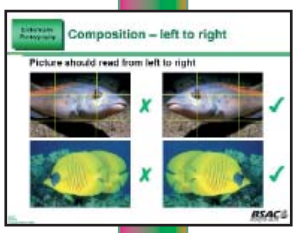
An alternative to white balancing underwater is to use a filter to correct for the loss of colour. Various filters are available depending upon the colour of water you wish to dive in and depth that you wish to go to. Filters can be used in combination with manual white balancing for a greater range of diving conditions. Note, if you use a filter you cannot use strobe lighting as well.



Composition

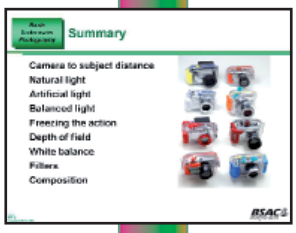
Where you place the main subject matter or focal point of your image (the area where your eye is drawn to) is highly subjective and is a personal preference. There are, however, some guidelines that will give you a head start in achieving a pleasing image.

According to the rule of thirds, generally the most pleasing position to have the main focal point of your image (for instance the eye of a fish) is a third of the way into the image from either the left or right hand side of the frame and a third of the way from the top or bottom of the image. This gives you four points in the frame.



Composition - left to right

Another aspect of composition is that in the Western world we read from left to right. It is thus more pleasing if your image 'reads' (the eye is drawn) from left to right. The examples on the VA not only demonstrate how left to right looks better [although it is a subtle point] but also show that it is not necessarily the way a fish is swimming for the picture to read left to right. Look at the yellow fish and your eye will be drawn to the right - and it is also swimming that way. Do the same with the cuckoo wrasse and your eye will again be drawn to the right ie, towards the body even though the fish is swimming the other way.



Summary

Camera to subject distance

Natural light

Artificial light

Balanced light

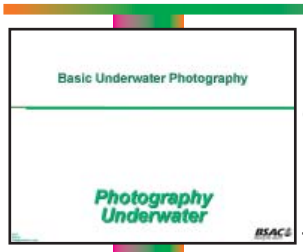
Freezing the action

Depth of field

White balance

Filters

Composition



PHOTOGRAPHY UNDERWATER

Guideline duration 45min

Lesson Objectives

This lesson warns students about the safety issues associated with underwater photography, and gives advice about the precautions to take. It also gives a number of tips for getting the best shots, and describes the Underwater Photography Code of Practice.

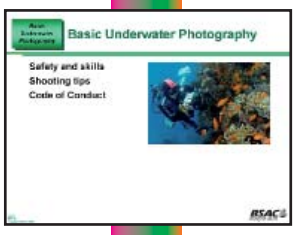
Achievement Targets

At the end of this lesson students should:

- appreciate the risks of underwater photography and be aware of the precautions and skills needed to deal with them
- remember some shooting tips, and know where to find the rest
- be aware of the Code of Practice and know where to find a copy.

Additional visual aids

Hard copy of the Code of Practice

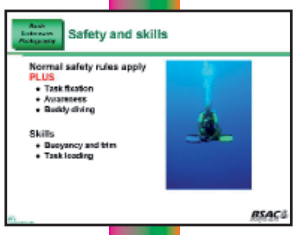


Basic Underwater Photography

Safety and skills

Shooting tips

Code of conduct



Safety and skills

Normal safety rules apply PLUS

- **Task fixation**
  Remember to monitor deco status, depth, gas etc. Task fixation is worse when suffering from narcosis. It is best to stay shallow (where you will get better light too).

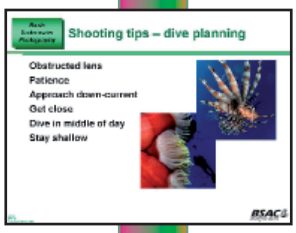
- **Awareness**
  In concentrating on photographic task, you can not only neglect to carry out the monitoring you need to do, but may fail to notice situations developing around you. Stay alert.

- **Buddy diving**
  Photographers may not be the most attentive of buddies, and may wish to stay in one place for long periods. Buddy teams should be carefully considered to put people with similar interests together eg, photographer and model or two photographers dive together. Also consider safety aspects: inexperienced divers who need special attention, independent gas supplies, risk of separation, etc.

Skills

- **Buoyancy and trim**
  The ability to stay still and accurately positioned is very important. If you are unable to do this blurred shots, frightened fish, damaged coral, stirred up silt, etc will result.
  No photograph is worth endangering marine life or damaging the fragile ecosystem that fellow divers wish to enjoy.

- **Task loading**
  Need to be able to perform all normal diving tasks while carrying and/or operating the camera.
  Developing the ability to be able to carry out long periods of swimming underwater with both hands behind the back is a good exercise for budding underwater photographers. It ensures that they have the ability to dive without the use of the hands that will be occupied by the camera set-up.



Shooting tips - Dive planning

Some of the following points reiterate those made in earlier sessions.

Obstructed lens

Be aware of dive gear, kelp, bubbles, etc. floating in front of the lens.

Patience

Be calm and patient, let ‘curious critters’ get closer and closer.

Approach down-current

Get up current from a good spot and drift along motionless with your camera in ready position.

Get close

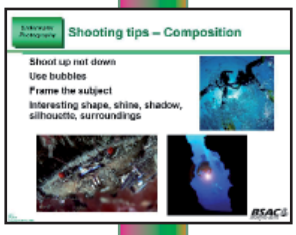
Even clean water is full of micro-organisms and other particles. The less water between you and your subject, the less impact this will make and therefore the clearer your shots are likely to be.

Dive in middle of day

Strong sunshine and clear water is ideal to start off taking images, dive in the middle of the day when the sun is at its highest.

Stay shallow

Best results can be achieved just below the surface. Light disappears quickly as you go deeper, as do colours. The autofocus systems on most compact cameras work best when there is plenty of light.



Shooting tips - Composition

The 3 VAs for this topic illustrate a variety of composition methods.

Shoot up not down

Don’t shoot down unless you have a good reason, like wanting to shoot dark subjects on a white sandy bottom.

Shoot at an upward angle to capture a more dramatic image.

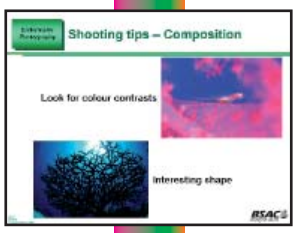
Use bubbles

Capture rising air bubbles against the reflections of the surface water. This will indicate motion.

Frame the subject

Use the walls of a canyon or parts of a wreck as a frame for your subject.

Look for interesting shape, shine, shadow, silhouette, surroundings



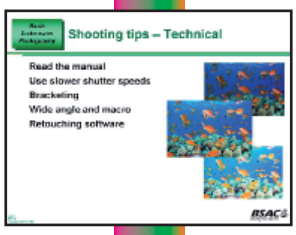
Soldiers learning the art of camouflage are taught to avoid becoming conspicuous by disguising or eliminating their shape, shine, shadow, and silhouette (amongst other things). Photographers should seek out subjects doing the exact opposite. Look for contrasting colours, bizarre shapes, towering kelp forests, subtle shades of water colours, sand and rock, wild structures, or dark shades of a wreck penetrated by shafts of sun light.

Look for colour contrasts

Get a mystic blue background, an interesting little red fish and yellow coral in the foreground. These colour contrasts will add depth to your pictures.

Isolate subject from background

Isolate the subject from the background so it stands out.



Shooting tips - Technical

Read the manual

Learn the capabilities of your camera setup before taking it underwater.

Use slower shutter speeds

Motion is slower under water, which gives you the option to use a slower shutter speed than you can on land before camera shake is noticed. Keep this in mind when selecting your shutter speed.

Bracketing

In difficult conditions take several images of the subject, altering the exposure slightly (bracketing)

Wide angle and macro

Wide angle and close up (macro) lenses enable you to get close.

Focus: the general rule is to use the camera's autofocus for wide angle. Also autofocus should work in macro mode if there is plenty of light. The best way, however, especially for close-up photography is to use manual focus if the camera has this feature. This usually involves setting the focus to a pre-determined distance and then moving the camera back and forth until the image is sharp. For low contrast subjects such as deep wrecks or dolphins in blue water sometimes the camera can't lock onto the subject so manual focus is essential.

Retouching software

One of the advantages of digital cameras is that you can retouch your photos afterwards to replace colours lost underwater – learn to use a post-processing software package like Adobe Photoshop. Using RAW format will give you the most options if you want to do this.

Code of Conduct

Most underwater photographers are concerned to protect the environment in which they take their pictures and to avoid stressing marine creatures when they are taking their images. This is good for the marine environment and leads to better photographs. This Code sets out good practices for anyone who aspires to take pictures or video underwater. Many aspects are also applicable to the general sports diver. [*Note to instructors: the headings are for teaching purposes only; they are not part of the Code itself. Printable copies may be downloaded from the MCS website*].

Code of Conduct

- **Produced by MCS**
- **Supported by all diving agencies**

This Code of Good Practice has been introduced by the Marine Conservation Society with funding from Project AWARE (UK), the Marine Wildlife Photo Agency, Ocean Optics, the Northern Underwater Photography Group and Menai Sub-Aqua Club. It is endorsed by the British Society of Underwater Photographers, the Northern Underwater Photography Group and the Bristol Underwater Photography Group. It is also being supported by the Sub-Aqua Association, the British Sub-Aqua Club and the Scottish Sub-Aqua Club. For further copies of the Code please contact MCS on 01989 566017 or www.mcsuk.org

Contents summary

- **No novices**
  No one should attempt to take pictures underwater until they are a competent diver. Novices thrashing about with their hands and fins while conscious only of the image in their viewfinder can do untold damage.

- **No danglies**
  Every diver, including photographers, should ensure that gauges, octopus regulators, torches and other equipment are secured so they do not trail over reefs or cause other damage.

- **Good buoyancy**
  Underwater photographers should possess superior precision buoyancy control skills to avoid damaging the fragile marine environment and its creatures. Even experienced divers and those modelling for photographers should ensure that careless or excessively vigorous fin strokes and arm movements do not damage coral or smother it in clouds of sand. A finger placed carefully on a bare patch of rock can do much to replace other, more damaging movement.

- **Take the easy options**
  Photographers should carefully explore the area in which they are diving and find subjects that are accessible without damage to them or other organisms.

- **Choose willing subjects**
  Care should be taken to avoid stressing a subject. Some fish are clearly unhappy when a camera invades their ‘personal space’ or when pictures are taken using

flash or lights. Others are unconcerned. They make the best subjects.

- **Thou shalt not kill**
  Divers and photographers should never kill marine life to attract other types to them or to create a photographic opportunity, such as feeding sea urchins to wrasse. Creatures should never be handled or irritated to create a reaction and sedentary ones should never be placed on an alien background, which may result in them being killed

- **Don't be greedy**
  Queuing to photograph a rare subject, such as a seahorse, should be avoided because of the harm repeated bursts of bright light may do to their eyesight. For the same reason, the number of shots of an individual subject should be kept to the minimum.

- **Don't stress**
  Clown fish and other territorial animals are popular subjects but some become highly stressed when a photographer moves in to take a picture. If a subject exhibits abnormal behaviour, move on to find another.

- **Night dives - dip don't dazzle**
  Night diving requires exceptional care because it is much more difficult to be aware of your surroundings. Strong torch beams or lights can dazzle fish and cause them to harm themselves by blundering into surrounding coral or rocks. Others are confused and disturbed if torch beams or lights are pointed directly at them. Be prepared to keep bright lights off subjects that exhibit stressed behaviour, using only the edge of the beam to minimise disturbance.

- **Don't leave trapped bubbles**
  Care should be taken when photographing in caves, caverns or even inside wrecks because exhaust bubbles can become trapped under overhangs killing marine life. Even small pockets of trapped air which allow divers to talk to each other inside them can be lethal for marine life.

- **Watch where you're going**
  The image in the viewfinder can be very compelling. Photographers should remain conscious of their position and of the marine life around them at all times. In sensitive areas, they should avoid moving around on the bottom with their mask pressed up against the camera viewfinder.

- **Report pollution and damage**
  Areas of extensive damage or pollution should be reported to the appropriate authorities.

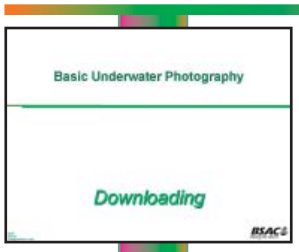
Today, when so many more divers are taking up underwater photography, both still and video, it is essential that the preservation of the fragile marine environment and its creatures is paramount and that this Code of Good Practice is carefully observed.

Summary

Safety and skills

Shooting tips

Code of Conduct



DOWNLOADING

Guideline duration 75min

Lesson Objectives

To be able to download the images captured by the camera on to a PC or MAC

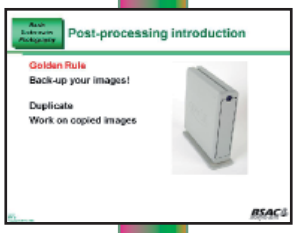
Achievement Targets

At the end of this lesson students should be able to:

- download images
- view images
- Understand basic manipulation

Additional visual aids

Cameras and USB cable or card reader PC or Mac



Post-processing introduction

When shooting film all the hard work had to be done before the shutter was released to achieve a perfect exposure. When the film was processed there was no going back – the frame was either correctly exposed or it was not and that was the end of the story. With digital photography it is almost the reverse. Obviously the exposure has to be fairly accurate in the first place. However, the majority of the work to produce good images has just started when the shutter is released. Changes usually need to be made to the exposure, contrast, colour, hue and so on after the image is captured. In fact underwater images nearly always require some adjustments to get them perfect. This session covers the most basic adjustments you can make, each of which can dramatically improve your results. One word of caution, don't overdo adjustments. When viewing your pictures on a computer screen it is all too easy to over-enrich the colour and make them razor sharp only to be disappointed when they are printed. Some kind of manipulation software will be required. Adobe Photoshop is the most common and widely used.

Golden Rule

Before you make any adjustments to your images always make a copy of them. Archive and backup the originals securely so you can always retrieve them if you find that your manipulated image is not how you would like it. Depending on how important your images are to you, consider threats such as hard drive failure (it will happen eventually), theft, loss, and fire. As a minimum an external hard drive should be used. This can also hold your backed-up original files, so you have the files stored on both your main computer and external hard drive simultaneously. For your best pictures it is recommended to further back them up on a second standalone hard drive or CD/DVD and perhaps store them off-site.

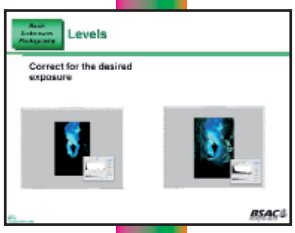
Backups should be tested regularly, to verify that a restore would actually work if you needed it.

Duplicate

If your archived images are not readily accessible for everyday use (eg, on remotely stored media such as CD or DVD, or requiring to be downloaded) duplicated copies of your images on your PC or laptop can be very handy.

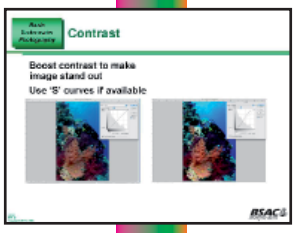
Work on copied images

It can be very annoying to overwrite the original file then discover that you have made a mistake while editing.



Levels

Levels are the amount of light that the image contains, represented as a bar graph. When viewing the image in RGB (red, green, blue) on a computer screen, each particular colour can be altered independently of the other or all three can be adjusted together. So if the image is lacking say red light, an adjustment can be made to alter the balance and in effect add the red colour to the image. Alternatively for example if the whole picture is under exposed then an adjustment can be made to correct this. There is only a certain amount of correction one can carry out before the image starts to 'break down' so generally only relatively minor changes can be made.

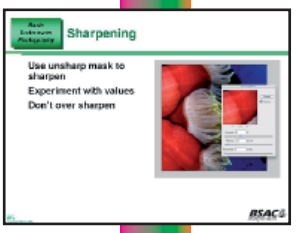


Contrast

Underwater images nearly always lack contrast, with the possible exception of brightly illuminated macro shots. This is caused by the higher density of water when compared with air in between the camera lens and the subject. A slight increase in contrast can help make your image stand out. This can either be done using the contrast adjustment function or for greater creativity by making an 'S' shaped curve with the 'curves' option, if available.

Saturation

The same effect that causes loss of contrast also is responsible for loss of saturation (how bright colours appear). By increasing the saturation your images will appear more vivid.



Sharpening

The final step in adjusting your images is to sharpen them. This is where the adjustment enhances the image to make it appear more crisp. All digital images require, to some extent, a degree of sharpening. The most common method is to use a feature called 'unsharp mask'. Originating in the printing industry it doesn't make the image softer but actually does the opposite and makes it sharper. The values of unsharp mask you select are a huge debate among photographers and experimentation is the order of the day. A good starting point is around 80 percent, with a radius of value of 1.5 - 4 and threshold value of 1-4. One word of caution, by far the majority of photographers over sharpen their images, which results in unnatural looking prints.

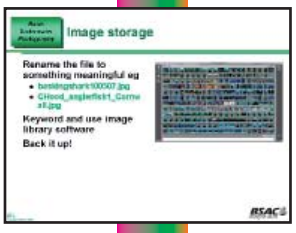


Image storage

It is important to make sure you will be able to find your photos easily in the future:

Rename the file to something meaningful

- **baskingshark100507.jpg**
- **CHood_anglerfish1_Cornwall.jpg**

Keyword and use image library software

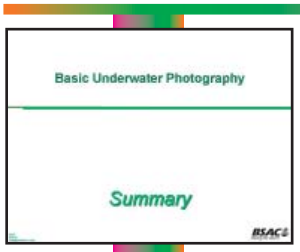
Image library software such as Adobe Photoshop, the software packages often supplied with cameras, and online services such as Flickr, help to keep tabs on your photos. They enable you to apply keywords of your choice, such as 'wrecks', 'sharks', 'UK', 'divers',

and 'Sudan 2007', easily to each photo. The software keeps track of the location of each of your photos and enables you to browse and search through your library.

It is worth spending a little time at the outset thinking about what keywords you will want and then setting them up. It is very easy and quick to apply keywords to a hundred or so photos as you upload them, but a very different matter to apply them retrospectively to a library of 10,000+.

Back it up!

Once you have edited your images do not forget to back them up and test the restore process!



SUMMARY

Guideline duration 10min

Lesson Objectives

Review of the course.

Achievement Targets

At the end of this lesson students should:

- have asked any questions they wish to ask
- have a clear idea of what they need to do to progress their underwater photography skills

Review

Practical lessons learnt

Cover any specific points, which have arisen during the course.

Also remind students of the skills and knowledge outside the scope of the course that are crucial for expert underwater photographers:

- being completely comfortable in the water, perfect buoyancy skills, and total familiarity with their own diving equipment are paramount
- it is also essential to have an in-depth understanding of the subject matter you wish to photograph. How will the animal react? Can you do it harm or visa-versa? Or, can you predict were it will be so you can get a better image?
- finally their knowledge of their camera set-ups must become second nature – there's little point in being in the perfect situation to take an once-in-a-lifetime image only to discover your camera settings are all wrong!
- practice, practice, practice!

Open forum

PRACTICAL UNDERWATER PHOTOGRAPHY

Guideline duration 3-6 hours, depending on numbers and conditions

Lesson Objectives

In this underwater practical students take shots of other students and static objects provided by the instructor, in a variety of lighting conditions. They then surface and review their shots with the instructor. They then submerge and have a second attempt, adjusting the camera settings, and/or their technique as necessary in the light of the results and guidance received.

Achievement Targets

At the end of this lesson students should:

- have loaded a camera into a housing
- have taken at least ten underwater photographs, of a variety of subjects
- have reviewed the results with an instructor
- have taken a further ten or more photographs, having modified their technique and/or the camera settings following review, if necessary
- understand the need to be in control of the camera.

Equipment Needed

Half a dozen or so toys that can be put in the water eg, wooden fish tied to a weight. If they can move so much the better. Outdoors sites often already contain suitable photographic subjects, such as garden gnomes, dumped rubbish, fish, other divers, etc.

Sufficient housed cameras for the number of students.

Sufficient spare batteries and memory cards to last the session.

Personal diving equipment appropriate for the conditions.

Lesson Contents

Ensure that BSAC Safe Diving practices are followed during this session. Also check that local health and safety requirements regarding lifeguards, pool use etc, are observed. The dives may be conducted in a pool or in open water or both, at the discretion of the instructor. Apart from normal dive management considerations, the only requirement of a site is that it should be free from conditions which would detract from students' ability to benefit from the course, such as poor visibility, temperatures or depths that would curtail dive duration, other divers and swimmers, significant water movement, surface traffic, and so on.

The instructor should arrange for any photographic 'model' objects to be placed underwater, and retrieved at the end of the session.

It is not a requirement of the course that instructors dive with the students during this lesson, but they may do so if they think it appropriate. For example, if the practical is conducted at an open water site known to the instructors but not the students, it may be helpful for an instructor to act as dive guide and lead the students to areas with the best photographic opportunities.

1. Briefing

- Assign each student to a buddy team. Buddy pairs are preferable, but larger groups may be used if necessary.

- Explain the task to the assembled students. Suggest that they photograph each other, and the supplied objects. Suggest that they experiment with different settings to achieve different exposures etc, and remind them that the most important thing is to be in control of the camera. If sharing a

camera they will need to agree a method for identifying whose photos are which.

2. Preparation

The members of each dive team prepare their photographic and diving equipment. The instructors should observe and intervene if appropriate.

- Students prepare their camera and housing, and perform pre-dive checks as taught in the lesson on Housings.
- The members of each buddy team should agree a dive plan amongst themselves.
- Students prepare and don their personal diving equipment.
- Carry out buddy checks.

3. Dive 1

Each buddy team carries out its dive plan, without underwater supervision or instruction. Each student has a go at photographing the other divers, and the supplied objects. Students should experiment with different settings to achieve different exposures etc. Each student should practice hovering motionless while operating the camera. They should take at least ten photographs each.

4. Review

Each buddy team reviews its results with the instructor, and reformulates the plans for the second dive as required.

5. Dive 2

The students repeat the elements of the Preparation lesson as necessary, and then repeat Dive 1, putting into practice any lessons learned during the review. Depending on circumstances, it may be appropriate to defer the second dive until a later date or to dispense with it entirely.

6. Wash down and tidy up

The students inspect, wash down and dry their equipment, remove their cameras from the housings, and pack everything away.

Skills Performance Standards

At the end of this lesson, students should be sufficiently competent to achieve the following skill performance standards without supervision, in sheltered water conditions:

- **Camera preparation** – loading a camera into a housing
- **Underwater photography** - taking underwater photographs of a variety of subjects

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