

Underwater Trails Handbook

Responsible Publisher

Project sponsor :

WWF

WWF is the world's largest nature conservation organisation with over 5 million donators worldwide. The organisation has an operational network in 100 countries supporting 1,200 nature protection programmes. WWF's mission is to halt and then reverse the destruction of the planet.

> www.wwf.fr

MedPAN North

The MedPAN North project is a transnational European project with the general aim of improving management effectiveness of marine protected areas in the Northern Mediterranean. It is conducted under the stewardship of the MedPAN network and is coordinated by WWF-France. It involves 12 partners from 6 European countries bordering the Mediterranean : Spain, France, Greece, Italy, Malta and Slovenia. The project is co-funded by the European Regional Development Fund through the Med Programme, with a budget of €2.38 million. The project began in July 2010 and will run through to June 2013.

> www.medpannorth.org



Technical partners



CPIE Côte Provençale

The CPIE Côte Provençale (Centre for Environmental Initiative) or Atelier Bleu du Cap de l'Aigle (La Ciotat, France) has been active in education and the Mediterranean coastal and marine environment for almost 30 years, gradually enhancing its know-how with new skills as it has developed.

The centre :

Contributes to sustainable management of the territory in support of local policies.

Interfaces between policymakers and stakeholders, sea users and professionals by educating children, informing and raising awareness among the general public, mediating and providing training for other players.

Takes action to promote responsible conduct and attitudes.

Develops and shares expertise in Sustainable Development Education.

The CPIE is active at different levels in the territory :

On the **Provençal coast** (from Cassis to Six-Fours-les-Plages) as a key player among the various target groups and decision-making managers for sustainable territory management.

Across the **PACA region** : as a partner to institutions and local authorities providing its skills in project management, network coordination, stakeholder cooperation in various fields and educational engineering.

On the French Mediterranean coast and its western area to develop inter-regional collaborative projects, relying particularly on the ECOREM collaborative platform.

> www.atelierbleu.fr - www.ecorem.eu



ADENA

Based in Cap d'Agde, ADENA is an association that has worked to foster knowledge, protection and the promotion of wildlife and the Mediterranean environment for 30 years. It manages the Bagnas National Nature Reserve and the Natura 2000 sites in Bagnas. **It also runs innovative projects on the "Posidonia of Cap d'Agde" marine Natura 2000 site** to jointly ensure knowledge, protection and sustainable development of the marine environment in partnership with local stakeholders (institutions, fishermen, divers, boaters, etc.). Working with the public to raise awareness of and educate in marine and land environments, the association has also created an underwater trail open to all.

> www.adena-bagnas.com

Financial partners



MED Programme

The MED Programme is a European transnational cooperation programme within the framework of the “territorial cooperation” objective of the European Union cohesion policy. Partners from thirteen countries including all those on the Northern Mediterranean coast work together to strengthen competitiveness, employment and sustainable development in this area.

> www.programmemed.eu



MedPAN

Since 1990, the MedPAN network has brought together managers of marine protected areas (MPA) in the Mediterranean and supported them in their management activities. MedPAN became an independent structure in 2008 and aims to contribute to the creation, operation and perpetuation of a Mediterranean MPA network.

> www.medpan.org



Rhône-Mediterranean and Corsica Water Agency

The Rhône-Mediterranean and Corsica Water Agency is a French public undertaking involved in managing water and supporting action and projects within the scope of the European water framework directive : good condition of the environment, quality of water, etc.

It is a key partner for all managers and stakeholders who contribute to its objectives on the Rhône river and Corsica basins, particularly measures that contribute to sustainable management of the marine territory, to informing the public and to controlling flows, like underwater trails.

> www.eaurmc.fr



Provence-Alpes-Côte d'Azur Region

The Provence-Alpes-Côte d'Azur Region (France) is an elected assembly which manages and exercises powers over its territory particularly in economic and sustainable development matters. The Region is a key partner in projects that contribute both to environmental protection and economic development. It also supports projects that involve the Mediterranean as a whole, assisting economic stakeholders and associations either financially or by providing logistics and technical skills.

> www.regionpaca.fr



The Bouches-du-Rhône General Council

The Bouches-du-Rhône General Council is the county's deliberative assembly; it is involved in social action, education and support for local development. In this capacity, it takes particular interest in action that contributes to sustainable development through tourism-related projects.

> www.cg13.fr



The Réseau Mer

The Réseau Mer (Sea Network) is a group of stakeholders involving associations, institutions (local authorities, public services and undertakings, etc.), scientists, marine environment managers, water sports and tourism professionals, etc. who cooperate through their different skills to create sustainable development education and awareness projects in support of public policies. This network has 180 members who participate as a group in project development. The network champions many projects in various areas, e.g. the "Écogestes Méditerranée" campaign (awareness-raising among boaters), the "Inf'eau mer" campaign (information on beaches), a collection of brochures for the general public "Cap sur...", the co-writing of books such as "l'éco-guide du bord de mer" (the eco-guide to the seaside), the booklet "A l'école de la mer" (At sea school) and the "Guide des sentiers sous-marins" (Guide to underwater trails).

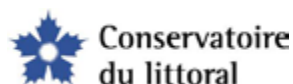
> www.reseamer.org



The Pyrénées Orientales General Council

The Pyrénées Orientales General Council is the deliberative assembly which runs the county; it is involved in social action, schools, transport, departmental roads and supporting local development. As such, it takes particular interest in action that contributes to sustainable development through tourism-related projects.

> www.cg66.fr



The Conservatoire du Littoral

The Conservatoire du littoral (Coastal protection agency) is a French public undertaking that contributes to environmental protection by acquiring properties located on vulnerable, threatened or outstanding areas. It then entrusts the management of these territories to local authorities or associations in accordance with guidelines on preserving the natural environment. It takes an interest in underwater trail-type projects which contribute to environmental protection and flow management in its territory.

> www.conservatoire-du-littoral.fr



French Global Environmental Facility

Working to support French cooperation and development policy for global environmental protection, the French Global Environmental Facility (FGEF) provides grants to sustainable development projects in areas relevant to the multilateral agreements on the environment signed by France.

The FGEF is an instrument of French cooperation and development policy in the areas of climate change, biodiversity, international waters, land degradation (including desertification and deforestation), persistent organic pollutants and protection of the ozone layer.

> www.ffem.fr



MAVA Foundation

Dr Luc Hoffmann established MAVA in 1994 as an expression of his long personal commitment to conservation. MAVA is a family-led, Swiss-based philanthropic foundation with an exclusive focus on the conservation of biodiversity.

Its focal regions are the Alpine Arc and Switzerland, the Mediterranean Basin and Coastal West Africa.

> fr.mava-foundation.org



Prince Albert II Foundation

In June 2006, HSH Prince Albert II of Monaco decided to establish his Foundation to address our planet's alarming environmental situation. The Prince Albert II of Monaco Foundation is dedicated to the protection of the environment and the promotion of sustainable development on a global scale. The Foundation supports initiatives taken by public and private organizations, in the fields of research and studies, technological innovation and socially-aware practices.

> www.fpa2.com



Agence des aires marines protégées

The Agence des aires marines protégées is a public undertaking created by the law of 14 April 2006 and placed under the governance of the Ministry of Ecology, Sustainable Development and Energy.

The main missions of the Agence des aires marines protégées are : supporting public policies for the creation and management of marine protected areas in all French waters, running the MPA network, providing technical and financial support to marine nature parks, and strengthening French potential in international negotiations concerning the sea.

> www.aires-marines.fr

Responsible publisher : WWF-France

© WWF-France, CPIE Côte Provençale, ADENA

Reproduction of this publication for educational or other non-commercial purposes is authorized without prior written permission from the copyright holder provided the source is fully acknowledged. Reproduction of this publication for resale or other commercial purposes is prohibited without prior written permission of the copyright holder.

Citation : Baude J.L., Blouet S., Dupuy de la Grandrive R., Jourdan E., Piante C. (2012). Underwater Trails Handbook. MedPAN North Project. WWF-France. 80 pages.

Coordinated by : C. Piante and J.P. De Palma

Illustrations : Carole Danfossy

English translation : Traduction ARMARIS

Layout : Poulets Bicyclettes

Printed by : Imprimerie CCI, Marseille - France

Produced by :
WWF-France
<http://www.wwf.fr>

Cover photo credit : Cap d'Agde Underwater Trail © Renaud Dupuy de la Grandive

Available from : www.medpan.org

ISBN : 979-10-92093-00-1 9791092093001
August 2012



Underwater Trails Handbook

2012

Contents

Acknowledgements	11
Introduction	12
1. Definition of an underwater trail	13
2. Underwater trails - a land-use management tool	17
3. Regulations for underwater trails	25
4. Educational aspects and methods	34
5. Designing an underwater trail	46
6. Economic approach to the underwater trail	57
Conclusions	68

Acknowledgements

In 2008, the CPIE Côte Provençale published the “**Methodological and Technical Guide to Underwater Trails**” within the framework of a project supported and funded by the PACA Region, the Rhône-Mediterranean and Corsica Water Agency and the Bouches-du-Rhône General Council. The document is designed for local authorities and managers of the coastal environment. It outlines the framework for developing the activity and organisation of underwater trails as tools for managing the territory, in the French Mediterranean.

Seven authors contributed to drafting the initial version of this work :

- ◆ Pierre Boissery, from the Rhône-Mediterranean and Corsica Water Agency,
- ◆ Nathalie Quelin from the Regional Directorate for the Environment, Spatial Planning and Housing (DREAL) PACA,
- ◆ Benjamin Durand from the Bouches-du-Rhône General Council
- ◆ Valerie Raimondino from the Provence-Alpes-Côte d’Azur Regional Council
- ◆ Jean Louis Baude, Christelle Masclef and Eric Jourdan, from the CPIE Côte Provençale.

The work was drafted on the basis of experience gained by the parties to the “Charter of underwater trails”. This Charter sets out the values shared by structures that run underwater trails as part of an educational approach to the environment.

The French version of the “Guide to underwater trails” has been used as a basis for this new version with Mediterranean and international scope.

The original version of the “Methodological and Technical Guide to Underwater Trails” is available at : <http://ecorem.fr>

Mediterranean adaptation

This document has been adapted within the framework of the European MedPAN North project, coordinated by WWF-France.

It is the result of work achieved thanks to input from several organisations.

Five authors worked on the Mediterranean adaptation of the Methodology and Technical Guidelines to Underwater Trails :

- ◆ Jean-Louis Baude, Eric Jourdan - CPIE Côte Provençale
- ◆ Renaud Dupuy de la Grandrive, Sylvain Blouet - ADENA
- ◆ Catherine Piante - WWF-France

The adaptation was funded by the Med Programme, WWF-France, PACA Region, the MedPAN association, the Conservatoire du Littoral, the Pyrénées Orientales General Council, the French Global Environmental Facility, the MAVA Foundation, the Prince Albert II of Monaco Foundation, and the French Agence des Aires Marines Protégées.

Introduction

The seas and oceans are environments with a wealth of diversified resources. They play an active part in regulating key factors of the planet and are still the main means for transporting goods and passengers. With the advent of tourism, the world's main economic sector, the sea also became a recreational area hitherto regarded as completely free, where anything is permitted.

But the ecological balance of the sea is now under threat. In coastal areas, its rich and diverse fauna and flora are regularly under stress. Being almost enclosed, the Mediterranean Sea is all the more fragile. Demographic pressure is the most significant. In 2025, the Mediterranean coasts should be home to 176 million permanent inhabitants and tourist numbers in coastal regions will reach 312 million. The Mediterranean also bears a considerable share of the global freight traffic and is seeing significant growth in cruise and yacht traffic.

The sea has long been regarded as a law-free area. Its use is now subject to **international conventions** placing the emphasis on environmental conservation, such as the **United Nations Convention on the Law of the Sea** and the **Barcelona Convention** with regard to the Mediterranean.

Aware of the importance of protecting certain areas, most countries bordering the Mediterranean have created **marine protected areas (MPA)** mainly in coastal areas. MPAs can be regarded as sustainable development labs working for effective ocean and coastal management. Not only do they protect sensitive environments and endangered species, they are also a means of increasing the productivity of fishing grounds, regulating the different uses of the sea, supervising sustainable tourism and creating new activities that generate jobs.

Out of the tools that contribute to educating and raising public awareness of the environment in MPAs, “underwater trails” have swiftly gained recognition as practical and effective, embodying the concept of sustainable development.

Sponsored by the MedPAN North project under **the stewardship of the MedPAN network, this document is the Mediterranean version of the Methodological and Technical Guide to Underwater Trails** published by the Atelier Bleu in 2008. It is intended for MPA managers in the 21 countries in the Mediterranean basin that

wish to create underwater trails in their territory and more broadly for coastline management stakeholders.

Objectives of the guide :

This guide is intended to be a methodological and technical **reference document** for the creation and management of underwater trails. It is designed for MPA managers and more broadly for stakeholders involved in coastline management, particularly in environmental education.

There are six parts to the document :

- 1. Definition of underwater trail :** proposed criteria for characterising and recognising the various existing types.
- 2. Underwater trails - a land-use management tool :** given the pressure on Mediterranean ecosystems, underwater trails may play a role in their management.
- 3. Regulations :** presents a list of regulatory aspects that any project sponsor must take into account within the framework of domestic legislation.
- 4. Educational aspects and methods :** target groups, different approaches to educational practices, content and methods, possible tools.
- 5. Designing an underwater trail :** addresses the actual creation of an underwater trail, from choosing the site through to organisation, necessary resources and cost. This section provides a basic framework for the specifications needed to create an underwater trail.
- 6. The economic approach to the underwater trail :** addresses the various business models that project leaders may consider based on case studies.

The document concludes by addressing the opportunities and challenges of an underwater trail.

1. Definition of an underwater trail

1.1 From snorkelling to an underwater trail

© E. Voito - OCEC



The Lavezzi Islands underwater trail (Strait of Bonifacio Nature Reserve - France)

Out of the terms frequently used in the media or by structures organising activities to discover the marine coastal environment, the following are often used interchangeably :

- ◆ **Snorkelling.** This usually refers to a leisure activity of discovering the marine environment on the surface, without any particular sports connotation.
- ◆ **Underwater trail or snorkel trail** generally refer to a leisure activity of exploring the environment regarded more as a sport. The activity will usually also involve a specific organisation and sometimes a guide.
- ◆ **Snorkel tour or long-distance snorkelling** refer to a mainly sports activity organised as a specific event.

Given the differences in terms and meaning, a precise definition of “underwater trail” has been developed to characterise this innovative concept in the context of Environmental Education towards Sustainable Development.

Definition :

An underwater trail results from a combination of three elements which, in synergy, give the concept a specific identity : **exploration in water**, using light equipment, **a site**, usually at sea, and an **educational focus designed to bring about behavioural change**.

1.2 Underwater trail : an instrument for sustainable development

An underwater trail is a concrete example of action taken for the sustainable development of a territory. Social, economic and environmental aspects can be taken into account, integrating land-sea continuity, which is important to understand and address issues on our coastlines.

As the three components of sustainable development remain closely linked in this activity, underwater trails can be used :

From an economic perspective as :

- ◆ An instrument to develop sustainable, environmentally-friendly and responsible tourism,
- ◆ A job-creating instrument,
- ◆ A professional training tool for stakeholders having a connection with the marine environment, even indirect.

Cabrera Archipelago Maritime – Terrestrial National Park - Spain



From a social perspective as :

- ◆ A personal development tool suitable for all : children, families, seniors,
- ◆ An instrument for integrating people with social or physical difficulties.

From an environmental perspective as :

- ◆ An environmental education tool for a large target group including school pupils and young people by integration into educational projects,
- ◆ An environmental conservation instrument in land-use management as it contributes to channelling visitor flows and thus reduces their impact on the environment.

1.3 Points of reference

Behind a “simple” activity of discovering a shallow seabed with light equipment, i.e. a mask and sometimes flippers and a snorkel, lies a whole range of practices. They may be organised or otherwise, done independently or under supervision, etc. Below are a few points of reference about the origins of this activity, which has developed from a mere leisure activity in water and now includes many variants.

1.3.1 Originated in a tropical environment

The history of snorkelling goes back to 1958 in the British Virgin Islands. Originally, the activity was called sea-watching and consisted in contemplating the underwater environment from the surface, using a snorkel instead of diving equipment and always without the slightest predatory behaviour. In the tropics, the particularly pleasant environmental conditions meant non-divers could easily enjoy the beauty of the seabed... For a long time, snorkelling was essentially a secondary activity done by divers or non-divers accompanying them.

1.3.2 A few examples of development outside the Mediterranean

In certain parts of the world where the environmental conditions are particularly inviting, easy implementation and public interest in discovering the marine world led to widespread development. Places like Australia, Mexico, Florida and Egypt have thus become very popular for snorkelling. For example, in the Yucatan, entire coves have now been laid out as water parks specifically for the activity. In Australia, on the Great Barrier Reef, pontoons have been built to receive charter boats full of snorkelers. Even though the environmental impact of the activity is taken into account, economic considerations prevail.

1.3.3 Mediterranean development

At the same time, in the western Mediterranean, despite the more seasonal environmental conditions, snorkelling also developed through two different approaches.

In Spain, around the Medes Islands, snorkelling initially developed alongside traditional diving, until the economic model became more profitable, with the activity drawing more people and generating bigger figures.

In France, an original approach focusing on environmental protection called “underwater trails” gradually emerged. The Port-Cros national park was the first park to develop the activity some thirty years ago, primarily with the aim of protecting environments, raising user awareness and changing behaviour. **Unlike snorkelling, underwater trails are necessarily an organised activity.**



La Palud underwater trail (Port-Cros National Park - France)

© Parc national de Port-Cros - C. Gérardin

Recently, greater concern for environmental issues has speeded up the phenomenon with the development of underwater trails throughout the French Mediterranean coast. MPA management structures, local authorities and environmental education groups thus propose underwater trails as part of an Environmental Education towards Sustainable Development approach. Today, an underwater trail community has been created with a charter of shared values, involving 20 organisations. The priority focus is environmental protection and change of behaviour. The activity is organised for longer than the summer season and for different target groups. In 2006, a survey conducted with nearly 12 organisations assessed the number of people who had done an underwater trail on the French Mediterranean coast at 50,000.

Underwater trails are arousing a lot of interest in other Mediterranean countries and several projects are currently underway.

1.4 Underwater trail development issues

The attraction of outdoor leisure activities and particularly in water is undeniable. Tourist numbers in summer on the Mediterranean coast place the region as the world's top destination. How long can we go on allowing tourist activities to develop without control, driven solely by an economic model of consumption and/or deterioration of the land and sea?

Eco-tourism activities can play an important part if these practices are organised with regard for quality and a number of values. The development of underwater trails is directly part of this approach. To take the different issues inherent in this activity into account, organisers may focus on the following aspects for the environment :

- ◆ Respect for marine life, disturbance, contact, damage, etc.
- ◆ Monitoring the impact of visits on the area,
- ◆ Educational approach to change behaviour,
- ◆ Nature and the relevance of the environmental messages conveyed,
- ◆ The link to be developed between the activity and the territory.

Other operational issues tie in closely with the environmental approach :

- ◆ Cohabitation with the various other uses and users of the environment,
- ◆ The measures taken for user safety and well-being,
- ◆ Training of operators involved in running underwater trails,
- ◆ The importance of operators setting the example, etc.

In the French Mediterranean, an **“Underwater trail”¹ charter has been drafted** by a working group² consisting of marine protected areas (Port Cros National Park, Blue Coast Marine Park, Cerbere-Banyuls Marine Nature Reserve, Strait of Bonifacio Nature Reserve) and some fifteen other environmental education organisations. The objective was to highlight common values to nest an underwater trail in an Environmental Education towards Sustainable Development approach.

Article 1 completes the definition of an underwater trail : “An underwater trail is an organised and educational marine activity aiming to show people the diversity of marine landscapes safely while highlighting the fragility of ecosystems and supporting changes to behaviour.”

The Charter emphasises the manager's **responsibility** as regards the site and the educational aspect of the activity, as well as the content of the environmental message. Such are **the core values of an underwater trail**. Parties to the charter undertake to :

- ◆ **Inform the public about :**
 - ◇ The diversity of the marine environment,

- ◇ Its functioning and complexity,
- ◇ Its special features in relation to the land environment,
- ◇ The position of man in this environment.

- ◆ **Allow people to discover the local components of the marine environment :**
 - ◇ Wealth and diversity,
 - ◇ Fauna, flora,
 - ◇ Habitats,
 - ◇ Territorial issues,
 - ◇ Specific features of the site.
- ◆ **Raise public awareness of environmentally-friendly behaviour and practices which are also respectful of other users.**
- ◆ **Seek optimal conditions for user safety.**

The community of underwater trail managers that are parties to the charter today includes the best known trails on the French Mediterranean coast. In future, it will seek to expand to all underwater trail organisations keen to adopt an approach based on quality and ongoing improvement.

1.5 Some features of underwater trails

1.5.1 Shared features

A survey on the types of activity done in France was carried out in 2007³ and highlighted a number of points common to the various underwater trails :

- ◆ Environmental protection and/or education.
- ◆ The choice of the site based on the nature of the territory and/or a remarkable environment (setting, surroundings, biodiversity and landscape).
- ◆ A site made safe in one way or another by signposting (other users), monitoring, accompaniment and/or posters (regulatory and hazards).
- ◆ An itinerary in an area that varies from a depth of 0 to 10 metres corresponding to the limit of visibility from the surface.
- ◆ Observation stopping points with explanations provided by marker buoys, underwater notice boards, a guide or by FM radio snorkelling equipment.

3 Survey carried out by the CPIE Côte Provençale.

1 <http://atelierbleu.fr/wp-content/uploads/charte%20des%20sen-tiers%20sous-marins.pdf>

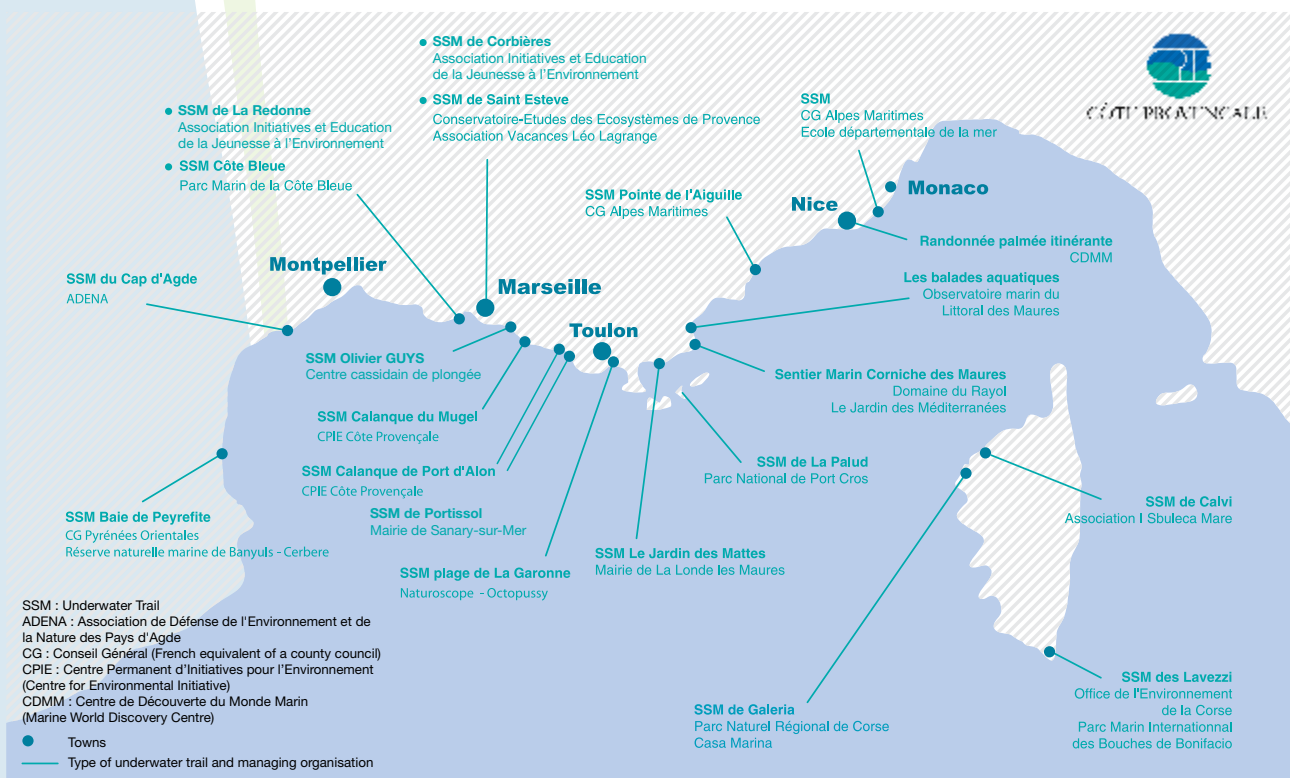
2 Working group that met within the framework of the Réseau Mer (Sea Network) “Environmental Education” of the PACA Region on 7 January 2007.

1.5.2 Differentiating factors

Although the underwater trails have a number of points in common, they may differ on other criteria :

- ◆ The **diversity of the surroundings and habitats** presented. There are both “thematic” trails and trails with “different types of habitats”.
- ◆ The **way they are organised** : with or without a guide, or both.
- ◆ The **structuring of the trail** : in terms of signposts for safety, prohibition, notice boards, stop-point buoys; trails can be classified as “light” and, conversely, “structured”.
- ◆ The **opening period** : full year or seasonal.
- ◆ The **type of activity** : occasional or ongoing, as part of a learning project (i.e. courses or one-off activity, etc.).
- ◆ The inclusion, in **messages**, of **territorial issues**, the **impact of the catchment area** (land/sea continuity) and **uses** (sharing the area) which is not always the case.
- ◆ The **target group** : general public, specific group (children), varied.

UNDERWATER TRAILS IN THE FRENCH MEDITERRANEAN



2. Underwater trails, a land-use management tool

2.1 Mediterranean ecosystems

2.1.1 Definitions

A biocoenosis : Grouping of living beings (plants, animals, etc.) living in a given environment and interconnected. The term covers both communities, the distribution of their species and their inter-relations. Populations of a biocoenosis live together in an orderly fashion and not as randomly distributed organisms. The organisms are spread over the area such that they make best use of the environmental conditions.

A biotope : An area occupied by a biocoenosis. It is the component containing sufficient resources to ensure life continues and develops.

An ecosystem = BIOTOPE + BIOCOENOSIS

An ecosystem is a functional ecological unit with a certain stability, comprising a set of living organisms (biocoenosis) exploiting a given natural environment (biotope). This concept also encompasses interactions between species themselves and with their habitat. Ecosystems are generally characterised by the substrate they comprise (sand, rocks, etc.), but some are defined by the dominant species found in these areas (Posidonia seagrass, coraligenous, etc.). It is important to understand that there are interactions between them, but that the boundaries between each one are not as clear as one might think. The transition from one ecosystem to the next is often gradual.

2.1.2 Specific features of the Mediterranean

The Mediterranean is a **semi-enclosed sea** linked to the Black Sea by the Bosphorus and Dardanelles Straits, to the Red Sea by the Suez Canal and to the Atlantic by the Strait of Gibraltar. Accounting for 0.8% of the world's ocean surface area, **the Mediterranean is teeming with biodiversity** and is home to more than 8% of marine biodiversity (10,000 to 12,000 marine species identified, combining flora and fauna). With a **high rate of endemism**, compared to most other seas and oceans, 87% of its biodiversity is present in its western basin alone. Our coastline really deserves the keen interest it arouses but also, and above all, our full attention.

2.1.3 Distribution of life

No underwater landscapes have formed at random. The sea shapes the physical environment. Living organisms are spread over these areas according to the influence of factors such as :

- ◆ **Light** : it decreases with depth and with the complexity of the terrain. Algae and plants flourish in well-lit areas (called **photophilic**), while some animals shun light (called **sciaphillic**).
- ◆ **Suspended particles** : these are small grain minerals and fragments of organic matter that are often the basis for food.
- ◆ **Temperature** : the greater the variations in temperature, the more influence it has (this is particularly the case near the surface).
- ◆ **Hydrodynamism** : the swell is greater closer to the surface, and the waves will have an impact on biocoenoses.
- ◆ **The nature of the seabed** : the stability of the bed or the presence of crevices (shelter and protection) will also be an important selection factor for living organisms.

The heterogeneity of the distribution of species depending on depth is an essential point for understanding the issues. Most species are found in the areas closest to the surface and the number decreases with depth.

There are two major types of marine living beings, divided by their ways of living : pelagos and benthos.

Pelagos is the group of organisms living in open water. It includes :

- ◆ Plankton, comprising all organisms that are passive in relation to the movements of the mass of water and living in suspension (phytoplankton, plant fraction and zooplankton, animal fraction),
- ◆ Nekton, comprising all organisms capable of moving around, possibly against currents, such as fish, some crustaceans, cephalopods and marine mammals.

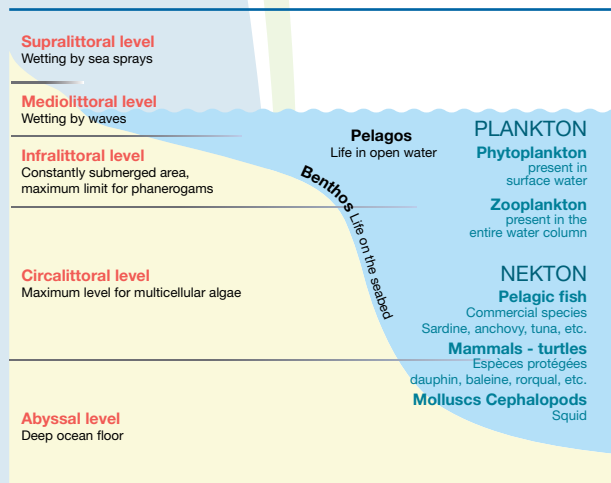
Benthos comprises the group of organisms living in **direct contact or close to the seabed**. It also includes a plant fraction, phyto**benthos**, and an animal fraction, zoobenthos. Most benthic species are fixed or barely mobile and are therefore strongly **subjected to changes to their environment**. Their classification is tiered according to ambient factors : primarily wetting and light as well as hydrodynamism, salinity, the nature of the substrate and the temperature. Groups of remarkable and characteristic species can be identified.

There are therefore several tiers according to the vertical gradient of light and wetting :

- ◆ **Supralittoral level** which is home to organisms requiring high wetting provided by sprays and strong waves, without being immersed. They are adapted to drying,
- ◆ **Mediolittoral level** corresponding to the area lashed by the waves and subjected to tides. This area is an alternation between emersion and immersion. The height of this level is limited in the Mediterranean due to the low amplitude of the tides,
- ◆ **Infralittoral level** : submerged area compatible with the life of the marine phanerogams and photophilic algae (approximately 40m),
- ◆ **Circalittoral level** : down to the maximum depth compatible with the survival of multicellular algae (approximately 120m),
- ◆ **Abyssal level** : very deep, still relatively unknown.

Spanning 21 countries, the Mediterranean coast totals about 46,000 km, more or less equally divided between rocky coasts and accretion coasts (sandy beaches, barrier beaches and coastal dunes, marshes, lagoons, estuaries and deltas). The fringe of the marine coastline (infralittoral level) only represents approximately 5% of the total area of the Mediterranean, but its ecological and fishery value is high.

THE DIFFERENT LEVELS IN THE MARINE ENVIRONMENT



2.1.4 Remarkable biocoenoses

There are several remarkable coastal biocoenoses : *Posidonia* seagrass, coralligenous biocoenosis, sandy seabeds, lagoons, caves, etc.

Here we present two emblematic biocoenoses :

a/ *Posidonia seagrass*

Posidonia oceanica seagrass is regarded as one of the most important ecosystems, and even the **pivotal ecosystem** of the entire Mediterranean coastline area. An endemic Mediterranean species, it is the ultimate stage of a succession of stands and its presence is the sine qua non of the ecological balance of many Mediterranean coastal seabeds. It is regressing in many regions. It is a habitat protected by many national laws as well as by the Barcelona Convention and the European Habitats Directive. Two other marine phanerogams may be found in the littoral zone : *Cymodocea* and *Zostera*.



Posidonia oceanica, flower, fruit and ball

b/ *Coralligenous biocoenosis*

The coralligenous biocoenosis, a natural construction built mainly from limestone plants, is a habitat for almost 1,700 plant and animal species. These algae accumulate over time to form concretions which tend to completely cover the substrate thus creating a mosaic of plant and animal communities. It grows at a rate of 1 mm/year. It therefore takes several thousand years for this ecosystem to develop. The coralligenous community constitutes a **real seascape**, ranging from a few metres below the surface to a depth of several tens of metres. Its inhabitants occupy all three dimensions of the space. All major marine animals are represented with unique biodiversity.



Coralligenous biocoenosis - Croatia

© S. Habsbruck - Atelier Bleu

A. Rosetti - Sunce



© M.Floriani - MedPAN

Urban development on the coast - Lebanon

2.2 Pressures on ecosystems

2.2.1 The destruction of habitats

Today, the massive physical destruction of habitats is the biggest threat to marine biodiversity. Due to its climate, the Mediterranean coast is a much coveted habitable area which is saturated in many places. Coastal development is the cause of the regression of ecosystem-engineering organisms. In 50 years, there has been a major regression of *Posidonia* seagrass surfaces all around the Mediterranean, particularly around major cities, seaside resorts or industrial ports.

Change in the topography of the coastlines is the cause of changes in sedimentary movements on the coast. These effects can be felt several tens of kilometres away. This phenomenon, coupled with the artificial growth of beaches with fine particles, increases the sedimentation of seagrasses.

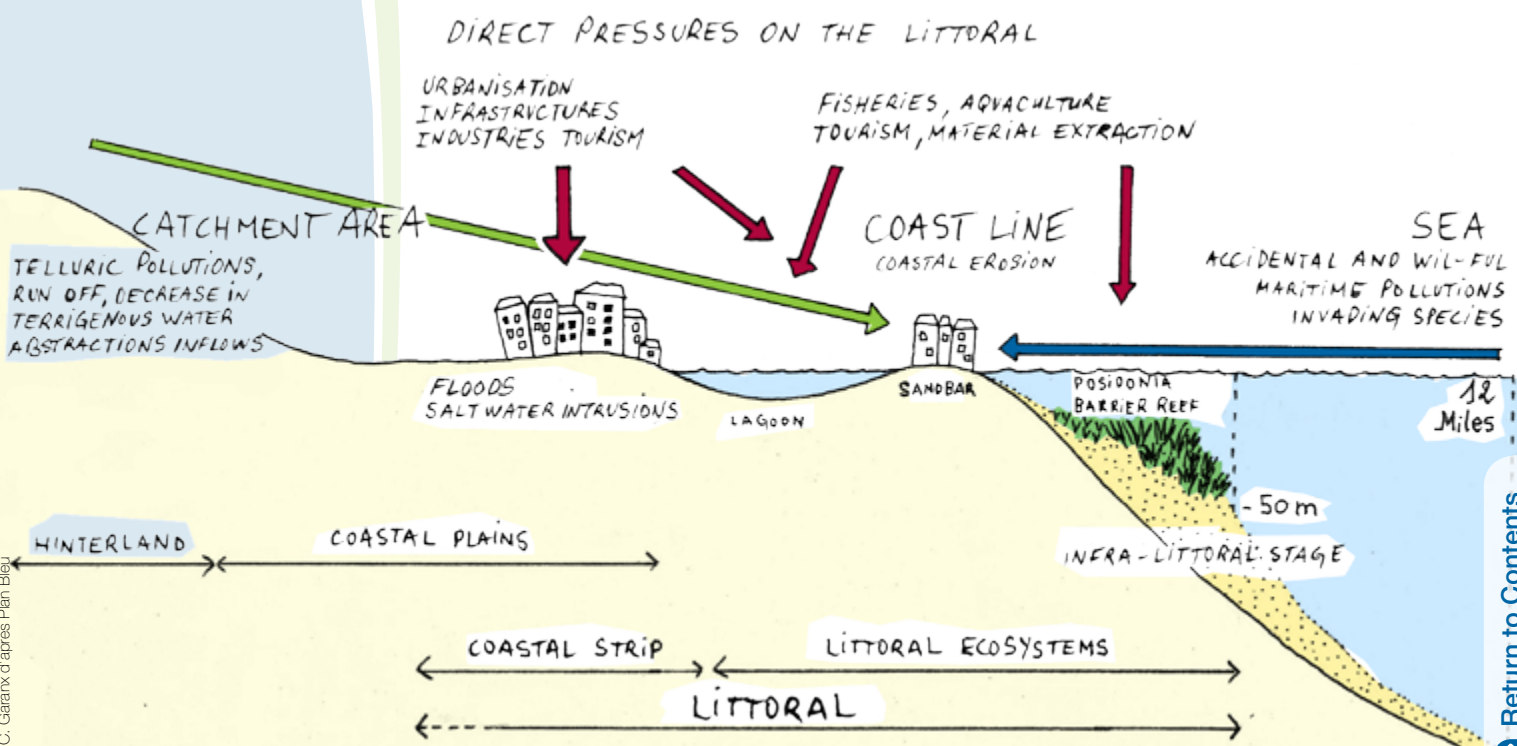
In addition, leisure activities and outdoor sports are constantly on the rise, as illustrated by yachting. **For example, approximately 35,000 pleasure boats use the waters of Port-Cros national park between April and October.** The impact of the repetitive mooring of these vessels in shallow areas contributes to the decline

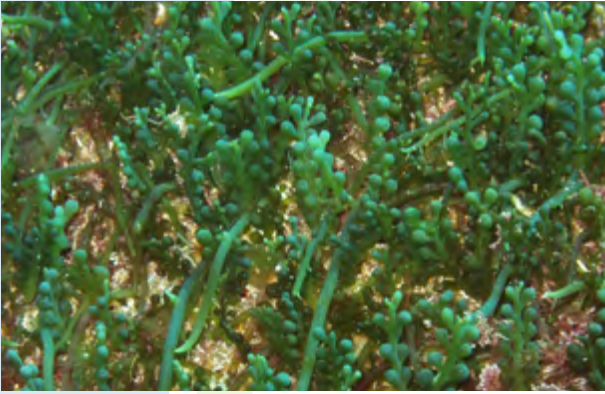
in coastal habitats. Scuba diving has also grown significantly in recent years. Some sites have thus been subjected to a significant influx of visitors threatening the equilibrium of ecosystems and damaging habitats.

2.2.2 Invasive species

One very strong cause of disturbance to the marine environment is linked to the introduction (deliberate or accidental) of non-native species with multiple origins :

- ◆ Parasite species or voluntarily imported species,
- ◆ Input of domestic animals or plants to the natural environment,
- ◆ Transportation of organisms by the maritime routes, especially by emptying ballast water in ports,
- ◆ Transportation and release of species by anchors,
- ◆ Lessepsian migration (from the name of the builder of the Suez Canal).





Caulerpa racemosa

The Mediterranean is a particularly affected sea since there are nearly 500 non-native marine species in total. When they survive and proliferate, these species can cause changes to the biotope. When the introduced species compete with native species and tend to replace them, they are called invasive species (example : *Caulerpa racemosa*).

The consequences of these biological invasions can have serious repercussions at different levels. The replacement of ecosystem-engineering species changes all the communities that are associated with and adapted to them. The uncontrolled development of these species leads to a homogenisation of more or less extensive geographical areas which can result in :

- ◆ A reduction in the number of habitats,
- ◆ A reduction in the abundance of native organisms,
- ◆ A reduction in the size of these organisms,
- ◆ A reduction in the specific biodiversity on a regional scale,
- ◆ The production of toxic products.

The consequences can be devastating for the local economy, due to a reduction in the catches of commercial fish or a loss of landscape diversity due to scuba diving activities.

2.2.3 Exploitation of resources

a/ Professional fishing

There are two types of professional fishing in the Mediterranean : small-scale coastal fishing and open-sea fishing. The practices of these two categories of fishermen have very different impacts on the environment. Small-scale coastal fishing is a local activity with an ever-declining number of professionals. The majority are gillnetters and their catches are therefore very targeted. There are also some urchin fishermen and longliners and again specific species are fished. Their area of operation is within the 3 nautical miles zone. As the size of the vessels is less than 18m, this activity is only done during the day and they often sell their catch directly on the wharf. Open-sea fishing occurs beyond 3 miles : trawlers perform non-selective catches on pelagic fish and tuna seiners target bluefin tuna. The boats are much larger and require staff. Their economic viability therefore requires significant catches.

Thus, given the specific features of each practice, problems of overfishing cannot be generalised to the entire profession. Small-scale fishermen are involved in managing the marine environment and are an integral part of the territory.



© R. Dupuy de la Grandrive

Professional fisherman in the Ain Ghazala Marine Protected Area - Libya

The importance of the open-sea fishing economy and the constant increase in catches is one of the reasons for the decline of fish stocks. This over-exploitation is even going so far as to change the genetic structure of certain species. Catches that are too large on one compartment, usually predators, cause major changes to the entire trophic network. Disrupting the trophic equilibrium by the decrease or disappearance of a compartment can cause imbalance resulting in the proliferation of species that no longer have any predators or even in the disappearance of associated or dependent species.

b/ Recreational fishing

Amateur fishing or recreational sea fishing means fishing intended solely for consumption by the fishermen and their families, so the catches are neither displayed nor sold. This activity encompasses a great variety of practices and is experiencing significant growth in some countries. Amateur fishing catches are increasingly studied in the Mediterranean. Some studies have shown that the stock taken is significant compared to those of professional fishing with sometimes equivalent annual tonnages. Non-compliance with catch sizes (small fish), often detected, alters the resource's ability to regenerate, causing a demographic imbalance.

2.2.4 Pollution

a/ Catchment area

Uptake from the catchment area can be anthropogenic : for example the discharging of water used by man for everyday living (urban water, treated or not) or for activities (industrial waters whether treated or not, farming, etc.). It may also be natural input by water courses, often eroded by the contamination they suffer throughout their journey. Lastly, rain water is a further contribution to the sea, and with it, all the contaminants that it has recovered on its journey (leaching of the atmosphere and soil). These pollutants can be dangerous for marine flora and fauna and adversely affect human activities (tourism,

fishing, etc.) by contaminating shellfish, fish and other crustaceans or by the poor quality of bathing water.

b/ Wastewater

In the Mediterranean, 101 critical priority coastal sites have been identified¹ in terms of land-based sources of pollution. Non-treated domestic and industrial wastewater discharges are the main cause of contamination and they increase with the population. Now, coastal regions are particularly attractive : thus, the population of the coastal towns on the Mediterranean could grow by 1% a year through to 2025 to reach 90 million compared to 70 million in 2000² These permanent populations are boosted by tourists who can more than double the number of people during the summer season.

The impact of industrial discharges must not be overlooked. The main components discharged are mercury and cadmium (the most monitored), organochlorines (present in solvents, pesticides, insecticides, fungicides or refrigerants for example) and persistent hydrocarbons. Many industries discharge into the sea via rivers. In some countries, the law now requires this type of industry to have water treatment systems. Rainwater gets loaded with pollutants during its journey. It picks up solid micro-particles in the atmosphere (heavy metals, nitrogen and sulphur oxides). On land, they trickle down and wash the soils which have accumulated all sorts of items.

The impact of run-off water is linked to the characteristics of rainfall. In the Mediterranean region, annual average rainfall is low. Rainfall has a strong impact because it appears in the form of rare and violent peaks. It drains large quantities of water which are loaded with pollutants accumulated in the atmosphere and in the soil, especially in the summer period.

c/ Macro-waste

Waste from various sources is found on the coastline :

- ◆ **Coastline user waste** : remnants of picnics, glass or plastic bottles, metal cans, cigarette butts and empty packets, newspapers, sunscreen, clothing, etc.
- ◆ **Ports** : waste comes from losses occurring during cargo handling on the wharfs and ships, from fishing activities, maintenance done in careening areas as well as discarded domestic waste.
- ◆ **Landfills** : open dumps in the vicinity of the coastline and water courses are a major source of waste into the sea.
- ◆ **Domestic and industrial activities** : any waste escaping the disposal system is likely to end up on the coastline.
- ◆ **Passing ships** : the amount of this waste is difficult to estimate. The French research institute for use of the sea (IFREMER) has demonstrated a link between accumulation of debris on the seabed and car ferry routes.



© R. Dupuy de la Grandrive

Macro-waste in Italy

d/ Nautical activities

The concentration of boats and therefore waste creates a health risk : the quality of the bathing water can therefore deteriorate at some mooring sites. Products used can build up on the water's surface, particularly detergents and soaps. Surfactants restrict the exchange of oxygen between the air and the water. They attach themselves to plants, inhibit their growth and induce necroses. *Posidonia* seagrass beds are therefore very sensitive to them. They also modify the behaviour of fauna, particularly shellfish (filters).

2.2.5 Climate change

The current climate context is also a major factor in environmental disturbances. There are two major trends in climate change :

- ◆ **An increase in average temperature on a global scale.**
- ◆ **An increase in the frequency and magnitude of extreme weather events.**

These factors cause changes which vary in extent on a local scale. They may lead to changes in the areas of distribution of certain species or the disappearance of relatively immobile, little dynamic species. We therefore sometimes talk of the "tropicalisation" of the Mediterranean, meaning the appearance, in the north-western basin, of species that prefer hot climates.

1 Source : MedPOL

2 Source : Plan Bleu

2.3 Efforts to protect coastline biodiversity

2.3.1 The Barcelona Convention and European legislation

In addition to the United Nations Convention on the Law of the Sea and the other international instruments aimed at protecting the marine environment, the Action Plan for the Mediterranean and its Barcelona Convention (1976) are the instruments for regional cooperation and regulation designed to protect marine and coastal biodiversity in the Mediterranean. An initial protocol on “special protected areas” (SPA) came into force in 1986 and was replaced with a new protocol in 1995 on both “Special Protected Areas and Biological Diversity in the Mediterranean”. Parties to the protocol undertake to protect and develop the natural and cultural heritage and to include the conservation of biological diversity in their national policies.

At European level, several directives aim to protect the marine environment : the Habitats and Birds Directives (Natura 2000), the Water Framework Directive, and the Marine Strategy Framework Directive.

2.3.2 Marine protected areas

The adoption in all bordering countries of laws to protect nature, the rallying of public opinion and NGOs as well as the many international legal instruments have contributed to the increase in the number of coastal, marine and terrestrial protected areas in the Mediterranean. There are several hundred marine protected areas (MPA) in the Mediterranean, including the Natura 2000 sites at sea. Most

MPAs in the Mediterranean are “multi-purpose”, which means that human activities are permitted in most of the site, usually around a fully protected area.

MPAs can be regarded as sustainable development labs working for effective ocean and coastal management. Not only do they protect sensitive environments and endangered species, they are also a means of increasing the productivity of fishing grounds, regulating the different uses of the sea, supervising sustainable tourism and creating new activities that generate jobs.

Marine protected areas managed in the Mediterranean cover approximately 4% of the Mediterranean. If we exclude the Pelagos sanctuary (87,500km²), the area covered by MPAs amounts to only 0.4% of the total area of the Mediterranean. They are still unevenly distributed around the Mediterranean basin, the largest number being in the western Mediterranean and in the north of the basin³. Scientists and international agencies consider that between 10% and 30% of the marine environment should be protected for long-term conservation.

Many Mediterranean marine protected areas do not have

3 Ameer Abdulla, Marina Gomei, Elodie Maison and Catherine Piante (2008) Situation des Aires Marines Protégées en Mer Méditerranée. IUCN, Malaga and WWF, France. 159 pp.

sufficient means to be managed well and to take real conservation measures. The organisation and regulation of different uses at sea, professional or recreational fishing, spearfishing, scuba diving, mooring, navigation, scientific research and bathing are not always optimum. They often lack qualified personnel and equipment (boats, signposts, infrastructure, etc.), financial resources and even a managing entity.

Since 1990, Mediterranean MPA managers have grouped together within the MedPAN network⁴. Organised as an association since 2008, the network is involved in improving manager capabilities in the Mediterranean basin by sharing good practices and providing tools for specific aspects of MPA management.

2.3.3 Integrated management of coastal areas

However, all these protection efforts are not sufficient to reverse the general tendency of deterioration in Mediterranean coastal biodiversity. Specific coastal policies must be introduced to expand the protection tools beyond conventional approaches to nature conservation and develop an integrated approach to coastal management and development. **A growing number of human activities** (both traditional such as fishing or farming, and new, such as energy, recreation and tourism) or **impacts** of human land-based and marine activities (pollution of coastal waters, loss of biodiversity and disappearance of landscape) are found around these areas. This continued growth is reflected on land by property problems and at sea by conflicts of use. Faced with this **growing overload on a limited area**, the conventional sectional approach, where each regulatory instrument or action only recognises the objectives of a single stakeholder and disregards the impacts on other sectors of activity, is no longer suitable. With **Integrated Management of Coastal Zones, these interrelated problems can be addressed in a comprehensive manner.**

Unique at international level, the **Barcelona Convention parties adopted a Protocol** on the Integrated Management of Coastal Areas in 2008. It will enable Mediterranean countries to improve the management and protection of their coastal areas and to tackle new challenges concerning the coastal environment such as climate change.

2.4 The role of underwater trails in environmental management

Most marine protected areas plan their action using a **management plan/scheme**. In addition to action to protect or restore the environment, management of uses and pressure, and environmental awareness-raising and education are of particular importance. Underwater trails are one of the strategies for channelling visits to a determined area, while fostering environmental education that a manager may include in the management plan.

4 www.medpan.org

A survey of a dozen underwater trail managers has allowed us to identify the missions they regard as a priority for an underwater trail : **presentation of the environment, environmental education and awareness-raising, communication, and promoting heritage and the marine environment.**

An underwater trail is a way of teaching users to view the sea differently, as a living environment with strengths and weaknesses. Users must be encouraged to **adopt appropriate behaviour to protect the sites.**

These facilities are set up on resourceful but fragile sites. Their existence could help to **channel visitors to a less vulnerable part of the site.** This is particularly the case for marked out trails.

An underwater trail is also a **source of economic activity**, creating jobs and generating revenue if an admission fee is charged. That revenue can then be reinvested in site management. In France, the number of annual users is estimated at 50,000, 17,000 of whom are supervised.

Today, almost 20 entities involved in environmental education organise underwater trails in the French Mediterranean. Two-thirds are local authorities or public institutions. The others are associations. Most of them work in partnership with an environmental management organisation (such as the Conservatoire du Littoral (Coastal protection agency)). Underwater trails are therefore tools integrated into management plans.

Here are a few examples :

a/ Peyrefite underwater trail

(Management : Cerbère-Banyuls Marine Nature Reserve / Pyrénées Orientales)



© Conseil Général 66

The reserve was officially created on 26 February, 1974; it is the only exclusively marine nature reserve in metropolitan France.

Its **objectives** are :

- ◆ Objective I : Develop knowledge of the nature reserve's ecological heritage
- ◆ Objective II : Preserve and maintain the habitats of the nature reserve and their specific diversity
- ◆ Objective III : Control human activities in order to

align visitor numbers to the site with the heritage conservation objectives

- ◆ Objective IV : Plan action on areas around the nature reserve with the aim of enhancing site protection
- ◆ Objective V : Improve hosting of school trips and educational events
- ◆ Objective VI : Strengthen the information and communication policy
- ◆ Objective VII : promote the nature reserve as a medium for basic research
- ◆ Objective VIII : Ensure optimum administrative and technical management of the nature reserve
- ◆ Objective IX : Develop the integration of the nature reserve into the network of protected areas and promote its missions externally
- ◆ Objective X : Develop marine area management in connection with the catchment area

With the aim of educating the local population and tourists in marine environment protection, the Pyrénées-Orientales General Council, via the Cerbère-Banyuls Marine Nature Reserve, created an underwater trail in 2000.

b/ Trails along the Maures coastline

(Management : Observatoire Marin du Littoral des Maures / Var)



© Le jardin des mattes, SSM de la Londe les Maures

The Observatoire Marin is a scientific, technical and educational advisory organisation which takes action for the sustainable development of the Maures coastline through knowledge of the coastal environments, **awareness-raising among users** and management of coastal environments and their uses. As part of its action plan, the Observatoire Marin created an underwater trail in 2007.

c/ La Palud underwater trail

(Management : Port-Cros National Park / Var)

L. Nedelec - Parc National de Port-Cros



La Palud underwater trail is designed to introduce adults and children to the Mediterranean marine environment by contact and immersion in an unperturbed area of the coastline. This discovery activity is part of a broader approach of receiving and educating the public, alongside other tools offered on site. Since it opened in July 1979, the Port-Cros underwater trail has been seen by the public as an excellent way of discovering the Mediterranean marine environment.

d/ The underwater trail in the Cap d'Agde Posidonia Natura 2000 site

(Management : ADENA / Hérault)

© R. Dupuy de la Grandrive



The association ADENA works to protect, manage, raise awareness and allow people to discover the natural terrestrial and marine environment. It particularly manages the Natura 2000 marine site "Cap d'Agde Posidonia" where it created the first underwater trail in Languedoc Roussillon in 1995. The aim is to show people the diversity of marine species and seascapes, to highlight their vulnerability and to support changes in behaviour. An innovation was recently introduced by offering users the possibility of doing the trail equipped with a digital camera.

e/ Port d'Alon Calanque underwater trail

(Management : CPIE Côte Provençale - Atelier Bleu du Cap de l'Aigle / antenne du Var)

The CPIE Côte Provençale has created and/or manages 5 underwater trail sites in different areas, each tailored to a specific local context. The site of the Port d'Alon Calanque is a property of the Conservatoire du Littoral (Coastal protection agency) and is managed by Saint-Cyr-sur-Mer town council. In 2005, the site's management committee was keen to promote the marine environment while encouraging its preservation as the site was already very popular. The objective was, therefore, to develop public reception and the discovery of the surroundings, while above all managing flows. An underwater trail was created as a guided activity but without marking and for a small number of people per day (16 people maximum - one guide). In 2010, following on logically from the action taken, the Port d'Alon site became the first French site where management of a Maritime State Property was entrusted to the Conservatoire du Littoral. The CPIE Côte Provençale supports management activities via technical assistance and environmental monitoring of the marine part of the site.



Sophie sud

3. Regulations for underwater trails

The creation of underwater trails raises many regulatory questions. This guide, which covers all the countries on the Mediterranean, does not purport to explore all existing legislation and regulations in those countries. It does, however, provide a list of points that project sponsors are invited to consider.

3.1 The general regulatory framework of the marine and coastal environment

3.1.1 General regulatory framework

It is often defined by two main references which project sponsors should consult within the specific regulatory framework of their countries :

- ◆ Maritime and Coastline Legislation,
- ◆ Sports Legislation.

3.1.2 Maritime State Property

In most Mediterranean countries, the coastline marine fringe is part of the 'Maritime State Property'. As such, it is administered by the domestic maritime authorities.

An underwater trail may in some cases require the installation of underwater facilities such as the positioning of buoys. For example, in some countries, permits must be obtained from the authorities for these facilities.

3.1.3 Natural areas

The qualification of some natural sites or their regulations must also be taken into consideration when creating and organising an activity such as an underwater trail.

There are different types of MPAs in the Mediterranean countries : nature reserves, national parks, special protected areas, Natura 2000 sites at sea, etc. Most are so-called "multi-purpose" MPAs in which a large number of activities are possible within the framework of general regulations or rules specific to the MPA, or even contractual arrangements with certain user groups.



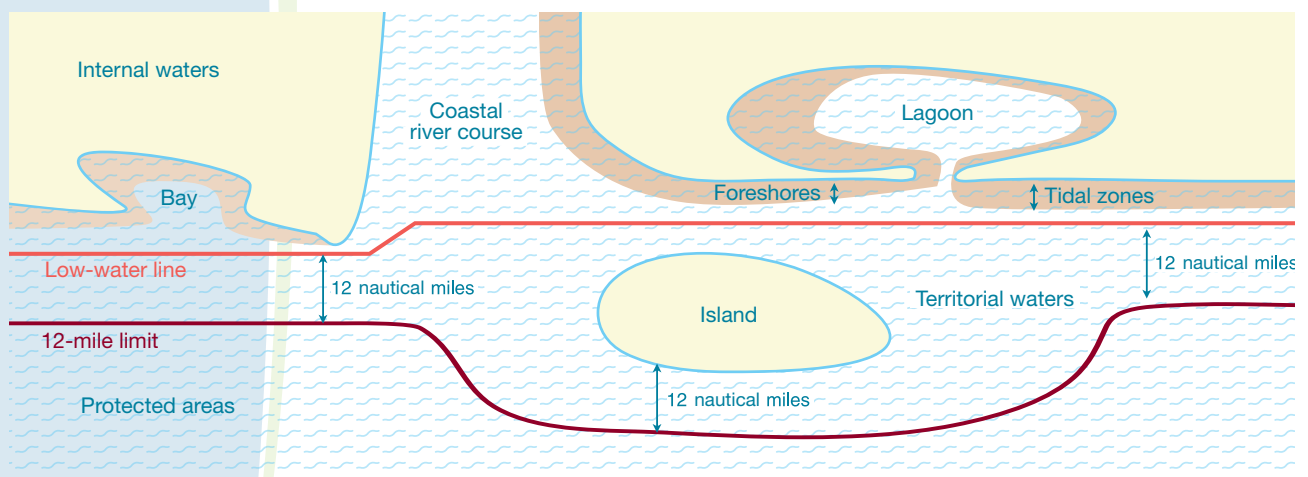
© E.Trainic

Capo Carbonara Coast - Italy

3.1.4 European regulations

Many European regulations may also impact an underwater trail activity in the seven European countries around the Mediterranean, but also those in the process of joining the European Union.

MARITIME STATE PROPERTY : Territorial waters, tide lands, foreshores and internal waters intérieures



Examples include :

- ◆ The Bathing Water Directive (2006/7/EC)
- ◆ The Water Framework Directive (2000/60/EC)
- ◆ The Marine Strategy Framework Directive (2008/56/EC)
- ◆ The Habitats Directive (92/43/EEC) and the Birds Directive (79/409/EEC) for Natura 2000 sites.

The direct impact of these European regulations on the activity remains limited. It should be noted, however, that underwater trails may be part of action taken by a government to respond to some of the issues listed in these directives. The activity may therefore be funded or require specific monitoring within the framework of evaluations in connection with these directives.

3.2 Which specific regulations should be taken into account?

An underwater trail involves implementation both on land (reception, access to water, etc.) and in the sea (the discovery activity). It involves receiving the public in conditions that must be perfectly safe, for an organised sports, tourism and educational activity, for which a fee may or may not be charged. There are therefore many implications in terms of jurisdiction and regulations :

- ◆ The jurisdiction of the Government and local authorities on the land part of the site,
- ◆ The jurisdiction of the Government and local authorities on the marine part of the site,
- ◆ The different levels of responsibilities for and rights over these territories,
- ◆ The legal framework governing the nature of the activity (sports, tourism, education, etc.)
- ◆ The regulatory aspects of organising the activity (specific types of visitors, training for guides, etc.)
- ◆ The regulatory aspects of the safety of the activity and equipment standards,
- ◆ Taxation relating to employment or sales, etc.

In these areas, each State has its own regulations which will be more or less complex, its own practices and its specific rules. To provide each potential underwater trail operator with optimal support for their projects, irrespective of the country, a list of themes and questions is proposed below :

3.2.1 Areas of jurisdiction over land

Different public organisations may have jurisdiction over or responsibility for the land part of the territory, from the relevant ministry down to local authorities. It will be useful to identify the scope of each one and the relevant legal instruments to take them into account. Where the role of these bodies is significant for the project, it will also be useful to identify the stakeholders representing these institutions to involve them in the initiative. For example, occupying a reception area, whether the facility is permanent or temporary, building an equipment store or installing a notice board on the seafront are fixtures

and uses generally covered by regulations.



© R. Dupuy de la Grandrive

In Taza National Park - Algeria

3.2.2 Areas of jurisdiction over the marine part

The use of marine areas is generally governed by different bodies to those that govern land. Jurisdiction may even be shared at sea between the surface, the water column or the seabed. Finding out how jurisdiction is allocated and identifying the various relevant documents will thus be important. It will be useful to identify the stakeholders representing these institutions and, depending on their prerogatives in respect of each area, to involve them in the initiative. To install a marking buoy at sea, be it for safety or educational purposes, a mooring point must be fixed to the seabed. This fairly simple equipment uses three areas (the surface, the water column or the seabed) which require specific steps to be taken.



© A. Rosetti Sunce

Underwater landscape - Croatia

3.2.3 In which organisational framework should the activity be positioned ?

The sponsor of an underwater trail project will need to specify the nature of the activity that it wants to develop in order to identify whether the practice is defined as a sports activity or a practice within another context such as tourism or education.

This then raises the question of the regulations governing the organisation of the activity, to which there are two aspects :

- ◆ General regulations governing the organisation of a sports activity or other,
- ◆ The case of a particular environment : the marine environment



Reception point of the Cap d'Agde underwater trail - France

a/ The organiser must identify and know the rules of organisation that apply to all the activities an underwater trail involves :

- ◆ The type of entities authorised to organise the activity (association, local authority, company, public undertaking, etc.)
- ◆ The legal obligations for the organising entity (declarations, posting notices, morality, insurance, etc.)
- ◆ The legal obligations for supervisory staff (declaration of good character, qualifications, medical fitness, insurance, etc.)
- ◆ The required health conditions (separate changing rooms, showers, toilets, etc.)
- ◆ The specific material conditions required according to visitors (men, women, school pupils, people with disabilities, etc.)

b/ The organiser must identify any specific requirements relating to the trail site, especially at sea :

- ◆ The various qualifications needed to supervise the activity,
- ◆ The need for frequent refresher training (first aid, physical abilities, etc.)
- ◆ The authorised number of people at sea,
- ◆ Safety obligations and emergency resources.

In France, for example, depending on the visitors received, reference can be made to two separate regulations :

For a general public activity, the reference framework for the activity is the practice of sport. The marine environment is defined as a “specific environment” and all organisational conditions stem from this analysis. For school children, the Ministry of Education specifies the context in which it authorises the activity as well as the specific conditions of its organisation for pupils.

3.2.4 What means are required to guarantee safety ?

While doing an underwater trail is not a very risky activity, it is still essential to ensure user safety.



Fire brigade premises on the site of the Peyrefite underwater trail (Banyuls-Cerbère Marine Nature Reserve - France)

When a legal framework governs the safety of an underwater trail, it is sufficient to apply the rules. However, for a relatively new activity, with few or no reported accidents to date like underwater trails, there are not necessarily any reference frameworks or safety standards. The safety of the activity is often organised through other similar activities such as scuba diving or swimming.

If the activity is accompanied in water by a guide, it is called a “guided” underwater trail : the closest reference activity could be diving which also uses a mask, flippers and snorkel and is often accompanied by a diving instructor.



Group on the Lavezzi underwater trail (Strait of Bonifacio Nature Reserve - France)

If the proposed activity is simply overseen from the shore, it is a “self-use” underwater trail and the nearest reference activity could be swimming.

a/ Who defines the organisational framework for the activities ?

Guidelines for organising and securing activities may be issued by several types of bodies such as Governments, ministries, local authorities, civil society entities (NGOs, federations, etc.). The obligation to take these guidelines into account depends on the degree of recognition of the body specifying them. Governments generally advocate “minimum” obligations as regards safety requirements and then local authorities or federations in charge of the

activities clarify these recommendations without them necessarily being mandatory. An underwater trail organiser is strongly advised to find out about all the applicable recommendations and have a justified reason for any deliberate non-compliance.

b/ Which risks should be taken into account ?

The risks to be taken into account will depend on the type of underwater trail, i.e. whether it is guided or not. For each of these two approaches, an organiser must take three kinds of risk into account :

- ◆ Risks directly relating to the type of activity,
- ◆ Risks relating to the environment in which it is done,
- ◆ Risks relating to other users of the environment.

For each of these risks, a specific analysis must be done to take them into account and respond to them in an appropriate manner. Key factors in addressing these risks include :

- ◆ The choice of the activity area (shelter, current, ease of access to water, etc.)
- ◆ The marking of the area at sea (visibility of the activity by other users, site boundaries, etc.)
- ◆ The organisation of uses in this area (other authorised activities, regulation of visits, conditions in which an activity must be cancelled, etc.)
- ◆ The provision of information to users (conditions, abilities, recommended duration, advice, etc.)
- ◆ The supervision or guiding of the activity (expertise, qualifications, number of staff, etc.)
- ◆ Assistance and response means (communication means, first aid, etc.)
- ◆ The individual equipment made available to users (thermal protection, etc.)
- ◆ Equipment disinfecting, particularly rented snorkels to avoid health risks (contamination)

c/ The concept of “due care”

“Due care” is not necessarily a legal concept applicable in all Mediterranean countries, but it deserves to be presented. In France, the concept of “due care” relates to all measures that have been taken to ensure user safety. In the event of an incident requiring individual levels of responsibility to be determined, a lawyer will primarily rely on :

- ◆ The legal framework where it exists,
- ◆ Then recommendations and practices which are not laws but which are part of what is usually done in a similar context (search for reference),
- ◆ And lastly the measures that have been taken to ensure safety, even if they are not mandatory..

Where the measures to be taken are known, it is therefore important that the project sponsor apply them, as a minimum requirement.

3.2.5 Which system of taxation applies to an underwater trail activity ?

To address the matter of tax, revenue and expenditure must be considered. Given that a fee may be charged for an underwater trail activity or that staff may be employed, it is important to explore the question of staff employment conditions (qualifications, skills, status, financing the job, type of contract, etc.) as well as the revenues that the activity may generate.

Taxation can relate to sales from an activity or service, the provision of equipment for a fee, employment of staff for reception, organisation and supervision, etc. The tax framework of the activity may be directly linked to how the underwater trail is organised and the type of entity running it.

Children setting off to do the Port d'Alon underwater trail (Port d'Alon Conservatoire du Littoral site, La Nartette - France)



3.2.6 Are there any specific regulations governing the equipment used ?

Some of the equipment used or made available for the activity may be subject to regulations or restriction on use to specifically trained staff : for example, the use of a boat to reach the site, the use of certain breathing equipment, etc. Legislation on scuba diving equipment may sometimes apply to this activity when the use equates to scuba diving.

All equipment used may be concerned :

- ◆ Safety or buoyancy assistance devices, mainly boards and buoys which are used for signalling but also and especially for child assistance,
- ◆ Equipment (flippers, mask, snorkel and wetsuit).



Group with a guide on the Port d'Alon underwater trail around the safety board (Port d'Alon Conservatoire du Littoral site, La Nartette - France)

In the absence of any specific regulations, responsibility for a product comes under the manufacturer's general duty of safety. In normal conditions of use, the products and services must offer the level of safety that can be reasonably expected and not adversely affect user health or safety.

In the case of underwater trails, the safety equipment is not always intended for this use, so it is advisable to check :

- ◆ The buoyancy and stability of floating devices during use with the maximum number of users,
- ◆ Resistance to tearing (closeness to rocks),
- ◆ The presence of a safety valve.

3.2.7 Are there any specific rules governing the site or the environment ?

In a protected site such as a marine protected area, there may be areas where some or all activities are prohibited. This should obviously be checked by the organiser.

The environment is not generally taken into account as such in the regulations but may be indirectly subject to :

- ◆ Certain laws with a clear environmental protection focus (access area or car park to be used, visits to the site allowed outside the reproduction periods of certain species, regulations on picking or catching activities, etc.)
- ◆ Regulations concerning hygiene, consumption, waste and pollution (laying out a picnic area, installing facilities for storage and waste collection, etc.)
- ◆ Regulatory recommendations relating to the organisation of the activity and supervision, especially staff training (level of knowledge, required qualifications, skills recommended on site, etc.).

Even when there are no rules that specifically govern these points, the activity organiser must take these aspects into account as they are directly linked to the increase in visits to the site. They should be anticipated to avoid all deterioration of the site.

3.3 The underwater trail activity and the various forms of organisation

3.3.1 Features

Snorkelling in an underwater trail, regardless of its legal nature, is characterised by five factors : the type of protection of the area, the status of the organising entity, the participant's status, the type of supervision and the type of educational organisation. Regulatory consequences will differ depending on the factor in question.

- ◆ **The type of protection of the area** is determined by the presence or not of buoys and beacons and by related restrictions on use (area reserved for swimming, navigation prohibited, spearfishing and fishing prohibited, for example).
- ◆ **The type of organising entity**, which can range from the absence of any identified entity to a public undertaking or equivalent, via various forms of partnership or business structures or NGOs.
- ◆ **The type of user** depends on whether access to the activity is free of charge or not and whether or not it is managed by an identified entity.
- ◆ **The type and role of the staff who ensure safety**, depending on whether they are volunteers or paid employees and their role :
 - ◇ either simple supervision to guarantee safety of the area,
 - ◇ or organising, teaching or accompanying the activity.



No-sailing and no-mooring zone on the La Palud underwater trail (Port Cros National Park - France)

3.3.2 An underwater trail with free access

An underwater trail is described as having free access when use of it is organised, but users are not accompanied during the aquatic part of the discovery. This activity involves a number of educational and safety factors. This is what we call a “self-use” underwater trail. The organisational framework is most often similar to that of swimming in an adapted area where the organiser prompts the user to enter the water to do the activity and thus has responsibility.

The organisation of a free activity must respond to two main concerns : safety and educational organisation. Safety is all the more important if the organiser of a self-use underwater trail encourages visitors to come to do an aquatic activity without any supervision in the water.

a/ Safety

Means of ensuring safety during self use of a trail are based on :

- ◆ The risks associated with other uses of the water.
- ◆ The risks relating to a user getting in difficulty.
- ◆ Access to the water (entering and leaving the water).

Safety in respect of other users of the water is for the most part ensured by means of signs. These signs inform users of the delimitation of an area with specific regulations and encourage them to pay special attention.

Notice boards at the reception area or at the site where users enter the water can also be used to inform them about safety issues such as :

- ◆ The area to which use is restricted, distances to be observed in relation to other users,
- ◆ The recommended duration of the activity as regards individual capabilities,
- ◆ The advantages of doing the trail in pairs or in a small group,
- ◆ The risks of diving,
- ◆ The first signs of difficulties.

The other safety means used for a free-access activity (monitoring, means of communication, breathing support etc. and their implementation framework) fall under the practical organisation of the activity rather than the educational aspects. A list of factors to be taken into account has been given above.

b/ Educational organisation

The educational aspects of the activity can be organised in many ways, and be done in the vicinity of the site, on the land part, or directly in the water. An exhibition, notice boards by the sea or in the water or even specific aquatic communication tools such as FM radio snorkels can be used. The content, teaching methods and the technologies developed to make these tools interesting vary.

The oldest are mainly based on visuals, i.e. reading a fixed medium, on the beach or in the water, or giving out documents to participants. Other more recent tools use audio technology such as “FM radio snorkels”. The message is communicated with a tape recording which plays continuously or is triggered by snorkelling close to an emitting terminal.

Lastly, in 2010, a new concept was created by the CPIE Côte Provençale for Cassis in France, based on self-use. This approach, which does not use costly technology, is primarily based on the needs and desires of a user who discovers a natural area. The educational approach is structured around two steps :

- ◆ Time in the water spent discovering the environment guided by underwater notice boards created specifically for the site, suggesting active discovery situations on land or underwater, visual and tactile situations and dynamic or stationary observation.
- ◆ Time out of the water, chosen by users, for which they have a personal booklet containing information to help them understand their experience in the water and take steps to change their behaviour..



Stop-point buoy with underwater board, Cap d'Agde underwater trail (Posidonia Natura 2000 Site - France)

ADVANTAGES

- ◆ Choice of itinerary, departure time and duration of the activity
- ◆ Choice of the people with whom the activity is done
- ◆ Freedom to choose when and whether or not to receive information
- ◆ Independence - sense of freedom

DRAWBACKS

- ◆ Accessible primarily to people familiar with using mask, flippers and snorkel
- ◆ Encounter and discovery of the environment restricted by the user's ability to observe
- ◆ User advice and leads for behavioural change are limited
- ◆ The impact on the environment is therefore greater

3.3.3 A guided underwater trail

An underwater trail is described as guided when the users are **accompanied by an instructor or a guide**, at least during the aquatic part of the discovery.

a/ Safety

Only a **qualified guide** can supervise the aquatic part, from explaining the equipment and giving technical advice to leaving the water. The **level of qualification** will depend on the context in which the activity is run and the existing regulatory framework. The type of visitors can also impact the required qualifications for trail guides, especially when it comes to children, specific groups and schools. The accompanying guide's role in the safety of the activity mainly lies in **anticipation** and **response**. **Specific equipment** will be used.

Anticipation

By communicating with the user, the guide :

- ◆ Finds the right equipment,
- ◆ Listens and reassures,
- ◆ praise.r.

S/he will adapt the activity taking all the environmental conditions and the capabilities of his/her group into account.

Response

The trail guide must be able to assist a user in a stressful situation or in real difficulty and help move part of a group in difficulty in the water.



Group at the Lavezzi underwater trail around the diving instructor-guide (Strait of Bonifacio Nature Reserve - France)

Specific equipment

- ◆ The equipment provided to the user is important for safety, particularly the insulated clothing (wetsuit or shorty) which provides thermal and solar protection and improves user buoyancy. Ballasting is to be avoided.
- ◆ The guide's own equipment (flippers, mask, snorkel, wetsuit) should enable him/her to ensure the safety of the group in optimal conditions.
- ◆ The trail guide may use buoys, support boards or a canoe to guide the group and for assistance.
- ◆ The other means used to make a guided activity safe (means of communication, breathing apparatus and their framework of use) relate to the practical organisation of the activity rather than the educational aspects.

b/ Educational organisation

The educational organisation of a session is based on factors such as content, method and group management (see Chapter 4).

c/ Advantages and drawbacks of a guided trail

ADVANTAGES

- ◆ Activity open to an extremely broad target group, including people who are afraid of water
- ◆ Permanent exchanges between the group and the guide
- ◆ Equipment usually supplied in full
- ◆ Only underwater trail activity possible for a group organised by a third-party entity
- ◆ Easier and closer discovery of the environment (touch, close watching, etc.)

DRAWBACKS

- ◆ Heterogeneity of the group, which may restrict the possibilities (content and area of discovery)
- ◆ Limited number of people per guide
- ◆ Obligation to comply with instructions relating to the group

Note : self-use and guided underwater trails can coexist on the same site.

3.4 A few things to consider regarding specific groups

When organising an activity for so-called "specific" groups, i.e. the disabled, school children, children on holiday without their parents, etc. a number of specific factors may need to be taken into account.

3.4.1 Activities for minors

As part of a holiday and at recreation facilities for children, outside the parental home or for schools, snorkelling activities may be subject to specific regulations. The safety of minors when they do an activity without being

under the direct responsibility of their parents is highly regulated. For example, parental permission may be required, a doctor's certificate may be necessary, or the trail guide may need specific qualifications, etc. Diving while holding one's breath during the activity may be prohibited or limited to a nearby area. Each of these additional restrictions is intended to protect minors and avoid taking risks. Also note that the self-use underwater trail activity, i.e. not accompanied in the water by an adult, may be prohibited for minors. The self-use activity may also be prohibited for schools which have to be supervised. This is particularly the case in France.



© sophie.sud

Group of children on the Port d'Alon underwater trail (Port d'Alon Conservatoire du Littoral site - La Nartette - France)

3.4.2 Other specific groups

An underwater trail is easy to do and thus appeals to a broad range of people : little or no technical equipment, no heavy equipment, often inexpensive, fast to do, without any major effort, etc. It is therefore particularly accessible to specific groups, seniors, young children, people who are overweight and disabled people in the broad sense. There are rarely any regulations concerning the organisation of the activity for these groups, and in fact it is not necessarily desirable. Yet, NGOs or associations working with these groups can provide sensible advice on how to take them into account specifically for this activity. Training for guides can be arranged if the organisation running the underwater trail wishes to work with these groups.



Access for the disabled (Port d'Alon underwater trail, Conservatoire du Littoral site, La Moutte - France)

3.5 The different skills and professions relating to an underwater trail

The diversity of possible solutions to implement an underwater trail reveals a number of skills that must be mastered to organise the activity. Some of these skills, in particular in terms of supervision, are usually associated with qualifications which may be required by regulations.

- ◆ **Skills required for reception :**

Informing the public, oral and/or written communication skills, computer literacy to create documents and or disseminate information. Tourism professionals generally have these skills.

- ◆ **Technical skills relating to the aquatic activity and the organisation and safety of a group in water, for a regulated activity :**

Diving professionals generally have these skills.

- ◆ **Technical skills involved in supervising and securing a marine area :**

For a self-use underwater trail, it is recommended and sometimes even compulsory to ensure safety by supervision, with competent staff able to assist someone in difficulty. Use of sea rescue equipment (VHF, oxygen therapy, boat, etc.) and command of first aid are an integral part of the required skills.

- ◆ **Teaching skills related to the objectives of underwater trails :**

These teaching skills encompass all the various jobs mentioned above. Depending on how the activity is done, these skills may be held by the reception staff, the trail guides or the lifeguards watching over the zone from the shore (see Chapter 4).

- ◆ **Environmental skills :**

Like teaching skills, these environmental skills can be found across the various jobs involved in the operational part of the underwater trail. As already widely discussed, the environmental approach is not limited to a biologist or oceanographer approach, but must incorporate the territorial stakes (see Chapter 4).

4. Educational aspects and methods

4.1 Objectives and missions of the underwater trail

An educational tool above all

An underwater trail is a tool for environmental and sustainable development awareness and education. The aim is to enable people to discover an often unknown environment, and to pass on values to improve knowledge and encourage environmentally-friendly behaviour.

It can be part of educational projects, environmental awareness action, marine environment information initiatives and management and promotion of the territory.



© CPE Côte Provençale

An underwater trail guide talking to his group (Mugel underwater trail, Les Calanques National Park)

The content covered in an underwater trail

The content covered in an underwater trail is not confined to merely presenting the species encountered. They should enable a number of topics relating to the site and local challenges to be put into perspective.

Here are a few examples :

- ◆ Continuity between land and sea,
- ◆ The characteristics and functioning of the Mediterranean,
- ◆ The concept of “living” and what it involves,
- ◆ The role of light,
- ◆ The link between the species encountered and the habitats,
- ◆ The existence of seasonality including at sea,
- ◆ Reproduction strategies,
- ◆ Human intervention in the environment,
- ◆ The impact of human activities at sea,
- ◆ Sharing the area and the cohabitation of activities on the coast, etc.

These topics can be addressed to a greater or lesser extent during the activity, in the different stages of the underwater trail.

4.2 General conditions and organisation

The watchword when organising the activity is “adaptation”, to the conditions of the environment and to the user group. The points developed here are common to many activities in the great outdoors and have been adapted to the underwater trail activity.

4.2.1 Age limits

The very nature of the activity, mainly on the surface, without any heavy equipment and with few very technical aspects, means no age limits need be applied, provided users can do the trail in good conditions. The activity is therefore only possible if aquatic equipment that is



© Y. Bellhimer

Taza National Park - Algeria

suitable in size and thermal protection for the trail and the environmental conditions is available. Attention should be paid to specific cases, such as schools or holiday centres, for which conditions of age and ability may be defined.

For children

For an underwater trail at sea, all the equipment is available in sizes from 6 years up. Wetsuits for children, approved for “diving in warm water” (16 to 24°C), are generally suitable for use on the surface (without crushing the neoprene) for 30 to 40 minutes, in good isothermal conditions, in water between 12 and 14°C. Therefore, stages during which participants remain still should be limited. The length of the activity must be adapted to the temperature of the water, the site facilities (dressing room, hot shower, etc.) and the equipment (short or full neoprene suit).



A group of children

For seniors

Seniors who do regular exercise can do a trail even over the age of 75. Ease of use and simplicity of equipment should be preferred over technical considerations. The person doing the underwater trail must be keen to do it personally, and not just to take part in a group or family activity.

However, with **very young or elderly people, a guided activity is preferable.**

4.2.2 The temperature of water

Regardless of the temperature of the environment, it is important to have insulated clothing adapted to the target group. Facilities equipped with showers and changing rooms are strongly recommended. Throughout the activity, supervision for children is particularly important to avoid hypothermia, which they do not always express. For people with physical disabilities, this supervision is also extremely important because the cold is not necessarily felt in all parts of the body.

4.2.3 Duration of the activity and choice of itinerary

The buoyancy of the wetsuit encourages low muscle dynamics and gives the impression that there is little expenditure of energy. Yet, in cold or temperate water, signs of fatigue such as cramp or hypoglycaemia occur

without warning between 40 and 50 minutes of activity. With beginners, attention should be paid to the duration of the activity and the choice of itinerary, so as to be near a support or the beach in case these signs occur. Generally, feeling cold and tired greatly affects enjoyment and interest in the activity.

4.2.4 Time slots

There are no recommended time slots for doing the trail. It is even possible, to diversify observations and interest in the environment, to do the activity at night or very early in the morning. However, it is important to ensure that participants have had a sufficient intake of calories in the two and a half hours prior to the activity to avoid extreme fatigue or hypoglycaemia. Energy expenditure remains significant (equipment, cold, movement, stress, etc.). Do not hesitate to question participants before the activity to anticipate any difficulties and provide high-energy snacks at the site. These small things are all the more important with children and teenagers.

4.3 The different groups and their specific requirements

The first factor in segmenting the target group for an underwater trail lies in the way participants decide to do the activity.

There are two cases :

- ◆ “Organised groups” : a third party is involved in prompting the group to do the activity,
- ◆ The “general public” : the decision to do the activity is made solely on the person’s own initiative.

4.3.1 Organised groups

The third party may be a teacher, a manager of a leisure centre, a youth worker, a special-education teacher or an educational team. The activity is organised within the framework of a class, school or group project. A third-party organiser, or group leader, will almost always choose a guided trail and then entrust part of their responsibility to a third person.

Their precise expectations are therefore clear as regards the regulatory framework, safety, care and adaptation to their own expectations and to those of their group. They are also seeking new and diversified learning situations for their group as well as a good quality/price ratio.

For this type of visitor, the underwater trail activity is usually part of a broader project that the organiser has started before the activity and will continue after it.

4.3.2 The general public

These participants are responsible for themselves and therefore have much more freedom over the choice of a guided or self-use activity.

For these visitors, the decision to do the trail, even though it is sometimes made in advance, it is often made “on the

spot". Certain factors encourage this decision, such as being on holiday, being in a group, being assured of the conditions and optimal safety (good weather, recommendations of a tourist operator, etc.), being on a quality site conducive to the activity.

Often there is a group (sports) or family (pleasure sharing) spirit with one instigator (child or adult) who maybe already knows the site or this type of activity and wants to share the experience or introduce others to it. The activity may be guided or done without supervision at an organised site.

Whenever an adult entrusts a third party with responsibility for a child, the supervisor's professionalism is essential (safety, confidence and cost).

4.3.3 User specificities

Each type of user has specific characteristics, in respect of the activity, and which determine a number of factors to take into account when organising the underwater trail. The guide or the instructor must also be aware of these factors. In both cases, the objective is to offer a quality activity.



*Calanque du Mugel (rocky inlet),
Les Calanques National Park (France)*

Families

Key words : **shared enjoyment / safety.**

From a physiological point of view, special attention will be paid to resistance to cold for children.

From an educational perspective, it is necessary to alternate two levels of communication : one for adults, the other for children.

In addition, if there is a guide, the latter will play a supervisory role to avoid parent/child interference which can be detrimental. However, regard must be had for parental authority.

Adults

Key words : **knowledge, sport and sharing.**

In the educational approach, it will be necessary to be able to respond to different expectations sometimes specific to the group.

Teenagers

Key words : **rewarding experience and group activity.**

From a physiological point of view, attention must be paid to the risks of hypoglycaemia and cramp.

Regarding the educational approach, attention should be paid to the reception conditions and in particular respect for privacy (changing rooms, showers, etc.).

During the aquatic activity, the organiser should consider all possible risks that teenagers may take (interactions with other users, showing off, etc.). It is also advisable to alternate situations so that the group does not lose interest in the activity.

Children

Key words : **confidence-building, amazement and fun.**

From a physiological point of view, attention must be paid to the risks of cold and hypoglycaemia.

The educational approach is based on anticipation. It is important to detect individual fears and non-swimmers in order to provide personalised support while managing the group.

The group's confidence will be gained by organising clear, simple and progressive "technical" situations in a recreational manner while observing the environment.

Seniors

Key words : **confidence-building, accessible discovery and knowledge.**

From a physiological point of view, the organiser should check for any heart conditions and check that people are comfortable, especially with the equipment.

Regarding the educational approach, it is important to build confidence in this group, giving them time to put on equipment and feel at ease in the water.

Visitors with reduced mobility

Key words : **accompanied independence, extending abilities, amazement.**

From a physiological point of view, the organiser will take into account any medical contraindications and pay attention to the cold which is not necessarily felt when certain parts of the body do not move.

For the educational approach, the guide will focus on conducting the session while avoiding helping "able-bodied" people so that everyone has a sense of independent success. It is also important to give this group encouragement

4.4 The educational approach to the underwater trail

4.4.1 The general educational conditions

The educational aspect of the underwater trail must be such that the self-use or guided activity responds in part to its various objectives in terms of information, awareness, behaviour change and land-use management.

a/ Participant well-being

Well-being is a personal feeling that is essential to the activity's educational approach. It is directly linked to the quality of attention, understanding, and being open to discovery. As with any feeling, it depends both on the objective conditions of the activity but also the subjective aspects linked to the environment explored.

Well-being will depend on :

- ◆ **Visible safety features :**
 - ◇ Supervision of the area.
 - ◇ Supervision of the activity.
 - ◇ Marking of the area or for the activity.
 - ◇ Presence of a resting point.



Self-use underwater trail
(Banyuls-Cerbère Marine Nature Reserve - France)

- ◆ **The perception of the aspects of the environment :**
 - ◇ Sheltered area.
 - ◇ Visibility of the seabed, colour or clearness of the water.
 - ◇ Shallow depth.
 - ◇ The temperature of water.
 - ◇ Ease of access.
- ◆ **Personal perceptions :**
 - ◇ Positive buoyancy and without effort (linked to wearing wetsuits).
 - ◇ Staying at a comfortable temperature (suitable wetsuit).
 - ◇ Quality of the equipment made available (full-length or shorty wetsuit, mask, flippers, snorkel, etc.).
- ◆ **To the quality of the relationship established with the guide :**
 - ◇ The success of the activity hinges mainly on the instructors' group leadership skills, whatever the group supervised.

b/ Conveying messages

The very purpose of an underwater trail is to use a discovery activity in a natural environment to convey a number of messages. To be clearly understood, messages must be given at appropriate times that are worth determining. Several factors need to be taken into account to determine the suitability of a message, the main three being :

The trail participant's powers of observation :

This is a key factor in conveying messages. Imagine how a group would lose interest and feel frustrated if the accompanying guide or self-use guiding tool provides

content on topics that no one has been able to see! This situation is one of the most frequent educational mistakes encountered. The permanent search for a link between the content covered, the information given, and the group's powers of observation remains one of the keys to the success of this activity. Simple things often hold people's attention, where they are accessible and easy to see.

Synchronisation between observation in the environment and related content :

Les échanges et le jeu des questions-réponses sont des éléments importants pour la compréhension. Il existe différents outils permettant de transmettre des messages. Certains sont synchrones avec le moment de l'observation et d'autres sont plus ou moins décalés.

Discussions and a question-and-answer quiz are important elements for understanding. Various tools are used to convey messages. Some are synchronous with the time of sighting and others are more or less deferred.

The classification below is made according to the time difference in relation to the sighting :

1. Signs on the beach,
2. Underwater signs,
3. FM radio snorkels
4. Guide in the water



FM radio snorkels
(Banyuls-Cerbère Marine Nature Reserve - France)

Choosing the right time :

Talking about a subject directly related to an observation, whether it can be seen at a distance, close up or touched, is a great way of passing on a message. That said, in the natural environment, the content cannot be detailed, developed and put in context. There is a time for the sensory experience and discovery and another for more in-depth 'intellectual' understanding which usually requires more attention and quiet.

Separating these two times, i.e. the experience from the developed explanation, is a better way of responding to individual possibilities and expectations during the activity.

4.4.2 Conducting the activity

Conducting an underwater trail can be based on five more or less formally defined steps :

a/ Reception

Technical reception

There is always a very functional aspect to reception, whatever the type of underwater trail. It is usually done with a reception area, on the site, allowing for direct contact with users to inform them of all the aspects of doing the trail :

- ◆ Information about how to access the site (signposts, map, etc.),
- ◆ General presentation of the organising entity and/or the site manager,
- ◆ General presentation of the activity,
- ◆ Safety instructions (use of equipment, area of activity, weather conditions, evaluation of individual abilities, etc.),
- ◆ Conditions of use (self-use, guided, equipment on loan or for hire, prices, opening times, group numbers, booking, etc.),
- ◆ Expected behaviour in the water (contact with the seabed, picking up or moving living beings, other users, etc.).



Underwater trail reception point
(Banyuls-Cerbère Marine Nature Reserve - France)

This step may be done by means of signs or information leaflets or by the reception staff present on the site.



Exhibition board at the Peyrefite self-use underwater trail
(Banyuls-Cerbère Marine Nature Reserve - France)

Thematic reception

The reception also includes thematic information related to the site.

Priority should be given to this reception phase as it prepares the group for the aquatic activity. However, it should not last too long, because visitors keen to do the activity may become impatient. They may not be receptive to the messages they are given. This thematic part can also be developed during the aquatic activity and then resumed, depending on visitors' questions and requests.

b/ Equipment

The organisation relating to the time needed to equip users is a key factor in the success of the activity on several levels :

- ◆ Distributing suitable user equipment is essential for them to feel comfortable,
- ◆ A dedicated equipment area is necessary to accommodate certain groups or adapt to the weather conditions,
- ◆ This observation time allows the supervisor to detect any fears that are sometimes not expressed,
- ◆ Provide information about other site users, safety, conditions of use and use of the equipment.

MEANS USED FOR THE RECEPTION PHASE	ADVANTAGES	DRAWBACKS
EXHIBITION ROOM	Promotes the site	Difficulty finding a suitable area
	Presents the major themes you would like to develop during the activity	Significant investment in terms of set-up, maintenance and running costs
	Can inform about safety aspects	
NOTICE BOARDS ON THE SEAFRONT	Essentially the same advantages as the exhibition room	Sometimes lengthy administrative steps to obtain authorisation
	Reasonable cost of creation and maintenance	The size of the boards restricts the content that can be addressed
	Channels visitors by identifying a starting point for the activity	
	Requires less space	
A GROUP GUIDANCE AREA	Formal area which channels the group's questions and expectations	Difficulty finding premises on site or a quiet area
	Allows guides to identify their group	
	Limits external interference and fosters discussion and listening	

MEANS USED FOR THE EQUIPPING PHASE	ADVANTAGES	DRAWBACKS
THE RECEPTION PREMISES (changing room, shower, toilet)	Responds to an important user expectation	Facilities difficult to find
	Significantly conditions the decision to do the activity	May limit the number of people received
	Sign of the quality of the activity to the user Allows various groups to be received	
THE EQUIPMENT PROVIDED (mask, flippers, snorkel, wetsuit)	Allows people to do the activity, as not everyone has their own equipment	Cost of investment, maintenance and renewal
	Responds to an expectation of the user	Requires specific management (distribution, rinsing, storage, etc.)
	A wetsuit encourages people to come outside the summer period	

c/ The activity in water

During this stage, the topics addressed during the thematic reception are illustrated (distribution of life according to light, behaviour of living beings, etc.). The information given to the public can be developed and adapted according to the sites, their characteristics as well as the guides and educational tools used. Where the activity is done with a qualified accompanying guide, the content can be constantly adapted to the users. Various more or less effective educational tools can however be used when the trail is done unaccompanied. They can be grouped into two categories : tools for conveying messages and tools for safety.



© CPIE Côte Provençale

EDUCATIONAL TOOLS USED

ADVANTAGES

DRAWBACKS

SIGNS ON LAND



Taza underwater trail (Algeria)

- ◆ Permanent information
- ◆ Identical messages for everyone, validated and relating to the operator's commitments or a charter
- ◆ Access and use with maximum freedom

- ◆ Information not provided at the same time as observation in the water
- ◆ Difficulty remembering and understanding all of the information given
- ◆ Only works with the visual memory

UNDERWATER SIGNS



Cerbère-Banyuls Marine Reserve

- ◆ Permanent information
- ◆ Information more directly linked to the environment where the sign is positioned
- ◆ No or little time difference between the message and the observation
- ◆ May be fixed to buoys possible
- ◆ Access and use with maximum freedom

- ◆ Succinct content
- ◆ Not always easy to read underwater
- ◆ Groups concentrated around the signs (risk of deterioration)
- ◆ Creation, maintenance and cleaning costs
- ◆ Difficult to adapt content over time given the production costs

FM RADIO SNORKELS WITH TRANSMITTER ON THE BEACH



Cerbère-Banyuls Marine Reserve

- ◆ Information often more detailed than on underwater signs
- ◆ Easier to listen than read because it does not require any particular skill

- ◆ Less freedom because the broadcast time needs to be respected
- ◆ Concentration of the group in one place to listen to the messages
- ◆ Possible difference in time between the message and the observation
- ◆ Possibility of reception problems if the transmitter is far away

EMITTING BUOYS WITH FM RADIO SNORKEL



Cerbère-Banyuls Marine Reserve

- ◆ Same benefits as to the FM radio snorkels with a transmitter on the beach
- ◆ Possibility of doing the trail at your own pace
- ◆ Staggering of visits to the area and over time
- ◆ Possibility of receiving significant numbers of visitors at the site

- ◆ Possible difference in time between the message and the observation

READY-TO-USE CAMERA

© M. Foulaqué - SEANEO

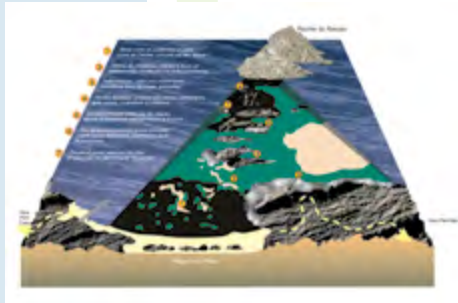


Educational approach developed by ADENA (France)

- ◆ Rewarding for the user
- ◆ Fun
- ◆ Develops observation
- ◆ Difficult to use for a novice
- ◆ Limited picture quality achieved
- ◆ A specific amount of “operating” time is required

LEAFLET OR INDIVIDUAL BOOKLET PRESENTING THE TRAIL

© Parc national de Port-Cros



Port-Cros National Park

- ◆ Information about the environment and the main protected areas
- ◆ Discovery aid (when the user knows how to observe)
- ◆ Information often limited to the characteristics of species, as well as the name and sex of the animals encountered
- ◆ Representation of species not always true to reality, particularly outside reproduction periods
- ◆ High cost and production quantities

CONCEPT WITH SUBMERSIBLE BOARDS AND INDIVIDUAL USER BOOKLET

© CPE Côte Provençale - SSM autonome de Cassis



Self-use underwater trail in Cassis

- ◆ Same advantage as the other self-use activities, plus :
- ◆ Separates the active discovery in the water (underwater board) from in-depth understanding (individual user booklet)
- ◆ Integrates individual involvement
- ◆ Self-use tool with minimal space taken up in the environment and no fragile equipment
- ◆ Limited maintenance and up-keep costs
- ◆ Teaching materials easy to update at low cost
- ◆ Easy visitor management
- ◆ Requires specific design work (educational, technical) adapted to the potential of each site
- ◆ Specific tools limited to a single site
- ◆ Need for an operator on site to inform, hand out and collect ready-to-use tools

TOOLS FOR SAFETY

ADVANTAGES

DRAWBACKS

MARKING BUOYS AT THE SITE

© Y. Strebler - CG06



Cerbère-Banyuls Marine Reserve

- ◆ Safety in relation to other users
- ◆ Builds user confidence
- ◆ Can be used for support (if fitted with handles)
- ◆ Installation and permits
- ◆ Purchase and maintenance costs

MARKING BUOYS FOR THE USER OR USER GROUP

© A. Ruoppolo



- ◆ Allows other users to view the activity
- ◆ May allow a board or a flask to be suspended
- ◆ Prevents groups splitting up
- ◆ Easy to transport, store and use
- ◆ Very limited support points
- ◆ Not very suitable for large groups

MARKING BOARD (SPEARFISHING BOARD)

© CPIE Côte Provençale



- ◆ Same benefits as the marking buoy
- ◆ Possibility of fixing handles to facilitate support and stabilisation of a whole group of 8 children
- ◆ Investment
- ◆ Does not allow heavy safety equipment to be carried

INFLATABLE KAYAK

© CPIE Côte Provençale



- ◆ Can easily be fitted with handles to support and stabilise an entire group
- ◆ Allows the activity to be run with very mixed groups (possibility of taking 1 to 3 tired children temporarily out of the water), while still keeping the group dynamics
- ◆ Can be used for first aid
- ◆ Significant investment
- ◆ Difficult to transport, store, set up (inflate/deflate for transport)

d/ Recovering equipment and recapping on the activity

Taking off and recovering equipment needs to be organised to draw the activity to a close and is an unavoidable stage. However, the time this takes can be used in a variety of ways :

Evaluation of the educational approach and the activity

- ◆ Questions or an evaluation questionnaire on the various stages and tools offered, etc.
- ◆ An activity guest-book.

Promoting the activity, the content and messages conveyed

- ◆ Showing simple actions to reduce water consumption, the use of biodegradable products, etc.
- ◆ Handing out an activity booklet including most of the content and the visitor's eco-actions,
- ◆ Offering a certificate or a charter on simple practices applied in the underwater trail.
- ◆ Looking at and explaining photos taken by the visitor during the trail.



Guided underwater trail (Port d'Alon Conservatoire du Littoral Site, La Nartette - France)

An on-going evaluation of practices and their impact on the environment is an integral part of any educational approach.

4.5 Cross-disciplinary skills : teaching and environmental

4.5.1 Technical teaching

The accompanying trail guide must have full knowledge of safety and good command of safety techniques. This should include :

- ◆ Knowing how to manage the actual organisation of the outing,
- ◆ Providing effective technical teaching adapted to their participants,
- ◆ Knowing how to advise on the use of small equipment,

- ◆ Knowing how to adapt the itinerary to the age and level of the participants and the environmental conditions (current, visibility, water temperature, depth, nearby berthing, etc.),
- ◆ Seeking optimal conditions for user safety,
- ◆ Knowing how to offer assistance and rescue if necessary.

4.5.2 The environmental content

The topics covered during the activity are very varied. They mainly relate to the marine environment (marine biology, oceanology, ethology and behaviour of fish, etc.). They may extend to the terrestrial landscape, geology, botany, the climate and the sociology of uses at sea. Given the diversity of subjects, not everything is dealt with in-depth in a single activity. The content should not be a series of technical and/or scientific data difficult to understand. The information must remain simple and give meaning to or create a link between different elements.

Above all be general

The level of expertise required to talk about these many subjects is often not very high. Knowledge and "careful observation" of the local context, activities, possibilities and challenges are often used to address most of these subjects in a cross-cutting and relevant way. The staff in charge of the environmental content takes a global view of a situation or subject and is careful to put human beings at the heart of the issues.

The speaker's position

During the reception or activity stage, the speaker may be identified as the technical, educational reference person who facilitates or guides the discovery, arouses interest, points out and advises. Given all the topics that participants may ask about, their positioning is not necessarily that of a specialist. The speaker must be capable of admitting that s/he does not know the answer. S/he will then ask other participants in the group to give their opinion or share their knowledge and suggest finding the answer to the question at the end of the activity in the documentation available at reception. S/he can improve his/her knowledge by reading specialist journals, attending certain training courses, etc.

4.5.3 Leading and managing the group

Experience is essential in order to lead and manage the group. The key factors to take into account on an underwater trail are presented below.

Alternation

Most people understand and retain information using their visual or auditory memory. Everyone also has a limited attention span which is even shorter when only one of the senses is stimulated.

These points should be taken into account to hold the attention of an audience during the various sequences of an activity. It is therefore important to be able to alternate :

- ◆ The topics covered,
- ◆ The activity sites,
- ◆ The senses stimulated,



*Lavezzi guided underwater trail
(Strait of Bonifacio Nature Reserve - France)*

- ◆ Active situations (sensory awareness, curiosity, research, etc.) and more passive situations (listening, etc.),
- ◆ The teaching materials between visual and auditory media,
- ◆ The observation situations,
- ◆ Situations involving the cognitive or the emotional,
- ◆ The position of the guide sometimes as an observer within the group, sometimes as a point of reference,
- ◆ The pace of the various stages, sometimes calm, sometimes more athletic.

By seeking to achieve this alternation, curiosity and attention can be maintained while setting a pace for the session and creating group dynamics. In turn, everyone finds themselves in more positive individual situations depending on their priorities in terms of understanding.

Listening and giving a sense of responsibility

Each participant has skills and knowledge of the activity. The reception and supervisory staff is **not a unique** point of reference for all content and practices and the staff can **share this role** with other people in the group (teacher, student, swimming instructor, youth worker, or any other person) depending on the activity sequences. Running a thematic session often amounts to seeking answers to simple questions and organising them to achieve overall coherence which becomes easily understandable to everyone and fuels discussions on the theme.

This very participatory approach is **rewarding** for the group since the session is primarily based on their knowledge. The guide appears simply to add the input needed to fully understand and analyse the topic. It is also a way of ensuring that **content is adapted** to the group.

Note : This very participatory approach cannot be applied to the safety aspects. In this respect, only the staff organising the activity can be the point of reference and guarantee the smooth running of the activity.

Facilitating, making accessible

Group leadership and management must include the concepts of ease and accessibility for visitors. This aspect is found in every stage of the activity through :

- ◆ The vocabulary used (no or few scientific or Latin words, etc.),
- ◆ The content covered (listen to the audience to determine the level of speech),
- ◆ The proposed learning situations (gradual learning and technicality),
- ◆ Observation situations (according to the level of ease in the water),
- ◆ The choice of the trail area, etc.

4.5.4 Be a spokesperson

One of the priority objectives of an underwater trail activity is to contribute to changing visitor attitudes so they become more respectful of the environment. The activity must therefore establish the **link between theory and practice**.

Based on their environmental knowledge and without being moralistic, the educational staff must be able to explain and give the necessary advice for adopting environmentally-friendly behaviour, before, during and after the trail in order to :

- ◆ Restrict contact with the seabed,
- ◆ Justify the choice of the area where participants enter the water,
- ◆ Be sure participants will adopt appropriate behaviour to limit disturbance to the environment,
- ◆ Avoid wasting fresh water during rinsing or showers,
- ◆ Encourage the public to bear the issues in mind after the activity.

Set an example

The principle of setting the example is essential. The role of the supervisory staff in the activity is such that it must act responsibly throughout the activity and strictly observe all the instructions and recommendations to limit distur-

bance to the environment and more generally the activity's impact.

For a trail guide accompanying participants in the water, this principle can create a dilemma when it comes to bringing a living being to the surface. Far from being trivial, we consider this question to be crucial and it cannot be answered simply by yes or no. What does this act add to the activity? What are its limits? When may it be possible?

The possible advantages of the act

- ◆ Such contact makes the concept of fragility, which is closely linked to the sense of touch, more concrete.
- ◆ It adds another dimension to the concept of "living" which is often associated with mobility.
- ◆ Close observation allows movement to be seen (ambulacral feet of echinoderms for example).
- ◆ It furthers and complements the visual discovery limited by distance (details, colours, etc.).
- ◆ By authorising and accompanying close-up discovery of certain species on the surface, with or without contact, participants will more easily accept that they may not touch everything.

In fact, the environment is discovered while arousing curiosity and emotion but limiting disturbance.



© sophie.sud

*Guided underwater trail
(Port d'Alon Conservatoire du Littoral Site, La Nartette - France)*

Drawbacks

- ◆ This contact may disturb or even cause significant damage to relatively immobile creatures that are easy to catch, especially if visitor numbers in the area are high.
- ◆ This act could contribute to slow deterioration of underwater trail areas, chosen for their seascape and wealth.
- ◆ It could lead people to think that everyone can freely touch or take anything, without impacting the environment and thus create bad habits.
- ◆ It could encourage intrusion into the environment and damage by contact with the seabed, by participants who are not at ease in the water.
- ◆ Lastly and more generally, it could convey messages that run counter to the commitments of the Charter.

Why bring a living creature to the surface?

This act must be regulated by a number of conditions, to limit disturbance to the environment, to constantly strive for minimum disruption of the species and to put man in his rightful place in this environment.

The following points are therefore vital :

- ◆ The creature must be a moving living being (not fixed to the seabed!),
- ◆ Its physical integrity must not be harmed by handling (hold on the seabed, observation, return to the seabed);
- ◆ The act must be part of a logical and explained learning process (when, how and why it is done but also why it is not done),
- ◆ Such an act must not be systematic,
- ◆ The living creature should be put back into its environment after the observation,
- ◆ It must be handled without any possible controversy and with the utmost caution,
- ◆ A creature must not be taken out of water if it is not suitable for removal,
- ◆ No reproduction must be disturbed.

Lastly, for the coherence of the message and behaviour, it appears better not to catch anything (dead shellfish, sea urchins, sponge skeletons, etc.).

Freedom of choice of the accompanying guide

It is important to specify that the act of bringing a living creature to the surface or not is exclusively educational and therefore supervised; it must be adapted :

- ◆ To the site (specific site regulations, visibility, depth of the activity facilitating quality observation from the surface or not),
- ◆ To the priority message that the activity organiser wishes to convey,
- ◆ To the educational positioning of the trail guide in the activity.

There is therefore no one answer to this question. Each person will make their own decision and cannot be criticised, but it must be possible to explain the act to justify the commitment to exemplary conduct.



© E. Volto - OEC

*Lavezzi guided underwater trail
(Strait of Bonifacio Nature Reserve - France)*

5. Designing an underwater trail

5.1 Defining the project content and targets

5.1.1 What are the priority objectives of an underwater trail ?

An underwater trail is a multi-purpose instrument which can meet several different and complementary objectives :

- ◆ Land-use management and environmental conservation
- ◆ Environmental education, awareness-raising or training of seasonal or local visitors, in a professional or recreational context,
- ◆ Promoting heritage or a region,
- ◆ Implementing a quality recreational nature area,
- ◆ Developing an economic resource,
- ◆ Responding to a social need (access to water, discovery, etc.).

The organisation and the required means will differ depending on the main role chosen, particularly in terms of the way the activity is run and the messages to be conveyed. The operator must define the specific and detailed objectives prior to drafting the operational specifications. As there are often several objectives, they should be given an order of priority. The project must also be coherent and suited to the project sponsor's legal status (local authority or public/private undertaking) and material and human resources.



Coast along the Torre del Cerrano marine protected area - Italy

5.1.2. Target groups

The type of target groups must be defined at the start of the project. The target visitors defined can be a decisive factor in the choice of the site for the activity, the operating

period, the method of management, safety aspects, visitor accessibility and expected numbers. Once the site has been chosen and the specific resources determined, it will be much more difficult to adapt to certain organised visitor groups (e.g. schoolchildren) or specific groups (seniors, people with disabilities), particularly from a safety or regulatory point of view.

There are many different types of potential target groups :

- ◆ General public : individuals or families on a day trip or on holiday,
- ◆ Individuals on a discovery course (adults and children),
- ◆ Sports enthusiasts (who already do another activity that may be complementary to the trail : diving, etc.),
- ◆ School pupils as part of educational projects,
- ◆ Leisure centres and/or sports clubs (children),
- ◆ Organised groups of adults (clubs, works councils, business courses),
- ◆ Young people, as part of a social programme / local policy,
- ◆ People with disabilities,
- ◆ Seniors, etc.

5.2 The project environment : partners to involve

5.2.1 Institutional partners

The institutional partners of MPAs are directly concerned by the creation and running of an underwater trail, particularly in terms of any permits needed to install facilities on the Maritime State Property (MPA) or checking stakeholder competences. **It is important to involve them from the start of the project.** These partners vary in the different Mediterranean countries but may include :

Public services and institutions responsible for Government action at sea :

- ◆ Authorities responsible for the environment
- ◆ Authorities responsible for facilities at sea
- ◆ Maritime affairs department
- ◆ Law enforcement authorities (coast guard, sea police, etc.)
- ◆ Public institutions such as national agencies responsible for the coastline (for example, the Coastal Protection and Development Agency¹ in Tunisia, the National Coastline Authority² in Algeria, the Coastal Protection Agency³ in France, etc.).

1 Agence pour l'Aménagement et la Protection du Littoral (Tunisie)

2 Commissariat National du Littoral (Algérie)

3 Conservatoire du Littoral (France)

Local authorities involved in management of Maritime State Property :

- ◆ Town councils on the coast where the activity will be carried out
- ◆ Any other local authorities possibly concerned by the establishment of the trail (Governorate in Tunisia, Wilaya in Algeria, General or Regional Council in France, etc.)
- ◆ Any local public undertaking with specific jurisdiction for marine environment protection and management.

5.2.2 Other users of the marine area

The seafront is often a popular area with local people or holidaymakers and it is also a source of income for some professionals (fishermen, beach attendants, equipment rental businesses and restaurant owners). When setting up an underwater trail, the project may directly or indirectly concern a great variety of users, particularly due to the actual or more often presumed affect that it might have on their activities.

An underwater trail is an activity that is compatible with all other uses of the seafront, except for sailing or engine-powered high-speed water activities.

It will therefore be important :

- ◆ To identify and locate other uses of the area, both permanent and seasonal. A map of uses is an appropriate tool.
- ◆ To locate any hazardous areas for user safety
- ◆ To locate the sectors to be shared where prior consultation should be conducted, so they do not become areas of conflict due to reciprocal disturbance.



© M.Mabari - MedPAN

Professional fisherman in Scandola nature reserve - France

AREAS OCCUPIED FOR DIFFERENT USES - CALANQUE DU MUGEL (LES CALANQUES NATIONAL PARK - FRANCE)



Below is a non-exhaustive list of users who are potential partners of the project :

- ◆ Professional fishermen (local fishing organisation),
- ◆ Other professionals present in the area : passenger transport, recreational equipment hire businesses, etc.
- ◆ Diving clubs,
- ◆ Water sports enthusiasts (yachting, windsurfing, kayaking, jet skiing clubs, etc.),
- ◆ Beach attendants in the area,
- ◆ Spearfishermen and recreational fishermen who usually don't fish in an organised structure and are therefore less easy to contact,
- ◆ Environmental discovery and/or protection associations, for their knowledge of the territory and any protection statuses it may have, etc.

In addition to mapping uses, setting up a **working group** or a **steering committee** including the main stakeholders will be a bonus when implementing the project.

5.2.3 Structures or human resources

To create an underwater trail, information must be obtained from various sources. In addition to the institutional stakeholders and the socio-professional groups mentioned above, other agencies can provide assistance :

- ◆ Other underwater trail operators,
- ◆ The Ministry responsible for the activity,
- ◆ Sports federations for relevant regulations (scuba diving, for example),
- ◆ The education board : academic inspectors and/or educational advisers in charge of sports or the environment (specific features relating to school trips),
- ◆ Scientific organisations / research institutes.

5.3 Analysis and choice of site

5.3.1 Analysis of the site's potential

To choose an underwater trail site, the site's potential must be studied and analysed and such potential compared with the project goals.

Five types of "potential" can be defined for an underwater trail area :

The "land" potential

This concerns the nature of the site : the extent to which the coastline is jagged and the profiles that can be seen from the sea. The "land" potential of the site is not insignificant, even for an aquatic activity, as showing the importance of the sea-land connection and its consequences on the marine environment can be an important factor in the content of the messages conveyed.

The "marine" potential

This information is mainly collected during field trips using a combination of several methods : inventory of biotopes, inventory of species, observation of sizes of species encountered, a seascape indicator specific to the creation of an underwater trail and various surveys. They will provide information about the wealth of the site and the diversity of the environments. Some data will vary significantly with the seasons but not necessarily in the same way for all sites. Therefore, this work should be done over an appropriate length of time to assess the environment's potential throughout the season during which the activity will take place.

The "safety" potential

The analysis of this aspect is a key factor. It will then be possible to make choices regarding organisation and to identify the required safety measures on the basis of the project objectives and target visitors. The factors taken into account will include exposure to prevailing winds and currents, the absence of any dangerous area (barely



Strunjan Nature Reserve - Slovenia



Tabarka underwater trail project (Tunisia)

© F. Dupuy de la Grandrive

submerged rocky areas where waves break, risk of falling stones, etc.). The extent to which the area is used by other potentially dangerous users should also be taken into account (motorboats, windsurfers, spearfishermen, etc.).

Potential for “access”

This is the key factor that will determine the type of visits and the number of potential users. How do you get to the site : on foot, by car, bicycle, boat, etc.? Can it be reached by public transport? What state is the road in and how far is it from a popular place? Are their possibilities for parking? How can the water be entered? Is it easy to reach from a beach, down steps or a gentle slope, or is it reached via a steep path?

Potential “fragility”

It will be necessary to assess the extent to which trail visits may impact the marine environment.

Several factors can be taken into account :

- ◆ The extent of the trail area where no inadvertent contact with the seabed is possible
- ◆ The extent of the area where inadvertent contact is possible,
- ◆ The distribution of the guided or “self-use” trail activity
- ◆ Factors relating to user behaviour
- ◆ The specific fragility of certain species.

Potential “appeal”

This is the overall appeal of the project, which includes the value of the site, the safety conditions and ease of access, plus factors relating to the quality of reception, such as :

- ◆ Communication and signposting,

- ◆ The standard of facilities provided (changing room, shower, etc.),
- ◆ How easy it is to do the activity,
- ◆ Organisation, safety and supervision,
- ◆ Physical conditions (water temperature, visibility, season, etc.).

An analysis of these different types of potential will determine whether the site is suited to the objectives of the underwater trail. Very often, this work allows the project’s initial objectives to be readjusted according to the site’s actual potential. Several possible scenarios can then be considered and precise figures set out.

At the end of this stage, a site map will be drawn up to :

- ◆ Define one or more itineraries reflecting the diversity of the landscape, wildlife and flora and fauna,
- ◆ Decide on the key points on the itinerary which will be the future observation spots,
- ◆ Determine any anchor points for signs and how they will be fixed,
- ◆ Continuously strive for minimum impact and disturbance of habitats and species,
- ◆ Develop the educational content for the guide and the materials used,
- ◆ Prepare an environmental monitoring tool.

All of the means to be implemented to carry out the project will also be considered.

EXAMPLE OF A MAP OF NOTEWORTHY POINTS: CALANQUE DU MUGEL (LES CALANQUES NATIONAL PARK - FRANCE)



5.3.2 Reception capacity

The reception capacity depends :

- ◆ On the overall pressure (or maximum capacity) that the site can bear, taking existing uses into account,
- ◆ On the manager's intentions and the required degree of control over the activity out of concern to protect the environment,
- ◆ On the factors identified in the analysis of the various types of potential (including access, appeal and safety),
- ◆ On the means that will be implemented especially for safety.

A few figures can also be used for reference :

Self-use trail

15,500 people do the Peyrefite underwater trail (Cerbère Banyuls nature reserve – Pyrénées Orientales) every season (2 months in the summer). The Pyrénées Orientales General Council, the site manager, has introduced an innovative system to channel visitor flows.

Specific signs indicate the trail's visitor status to people arriving :

- ◆ Green starfish : site not full,
- ◆ Orange starfish : lots of users,
- ◆ Red starfish : come back later.

Guided trail

The average figure is generally in the region of 2 or 3,000 visitors per season (2-3 months) at full development. The CPIE Côte Provençale, which receives school pupils, groups and people on courses throughout the year, has 5,800 visitors per year (from April to November) at the Mugel Calanque site (La Ciotat - Bouches du Rhône).

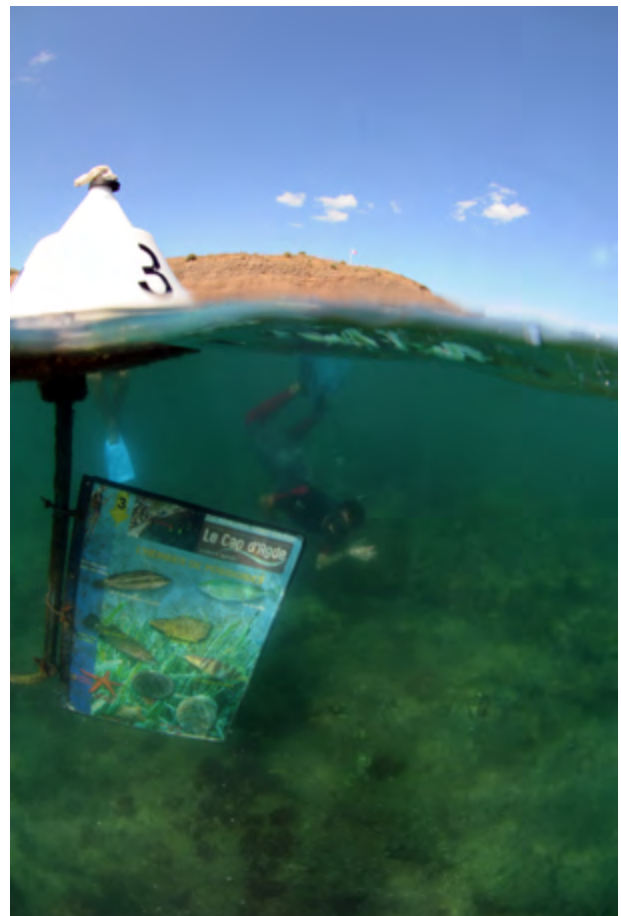
Quality must prevail over quantity in all cases. From an environmental and economic point of view, it is better to accommodate fewer people in good conditions, than to be overwhelmed by poorly controlled visitor numbers.

5.4 Organising an underwater trail

5.4.1 The major types of underwater trails

In the paragraphs below, self-use trails are distinguished from those done with a trail guide, but they remain an activity that is organised on the basis of identified objectives.

a/ Self-use trail



© R. Dupuy de la Grandrive

Cap d'Agde self-use underwater trail (Posidonia Natura 2000 Site, Cap d'Agde - France) Buoy with information board

At a self-use underwater trail site, visitors discover the site by themselves, without a guide. The site can then be run in several ways : above water boards, underwater boards, stop-point buoys at sea, audio guide via FM radio snorkels, submersible tablets. Each of these tools has a number of advantages and drawbacks that should be assessed with regard for the site in order to make the right choice.

Even if the trail is done without a guide, the **organising entity is responsible for the activity** and must take all the necessary measures as regards use, safety and supervision.

ADVANTAGES

- ◆ Users are free to choose the length of the activity, and when and who they do it with, etc.
- ◆ Visitor numbers can be high because they are not limited by trail guide staff.
- ◆ The marking buoys, when present, improve safety by making the itinerary more visible and providing a support point for users in difficulty.
- ◆ Marking buoys channel visitors and restrict harm to the environment.

DRAWBACKS

- ◆ For some types of self-use organisation, the problem of watching other users and monitoring the number of people on the site at the same time may arise.
- ◆ Some facilities can harm the site if they are not used correctly or are ill-suited.
- ◆ Only appropriate for people familiar with snorkelling, thus excluding some visitors (non-swimmers, school groups, etc.).
- ◆ A self-use trail is more difficult to sell. The organisation tools used must be very motivating (with an activity book to be handed in for example).

b/ Guided trails

Guided trails place responsibility for the activity with the supervisor / guide, who runs the activity and makes it safe. The guide welcomes and advises participants on how to equip themselves and explains how to do the trail, as well as the conduct to adopt to avoid damaging the environment. A maximum group size of eight people is recommended. The group must be equipped with a means of signalling (surface board for example). The conditions of use and supervision are governed by the activity's specific regulations in the area concerned.



Port d'Alon guided underwater trail - France

ADVANTAGES

- ◆ Once marked out, the trail is suited to all areas. It can be done from a boat on non-developed and/or inaccessible sites.
- ◆ The guide is responsible for user safety and can replace fixed means (less impact, simplified procedure, etc.).
- ◆ Itineraries can be varied depending on the themes and can be complementary to other approaches.
- ◆ Designed for all users, both swimmers and non-swimmers.
- ◆ **The organiser does not take direct responsibility for the activity which is transferred to the guide when s/he is trained and competent.**

DRAWBACKS

- ◆ One or more guides are required (depending on the number of people) and must have the necessary skills and qualifications.
- ◆ The cost of this type of trail is higher than a self-use trail.

c/ Buoys, beacons and anchorage

When the site is equipped, the equipment specifications (buoys, beacons and anchorage points) will make provision for means with the least environmental impact. The map of the environment and uses will help when drawing up the map of markers and itineraries.

There are ecological solutions tailored to each type of seabed⁴ : silt and sand, pebbles and scree, blocks and rocks, coralligenous beds and seagrass beds. The way equipment is fixed to the seabed will be determined on the basis of : mooring posts, sand screw anchors, helical anchor on seagrass beds, rings and stainless steel plates fixed by punching.

5.4.2. The choice of organising entity

The choice of the type of organisation is important because the consequences in terms of operation, regulations and investment are important.

This choice can be facilitated by taking the following points into account :

- ◆ The initial goal and the type of visitors received : is it a tourist trail for the general public, or is it an educational and land-use management tool ?
- ◆ The site's specific features : what are the requirements concerning the wealth and diversity of the site (are different types of itineraries possible), and the usage (variability of weather conditions) and safety conditions (presence of other users)? For example, doing a trail in a very diverse and varied site will be better controlled by the presence of guides.
- ◆ The desire to preserve the environment : this will involve installing protection means and signs for prohibitions and restrictions on use, as well as controlling the flow of users.
- ◆ The need to ensure optimum user safety : this will

⁴ See www.medpan.org : Guide to permanent ecological anchorages, 2007.

require specific means to guarantee safety (protection of the area, marking and guidance).

- ◆ The investment and operating costs that the structure is prepared to incur.

5.5 Components of the activity

5.5.1 Reception - a key function

Receiving the public is a vital function to be taken into account. This is the visitor's first point of contact with the activity, whether it is done with or without a guide. The reception is the first opportunity to provide information about the area, the activity, the climate and the environment.



Reception at the Peyrefite self-use underwater trail (Banyuls-Cerbère Marine Nature Reserve - France)

Depending on how the trail is organised, **reception** will involve :

- ◆ Directing visitors to the trail if it is done without a guide, and when the conditions of entering the water are not clearly defined.
- ◆ Providing information about the site's basic features (protection, classification, landscapes) and its organisation, to promote the landscape
- ◆ Displaying regulatory and mandatory information about doing the trail and emergency assistance.
- ◆ Providing information about potential dangers and the presence of other users who may represent an inconvenience or risk.
- ◆ Handling logistics and bookings in the case of guided underwater trails or entre / hire for non-guided snorkelling.
- ◆ Possibly giving a presentation of the environment, landscapes, flora and fauna before entering the water. Actually, in the case of a self-use trail, reception will cover tasks that are, in principle, done during the actual activity

Reception can be done, depending on the case, by :

- ◆ Information boards,
- ◆ Specific staff (instructor on land),
- ◆ Supervisory staff (but this is not necessarily their role),
- ◆ The accompanying guide (if there is one).

Here are two examples of different reception approaches :

The Peyrefite underwater trail in Banyuls is open to

the public for self use. As there is no guide in the water, the reception is all the more important. Means including **information boards, a reception point, exhibition premises and specialised staff** create an underwater trail that meets the Charter's criteria. This trail also provides FM radio snorkels.

The **Port d'Alon underwater trail in Saint-Cyr** is located within an area of the Conservatoire du Littoral (Coastal protection agency). The project sponsors have chosen a lightweight structure and a limited number of users. The **guide is in charge of both reception and the activity**. It takes about two hours, with a significant amount of time spent presenting the environment.

5.5.2 The actual activity

The activity is the culmination of everything that has been organised beforehand. Being the stage that follows reception, two aspects must be taken into account : doing the activity and the educational content.

The actual activity involves the technical and physical aspects, plus user well-being and safety.

The operator is responsible for risks incurred by the public, but also for satisfying user expectations (well-being, suitable equipment).

The operator must therefore :

- ◆ Provide information about the itinerary, access to the water and the conditions of doing the activity,
- ◆ Ensure that users have suitable equipment and know how to use it (role of the trail guide, the lifeguard or a person in charge of equipment hire).

The **educational content** depends on the objectives set by the trail project sponsor and may cover the following themes :

- ◆ Discovery of biodiversity, habitats, and flora and fauna.
- ◆ Discovery of landscapes and seascapes.
- ◆ Information about environmental vulnerability and human impact.
- ◆ Environmentally-friendly behaviour.

5.6 Means

5.6.1 Staff

Putting maintenance and logistics to one side, four categories of staff may be employed :

- ◆ **Reception staff** may only do the main reception tasks or act as land-based guides particularly in the case of a self-use underwater trail. **Purely reception staff** can provide information, answer queries and take bookings. They may be authorised to hire out equipment without however providing information about how to use it. Reception staff may be assigned by an independent organisation, such as a tourist office, for example.
- ◆ The **land-based guide** must be competent in environmental and coastal matters, have knowledge of

the key characteristics of the site's landscape and have organisational skills. S/he cannot go into the water as a guide and cannot explain how to use the equipment.

- ◆ **Lifeguards** when the activity is secured. Lifeguards are often not the same staff as those who are able to guide the activity.
- ◆ The **trail guide** accompanies users and explains how to use the equipment. In addition to the necessary technical skills, s/he must have good knowledge of the marine surroundings and the site's environment and landscape. The job of an "underwater trail guide" requires specific expertise that cannot yet be found in a traditional training manual⁵.



Guide at the Cap d'Agde underwater trail

Skills

The organisation receiving the public must have a comprehensive set of skills the extent of which will depend on the operator's organisational choices :

- ◆ Reception : ability to welcome, inform and manage bookings,
- ◆ Activity organisation : broad, cross-cutting skill,
- ◆ Knowledge of the marine environment, coastal landscapes and environmental problems
- ◆ Safety : surveillance of an area and/or supervision in the water

5.6.2 User facilities

Having premises is always a plus for organising the activity.

Welcoming the public

- ◆ Administrative reception area,
- ◆ Information point,
- ◆ Site, landscape and environment presentation point,
- ◆ Changing rooms and showers.

Technical facilities

- ◆ Equipment storage (flippers, masks, snorkels, wetsuits, FM radio snorkels),

⁵ The CPIE Côte Provençale which has been working in this area for many years provides skills training, without certification, specific to the job of an underwater trail guide.

- ◆ Storage of other items of equipment.

The possibility of using suitable premises on the site is often a luxury. Where there are no permanent premises, several solutions are possible :

- ◆ Mobile "beach attendant" type facilities (reception and technical facilities),
- ◆ A utility vehicle used as a technical room for equipment (if land access is available),
- ◆ A diving-type boat at sites that are inaccessible by land (technical and safety). For example, the Observatoire Marin du Littoral des Maures (Marine Observatory of the Maures Coastline)

These solutions offer the advantage of preserving the coastal area, but restrict the number of users.

5.6.3 Equipment

Outside the premises and facilities on land and in the sea, the organiser will need to invest in the following equipment :

- ◆ **Safety equipment for guided trails** : spearfishing board and signalling buoy,
Tips : Opt for quite a large, more conspicuous board to carry small educational material, water and possibly first-aid equipment.
A user in difficulty can also be brought back with a large board.
- ◆ **First aid equipment** : emergency kit, water, blanket, breathing apparatus,
- ◆ **User equipment** : flippers, masks, snorkels and wetsuits suitable for each user,
- ◆ **Communication equipment** : mobile or VHF radio phone
- ◆ **Surveillance boat**, semi-rigid type.

5.7 Monitoring the impact of the underwater trail activity

Underwater trail visitor numbers must prompt site managers to measure the potential impact of users on the marine flora and fauna.

Monitoring will be done to :

- ◆ Obtain information about development in trail use and the potential impacts of the various users,
- ◆ Observe changes to the fish population during the season, correlating the results with variations in visitor numbers,
- ◆ Improve knowledge of user expectations and perception,
- ◆ Raise user awareness of respect for and protection of the marine environment,
- ◆ Propose suitable management measures and reduce the various user impacts.

Several monitoring protocols may be implemented but there is still little assessment of their application in the Mediterranean and other monitoring activities better suited to this activity need to emerge.

5.7.1 Monitoring visits to the underwater trail

The protocol depends on the type of trail and the visitor numbers. One simple method consists in counting trail users present in the water every hour at a time *t* and during the opening hours of the underwater trail. This can be done by the staff or by lifeguards from the lifeguard station if the site is supervised, for example. Depending on the results, visitor flow management can be set up like at Cerbere-Banyuls Marine Nature Reserve



© C. GERARDIN - Parc National de Port-Cros

La Palud underwater trail (Port Cros National Park - France)

5.7.3 Flora and fauna monitoring

Ideally, marine biodiversity monitoring should be done on the trail site and a control site located close by.



© (CG66) Parc Marin de Cerbère Banyuls

Cerbère-Banyuls Marine Nature Reserve moderates the number of visitors to its underwater trail.

5.7.2 Monitoring user impact

Monitoring the impact of users on the environment involves going along the trail in the water at different times to monitor and note, from the surface, any user behaviour liable to impact the environment : hands, flipper movements, stepping on the seabed, vertical kicking, moving rocks, feeding, fishing, catching, disturbing animals, underwater photography. Each observation form will cover approximately 45 minutes of submersion. Each impact detected is identified according to the activity done by the user : free swimmer, snorkeler, FM radio snorkeler, scuba diver.



© Sentier sous-marin Cap d'Agde

Cap d'Agde underwater trail : Location of areas monitored

Generally, these monitoring activities are performed by independent service providers unless the manager has the appropriate skills.

Two categories of biodiversity can be monitored : fixed flora and fauna.

a/ Monitoring fauna :

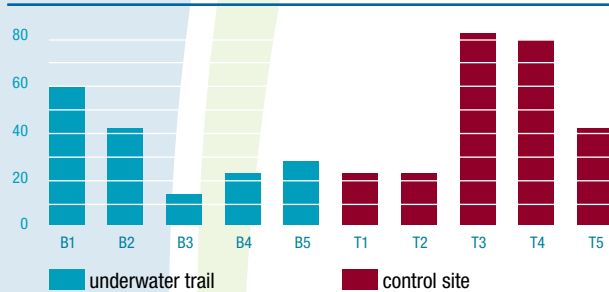
Several indicators can be monitored depending on the sites : sea urchins (when they are found on the trail), fixed flora and fish.

Monitoring sea urchins :

Sea urchin populations are liable to be disturbed or damaged by summer snorkelers. In the case of the Cap d'Agde underwater trail, sea urchins are counted at five

measurement sites along the trail and five sites in the control area. All individuals are counted without distinguishing between the two species *Paracentrotus lividus* and *Arbacia lixula*. A statistical analysis is conducted to be able to make comparisons.

NUMBER OF SEA URCHINS COUNTED AT EACH OF THE CAP D'AGDE TRAIL MEASUREMENT SITES



Fish population monitoring :

There are various possible methods for monitoring fish populations. One that can be used in the case of underwater trails is the FAST index (Fish Assembling Sampling Technique) developed by the University of Nice Sophia Antipolis. It swiftly provides a view of the populations in place and is very easy to use although it is better done with divers with good observation abilities. This protocol can highlight the effects of various forms of catches in an area, particularly when a regulation on catches is introduced or changes.

This monitoring must be done at different times and during the opening season of the trail. The observer randomly swims on the surface in the underwater trail area at a maximum depth of between 0 and 10m. In principle, at least one other control site which is not on the trail must be chosen. During the dives, the observer notes the presence of fish from a list of 24 target, indicative and easily identifiable species, plus six 'joker' species. The size of individuals is measured using two size classes (small/medium or large) and each count lasts for 15 minutes.

The data is then analysed : For each count, an index (I) is calculated based on the number of species observed and the estimated sizes. Five parameters are then calculated :

- ◆ An average index (average of the 6 values, Iav),
- ◆ A cumulative index (Icum),
- ◆ The number of species observed out of the list of target species (Nbsp),
- ◆ The proportion of species for which both size classes have been observed,
- ◆ The variation coefficient reflecting the variability of the six counts (VC).

Significant species selected are known and easily identifiable. They will be looked for in the various environments : open water, rocks and coralligenous, cracks and faults, soft seabeds and Posidonia seagrass.



Location of the different areas where fish is monitored (Peyrefite underwater trail, Cerbère - Banyuls Marine Nature Reserve)

b/ Fixed flora monitoring

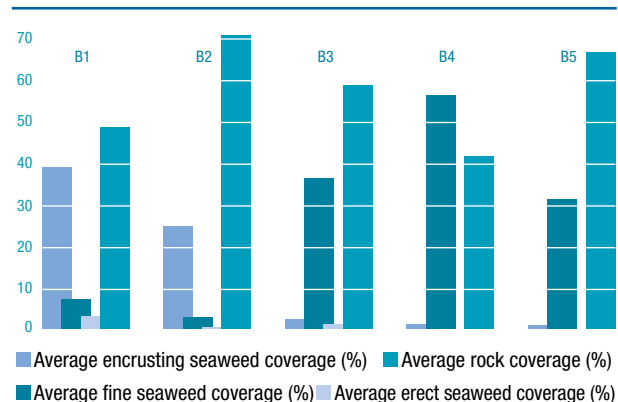
It is likely to be damaged or even destroyed by trampling, kicking with flippers and uprooting. The typology and exposure of the site will determine the types of monitoring (sheltered or wave-beaten mode). Depending on the complexity of the facies, several classes are determined.

The determination of seaweed coverage in each of the sites enables the facies to be estimated. A comparison of the changes to these facies over time will help reveal any impact of underwater trail use.

Three classes are monitored at the Cap d'Agde underwater trail :

- ◆ Encrusting seaweed (*Lithophyllum incrustans*)
- ◆ Fine seaweed coverage, less than 10cm tall; this class includes small seaweed adapted to an environment in wave-beaten mode (*Corallina mediterranea*, etc.)
- ◆ Erect seaweed, taller than 10cm (*Halopteris scoparia*, etc.)

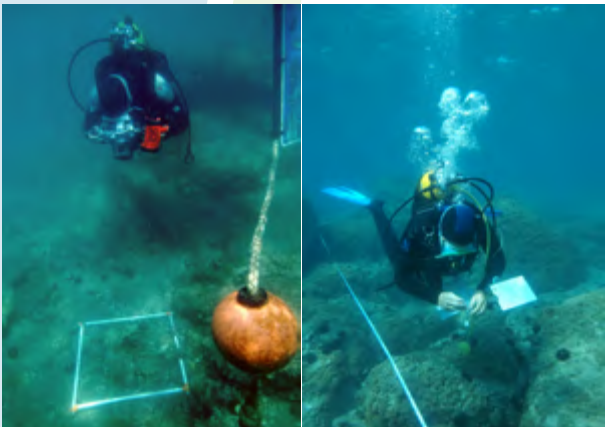
AVERAGE COVERAGE OF THE THREE CLASSES OF SEAWEED, AROUND EACH OF THE BUOYS OF THE CAP D'AGDE UNDERWATER TRAIL



Flora and fauna data was collected using underwater photography. With underwater photography, the quadrats can be subsequently analysed and the diving time optimised to increase the area studied. Along the entire

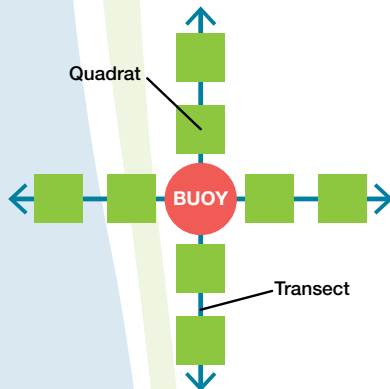
trail and on the control site, the quadrats were arranged on the rock along a transect and then photographed.

© M. Fouqué



Underwater investigation to gather flora and fauna data on the Cap d'Agde underwater trail

Four transects as well as two quadrats per transect were sampled for each buoy. As the quadrats are arranged on the rock at random distances, not all the quadrats could be sampled on certain buoys near the sand. At the control site, the quadrats were randomly arranged along parallel transects.



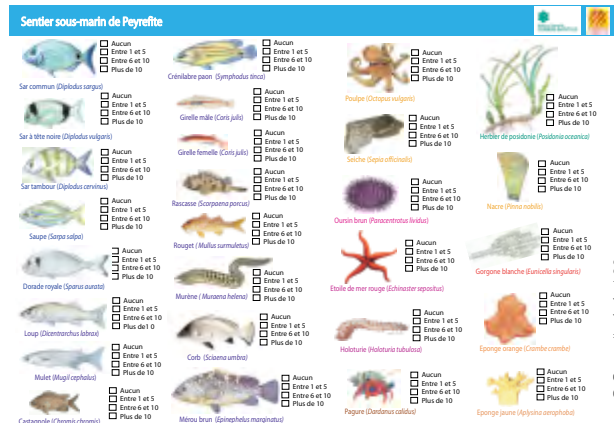
Sampling by buoy protocol on the Cap d'Agde underwater trail

The data from the images is processed using PS and MapInfo software.

5.7.4 Monitoring user perceptions

This may be either user perceptions of the natural site itself or of the activity.

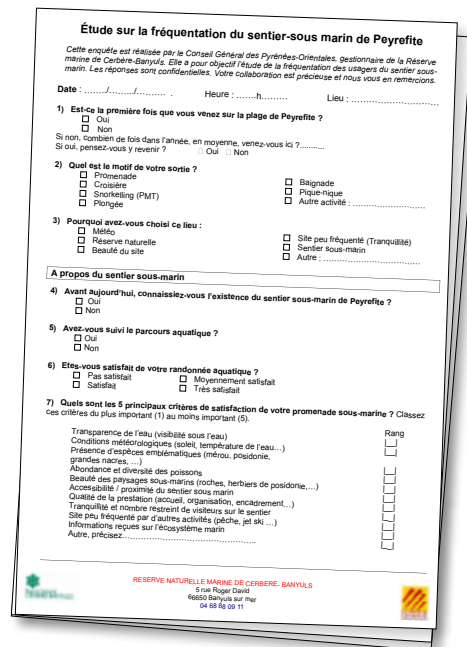
By studying user perception of the wealth of the site, the trail management can be adapted (change of itinerary for example). A submersible monitoring sheet can be handed out to trail users who have basic knowledge of the Mediterranean marine environment. A trail staff member can then collect the datasheets after the visit and enter the data in a computer system.



Example of the sheet handed out at the Peyrefitte underwater trail (Cerbère-Banyuls Marine Nature Reserve)

A satisfaction survey

Users can be given a survey form which covers several topics : the underwater trail activity, knowledge of the marine protected area if that is the case, socio-economic data, etc.



© Conseil général 66

Visitor counts, satisfaction, perception and analysis of user behaviour (especially in areas where contact with the seabed is possible) are very appropriate and necessary to assess the impact of the underwater trail activity.

To conclude, in line with the exemplary management that MPAs advocate, **monitoring the underwater trail activity is essential.** Simple and reproducible methods should be preferred. Although it is important to monitor the various aspects of an underwater trail site, i.e. fauna, flora, visitor numbers, and user perceptions, the choice of site remains the key factor. A wise choice will significantly facilitate the type and frequency of monitoring activities. Lastly, the MPA manager will adapt the monitoring to the financial resources available.

6. Economic approach to underwater trails

From an economic perspective, an underwater trail is an activity that generates market and / or non-market income and benefits the local population (leisure, sense of territorial ownership), tourists (discovery), professionals (indirect impact and derived benefits) and institutional stakeholders (promotion).

In the Mediterranean, the activity is seasonal and can be done during a good part of the year (six months). However, as with any outdoor activity, it can suffer economically from adverse weather conditions or temporary pollution causing partial or total stoppage. This risk is not insignificant in terms of the activity's economic viability.

While underwater trails can yield profits, they also incur expenditure. The decision to create an underwater trail will depend on the answers to the following questions : How much will it cost ? Will the income generated cover all or part of the costs ? What economic model should be chosen ?

The economic approach proposed in this chapter is the fruit of several years' experience gained by the CPIE Côte Provençale as the creator or operator of several underwater trails. The approach presented includes :

- ◆ Components of the strategy
- ◆ Types of visitors
- ◆ Services provided
- ◆ Economic models
- ◆ Costs
- ◆ Revenues
- ◆ Communication strategies
- ◆ Case study

In this chapter, we examine the direct profitability of an underwater trail (for the operator). We will not address non-market and indirect socio-economic benefits (for the local population and businesses), a question that is discussed in depth in the study "Underwater trails in the French Mediterranean : a socio-economic evaluation"¹.

6.1 Components of the strategy

Underwater trails vary greatly both in terms of their organisation and their economic model. This is due to the fact that each trail is adapted to its territory and environment

and to the manager's objectives. For each underwater trail, careful consideration is needed to identify the most suitable strategy to develop the activity.

When defining the strategy, the actions to be taken will be chosen based on an analysis of the project sponsor's situation (strengths, weaknesses and opportunities). Many factors require consideration, the most significant of which are detailed below.

The site's socio-economic environment is the primary component of the strategy. An effective strategy is integrated into the territory. For example, the proximity of an urban or a tourist area representing potential users, and the proximity of other, possibly complementary leisure activities must be taken into account in the activity development strategy.

The site to be used, its geographic location, its accessibility, wealth and diversity as well as the landscapes are key factors in the success or limits of the activity.

For example :

- ◆ A great variety of settings will allow project sponsors to offer a broader range of itineraries, thus encouraging people to visit the site several times.
- ◆ Difficult or remote access will be a restricting factor that should be mitigated.

The operator's organisational profile, expertise and resources must also be given consideration to determine the appropriate economic model and required resources. In an MPA, the operator may be either the manager or a delegated organisation. In both cases, the following points should be examined :

- ◆ Is the operator's economic structure authorised to collect revenue ? If not, can it rely on partners ?
- ◆ Are the manager's objectives for the environment compatible with a high number of visitors ? If so, which visitor limits does the manager intend to set ?
- ◆ Does the operator already have resources (trained staff, equipment) to facilitate the development of an underwater trail activity ?

By analysing the strengths and weaknesses and identifying opportunities for each component, it will be possible to choose the most appropriate strategy.

¹ IRSN, Université de Méditerranée, RMC Water Agency.
This publication is available in the resources of the ECOREM collaborative section (ecorem.fr - "resources" - keyword "underwater trail").

The table below provides examples to help with this reflection :

	COMPONENTS OF THE STRATEGY	STRENGTHS	WEAKNESSES	STRATEGIC OPPORTUNITY
SOCIO-ECONOMIC ENVIRONMENT	<ul style="list-style-type: none"> Local and tourist potential Complementary and/or competing activities 	<ul style="list-style-type: none"> Tourist town nearby 	<ul style="list-style-type: none"> Highly developed and competitive tourist attractions (diving clubs) 	<ul style="list-style-type: none"> Form partnerships with other bodies that organise complementary leisure activities
SITE	<ul style="list-style-type: none"> Wealth and diversity Access Defined maximum capacity 	<ul style="list-style-type: none"> Very rich and diversified site - several itineraries possible 	<ul style="list-style-type: none"> Difficult access and parking fee Vulnerability of the environment 	<ul style="list-style-type: none"> Guided activity to vary the itineraries and restrict pressure
THE OPERATOR : THE MPA MANAGER	<ul style="list-style-type: none"> Role and possibilities Partnerships Existing resources 	<ul style="list-style-type: none"> Presence of premises on the site 	<ul style="list-style-type: none"> No competence for offering the activity 	<ul style="list-style-type: none"> Rely on external expertise initially

It is generally a good idea to think about the project's key strategic focuses in consultation with local stakeholders (local authorities, tourism professionals, etc.).

6.2 Visitors

An underwater trail activity can be designed for various target groups.

For easy, recreational use without too much equipment, in complete safety, the activity can be done by people from the age of 6 up to 80.

The activity's **visitor potential** is the number of people likely to come and do the activity. In general, an activity's potential can be measured via market research (investigations in the field), but it can also be estimated by comparison with other similar local activities.

With their own knowledge of the economic environment and possibly by consulting other local stakeholders (tourism, sports federations and local authorities, etc.), operators will be able to estimate visitor numbers to the site for each main category; they will then be able to organise their resources according to the "expected numbers" for each of these categories :

- Local residents will regard it as a family activity that allows them to identify with the territory,
- Tourists see it as a discovery activity,
- Even experienced snorkelers or for example spearfishermen can enjoy rediscovering the environment with a knowledgeable guide,
- As a family, this is an activity that can be enjoyed together, regardless of age,
- For teachers and youth leaders, it is an educational activity to support their own teaching approach.

The different target groups (families, tourists, school pupils, etc.) have different expectations which may be incompatible. Mixing a family and a group of children or a sole tourist with a family will not necessarily give them full satisfaction.

Where an operator manages several underwater trails, activity sites may be specialised according to visitor types.



© R. Dupuy de la Grandrive

Shallow coastal waters in Slovenia ideal for snorkelling

Expectations change over time : a person who has already done the trail will have different expectations the second time s/he visits the site.

Expectations also change as a result of criteria external to the territory : tourist expectations are increasingly based on international standards in terms of services provided and quality of service; there can be a significant gap with services provided to satisfy local visitor standards.

As visitors have different expectations that change over time, the range of services must be diversified and visitor management, i.e. customer satisfaction, is an important factor of success.

Approach based on potential and expectations

The table below provides an example of the various visitors that a site may accommodate, and their potential expectations.

VISITOR TYPES	POTENTIAL FROM 1 TO 5	MAIN EXPECTATIONS	OPPORTUNITIES
LOCAL FAMILIES	3	<ul style="list-style-type: none"> Do an activity as a family during free time Introduce children and relatives to the activity 	<ul style="list-style-type: none"> An activity with a trail guide Different itineraries to secure loyalty
TOURISTS NOT WITH THEIR FAMILY	4	<ul style="list-style-type: none"> Discover the territory and its wealth Take part in a fun activity on holiday alone or with others Be able to use equipment not brought in their luggage 	<ul style="list-style-type: none"> A self-use trail that can be done alone (individual and group) is possible A diversified complementary offering (equipment hire, sale of articles, etc.)
SCHOOL CHILDREN	1	<ul style="list-style-type: none"> Educational focus Organisation permitting control of a group of children 	<ul style="list-style-type: none"> Specific organisation Competence of the trail guide

Lastly, it is important to estimate the expected visitor numbers per target group in advance. The table below shows typical seasonal use of underwater trails. It ultimately allows the number of days the activity is open to be defined.



The rich depths of the Medes Islands marine reserve (Catalonia, Spain)

Estimation of potential visitors to the site :

In reality, it is generally worth reflecting on the various groups' expectations and the site's visitor potential in consultation with local stakeholders (local authorities, tourism professionals, etc.).

TARGET GROUPS	APRIL	MAY	JUNE	JULY	AUGUST	SEPT.	OCT.
Local individual visitors							
Tourists							
Groups							
TOTAL							
Number of people / day							
Number of days open							

6.3 Range of services

This means the services made available; there may be only one service or several components.

An example of a single service : proposal of an underwater trail supervised by a trail guide from the MPA every day in the summer period in the morning from 10am to noon, equipment supplied; changing room and showers on site.

Another type of single service : access to a self-use underwater trail with equipment hire, and a submersible board presenting several interesting itineraries; no user facilities.

Another type of more complex range (comprehensive range) : a visit to a marine protected area including a tour on land and an underwater trail.

The content of the services (type of guide, opening times and period) may be variable, i.e. opening times changed according to the type of visitors, longer season to receive school groups, or arranging for an independent professional to give a presentation.

The range may be more or less diverse depending on how the operator wishes to respond to visitor expectations.

A single service includes a discovery of the environment with certain conveniences (equipment for the activity) and safety elements (buoy system, safety board). This type of service can be provided without too many requirements and means, often using the operator's resources or those of a local partner (delegation to diving club with specially trained instructors). It is appropriate for a start-up activity.

A range of services meets the expectations of a larger number of people; it is designed to secure user loyalty and is more profitable, although it demands more outlay. It is well suited to a developing or fully developed activity.

Diversifying the services

- Firstly, the services can be diversified on the basis of the trail's main characteristics :
 - Diversity of itineraries, size of the area,
 - Different types of trail (self-use and guided, FM radio snorkel),
 - Secondary practices (photos, rally),
 - Opening hours (underwater trail in the evening or at night for example).

- ◆ Secondly, “extra” services to the main activity may be proposed : equipment hire, a bookshop or a point of sale, or even access to an exhibition. These services may be part of a comprehensive offering (all-inclusive rate) or separate (fee per service).
- ◆ Lastly, a “comprehensive offering” may be provided where the main activity is combined with other land-based or water activities : interpretation of coastline landscapes, discovering traditional professions such as fishing.

A more diversified range responds to a greater variety of visitor expectations; it helps secure visitor loyalty and reduces risks incurred by bad weather conditions by offering people alternative activities when they cannot do the trail.



*La Palud underwater trail
(Port Cros National Park - France)*

In France, the Le Rayol Canadel site is a good example of a comprehensive range with an unguided or guided tour of the Mediterranean botanical garden, an underwater trail and a bookshop, plus a variety of events organised on a seasonal basis.

The underwater trail is no longer a separate activity in this case but is part of the MPA’s overall economic model. It therefore makes a much more productive economic contribution to the running of the MPA.

The quality of the services provided is also an important factor.

For an underwater trail, this particularly includes :

- ◆ Competent staff and the quality of their explanations
- ◆ The provision of facilities such as changing rooms and showers
- ◆ Safety standards comparable to the country of origin (tourists)
- ◆ Languages spoken by the reception staff

And contrary to popular belief, the wealth and interest of the site are not necessarily the most important satisfaction criteria, the main one being the quality of reception, the educational approach and the range of services. However, the other factors of quality, i.e. competence,

social interaction, associated services, etc. will be more important at a site with little diversity and wealth.

Quality is a concept that inevitably encompasses satisfaction. Measuring satisfaction in a simple way (questionnaire) is essential to continuously adapt the activity to visitor expectations.

To determine the range of services to be provided, it is a good idea to analyse the strengths and weaknesses. Like the tables above, the table below can be completed at a meeting attended by several partners.

COMPONENTS OF THE OFFERING	STRENGTHS	WEAKNESSES	OFFERING
SITE	<ul style="list-style-type: none"> ◆ Wealth and diversity ◆ Safe access 	<ul style="list-style-type: none"> ◆ Large area 	<ul style="list-style-type: none"> ◆ Diversified itineraries with a trail guide ◆ Ability to vary the opening hours
COMPETENCE	<ul style="list-style-type: none"> ◆ Land and sea 	<ul style="list-style-type: none"> ◆ No technical skills for doing the underwater trail 	<ul style="list-style-type: none"> ◆ Possibilities of activities in alternation with a skilled partner
PREMISES	<ul style="list-style-type: none"> ◆ On the beach 	<ul style="list-style-type: none"> ◆ No water supply 	<ul style="list-style-type: none"> ◆ Visitor reception and exhibition ◆ Shop ◆ Equipment hire
WELL-BEING AND SAFETY	<ul style="list-style-type: none"> ◆ Lifeguard ◆ Rescue equipment 	<ul style="list-style-type: none"> ◆ No changing room or showers 	<ul style="list-style-type: none"> ◆ Factors limiting the opening period and target groups

6.4 The economic model

The choice of an economic model involves both the choice of management and the financing method, and these two aspects are closely linked.

The activity can be managed in two ways :

- ◆ In simple terms, for an activity such as an underwater trail, there are two management models : direct management by the operator of the area or management delegated to a third party.
- ◆ There are two types of funding :
 - ◇ public or private funds (sponsorship) if users are not charged to do the trail,
 - ◇ or funding by users, when a fee is charged for the activity.

Depending on the case, this financial participation by visitors may cover the full cost or a varying portion of the costs incurred by the operator.

- ◆ Between the two extremes, there is a broad range of mixed solutions which are perfectly suited to the

various types of underwater trail and MPA managers, and to the various stages in the activity's development (start-up, growth and full development).



© R. Dupuy de la Grandhève

Cerro Gordo Nature Park in Andalucía - Spain

Direct management : the MPA manager is the operator and handles the entire set-up, maintenance, coordination and communication. The operator finds the necessary funding (public funding or sponsorship or collecting a fee for the proposed activities). The advantage for the manager is that it has complete control over the services provided, the quality of service and visitor numbers. The downside is that the manager bears the costs, must have the required internal skills and must appropriately insure the risks (financial and accidents).

Management delegated to a partner : while this model has undeniable advantages for the development of the activity, it requires the involvement of one or more completely reliable partners who are competent from a practical point of view and as regards environmental education or even environmental conservation. The service provider represents the management body's public image.

Management is delegated under an agreement drafted by the two parties and specifying their respective rights and duties, plus a periodic verification. The agreement may include specific clauses such as receiving certain groups (locals) free of charge or at a reduced rate as compensation for the delegation. If the partner is competent, mindful of the environment and acts in a manner respectful of the MPA manager's image, delegated management is a good solution if the aim is to promote an area rather than to make a financial contribution to the MPA.

In mixed models, all or part of the running of an underwater trail can be delegated and to varying degrees.

Some examples include :

- ◆ The educational aspects that are run by an entity specialising in environmental education and sustainable development or diving whereas investment, maintenance (buoy system) and marketing are done by the management body.
- ◆ The educational approach, marketing and monitoring of the environment and the buoy system are delegated to a third party, the remaining tasks being the management body's responsibility.
- ◆ The management body may provide premises while

the organisation in charge of the educational approach is also responsible for the equipment.

- ◆ The management body may reserve the site for certain groups (locals and schoolchildren) and delegate the management of other visitor groups (tourists).
- ◆ If it has extensive expertise, the partner organisation may also help the management entity, which runs the trail, to develop the activity.

Defining the economic model also involves determining which parties will cover the costs of preliminary studies, investment in material, equipment and premises, and the operating, educational organisation and maintenance costs. Will this be the management body, the local authority or the Government ?

a/ A range of funding to be explored

The funding, whether for the benefit of the manager or the organisation granted the delegation, may come from different sources :

- ◆ For example, investment costs may be funded by public or private subsidies and the operating expenses covered by the prices charged for services.
- ◆ Initially, the set-up of the activity may be subsidised by public or private funds with the activity gradually paying for itself.

b/ Below are two simplified cases of economic models :

Port d'Alon guided underwater trail (France) : The Conservatoire du Littoral, the site owner, and the town council that manages the site have delegated the entire educational organisation, marketing and monitoring of the underwater trail to an environmental education non-profit organisation specialising in the marine environment. The town council has granted the non-profit organisation premises and covers the costs of the buoy system. The delegation is covered by an agreement and an authorisation to temporarily occupy the maritime state property, specifying the parties' respective rights and duties. The partnership has worked for several years to the mutual satisfaction of all three parties. At this site, the non-profit organisation is financially self-sufficient (expenses-revenue balance). It did, however, receive financial aid from the regional authority and a public institution for the first three years.

The self-use underwater trail of Cassis (France) : The local authority wanted to develop an underwater trail in its territory. To do so, it called in an organisation specialised in developing the activity, which suggested the idea of a self-use trail. The town council fully delegated the design and set-up of the underwater trail to the specialised organisation with the service being paid for by the local authority. The local authority was keen to involve local economic stakeholders (diving clubs) in the approach and to work in consultation with other professional stakeholders (fishermen) and users. The town council then delegated the educational organisation of the activity to diving clubs (after training the diving instructors) in return for the possibility of receiving local school groups at the site free of charge. The diving clubs finance their

	THE MANAGEMENT BODY	SERVICE PROVIDER	OTHER STAKEHOLDERS
PRELIMINARY STUDIES		Feasibility study and assistance	
PREMISES AND ACCESSIBILITY	Premises made available		
BUOY SYSTEM AND ITINERARY		Design	
EQUIPMENT, BOAT	Equipment made available Surveillance boat		
EQUIPMENT FOR THE ACTIVITY			Provided by the local service provider
RECEPTION AND EDUCATIONAL ORGANISATION	Visitor reception		Underwater trail guide
CHARGING ENTRY FEES	At reception		
COMMUNICATION AND PROMOTION	Implementation of communication	Designing materials	
MAINTENANCE	Maintenance of the buoy system and the organisation		Maintenance of loaned premises

activity out of the fees charged to visitors and the town council bears the costs of maintenance (premises and equipment) and management (buoy plan, territory).

c/ Organising the economic model - who does what ?

In the table, we present a complex fictitious case of an economic model involving the management body, a service provider specialised in underwater trail organisation and a local non-profit or private stakeholder who is responsible for the educational running of the activity.



Port d'Alon underwater trail supervised by a trail guide

6.5 Costs

As outlined above, the set-up and running of an underwater trail activity demands an investment which will vary in amount depending on the site's features, the manager's objectives and the available resources (e.g. premises, buoy system). Operating costs are then incurred to run, maintain and promote the activity.

Whether the economic model chosen is that of a profit-generating activity or a service fully financed by the manager or the operator without any financial yield, cost data is vital.

In the case of an international approach, we know that the costs can vary greatly from one country to another, depending on the conditions of supply of specialist equipment, service provider rates, payroll taxes, etc. The methods of accounting for these costs may also vary depending on domestic accounting regulations. The proposed approach is a simple model that can be adapted to any country.

6.5.1 Investments

Investments are classified into two categories : those that will only be made once (preliminary studies) or which will last for several years (premises, buoy system) and those which must be periodically renewed because of wear (equipment).

Large beaches and untamed sandy coastline along the Gulf of Sidra (Libya)



a/ Investment in infrastructure and set-up

- ◆ Preliminary studies include the choice of the site, the itinerary, consultation with stakeholders and users of the territory and administrative requirements. They may be paid for directly by the organising entity in the form of staff costs or done by a third party as a service.
- ◆ Any creation of access means (layout), car parks, pedestrian access, access to the water and signalling, if they do not already exist.
- ◆ The premises, construction and installation of reception facilities, exhibition space, technical premises, changing rooms and showers.
- ◆ The technical elements of the underwater trail : safety, markers and buoys, water lines, ecological anchoring, land signage, land and sea stop-point boards (design and manufacture).
- ◆ Other equipment depending on the site's needs : vehicle, diving or surveillance boat, mobile facilities for people with reduced mobility.

b/ Renewable investments for the activity

- ◆ User equipment :
 - ◇ Flippers, masks and snorkels especially for children, wetsuits but not with a weight belt.
 - ◇ Full-length or shorty wetsuits suitable for different visitors (men, women and children).

c/ Recommendations for equipment

For a group of 8 (adults and children), allow 2 items of equipment per size. To welcome children in groups of 16, allow 5 items of equipment per size.

Example of indicative prices in France for 'entry-level' products

	ADULTS	CHILDREN
Combinaisons mono pièce	€80	€60
Shorty	€29	€26
Palmes	€20	€11
Masques	€6	€6
Tuba	€6	€3

In the French example, six outings (at €20 per trail) are required to recoup the full cost of the adult equipment (€112). For a child (€80), approximately 5-6 outings are required (€15 per trail).

- ◆ Safety equipment :
 - ◇ Safety equipment, safety board and signalling buoy,
 - ◇ First aid equipment : emergency kit, water, blanket and full respiratory apparatus.
 - ◇ Communication equipment : mobile or VHF phone

Example of indicative rates in France :

Communication equipment	VHS or mobile phone : €100
Simple buoy	Signalling buoy : €23
Safety board	Board with two inflatable tubes to carry equipment : €100
Inflatable kayak	For long snorkel tour : €350
First aid kit	Compliant kit : €30
Respiratory therapy	Seasonal hire : €745

d/ Educational materials

The creation of small information boards and other educational materials are part of the investment because they last for several years.

These costs include :

- ◆ Design of the educational tools
- ◆ Photographic databank
- ◆ Model and layout
- ◆ Production and printing of information boards

e/ Investment cost distribution

As initial investments last for several years, the cost can be spread over several years based on useful life, in order to calculate a total annual cost of the activity. Major investment and studies can be spread over a period from five years (equipment) to eight years (premises). The safety and activity equipment should generally be replaced every three or five years.

Using these indicators, the annual investment costs can be calculated using the table below. It is a fictitious example built from several real cases.

FIGURES GIVEN FOR THE CALCULATION EXAMPLE	AMOUNT	AVERAGE TERM	COST FOR THE YEAR
Structure and set-up investment			
Studies and assistance	10,970	8	1,371
Premises	0		
Organisation	0		
Equipment	2,485	8	310
Activity-related investment			
Equipment	4,415	3	1,471
Safety equipment	400	3	133
Design of education and communication materials	5,862	5	1,172
TOTAL	24,132		4,457

6.5.2 Operating costs

The operating costs of the underwater trail logically depend on the choice of organisation made beforehand (guided, self-use, reception, etc.) and the economic model adopted (delegated or direct management).



Staff and facilities at the La Palud underwater trail (Port-Cros National Park)

a/ Payroll expenses must be calculated as full costs (wages + payroll taxes)

Reception and supervision/guiding of the underwater trail includes, depending on the case :

- ◆ The staff who welcomes the visitors
- ◆ The staff who guides the activity or the lifeguard if it is a self-use trail (they can also be responsible for reception tasks)

Technical maintenance inherent in the deterioration of premises and equipment includes, depending on the case :

- ◆ The staff who does maintenance and work on the premises, the buoy system, or the costs of the service provider in charge of these tasks,

b/ The training of people involved in the activity.

The educational organisation of an underwater trail activity is a fully-fledged job which lies somewhere between that of a sports professional and the role of an environmental educator. The training should be budgeted either to be provided for the MPA staff or for the external partner in charge of this aspect.

c/ Service providers and partners

Depending on the case, this concerns :

- ◆ Delegated entities for all or part of the activity as seen in the paragraph on the “economic model”
- ◆ Partners in charge of promotion
- ◆ Any other entity providing services for the operator.

d/ Other expenses :

- ◆ The operating costs generally include :
 - ◇ Small equipment and materials necessary for technical maintenance
 - ◇ Administration costs (small administrative equipment, miscellaneous supplies)
 - ◇ Phone (costs of mobile and fixed telephone, contracts and calls)
 - ◇ Insurance covering third-party liability, premises and vehicles
 - ◇ Other miscellaneous expenses

- ◆ These expenses may be directly borne by the activity if they can be identified as such, or be distributed if they are expenses shared with other activities or borne by the MPA management body.
- ◆ Communication costs : these are costs of informing the public such as annually revised leaflets and posters.

Below is a fictitious example of a cost calculation based on several real cases.

FIGURES GIVEN FOR THE CALCULATION EXAMPLE	COSTS YEAR 1	COSTS YEAR 2	COSTS YEAR 3
Distributed investments (previous table)	4,457	4,457	4,457
Staff			
Reception Guide (1 guide for 3 months)	7,125	7,338	7,558
Technical staff			
Training (year 1)	850		
Service providers			
Operating expenses			
Minor equipment	200	250	270
Telephone			
Administration costs			
Insurance	99	100	110
Other			
Communication	700	750	780
TOTAL Expenses	13,431	12,895	13,175

In this fictitious example of a guided underwater trail, using the price of €20 for an underwater trail as the accounting unit, in the first year it reaches break-even point with 671 people, 644 in the second year and 658 in the third year.

6.6 Funding and revenue

Activities can be funded either by public or private subsidies, or by the revenue collected from visitors. Like businesses, most underwater trail operators can adopt a business model and collect revenue from the activity and ancillary services.

Funding of the activity does not necessarily come from one solution or another but more from a well thought-out mix :

- ◆ Public and private aid can be obtained for the creation and set-up of the activity and possibly to support the first years of operation,
- ◆ Revenue is used to cover all or part of current expenditure including payroll.

Public subsidies differ depending on the country. The main categories are as follows :

- ◆ Government or local authority subsidies directly for the project
- ◆ Employment aid which funds job creation
- ◆ European or international funds for the environment,

sea and solidarity.

- ◆ Especially :
 - ◇ European regional funds for European countries and those in the south and eastern Mediterranean
 - ◇ Calls for projects for the integrated management of coastal zones.

Private subsidies or sponsorship are funding contributions without any commercial consideration (other than featuring the logo). They come directly from a business or more generally a foundation.

Revenue is the money collected as payment for service or goods (sale).

The main revenue that can be derived from an underwater trail is :

- ◆ Payment of a fee for the underwater trail if it is a guided activity.
- ◆ Access to the site if the underwater trail is a self-use activity and even payment for parking, etc.
- ◆ Material and equipment hire for the activity (flippers, mask, snorkel, wetsuit, FM radio snorkel) but also the trail discovery booklets with its itinerary (ies),
- ◆ The sale of items, booklets, documentation.

The concept of revenue naturally involves that of prices which are set on the basis of :

- ◆ Cost price
- ◆ Expectations of the public and willingness to pay

How much does it cost to do an underwater trail ?

Above, we estimated the annual costs of an underwater trail. As a simple example, we will take a total annual overall cost of €14,000 (simple scenario). If the underwater trail is open for 70 days a year (estimate based on the weather), takings of €200 a day on average will be required to reach break-even point.

- ◆ For a trail done with a guide welcoming 12 people a day on average during the season (6 in the morning and 6 in the afternoon), the cost per person will be €16.
- ◆ For a self-use trail (scenario with the same total cost) which is done by 50 people per day on average, €4 per person including various items or equipment hire will be required.

This financial approach is of course quite simple, but experience shows that it gives a good approximation of the value of a service.



© F. Dupuy de la Grandrive

The rocky mountains on the Cyrenaican coast plunge into the Mediterranean (Libya)

But what price is the public willing to pay ?

In general, the public will be willing to pay a price that is comparable to another similar activity and in line with the perceived quality of service.

With the internationalisation of tourism and the fact that tourists, who represent a large part of the people doing eco-tourism activities, are willing to pay the same price they would pay in their home country, the differences in prices charged for the same activity (for example diving) in several different countries are becoming less significant; this can generate extra profit for operators located in countries where the cost of living is lower.

The most similar activity is diving run by professional bodies. For a similar length of time, the public generally considers diving to be an activity that requires more equipment (at least technical equipment). From our experience, we have estimated :

- ◆ A **guided** underwater trail at 65% of the price of a simple supervised dive (i.e. not part of a package or an introduction to diving), i.e. €15 to €20 in France, depending on the type of visitor.
- ◆ A self-use underwater trail at 50% of the guided underwater trail price, that is from €6 to €10 in France for all sources of revenue (equipment hire and booklets).
- ◆ Equipment hire alone is at the lower end of the price range : between €5 and €6.

Indirect takings should not be overlooked. The sale of booklets and documentation contribute to profitability, but also to visitor satisfaction as they can take away a souvenir of a rewarding experience.

6.7 Communication

Communication is the last step in the business plan; it will attract the public, thus enabling maximum visitor numbers to be achieved for the activity.

The role of communication is :

- ◆ To inform the public of the conditions of use (time slots, organisation, opening period and rates),
- ◆ To promote the activity, to give it an image consistent

with the operator's objectives (this is not a commercial undertaking but an activity nested in sustainable development of the area),

- ◆ To secure visitor loyalty by communicating information directly or through a network of partners likely to recommend it (tourist accommodation providers, other local stakeholders).

A few communication vehicles :

- ◆ The official opening is an important time to publicise the activity and attendance by local authority and government representatives will boost press coverage thus increasing awareness of the event.
- ◆ Leaflets and posters provide a way of communicating through various networks of recommending third parties; they include all the essential features for discovering the activity (place, opening times, rates, contact details, etc.).
- ◆ The press kit is a set of documents, articles and photos enabling journalists to write their articles.
- ◆ Signs around the site direct the public to the site or the activity; they may also be incorporated into a landscape interpretation scheme.

“Recommenders” are the organisations or bodies which pass information on to the public. They are usually invited to the official opening and contact is maintained with them through regular visits or news. These are in principle :

- ◆ The tourist office
- ◆ Tourist accommodation providers
- ◆ Other tourism industry stakeholders
- ◆ Local authorities

Some of them may directly market the service.

Today, the public knows of several diving destinations; many tour operators offer package holidays, while very few specialise in underwater trails or snorkelling. The activity's lack of “image” should be taken into account. The number of people who will go diving one day is estimated at between 3% and 5% of the European population. Underwater trails target the remaining 95%.



© Mille Sabords - CPIE Côte Provençale

Logo created for the Cassis underwater trail
(Les Calanques National Park, France)
cf. 4.4.2.c Concept with underwater boards

6.8 Detailed case-study : the Port d'Alon underwater trail (France)

The Port d'Alon case study is suited both to a delegated organisation (as is the case) and an MPA.

a/ Environment

Port d'Alon is a calanque (rocky inlet) area on the French coastline in Provence. Deep and sheltered from most winds, it provides an ideal site for an underwater trail activity. The site is marked out with buoys and protected from sea traffic. The site has a fisherman's cabin which is used as a changing room with an outdoor shower for use in summer. The site is reached on foot a few hundred metres away. There is a car park and access for the disabled to the coast.

b/ Economic model

The operator invested in all the equipment for the activity (valued at €4,800 and renewed every three years). No other investment apart from the marking buoy system was made in the area. The operator² bears all the operating expenses and receives revenue from the activity directly from the public. For the first three years, the operator received aid from the Regional Council and the

2 CPIE Côte Provençale



Sazani Island, marine protected area (Albania)

Water Agency amounting to 30% of current expenditure. Each year, in addition to running the trail, 17 days (valued at €2,018) are required to resume the activity (promotion and communication, recommending third parties, maintenance of premises and equipment, etc.).

c/ Implementation

The operator invested in all the equipment for the activity (valued at €4,800 and renewed every three years). No other investment apart from the marking buoy system was made in the area. The operator bears all the operating expenses and receives revenue from the activity directly from the public. For the first three years, the operator received aid from the Regional Council and the Water Agency amounting to 30% of current expenditure. Each year, in addition to running the trail, 17 days (valued at €2,018) are required to resume the activity (promotion and communication, recommending third parties, maintenance of premises and equipment, etc.).

d/ Visitors and numbers

The visitors welcomed comprise families (local and tourists), groups of children or foreign holidaymakers and disabled visitors.

After five years in operation, the number of visitors has reached 750 people over the 60 days the trail is open, from May to late August, i.e. just over 12 people a day. Groups account for 50% of visitors and individuals and families for the other 50%. During the summer season (July-August), the site is open six days a week. Over the rest of the period, it opens on demand (groups).

Most of the time, there is one trail guide who runs the activity in groups of eight. In the case of disabled visitors, only one person does the trail at a time.

The activity is generally done in two sessions lasting two and a half hours (one in the morning and one in the afternoon), but occasionally more (i.e. up to three sessions with one in the evening for groups).

e/ Competition

There are six towns along the Provençal coast each with an average of two diving clubs. Some of them offer activities similar to underwater trails (i.e. snorkelling). The operator has developed three guided underwater trails and one self-use trail on the coast in partnership with local land-use management bodies. The town councils have used the operator's services for two other underwater trail projects (one self-use and one guided). After several years in operation, cohesion rather than competition between the various activities has been noted. Surveys conducted among users show that underwater trails are mainly done by people living or holidaying in the immediate vicinity of the site. Whether locals or holidaymakers, 80% of users travel less than 10km to do the trail.

Economic approach

The rates in 2011 were :

- ◆ €16 for children and €20 for adults,
- ◆ For groups, the price was €149 whatever the number of participants (8 maximum).

Turnover in 2011 was €14,016, which is €18.60 on average per person. It has grown as shown below :

◆ 2007	€8,010
◆ 2008	€9,599
◆ 2009	€10,336
◆ 2010	€13,316
◆ 2011	€14,016

P&L 2011

EXPENSES	AMOUNT (IN EUROS)	INCOME	AMOUNT (IN EUROS)		
Shared equipment expenses	1,600 €	Recettes	14,016 €		
Payroll					
Annual set-up	2,018 €				
Educational running	7,125 €				
Other expenses					
Telephone, insurance, communication	560 €				
Shared fixed costs					
general administration of the entity	1,100 €				
TOTAL	12,403 €			TOTAL	14,016 €

The activity has made a profit for the past two years and reached €1,616 in 2011.

Conclusions

Being accessible to local populations, an underwater trail can be a concrete tool for securing stakeholder involvement in a project to create a marine protected area. For existing marine protected areas, an underwater trail is naturally in line with the objective of managing visits to the site. It also responds to the objectives of raising user awareness and protecting and improving the coastal and marine environment.

After emerging in French marine protected areas, the concept has been rolled out at several sites along the French coasts where it has proved to be very popular. Underwater trails are now developing in many other Mediterranean regions and this guide is designed to be a practical tool for project sponsors in the 21 Mediterranean countries.

We hope it will open up prospects for the creation of many underwater trails. Under the stewardship of the MedPAN association, a 'community' could be formed, leading to the development of a charter for Mediterranean underwater trails.

Bibliography

Ameer Abdulla, Marina Gomei, Elodie Maison et Catherine Piante (2008) Situation des Aires Marines Protégées en Mer Méditerranée. IUCN, Malaga and WWF, France. 159 pp.

AUGIER, Henry. Guide des fonds marins de Méditerranée : Écologie, flore, faune, plongées. Delachaux et Niestlé. Paris, 2007. 456 p. Les guides naturalistes. ISBN 978 2 603 01435 6

BAUDE, Jean-Louis. Grille d'évaluation d'un sentier sous-marin. CPIE Côte Provençale, Atelier Bleu du Cap de l'Aigle. La Ciotat, 2008. 7 p.

BAUDE, Jean-Louis, COUDERC, Béatrice. Typologie des sentiers sous-marins. CPIE Côte Provençale, Atelier Bleu du Cap de l'Aigle. La Ciotat, 2007. 9 p.

BEURIER, Jean Pierre. Droit maritime. DALLOZ, 2006. 1008 p. Dalloz action. ISBN 2 247 05820 5

CAMBERT H., Russo C., Nicet JB., Quod J-P. Etude de l'impact de la fréquentation d'aménagements liés à la Réserve Naturelle : le sentier sous-marin de l'Hermitage, Association du Parc Marin de la Réunion, 2007.

DELMAS, Alain, VEZIAT, Laurence. Guide juridique de la plongée. A. Delmas/IFPSPORTS, 2003. 446 p. ISBN 2 9503919 2 31

DUPUY DE LA GRANDRIVE R., BLOUET S., FOULQUIE M., Etude de l'impact de la fréquentation du sentier sous-marin sur le site de la Plagette au Cap d'Agde. Site Natura 2000 Posidonies du Cap d'Agde, Etat initial. ADENA, 2007. 21p.

CLAUDET J., LENFANT P., SCHRIMM M., 2010. Snorkelers' impact on fish communities and algae in a temperate marine protected area. (Biodivers Conserv)

FRANCOUR P., 2007. Evolution pluriannuelle de la faune ichthyologique des substrats rocheux et de l'herbier à *Posidonia oceanica* du Parc national de Port-Cros (Var, Méditerranée nord-occidentale) : analyse de la période 1988-2006. Contrat Parc national de Port-Cros & Laboratoire Environnement Marin Littoral n/ PNPC, LEML Pub., Nice : 1-28.

FRANCOUR P., SEYTRE C., 2006. Le cantonnement de pêche du Cap Roux : Problématique, méthodologie et premiers résultats. Rapport intermédiaire. Contrat Mairie de Saint-Raphaël et Université de Nice-Sophia Antipolis. LEML publ., Nice : 1-24.

GUAY A., STAGNOL D. 2009 - Évaluation de population la Grande Nacre (*Pinna nobilis*) dans la baie de Peyrefite. Impact potentiel de la fréquentation des plaisanciers.

Guide méthodologique et technique des sentiers sous-marins, Atelier Bleu / CPIE Côte Provençale.

LENFANT P., DALIAS N., PASTOR J., SARAGONI G., 2008. Suivi temporel du peuplement ichthyologique au sein et à proximité de la Réserve Naturelle Marine de Cerbère-Banyuls - Année 2007. Contrat Conseil Général des Pyrénées Orientales & Laboratoire Ecosystèmes Aquatiques Tropicaux et Méditerranéens UMR 5244 CNRS-EPHE-UPVD. Laboratoire Ecosystèmes Aquatiques Tropicaux et Méditerranéens UMR 5244 CNRSEPHE- UPVD publ. Fr. : 42 pages.

LENFANT P., PLANES S., LICARI M.L., 2000. Plan de gestion de la Réserve Naturelle Marine de Cerbère- Banyuls, Section B et C : évaluation du patrimoine et définition des objectifs - plan de travail, 26p + 5 annexes.

LENFANT P. et SCHRIMM M., 2005. Suivi de l'impact de la fréquentation du sentier sous-marin de la Réserve Naturelle Marine de Cerbère-Banyuls en 2004. Rapport EPHE, 24 p.

MUSARD O., POULAIN M., 2000. Le sentier sous-marin du Parc national de Port-Cros : Etude d'impact. 34 p.

Parc National de Port-Cros, Les actes – Rencontres sur les sentiers sous-marins. Hyères, 2002. 125 p.

PAYROT J., JENOT S. 2009 - Suivi des grandes nacres (*Pinna nobilis*) au sein de la Réserve naturelle marine de Cerbère-Banyuls - Recensement dans la baie de Peyrefite - année 2009. 32 p.

PAYROT J., 2010 - Suivi de l'impact du sentier sous-marin de Peyrefite - Réserve Naturelle Marine de Cerbère-Banyuls, Conseil Général des Pyrénées Orientales...

SICARD C., Conception de sentiers d'interprétation sous-marins à la pointe du Cap Corse l'association Finocchiarola pour la Gestion des espaces naturels de la Pointe du Cap Corse ; 2010.

French underwater trails charter

Introduction

Whereas,

- ◆ The Mediterranean coastline has outstanding natural heritage and landscapes, with a wealth of characteristic underwater flora and fauna, making it a remarkable natural environment,
- ◆ Coastal development is particularly high in the Mediterranean area, leading to excessive visitor numbers on its shores most of the time,
- ◆ Conservation of this diversity demands a holistic approach encompassing sustainable development through protection measures, site heritage management and also environmental education,
- ◆ Education in the marine and coastal environment is part of a sustainable development process, because :
 - ◇ It is an instrument of overall land-use management,
 - ◇ It aims to convey better understanding of the environments,
 - ◇ It is essential to make a lasting change to human behaviour.

An underwater trail is therefore an activity well suited to the discovery of shallow sea waters along the Mediterranean coast.

HISTORY

The underwater trail activity was initiated and developed by organisations working to protect the coastline and the marine environment, particularly Marine Protected Areas and Environmental Education organisations. The activity now encompasses a wide range of practices and a wealth of educational and operating initiatives.

Being relatively easy to do and thus potentially attracting a significant number of people, this activity has greatly developed in recent years.

An underwater trail activity is of interest to all local authorities and organisations concerned with SDEE (Sustainable Development and Environmental Education) as an educational, awareness, and territorial management and promotion tool.

It is also of interest to tourism and sports stakeholders keen to respond to new expectations among the public for this kind of activity.

Growing interest in this activity has led SDEE stakeholders already involved in the approach to assert their position with regard to its objectives and conditions of use.

In March 2002, the first underwater trail conferences were organised on the Giens peninsula (in Hyères, France). At these meetings, the various stakeholders were able to further their knowledge of the various aspects, pool their

experience and discover the wide range of approaches (education, organisation, types of site, and status of the area and the management entity).

Above and beyond these differences, the impetus created by these conferences revealed shared values and an ambition to work together.

In January 2007, the organisations on the French Mediterranean coastline running underwater trails as an SDEE tool asserted the need to develop a charter.

Objectives of the charter

Purpose :

- ◆ Define the values and operating principles shared by stakeholders who run underwater trails as a sustainable development and environmental education tool.
- ◆ Provide a reference tool for all stakeholders wishing to propose this activity within an SDEE framework.

Stakeholders :

The Parties to the Charter commit to the objectives and missions of the activity and the conditions of trail use.

The Parties may be :

- ◆ The direct managers of the activity, whether marine protected areas, environmental education or protection organisations or other private undertakings,
- ◆ Institutional and local authority partners.

Charter

The charter recognizes the diversity of approaches to underwater trails. It is designed to be open to new territories, new stakeholders and new initiatives provided they are compatible with the clauses hereof.

1 : Ethical context for the activity, respect for marine life

The Parties to this Charter undertake to respond to the public's expectations while preserving the marine environment. From designing through to running the underwater trail they propose, the Parties undertake to :

- ◆ Avoid disturbing or harming the species and environments as much as possible during use.
- ◆ Cease the activity on the site if it is clearly harmed or disturbed by it.

2 : Definition

An underwater trail is an organised and educational marine activity aiming to show people the diversity of marine landscapes safely while highlighting the fragility of ecosystems and supporting changes to behaviour.

3 : Aim and mission of an underwater trail

The underwater trail is an environmental and sustainable development education and awareness-raising tool.

It aims to convey values that lead to improved knowledge and the adoption of environmentally-friendly behaviour.

It is part of educational projects, awareness and information action, land-use management measures and territorial promotion.

The Parties to the Charter undertake to :

- ◆ Inform the public about the diversity of the marine environment, how it functions and its complexity, its special features in relation to the terrestrial environment and the positioning of man in this environment.
- ◆ Show the public the local aspects of the marine environment : wealth and diversity, fauna, flora, habitats, local issues and the specific nature of the site.
- ◆ Raise public awareness regarding environmentally-friendly behaviour and practices which are also respectful of other users.
- ◆ Seek optimal conditions for user safety.
- ◆ Use their best endeavours to comply with regulations governing the activity.
- ◆ Monitor the status of the area in question.

4 : Educational approach

The Parties to the Charter commit to an educational approach that :

- ◆ Fosters awareness, curiosity and emotion,
- ◆ Prompts the user to react and think,
- ◆ Encourages users to continue their reflection beyond the educational activity and to adopt environmentally-friendly behaviour.
- ◆ Proposes an itinerary that reflects the diversity of the coastal underwater seascapes and flora and fauna.

5 : Behaviour

Les signataires de la charte s'engagent à :

- ◆ The Parties to the charter undertake to :
- ◆ Restrict disturbance to the environment during use,
- ◆ Strive at all times to minimize disturbance to species,
- ◆ Consult and foster dialogue with other users of the sea for the smooth running of their activity.

6 : Means

The Parties undertake to :

- ◆ Use means and equipment that comply with the various regulations, to guarantee user safety and well-being,
- ◆ Have competent staff to run the activity and/or welcome visitors in accordance with clause 2; such staff must have received specific training in the environmental, biodiversity, educational and safety aspects of underwater trails,
- ◆ Ensure that staff regularly attends refresher training for safety of the activity,
- ◆ Create at least one visitor reception point with an information protocol that respects the commitments and sites identified
- ◆ Monitor the environment and the impact of activities on it.

7 : Shared values and contribution to sustainable development

The Parties to the Charter commit to an approach based on common values and fostering experience-sharing, the dissemination of information, and the pooling of expertise and know-how to implement shared projects.

They further undertake to advise local authorities and other stakeholders taking sustainable development initiatives.

They undertake to develop awareness of their commitments and of this charter.

NOTES

A series of horizontal dotted lines for taking notes, spanning the width of the page.

The MedPAN collection

The MedPAN collection is a series of tools and user-friendly guidebooks that can provide guidance and build capacity on key issues that managers of Marine Protected Areas (MPA) in the Mediterranean have to confront daily.

The MedPAN collection is fully adapted to the Mediterranean context and is peer reviewed by MPA managers and experts of the region. It gathers tools and guidebooks developed by key players in the Mediterranean under a unified look and feel.

The MedPAN collection is an initiative of several Mediterranean partners, including RAC/SPA, WWF, IUCN Mediterranean, MedPAN, ACCOBAMS, the French MPA Agency and the Conservatoire du Littoral. It is edited by MedPAN, the network of MPA managers in the Mediterranean.

