(Submitted by France)

This article was first published in French in the Journal Espaces, *Issue 244, January 2007.*

COMMERCIAL WHALE WATCHING OFF THE FRENCH MEDITERRANEAN COAST

Whale watching in the Mediterranean

Questions of sustainable development

PASCAL MAYOL

Director

Souffleurs d'écume voluntary organisation

pmayol@souffleursdecume.com

PIERRE BEAUBRUN

Lecturer, *École Pratique des Hautes Études* (EPHE), University of Montpellier II

beaubrun@univ-montp2.fr

FRANK DHERMAIN

Chair, *Groupe d'Études des Cétacés en Méditerranée* (GECEM)

frank.dhermain@wanadoo.fr

GERARD RICHEZ

Emeritus professor

gerard.richez@up.univ-aix.fr

Watching whales and dolphins in the Mediterranean is a booming ecotourism business. It provides economic benefits and can be a way of educating people about the environment and making them aware of the importance of protecting these species. But only if it respects the mammals' interests. An extensive study of the socio-economic aspects and ecological practices of the operators has been used to analyse the business against the criteria of sustainable development.

Tourist observation of cetaceans in their natural environment (or commercial "whale watching"[1]) is fast developing throughout the world. Where it is not properly managed it can cause serious ecological disturbance. But, well managed, it is a good instrument for environmental conservation and economic development. Off the French Mediterranean coast, whale watching has grown rapidly since the 1990s. In 2005, there were 23 operators and the business generated at least €1,730,000 in total tourist expenditure. At present, however, the business is developing in an unplanned manner (concentrated observation areas, intrusive approaches, poor education of the general public). With the current form of service offered, there are factors that limit future developments. In the light of these observations and with the highly supportive reaction of the operators, a project for a federation and urgent management measures are proposed as part of the Pelagos sanctuary.

[1] The English term is often used in French.

Commercial whale watching may be defined as observing cetaceans in their natural environment from a vessel or dry land, in the form of paid excursions. The recreation began in southern California in 1955, grew slowly and then took off in the 1980s and 1990s.[2] From 1991 to 1998, the number of whale watchers in the world rose by 12.1% and the latest estimates[3] indicate that whale watching operators in 87 countries attract over 10 million visitors to 492 maritime sectors.

The benefits of this business are many. Commercial whale watching is an industry that generates over $1 billion each year in direct and indirect tourist spending worldwide.[4] The International Whaling Commission encourages it as a sustainable and non-lethal use of cetaceans, since watching live whales is actually often more profitable than hunting them.[5] In addition, the business contributes to cultural development and provides an opportunity to inform public opinion and make people more aware of the need to protect cetaceans and their habitats. In various places round the world, scientists and whale watchers have cooperated constructively in research programmes.

Given whale watching's benefits for local communities and cetacean conservation, it is an effective and sustainable instrument for the development of eco-tourism, compatible with the requirements of Agenda 21. However, if it is poorly managed or unplanned, it can seriously disturb the ecosystem and threaten the principles of responsibility, ethics and not least sustainability that underpin eco-tourism.[6] For example, if certain rules for approaching the mammals are not followed (such as distance, speed and direction), whale watching can have major disturbing effects on cetacean populations. These include moving the mammals to areas that are less favourable for feeding and breeding;[7] increased energy consumption as a result of flight, stress and interrupted feeding and rest periods, or deviations in migration routes;[8] physiological damage such as the impact on hearing;[9] potential

---

[2] Erich Hoyt, "Whale-watching worldwide: an overview of the industry and the implications for science and conservation", *Proceedings of the 8th annual conference of the European Cetacean Societ*y, no. 8, pp. 24-29, 1994.

[3] Erich Hoyt, *Whale watching 2001. Worldwide tourism numbers, expenditures, and expanding socioeconomic benefits.* A special report for the International Fund for Animal Welfare, 2001, 159 p.

[4] Idem.

[5] Based on Fred O'Regan, in Hoyt, 2001; Wouter Egas, *Whale watching in Europe. Aspects of sustainability*. The Coastal Union Report, EUCC, 2002, 33 p.

[6] Sylvie Blangy and Françoise Kouchner, "Produits, destinations, particularités et enjeux de l'écotourisme en Europe", *Téoros,* no. 21(3), 2002, pp. 20-27.

[7] IWC, Report of the workshop on the science for sustainable whale watching, Cape Town, South Africa, 6-9 March 2004, Report of the IWC, 2004, 29 p.

David Lusseau, "The hidden cost of tourism: Effects of interactions with tour boats on the behavioural budget of two populations of bottlenose dolphins in Fiordland", *Ecology and Society,* 2004.

Lars Bejder, "Linking short- and long-term effects of nature-based tourism on cetaceans", doctoral thesis, Dalhousie University, Canada, 2005

[8] Andrew W. Trites, David E. Bain and John K.B. Ford, "Short- and long-term effects of whale watching on killer whales in British Columbia", *Proceedings of the 15th annual conference of the European Cetacean Society,* no. 15, 2001, p. 209.

David E. Bain, *A model linking energetic effects of whale watching to killer whale* (Orcinus orca*) population dynamics.* Orca Relief Citizens Alliance, 2002, 23 p. (unpublished).

Gisela Heckel, Stephen B. Reilly, Jim L. Sumich and Ileana Espejel, *The influence of whalewatching on the behaviour of migrating gray whales* (Eschrictius robustus*) in Todos Santos Bay and surrounding water*s, J. Cetacean Res. Manage., 2001, vol. 3(3), pp. 227-237

IWC, 2004.

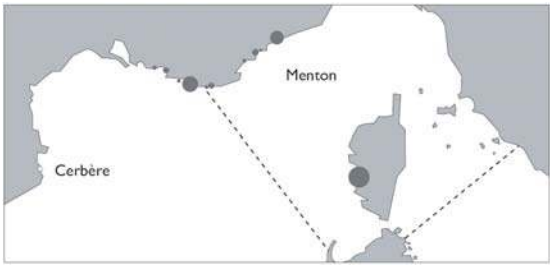
Lusseau, 2004.

[9] Trites *et al.,* 2001.

lung damage from exhaust gases[10]; and increased mortality from collisions.[11]

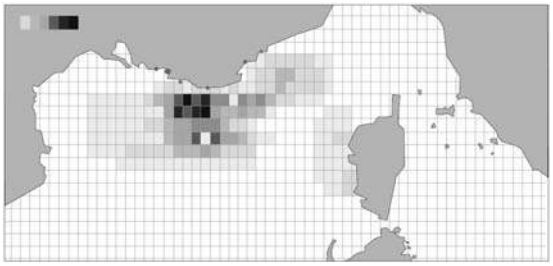
The commercial business of "swimming with cetaceans" is highly intrusive, and concerns the scientific community and environmental managers with respect to the imperatives of conserving cetacean populations. It may also be a source of hazards for human beings in terms of health (pathogen transmission) and security,[12] when accidents occur: some bathers have been injured by dolphins or whales in particular conditions, causing death in extreme cases.

Figure 1
Study zone



Study zone (Corsica + mainland from Cerbère to Menton), limits of the Pelagos sanctuary (dotted lines) and minimum cumulative tourist capacity for each place involved in whale watching off the French Mediterranean coast. Circle size is proportional to the number of places on boats (from 6 to 188) operating from these places.

Figure 2
Activity zones of whale watching operators off the French Mediterranean coast



The shade of grey represents the number of operators (from 1 to 8) working in each 10 by 10 minute longitude/latitude quadrilateral.

Before the study presented in this article,[13] there was some evidence of a boom in whale watching off the French Mediterranean coast, although its extent and nature were not accurately known. Since a protected area is involved (the Pelagos sanctuary[14]), it was essential to provide a detailed analysis of this activity in order to identify needs for training, track the activity over time, and consider how it should be managed to ensure its sustainable development.

Socio-economic aspects. In the study zone (the mainland coast from Cerbère [Pyrénées-Orientales] to Menton [Alpes-Maritimes], plus Corsica), fifteen communes are departure-points for whale and dolphin watching (see Figure 1). On the mainland from west to east, the first operators are based in Carry-le-Rouet, and the first zone of concentration is between Sanary and Hyères. A second cluster occurs between Fréjus and Beaulieu, where the continental shelf is particularly narrow.

[10] Pierre Beaubrun, "Disturbance to Mediterranean cetaceans caused by whale watching", in Giuseppe Notarbartolo di Sciara (ed.), *Cetaceans of the Mediterranean and Black Seas. State of knowledge and conservation strategies,* Report of the Accobams Secretariat, Section 12, February 2002, 26 p.

[11] IWC, *Report of the Scientific committee (IWC/57/REP1) from the 57th annual meeting,* 74 p., 2005.

[12] Susan H. Shane, "Human-pilot whale encounter: Update", *Marine Mammal Science,* no. 11, 1993, p. 115.

Susan H. Shane, Lee Tepley and Lisa Costello, "Life-threatening contact between a woman and a pilot whale captured on film", *Marine Mammal Science,* no. 9(3), 1993, pp. 331-336.

Amy Samuels, Lars Bejder and Sonja Heinrich, *A review of literature pertaining to swimming with wild dolphins,* Marine Mammal Commission, 58 p., 2000.

[13] This study was financed by the French Ministry of Ecology and Sustainable Development as part of the Pelagos sanctuary project.

[14] A tripartite agreement (France, Italy and Monaco), which entered into force in February 2002, covering a zone of 87,500 sq.km of nearshore and offshore waters between Corsica, Liguria and Provence, with the aim of maintaining populations of marine mammals in a satisfactory state of conservation.

The only two operators in Corsica work out of Ajaccio. The map shows three distinct zones: Ajaccio (minimum 188 places), Sanary (108) and Villefranche and its two neighbouring communes (114 in all). These figures are due to the size of the boats (capacity 80 to 180 each) rather than their number.

Following this coastal breakdown, we turn to the offshore sectors visited. Figure 2 gives an approximate picture of the spatial distribution of whale watching at sea, showing that

- operators tend to concentrate on a stretch from Marseille to Saint-Tropez between 10 and 30 nautical miles (nm) from land, and mostly between Sanary and Le Levant, outside the boundaries of the Pelagos sanctuary;
- whale watching occurs in nearshore waters, around the Îles d'Hyères and especially the west coast of Corsica (Gulf of Ajaccio and Scandola nature reservation);
- the activity extends to the west as far as the wide continental shelf of the Gulf of Lion.

Recreational whale and dolphin watching is a highly seasonal activity beginning in April-May (5-10 operators at sea) and peaking from June to September (18-23 operators). However a significant number of operators (2-8) keep working until the end of November.

The survey produced an exhaustive list of 25 whale watching operators working off the French Mediterranean coast, of whom 23 have their registered company office in France. Six specialist tour agencies were also identified. Legal status varies widely, from 8 public limited companies to 6 micro-enterprises and 5 voluntary organisations under the French 1901 Act.

The services offered by the operators are many and various. One-day trips (average 8 hours) account for 53%, selling individual embarkation tickets. One operator (4% of total) offers half-day (4-hour) trips with air spotting of the cetaceans. Short (3- or 4-day) stays are also possible (11%), and longer stays may extend to 20 days at sea (7%). And 21% of the services do not sell individual tickets, but hire out the boat and crew at a daily rate (the other 4% were not identified).

At least five operators (two voluntary organisations and three companies) use sailing ships, and the trips usually include a "sailing" component. All the other whale-watching trips are aboard motor vessels.

WIDE VARIETY OF NAMES

The various services come under a wide variety of names, of which the most popular is the "photo safari". This expression covers all wildlife observable at sea, without focusing on cetaceans alone. This is also true of the serious naturalist "trip to watch whales and dolphins, fish and seabirds off Cap Sicié and the Îles d'Hyères". Words like "discovery" and "open sea" express the ideas of adventure and open air that whale watching evokes. Voluntary organisations often use the terms "training course", "discovery", "observation" and even "census" of cetaceans. The trips that include swimming go for effective selling points ("diving and swimming among marine mammals" or "swimming with dolphins and whales"). All these names in practice cover three main types of service: simple observation of cetaceans (16 services, two of which are combined with "sport fishing"), naturalist trips where cetaceans are only one component (2 services) and swimming with cetaceans (4 services).

Prices range widely according to operator, service provided and the age of the wage watchers (Table 1). For the purposes of our analysis, we have weighted the various prices to obtain an identical base of adult fares per person per day. The price range is

wide: from €37 to €300, with an average of €149 (σ = 78). It is generally the voluntary organisations that provide the cheapest services (average = €62; σ = 24). The average price for other traditional whale watching operators is the same as the overall average (€149), with a standard deviation (σ) of €53 that shows their diversity. Swimming with cetaceans costs most (average = €260, which is 1.8 times the overall average; σ = 49).

We estimate direct expenditure generated by this activity at a minimum of €495,000. Total expenditure relating to whale watching off the French Mediterranean coast would appear therefore to amount to the tidy sum of €1.73 billion in 2005.

Most direct tourist expenditure[15] is concentrated in the Alpes-Maritimes *département* (69%). Var accounts for 22%, followed by Bouches-du-Rhône (8%) and Corse du Sud (1%).

Table 1

Operators' tariffs

Non profit	Other operators	
	Traditional WW	Swimming with cetaceans
62 euros	149 euros	260 euros
(σ=24 ; n=5)	(σ =53 ; n=14)	(σ =49 ; n=4)
	Average « other operators » : 174 euros	
	(σ =70 ; n=18)	
Overall average : 149 euros (σ =78 ; n=23)		

Analytical table of averages (and standard deviations) for tariffs per person per day by type of operator (non-profits, others, broken down into traditional whale watching and swimming with cetaceans).

A similar calculation was made to allocate direct expenditure to the various types of operator (1901 Act non-profits, for-profit structures offering traditional whale watching, for-profit structures offering swimming with cetaceans) in two ways:

- Figure 3 shows the rate of expenditure by type of operator;
- Figure 4, where expenditure is weighted by the number of operators in each category, shows the percentage for each operator in each category.

Overall, the three types of operator cover tourist expenditure fairly evenly, with traditional whale watching first (41%), swimming with cetaceans second (35%) and 1901 Act non-profits third (24%). The pattern is quite different in Figure 4, where it is clear that swimming trips generate the highest proportion of expenditure (59%, or €57,200 per operator). Non-profits (25%, or €24,200 per operator) come far behind, followed by traditional whale watching (16%, or €15,500 per operator).

Off the French Mediterranean coast in 2005, at least 4,841 people went whale watching, and the minimum number of boat places was 517. On average, each operator has 25 boat places, with a particularly high range (3-188) and standard deviation (45).

[15] Direct expenditure has been chosen because some proportion of total expenditure may not occur in the département (see Methodology, p. 53).

Figure 3
Distribution of direct expenditure by category of operator

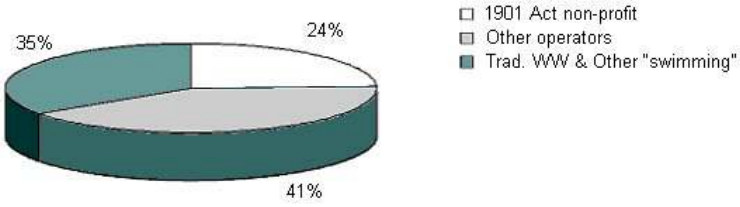
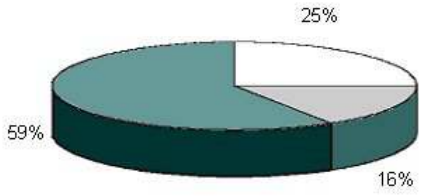


Figure 4
Distribution of direct expenditure by category of operator, weighted by the number of operators in each category



The figures vary widely from one *département* to another (Figure 5). Corse du Sud (administrative code 2B) and Var (code 83) have roughly the same number of boat places (188 and 161), but the number of operators is quite different (1 and 10). Close behind comes Alpes-Maritimes (code 06: 138 boat places, 7 operators). The number of boat places is much lower in Bouches-du-Rhône (code 13), namely 30 for 3 operators.

Of the 4,841 people who went whale watching in 2005, 69% started from a harbour in the Alpes-Maritimes and 25% from the Var. Corse du Sud and Bouches-du-Rhône shared the remaining 6%.

The non-profits and other traditional whale watching operators share the number of people who watched dolphins and whales evenly (2,185 and 2,176 respectively) (Figure 6).

The number of people embarking per operator is much higher for the non-profits (437 compared with 181), but the two types exhibit similar high variability (55 to 1,260 for the non-profits, and 0 to 1,100 for the traditional whale watching operators). The operators who offer swimming with cetaceans are outliers from the pattern, since they account for only 480 customers, one-fifth as many as the two other types. This is mainly due to the fact that there are few of these services compared with traditional whale watching (4, of which 3 in cooperation, compared with 18). However, the number of customers per "swim" operator (160) is close to the figures for the other whale watching operators (182) and its variability is lower (45 to 370).

Figure 5
Distribution of boat places by *département* and number of operators providing data

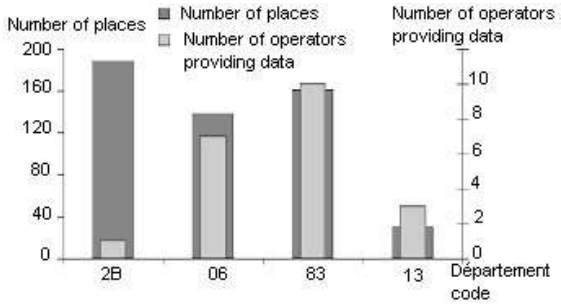
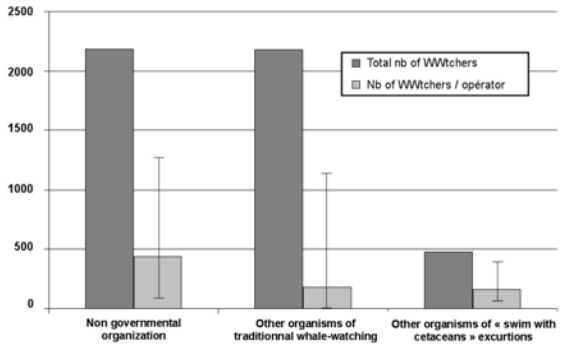


Figure 6
Number of whale watchers in 2005

by category of operator (dark grey) and average per operator (light grey; line shows range).



Ecological aspects. Figure 7 shows the results of investigations into compliance with the Code of Conduct produced by Pelagos.[16] We observed only two infringements in complying with the coastal strip, although Figure 7 demonstrates some pressure from the business within the 5 nm zone.

The three infringements concerning the rules when a creature comes close to the boat were observed on "swimming with cetaceans" trips, one of them inside the coastal strip with a group of Risso's dolphins *(Grampus griseus).* In the other two cases, and for species such as *Stenella coeruleoalba* and *Balaenoptera physalus*, our investigations showed that the mammals have to be cut off several times before customers can be put into the water beside them.

The small number of cases of waiting time if other boats are near (n = 4) and non-approach in the presence of newborn mammals (n = 5) make it hard to draw conclusions from the results obtained.

For the other points in the Code, a number of instances of intrusive behaviour were noted. It appears that most operators are not good at recognising signs of disturbance, and are not sufficiently trained to be attentive to them.

Many of them believe that approach from behind is the least disturbing and that to satisfy their customers it is essential to come very close to whales, often to less than 10 m. The aim is to increase the "thrill", especially if the whale dives, which is a consequence of being disturbed by the approach.

There are also frequent infringements of the prohibited zone and the 300-m zone rules (e.g. perpendicular routes to cut the cetaceans off, high-speed circling to make dolphins jump in the wake, en route sonar). We observed the systematic entry into that zone by the operators (except one) who combine sport fishing and whale watching on the same trip. The reason is that cetaceans and tuna fish are often found feeding in the same spot. The boats then frequently and repeatedly pass through schools of dolphins (or within 50 m of whales) towing decoys at a speed of 7 knots.

Altogether, 13 out of 19 operators approach the cetaceans in an intrusive manner. On the basis of this proportion (70%) and the likely future development of whale watching, it is to be feared that individual mammals and ultimately whole cetacean populations will be harmed by these uncontrolled approaches.

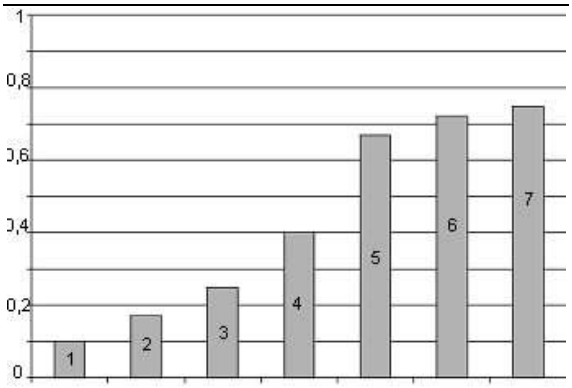
One of the main ecological and social values of whale watching is the education of the public in environmental matters. "Educating" the public is a large, complex concept that needs to comply with specific standards that can be adapted and finalised in the long term. This is a major challenge for this century,[17] particularly for an eco-tourism business as attractive as watching cetaceans. The results of the analysis of data provided by operators are given in Figure 8.

[16] Available on-line: www.souffleursdecume.com/_autres/code_de_bonne_conduite.pdf

[17] UNESCO, *Education for Sustainable Development. United Nations Decade 2005-20 14,* 2005.

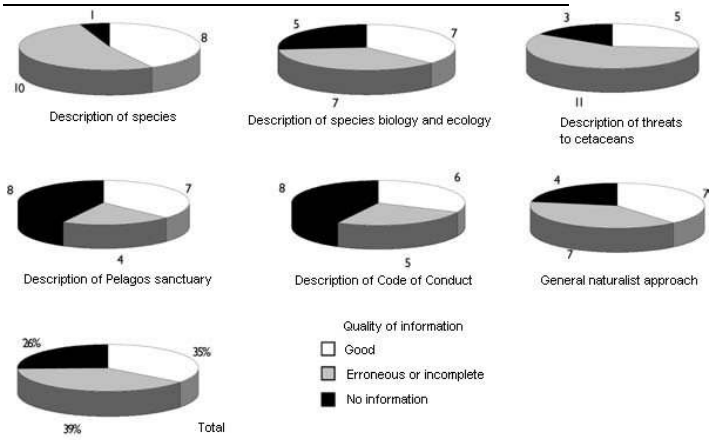
Figure 7
Compliance with Code of Conduct

The left-hand index shows the ratio of operators observed for infringements to the number of operators observed in the relevant situation (0 = no infringements, 1 = systematic infringement).



1. No whale watching in coastal strip (5NM) ; 2. Respect of rules if cetacean close to boat ; 3. Respect of timing if other boats ; 4. No approach if new-borns ; 5. Stop approach if signs of disturbance ; 6. Prohibited zone ; 7. Respect of rules in 300-m zone

Figure 8
Quality of information given to passengers by whale watching operators



The diagrams show different patterns according to the topic. Almost all the operators describe the cetacean species of the north-west Mediterranean, but the information is erroneous or incomplete in over half the cases (the main species are not all known and the various dolphin species are not identified).

Describing species biology and ecology is a vast topic, parts of which are known (e.g., food) and others relate to practical observations open to question (e.g., "When whales breach in summer, it's probably courting behaviour"). Erroneous information may go as far as calling dolphins "fish" or describing the fin whale's spume as a "geyser of water".

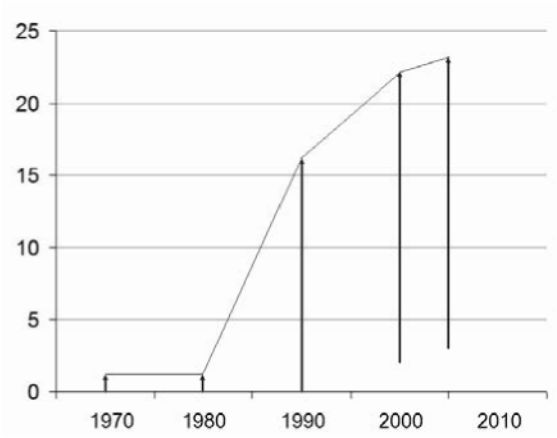
Reference is often made to the threats to cetaceans but in most cases this information is limited to contact with fishing equipment and the risk of collision with high-speed boats. A number of operators include in their information some mention of dolphins in captivity, which shows the "value of observing them in their natural environment". But it is alarming to note that more than two-thirds of operators understand barely, if at all, the serious potential impact of poor-quality whale watching on individuals, populations and ultimately the activity itself.

"Missing" information is mainly to do with the Pelagos sanctuary (5 operators only learnt of it as a result of this study) and the description of the Code of Conduct (only 6 operators out of 23 had a copy of the document).

Although inadequate in half the cases, an overall naturalist approach (presentation of the biotope and biotic communities) is adopted by the majority (14) of the operators. The voluntary organisations often give these descriptions, as do the sport fishing operators, who present the tuna family and selected feeding relations. As for wildlife information, we only came across one operator (a voluntary organisation) who dealt with the matter.

Overall it would appear that only one-third of operators cope well with the "education" side of their work by providing high-quality information on board. This aspect is underdeveloped among the others and is far from being a major component of their activity as it stands. Work remains to be done to support the operators in developing quality information in their material.

Figure 9
Number of whale watching operators, 1970-2005



EXPANDING ACTIVITY

The survey provided data showing a rising curve in the minimum number of operators at various points since the 1970s (Figure 9). The activity began to expand notably in the 1990s, with the appearance of at least 15 new operators. Ten years later, growth is still rapid, with a net increase of 6 operators from 1990 to 2000 (+8, –2) and of one in 2005 (+4, –3). In comparison, whale watching in the Italian waters of the Pelagos sanctuary has developed as follows: the number of boat places was at least 1,193 in 2003 (with 4 vessels able to carry more than 80 passengers) and the number of watchers was at least 15,900,[18] three times the number off the French coast.

Furthermore, 30% of the operators we recorded did not exist (or did not offer whale watching) before 2002, the year the sanctuary agreement was ratified by the three governments. This supports Hoyt's argument[19] in 2001 that the existence of Pelagos would help accelerate the expansion.

Of the 6 agencies involved in promoting this activity, some told us that they currently intend to publicise this tourist product throughout France. According to Hoyt,[20] the activity is already attracting a large number of tourists from outside France (15% Swiss and 8% Belgians in particular) and will attract more in the future.

The pattern of commercial whale watching off Corsica (mostly coastal and limited to large dolphin populations) differs from that off mainland France and is the subject of targeted studies. As has happened for the mainland, whale watching is likely to develop rapidly, since the Corsica regional committee for offshore fisheries and marine fish-farming recently stated that it would like to see a dozen or so professional operators develop tourist observation of cetaceans as a complement to fisheries in three Natura 2000 zones.[21]

Our study identified the "professional interest" of whale watching as still limited in extent, since it appears to contribute in a direct and substantive manner to the seasonal employment of only about fifteen people. A number of operating managers go whale watching in their spare time, in addition to their main job. In these cases, the companies do not have a real business

[18] Caterina Maria Fortuna, Simonepietro Canese, Michela Giusti, Giancarlo Lauriano, Peter Mackelworth and Silvestro Greco, "Review of Italian whale-watching: status, problems and prospective", *J. Cetacean Res. Manage.,* 2004

[19] Hoyt, 2001

[20] Idem.

[21] Parc National de Port Cros, *Comité National du Sanctuaire. Relevé de conclusions,* 10 June 2005, 9 p.

plan in terms of profitability, but rather enjoy a personal interest or hobby at reduced cost.

However, current trends may change the situation in the years ahead, and nine of the operators who completed the questionnaire consider that tourist demand has increased since they started in the business. To meet this demand, seven operators have hired staff or invested since 2000, and eight are thinking of doing so by 2010.

Since the survey was completed (November 2005), a further two operators are reported to have begun whale watching.

This research shows that whale watching off the French Mediterranean coast, although not fully established, has enjoyed an overall growth trend since the 1990s. This potential raises two challenges for the future:

- local economic development and the possibility for local residents to afford this activity without needing to travel far abroad;[22]
- better understanding and "ownership" of cetacean populations by communities as part of their local identity, leading to better prospects for conservation.

A number of factors that may restrict planned development have been identified. Here we cite only the most worrying ones if the proven growth in the business continues.

First, compliance with the Code of Conduct is seriously inadequate and, as it stands, cannot ensure the sustainable development of the activity. This is particularly worrying in the case of "swimming with cetaceans", which is the most profitable activity and in the absence of better information is likely to grow rapidly (two new operators are reported to have started up since November 2005). For some species *(Stenella coeruleoalba* and *Balaenoptera physalus)*, our experience would imply that their routes need to be cut off several times before people can be put in the water beside them. This approach infringes the Code of Conduct and the decree of 20 October 1970, which "prohibits the pursuit of marine mammals of the Delphinidae family" (such as *Stenella*). Even more worryingly, the species most sought after is *Globicephala melas* for behavioural reasons (sociable, not shy of humans). A number of negative interactions have been reported round the world where bathers' lives have been endangered by species of the same genus *(G. macrorhyncus),* whose behaviour can be unpredictable.

Trips that combine sport fishing and whale watching are also hard to reconcile with the Code. Fishing requires passing close to the cetaceans, increasing disturbance and the risk of collision. Perhaps the operators could stop combining the two activities in the same trips, as a first step towards sustainable development. In the short term, this does not appear to be commercially viable, since the customers who take the trips specifically and solely for whale watching generate only a small percentage of these operators' revenues (7.4% on average, σ = 10.6).

With two-thirds of the operators, the information given on board does not meet the "educational" standard one would expect from whale watching. In general, the range of knowledge among operators is highly variable and in most cases needs to be improved.

The distance off-shore of the mammals and whale watching's dependency on fossil fuels do not offer any sustainable prospects for this business. Many operators consider that they have little room for manoeuvre to cope with the

[22] Limiting travel is also a major component in the concept of sustainable development.

inevitable higher price of fuel,[23] which already accounts for 10%-25% of their budgets. Yet four-fifths of the boats in the study are powered by engines up to 2 x 480 horsepower. In view of the distance off-shore of the watching areas (over 20 nm, up to 50 nm), fuel consumption may exceed 1,000 litres a day, over half of which goes on the outward and return journeys.

Lastly, climate change may cause considerable disturbance to coastal environments[24] and the tourist industry in these areas may be affected by this.[25] The whales and dolphins that tourists watch may be seriously affected by the warming and consequent acidification of seawater.[26]

* *

This study of commercial whale watching off the French Mediterranean coast constitutes a "baseline" for the understanding of this tourist business by exhaustively identifying the direct players. It also provides an instrument for monitoring the business and basic ideas for regulating it to meet France's commitments to the Pelagos sanctuary.

Given the socio-economic and ecological importance and rapid expansion of whale watching off the French Mediterranean coast, current trends and the area's potential illustrate with great clarity the urgent need for concerted action for better management.

This approach, both voluntary and concerted, must take account of the economic realities of the business and the need to conserve cetacean populations, with the application, where necessary, of the precautionary principle. To that end, a quality label is currently being designed for those operators who wish to adopt the right approach. The system will combine:

- training for whale watching operators;
- knowledge of and commitment to complying with the Code of Conduct;
- development of trips with a naturalist purpose, rather than seeking to observe cetaceans at all costs. Supported by an effective, diversified awareness programme, this concept would lower ecological stress, cut transport costs (e.g. lower speeds of approach, no need for air reconnaissance), and provide the public with a rewarding day with no unpleasant surprises;
- creation of an advisory unit (exchanges between researchers and operators, reduction in fossil fuel consumption, etc.).

In the medium term, it is essential to increase our scientific knowledge of the impact of approaches on cetaceans and the visitor numbers each site can accommodate. In the long term, if the business expands so far that the voluntary approach becomes inadequate, whale watching will need a legal status (which it does not have at present) and a licensing system.

If no management measures are taken, whale watching may become a serious cause of disturbance to the ecosystem on which this recreational activity depends. Consultation with the operators, on the other hand, will enhance its benefits, ensure its harmonious development and make it a key factor in the conservation of cetacean species.

---

[23] Jean-Marc Jancovici, "Changement climatique… ou choc climatique?" in Yann Artus Bertrand (ed.), *365 jours pour la Terre,* 2003

[24] IPCC, Third Assessment Report on Climate Change: Synthesis Report, 2001, 205 p.

[25] ONERC, *Stratégie d'adaptation au changement climatique,* Version V.1 dated 8 July 2005. Working paper. 43 p., 2005.

[26] Delphine Gambaiani, Pascal Mayol and Stephen Isaac, "Literature review of potential impacts of global warming on cetaceans', *20th ECS conference. 2-7 April 2006,* Gdynia, Poland.

Study methodology

The purpose of the research work was to produce a socio-economic analysis of commercial whale watching off the French Mediterranean coast in 2005 and inventory methods of approaching cetaceans and the information given on board boats.[27]

STUDY SECTOR AND TYPOLOGY

Along the 1,960 km of French Mediterranean coastline (mainland and island), 64 communes were identified that have a harbour that could be used as a base for whale watching: 14 in Corsica, 36 on the Côte d'Azur Riviera and 14 on the Gulf of Lion. The boundaries of this study area and the zone covered by the Pelagos sanctuary for Mediterranean marine mammals are shown in Figure 1.

STUDY STAGES

The study covered the French and non-French structures (companies and non-governmental organisations) receiving private revenues to officially organise cetacean observation trips in French Mediterranean waters from French Mediterranean ports (whale watching operators) or to promote them (whale watching specialist tour agencies).

Two successive stages were undertaken for the survey conducted between June 2004 and November 2005. The first was to inventory the agencies and operators by ground investigations complemented by information from town halls, harbour master's offices, tourist offices and internet search. The second stage was to find the answers to a number of socio-economic questions and identify methods of approaching cetaceans and the operators' relevant knowledge. To that end, each operator was given a questionnaire before a research assistant boarded the boat for a trip. Since this was a survey rather than an inspection, managers were informed of the reason for this visit. In the case of two structures that did not wish to cooperate, parallel inquiries were used to answer some of the questions, on the basis of their advertising material and website (www.société.com), personal contacts and unannounced trips.

Data from various published sources[28] was also compiled to track the recent history of whale watching off the French Mediterranean coast.

ECONOMIC DATA

In order to provide an overview of the economic side of whale watching, and be consistent with existing research, we chose to apply the tourist expenditure method used by Hoyt.[29] These

---

[27] Pascal Mayol and Pierre Beaubrun, *Le Whale Watching en Méditerranée française. État des lieux et perspectives. Recensement des opérateurs, diagnostic socio-économique et écologique de l'activité, propositions préliminaires de gestion,* Report produced by *Souffleurs d'écume* for the Ministry of Ecology and Sustainable Development as part of the Pelagos sanctuary project, 2005, 104 p.

[28] Erich Hoyt, *Whale watching 2001. Worldwide tourism numbers, expenditures, and expanding socioeconomic benefits.* A special report for the International Fund for Animal Welfare, 2001, 159 p.

Erich Hoyt, *The Best Whale Watching in Europe: A guide to seeing whales, dolphins and porpoises in all European waters,* WDCS, Unterhaching, Germany, 2003, 60 p.

Julien Marchal, *Tourisme et cétacés. Étude des acteurs concernés, propositions de circuits en Méditerranée dans le sanctuaire des mammifères marins en Méditerranée et Gibraltar,* Sup de Co Montpellier - Sup de Co Entreprises - Terra Incognita, 2002, 100 p.

Mayol and Beaubrun, 2005

[29] Hoyt, 2001.

Another measurement is widely used by economists: rate of return (ratio of benefits divided

expenditures divide into two types: direct (i.e., cost of trip) and indirect (e.g., accommodation, travel, souvenirs), which together make up total tourist expenditures.

Direct expenditure was calculated from the proportion of revenues (including taxes) generated by whale watching trips as reported by the organisations identified. Failing that, the figures were estimated from available data such as the number of passengers carried on each trip, the number of trips per year and the cost of the services.

Some "recreational (or sport) fishing" operators also propose the observation of cetaceans. To include this in whale watching expenditure, we followed the example of Hoyt's work.[30] He includes naturalist trips (not strictly focusing on dolphins and whales), reducing expenditure by 10%-50% on a case-by-case basis, to reflect the estimated value of the "cetacean" component of the trip. We suggest using the figure of 10% of direct fishing expenditure to cover the whale watching side of these multi-theme trips,[31] as an accounting item we call adjusted direct expenditure (direct expenditure + expenditure relating to the cetacean component of "sport fishing" trips).

To estimate total tourist expenditure, we adopted the method used by Kelly,[32] which consists of multiplying direct expenditure by 3.5. This is used for whale watching structures near large towns and for trips of one day or less (covering the vast majority of inventoried operators).[33]

Hoyt[34] points out some disadvantages of this method for estimating tourist expenditure: it only provides a partial estimate of the economic impact of whale watching, since it does not cover its contribution to education about the environment or, in some cases, research. Nor does it cover the activity's environmental cost, such as pollution from boats, litter in the water, impact of tourist pressure on sensitive coastal areas, greenhouse gas emissions from visitors travelling by air or car, immediate and long-term environmental constraints on local infrastructure and, not least, the impact on cetaceans as individuals and populations.[35] However, Hoyt argues that the tourist expenditure method does provide a reference that is easy to interpret and can be understood by politicians, the general public and tourism and environment managers.

Note that all the economic figures put forward in this article are minimum estimates, since not all the organisations identified communicated all the data requested.

---

by investment). But this figure has never as yet been discussed in relation to whale watching: see Hoyt, 2001 and IFAW (Report of the workshop on the socioeconomic aspects of whale watching. Kaikoura, New Zealand, 8-12 December 1997. 88 p.).

[30] Hoyt, 2001.

[31] The proportion of these companies' revenues received from passengers travelling solely to observe cetaceans is included in its entirety.

[32] J.E. Kelly, "The value of whale watching", *Whales Alive Conference, Boston. June 7–11,* 1983 (unpublished), in Erich Hoyt, "Whale watching around the world. A report on its value, extent and prospects", *International Whale Bulletin,* n° 7, 1992, pp. 1-8.

[33] .For other cases (e.g., far from large towns, trips of more than one day), economists use a factor of 7.67 (Hoyt, 2001).

[34] Hoyt, 2001.

[35] To consider all these parameters would involve calculating the total economic value (TEV) of whale watching using cost-benefit analysis (CBA). Many elements in this calculation remain unknown for the study area, particularly the precise impact on cetaceans.

SOCIAL DATA

First, following Erich Hoyt's work, we propose a minimum estimate of the number of whale watchers who engaged in the activity in 2005. Second, boats were characterised by their scheduled passenger capacity (Category 3). Third, the information the operators give their customers was analysed under six headings: description of species, basic concepts of biology and ecology, description of threats, presentation of the Pelagos sanctuary, description of the Code of Conduct and overall naturalist approach. Three levels of information quality were established: good, erroneous or incomplete, and absent.

ECOLOGICAL DATA

Approaches to the cetaceans were analysed using a theoretical instrument to limit disturbances that may be caused by approaching the mammals: the Code of Conduct produced by the Pelagos sanctuary. An index was established for the ratio of "the number of operators observed to have committed one or more clear infringements divided by the number of operators whose compliance with that point of the Code could be observed" (0 = no infringements, 1 = systematic infringement).