Document: ACCOBAMS-SC14/2021/Doc18
Distribution: 20/11/2021

PROGRESS REPORT REGARDING BOTTLENOSE DOLPHIN CONSERVATION MANAGEMENT PLAN (CMP) IN ACCOBAMS AREA

Participants are kindly invited to bring their own documents to the Meeting.
This document will be available only in electronic format during the Meeting.

PROGRESS REPORT
REGARDING BOTTLENOSE DOLPHIN CONSERVATION MANAGEMENT PLAN (CMP) IN ACCOBAMS AREA

Presented by Guido Gnone, coordinator of the Bottlenose dolphin Conservation Management Plan (CMP) in ACCOBAMS Area

Issue: progress report regarding Bottlenose dolphin CMP in ACCOBAMS Area

1. Action requested

The Scientific Committee is invited to:

a. **note** the progress report regarding Bottlenose dolphin CMP;
b. **provide** advice on future actions to be undertaken.

2. Background

During MOP6 (Monaco, 2016) ACCOBAMS Parties have agreed to develop Conservation Management Plans (CMPs) for species/populations within the region following an agreed approach and template (Resolution 6.21).

The 2020-2022 work programme requested the Secretariat and the Scientific Committee to develop/revise/implement relevant Conservation Management Plans (CMP) for cetacean species.

Four CMP are currently being drafted: Fin whale, Risso's dolphin, Bottlenose dolphin and Common dolphin.

Respective drafts will be presented to ACCOBAMS Parties at the upcoming MOP8 in 2022 (Malta).

Draft 11.2021

ACCOBAMS CMP for Mediterranean Bottlenose Dolphin *(Tursiops truncatus)*

Coordinated by Guido Gnone
with inputs from Rus Hoelzel, Cristina Milani, Bruno Diaz Lopez, Antonella Arcangeli, Manel Gazo, Ibrahem Benamer, Aylin Akkaya, Hélène Labach, Marta Azzolin, Tilen Genov, Caterina Fortuna, Joan Giménez, Josè Luis Murcia, Giovanni Bearzi, Daniela Pace, Andre Moura, Elena Papale, Ada Natoli, Marta Azzolin, Hélène Labach, Greg Donovan, Letizia Marsili, Adriana Vella.

Attention please:
This document is a draft, prepared based on an on line consultation (see above) and will be discussed in a dedicated workshop, to be held under the ACCOBAMS coordination, for proper finalisation and subsequent approval.

CONTENTS

EXECUTIVE SUMMARY

(To be finalised when the plan is ready)

The overall goal of the Mediterranean Bottlenose Dolphin CMP is to manage human activities that affect this species in the Mediterranean Sea in order to maintain a favourable conservation status throughout its historical range, based on the best available scientific knowledge.

The draft was elaborated following the IWC general guidelines, identifying the main threats for the species in the Mediterranean context and possible mitigation actions to be implemented, and having as a basic conservation target the single geographical units of bottlenose dolphin.

Main threats:

- *Habitat change, reduction and fragmentation*
- *Overfishing and prey depletion*
- *Conflict with fishermen and bycatch*
- *Chemical pollutants*
- *Epizootics*
- *Climate change*
- *Cumulative and synergetic effects*

A further revision effort is currently underway to homogenize, as far as possible, the draft of the bottlenose dolphin CMP with the other CMPs under development (common dolphin, Risso's dolphin and fin whale). The final draft of the bottlenose dolphin and common dolphin CMPs will be discussed in a dedicated workshop of experts, to be held in March 2022, under the ACCOBAMS coordination.

1 INTRODUCTION

CMPs are developed under the umbrella of ACCOBAMS. All relevant bodies of ACCOBAMS must be fully involved: the Scientific Committee, the Secretariat, the National Focal Point (ACCOBAMS Res. 6.21) and the relevant stakeholders.

1.1 WHY A CONSERVATION MANAGEMENT PLAN IS NEEDED

(To be finalised when the plan is ready)

ACCOBAMS has agreed to develop Conservation Management Plans (CMPs) for species/populations within its region following an agreed approach and template (Resolution 6.21). This CMP is a framework to stimulate and guide the conservation of the bottlenose dolphin in the Mediterranean Sea. Like all CMPs, the present is intended as a living document and it will have to be re-evaluated and updated regularly.

The bottlenose dolphin is regularly present in Mediterranean basin and is the most sighted species over the continental shelf, which represents its preferential habitat. Because of this habitat preference, the bottlenose dolphin is probably the dolphin whose habitat was mostly modified by human activities. Despite this human pressure on its habitat, the bottlenose dolphin is still present over most of the Mediterranean continental shelf, therefore showing a resilience to anthropic pressures. The 'Mediterranean subpopulation' was classified as Vulnerable (…), but a probable reassessment to Least concern is forthcoming.

Thanks to its behavioural flexibility and opportunistic behaviour, which make it able to exploit new resources and bypass impediments, the bottlenose dolphin seems to keep a relatively safe conservation status at the Mediterranean level. However, the lack of available data, especially in the eastern and southern portion of the basin, and the fragmentation of knowledge, could prevent potentially negative trends in abundance to be detected, with considerable error bars on any basin-wide estimations. It is therefore urgent to fill up the knowledge gaps, identify outstanding potential threats and to put in place a consistent Conservation Management Plan (CMP) to consolidate the conservation status of the species and prevent or minimise future problems. The long-term conservation experience teaches that it may be very difficult to protect a species when its decline is highly manifested, while prevention is much safer, cheaper and successful. An effective CMP should be developed and implemented before populations become endangered (Donovan et al., unpublished).

The bottlenose dolphin colonizes the continental platform forming geographical resident units whose size and home range may change according to the geomorphological and ecological threats of the residency area. These units develop local specializations to better exploit the local resources (including the opportunistic feeding on gill nets, trawlers, aquaculture cages, etc.).

Because of the wide distribution (limited in most of the areas to the continental platform) and the frequent contacts and interactions with human activities (with special reference to fishing activities), the bottlenose dolphin needs a CMP that could guarantee (at least) the present status

of conservation and a peaceful coexistence with man.

The main potential threats identified for the target species are the contraction and degradation of the habitat (including marine traffic, noise pollution, marine debris), overfishing and conflict with fishermen, contamination of the food chain and epidemics.

The geographical units (with their local specialization and traditions) should be considered as the basic conservation and management target of the CMP; their number, the residency areas and home range, the size and size trend, the (local) anthropic pressures and threats should be known and monitored over time.

1.2 Overall Goal of the CMP

The overall goal of the present CMP is to keep the common bottlenose dolphin Mediterranean (meta)population to the present level (distribution, density, abundance - see the attributes) or (if future findings may suggest) to a higher level that could guarantee the subsistence of the same (meta)population despite potential negative events such as epidemics, climatic change, striking pollution events (oil spills) or other.

The single geographical units of bottlenose dolphin should be considered as the basic target of the CMP (management units), which should be designed to act on a local level.

The CMP is designed to maintain a favourable conservation status of the bottlenose dolphin throughout its historical range, based on the best available scientific knowledge but following a 'precautionary principle'; however a proper implementation of the same CMP should produce benefits also to the marine environment and related stakeholders.

- Aim for the species (*Tursiops truncatus*)
    - To keep the Mediterranean (meta)population size at present level or higher (if needed for safe conservation)
- Aim for the environment
    - To prevent further habitat constriction, deterioration, fragmentation
    - To prevent further decrease of fishery resources
    - To decrease the pollution level of the food chain
- Aim for stakeholders
    - To prevent environment deterioration
    - To promote environment valorisation
    - To keep the fishery resources at the present level or higher
    - To promote safer (less polluted) fish consumption

To optimize the costs and improve the results, the Tt-CMP should be developed and implemented together and consistently with the CMPs of the other cetacean species at a Mediterranean level, as each species may serve as a control for the others. The results over time and space should be compared to identify possible deviations in the presence of each different species.

2 LEGAL FRAMEWORK

2.1 INTERNATIONAL CONVENTIONS AND AGREEMENTS

One of the main challenges of the Tt-CMP is to manage and protect the bottlenose dolphin in an area (the Mediterranean Basin) where many different cultures and traditions coexist on the same seacoasts. This can make quite difficult to overcome the regional and national regulatory framework to establish a general management and conservation strategy for the target species.

However, there are different agreements and conventions that can give continuity and homogeneity to the conservation effort (see below). Despite the fact that only one of these was designed specifically for cetaceans protection (ACCOBAMS), most of them have targets that support cetacean conservation on a certain level (see also the paragraph on the Marine Strategy Framework Directive).

However, the species is listed in Appendix II of Convention on the Conservation of Migratory Species of Wild Animals (CMS), in Appendix II of the Bern Convention, in Appendix II of CITES, and in Annex 2 of the Protocol on Specially Protected Areas and the Biological Diversity in the Mediterranean of the Barcelona Convention.

- CITES (the Convention on International Trade in Endangered Species of Wild Fauna and Flora, also known as the Washington Convention). The convention entered in to force in 1975 and is aimed at ensuring that international trade in specimens of wild animals and plants does not threaten the survival of the species in the wild. The Convention has 183 parties all over the globe (see fig. 3).
- The The UNEP/MAP Barcelona Convention for the Protection of the Marine Environment and the Coastal Region of the Mediterranean. It is a regional convention adopted in 1976 to prevent and abate pollution from ships, aircraft and land-based sources in the Mediterranean Sea. The Convention has 22 contracting parties, including all the Mediterranean countries (fig. 4).
- In the context of the above mentioned Barcelona Convention, the Ecosystem Approach (EcAp) is a strategy for the integrated management of land, water and living resources and is the guiding principle to all policy implementation and development undertaken under the auspices of UNEP/MAP Barcelona Convention. The Contracting Parties have committed to implement the ecosystem approach with the ultimate objective of achieving the good environmental status (GES) of the Mediterranean Sea and Coast. This process aims to achieve GES through informed management decisions, based on integrated quantitative assessment and monitoring of the Marine and Coastal Environment of the Mediterranean.

  EcAp is based on 11 ecological objectives (ECOs) that should be able to target most of the threats identified by the present CMP (with the possible exception of the disturbance directly caused by marine traffic): 1. Biodiversity is maintained or enhanced; 2. Non-indigenous species do not adversely alter the ecosystem; 3. Populations of commercially exploited fish and shellfish are within biologically safe limits; 4. Alterations to components of marine food webs do not have long-term adverse effects; 5. Human-induced eutrophication is prevented; 6. Sea-floor integrity is maintained; 7. Alteration of hydrographic conditions does not adversely affect coastal and marine ecosystems; 8. The natural dynamics of coastal areas are

maintained and coastal ecosystems and landscapes are preserved; 9. Contaminants cause no significant impact on coastal ad marine ecosystems and human health; 10. Marine and coastal litter does not adversely affect coastal and marine ecosystems; 11. Noise from human activities cause no significant on marine and coastal ecosystems.

Vice versa, the Tt-CMP should be able to target the ecological objectives of the EcAp, with special reference to biodiversity (ECO 1) and its associated common Indicators: CI4 (Population abundance), CI5 (Population demographic characteristics), CI3 (Species distributional range).

- Regional Activity Centre for Specially Protected Areas (RAC/SPA) was established by the Contracting Parties to the Barcelona Convention and its Protocols in order to assist Mediterranean countries in implementing the Protocol concerning Specially Protected Areas and Biological Diversity in the Mediterranean. Tunisia has been hosting the Centre since its establishment in 1985.
- The Bern Convention on the Conservation of European Wildlife and Natural Habitats. It is a binding international legal instrument in the field of Nature Conservation. The Convention came into force in 1982 and has 51 parties, including four in Africa. The appendices to the Bern Convention served as the model for the annexes to the Habitats Directive (see below).
- CMS (Bonn Convention) - The Convention on the Conservation of Migratory Species of Wild Animals. The Convention entered in to force in 1983 and is aimed at protecting the migratory animals and their habitats; CMS has 126 parties. The common bottlenose dolphin (Tursiops truncatus) is listed in Appendix II since 1991, while the Black Sea bottlenose dolphin subspecies (Tursiops truncatus ponticus) is listed in Appendix I since 2009.
- Habitats Directive - Council Directive 92/43/EEC on the Conservation of natural habitats and of wild fauna and flora. It is a European Union directive adopted in 1992 as an EU response to the Bern Convention. Its goal is to protect nature and wildlife through a network (Natura 2000) of Special Areas of Conservation (SACs) and Special Protection Areas (SPAs). Tursiops truncatus is listed in Annex II and IV of the Directive (as a priority species requiring designation of Special Areas of Conservation).
- ACCOBAMS - Agreement on the Conservation of Cetaceans of the Black Sea, Mediterranean Sea and contiguous Atlantic Area. The Agreement entered into force in 2001 as a legal conservation tool to reduce threats to Cetaceans by improving knowledge. ACCOBAMS has 24 parties which include almost all of the Mediterranean and Black Sea countries.
- Marine Strategy Framework Directive (MSFD). The MSFD is a EU directive adopted in 2008 and aimed at achieving or maintaining the Good Environmental Status in European seas and has descriptors (see below) that, similarly to the UNEP/MAP EcAp (see above) should be able to target most of the threats identified by the present CMP (again with the possible exception of the disturbance caused by pleasure boating, where a specific awareness action may be needed - see Threats and Mitigation actions sections):
  1. Biodiversity - The quality and occurrence of habitats and the distribution and abundance of species are in line with prevailing physiographic, geographic and climatic conditions; 2. Non-indigenous Species - Non-indigenous species introduced by human activities are at levels that do not adversely alter the ecosystems; 3. Commercial Fish and shellfish - Populations of all

commercially exploited fish and shellfish are within safe biological limits, exhibiting a population age and size distribution that is indicative of a healthy stock; 4. Food Webs - All elements of the marine food webs, to the extent that they are known, occur at normal abundance and diversity and levels capable of ensuring the long-term abundance of the species and the retention of their full reproductive capacity; 5. Eutrophication - Human-induced eutrophication is minimised, especially adverse effects thereof, such as losses in biodiversity, ecosystem degradation, harmful algae blooms and oxygen deficiency in bottom waters; 6. Sea-floor Integrity- Sea-floor integrity is at a level that ensures that the structure and functions of the ecosystems are safeguarded and benthic ecosystems, in particular, are not adversely affected; 7. Hydrographical Conditions - Permanent alteration of hydrographical conditions does not adversely affect marine ecosystems; 8. Contaminants - Contaminants are at a level not giving rise to pollution effects; 9. Contaminants in Seafood - Contaminants in fish and other seafood for human consumption do not exceed levels established by Community legislation or other relevant standards; 10. Marine Litter - Properties and quantities of marine litter do not cause harm to the coastal and marine environment; 11. Energy incl. Underwater Noise - Introduction of energy, including underwater noise, is at levels that do not adversely affect the marine environment.

2.2 NATIONAL LEGISLATION AND MANAGEMENT ARRANGEMENTS

A table to synthetize the Range states information (ACCOBAMS, IWC if needed, other relevant management agreements…)

3 BIOLOGY AND STATUS OF MEDITERRANEAN BOTTLENOSE DOLPHIN

3.1 POPULATION STRUCTURE

The common bottlenose dolphin (*Tursiops truncatus* Montagu, 1821) is a cosmopolitan Delphinidae; its distribution is usually contained within the 45th parallel in both hemispheres, in tropical and temperate waters, but in the North Atlantic it can reach the 65th parallel (Rice, 1998; Wells and Scott, 1999). This wide distribution is associated with a remarkable morphometric differentiation among populations, which led to 20 species being classified in the 1960s (Hershkovitz, 1966). At today, most authors identify only two species: the common bottlenose dolphin (*Tursiops truncatus* Montagu, 1821) widely distributed worldwide, and the Indo-Pacific bottlenose dolphin (*Tursiops aduncus* Ehrenberg, 1833), distributed in coastal areas of the Indo-Pacific Ocean (Ross and Cockcroft, 1990; Hale et al., 2000; Moura et al., 2013, 2020). A third species, with a limited distribution in Southern Australia and Tasmania, has been suggested, the Burrunan dolphin (*Tursiops australis* sp. Nov.) (Charlton-Robb et al., 2011); however current genetic and morphological data are ambiguous in its support for a valid species (Jedensjö et al., 2020) and genomic data suggest that this may be a subspecies of *T. aduncus* (Moura et al., 2020). Within the species *Tursiops truncatus*, two sub-species with coastal distributions are currently

listed by the SMM Committee on Taxonomy (*T.t.ponticus*, in the Black Sea, and *T.t.gephyreus*, in South American Atlantic coastal regions), and divisions between several different coastal ecotypes and a globally distributed offshore ecotype, have been described by various authors in different areas of the world (e.g. Walker, 1981; Van Waerebeek et al., 1990; Parsons et al., 2006; Tezanos-Pinto et al., 2008; Mirimin et al., 2011; Louis et al., 2014; Gaspari et al., 2015; Chen et al., 2017; Bayas-Rea et al., 2018; Segura-García et al., 2018). This separation is particularly marked in the Atlantic coast of North America, where separation has been detected by several ecological, physiological and genetic measures (e.g. Duffield et al., 1983; Hersh and Duffield, 1990, Mead and Potter, 1995; Hoelzel, 1998 ; Torres et al., 2003; Moura et al., 2013; Moura et al., 2020).

According to Notarbartolo di Sciara and Demma (1994), the Mediterranean population is more akin to the coastal ecotype, while Cañadas et al. (2002), reporting the distribution of this species in the Alboran Sea, suggest a closer link with the Atlantic pelagic ecotype.

Natoli *et al*. (2005) investigated the genetic diversity of bottlenose dolphin populations along a continuous distributional range from the Black Sea to the eastern North Atlantic and found clear population structures over the geographical range, coinciding with transitions between habitat regions. Moore (2020) found a similar pattern based on genomic (3500 neutral RADseq) markers.

Gaspari *et al*. (2015b) noted that samples from deeper parts of the Mediterranean (e.g. Ionian Sea) were genetically more similar to samples from the Atlantic pelagic ecotype, and thus suggested a potential differentiation between coastal and nearshore waters also in the Mediterranean context. Further evidences for genetic differentiation within the Mediterranean were found by Gaspari et al. (2015a), Gonzalvo et al. (2016) and Brotons et al. (2019) and also some studies on social structure (Papale et al., 2016) and acoustic (La Manna et al., 2017) seem to confirm it.

However, the results from TursioMed, a networking project compiling census data on Mediterranean bottlenose dolphin, showed that most sightings occur within the 200 m isobath marking the border of the continental shelf, with sightings outside this limit being quite rare (despite the research effort). This habitat preference seems to be consistent in all the study areas covered by the network (Gnone et al., 2021). These results are consistent with those from Gnone et al. (2005), investigating the distribution of bottlenose dolphin stranding along the Italian peninsula over a period of 18 years (1986–2002). It is unclear, then, to what extent the genetic differences found by Gaspari and co-authors should be correlated to ecological habits; the issue deserves further investigation and the presence of different ecotypes in the Mediterranean Sea cannot be excluded at this stage (see also Louis et al., 2014). Laran and co-authors reported of an offshore distribution of a large number of bottlenose dolphins detected during aerial surveys in the French territorial waters of Pelagos Sanctuary (Laran et al., 2017). Several offshore encounters of bottlenose dolphins were also reported by the FLT Med Net (Fixed Line Transect Mediterranean Network) but were likely linked to an opportunistic behaviour mainly performed during the spring-summer season (Azzolin et al., 2016; Arcangeli et al., 2017).

As already reported, the bottlenose dolphins form geographical resident units, which show a certain level of behavioural specialization on the residency area and might considered as “behavioural types” (Vassallo *et al*., 2021), meaning a behavioural variety whose components all show similar behavioural traits, as a response to local ecological pressure and opportunities.

These specialization behaviours are most probably transmitted from one generation to the next as a local tradition (culture), allowing the dolphins to better exploit the residency area and to colonize new habitats. The behavioural specialization, which is always associated with residency, could also produce a certain level of isolation (Carnabuci *et al*., 2016; Gnone *et al*., 2011), possibly producing the genetic fine-scale structure described by Gaspari *et al*. (2015).

Information gaps/needs:
The single geographic units of bottlenose dolphin, being the basic target of the CMP effort, should be identified, together with the level of genetic differentiation (if any). This could be achieved by improving the efficiency of the stranding network to obtain samples and implementing biopsy campaign on different geographical units within the Mediterranean Sea.

3.2 DISTRIBUTION, MIGRATION AND MOVEMENTS

Distribution

The bottlenose dolphin is considered a regularly present species in the Mediterranean basin (Pilleri and Gihr, 1969; Cagnolaro *et al*., 1983; Notarbartolo di Sciara and Demma, 1994; Bearzi *et al*., 2009). The available literature suggests that this species could be sighted over most (if not all) the continental shelf of the Mediterranean basin, wherever a proper sampling effort is implemented (Gnone *et al*., 2021), even if with different density (see also tab. …).

Within the TursioMed project (Gnone *et al*., 2021), the bottlenose dolphin is the only species whose sightings have been reported by all partners of the network, from Spain to Tunisia, mostly within the 200 isobaths marking the boundary of the continental shelf (see tab … and fig. …).

Research Group	Study area	Country	n sight.	*Tt*	*Sc*	*Dd*	*Gg*	*Gm*	*Zc*	*Pm*	*Bp*	*Sb*	*Oo*	*Pp*	*Mb*	*Ba*	*Mn*
Alnilam Research and Conservation	Alboran Sea	Spain	1402	210	470	403	35	210	44	10	20	0	0	0	0	0	0
SUBMON	Spain SE	Spain	10	10	0	0	0	0	0	0	0	0	0	0	0	0	0
Association BREACH	Gulf of Lion	France	176	95	41	2	2	1	0	0	37	0	0	0	0	0	1
EcoOcéan Institut	Med French coast	France	1845	65	1277	2	24	27	1	94	355	0	0	0	0	0	0
GECEM	French riviera, Corsica	France	443	212	148	1	11	3	0	19	49	0	0	0	0	0	0
Tethys Research Institute - Cetacean Sanctuary Research	Pelagos W	Italy	2639	31	1924	3	52	25	34	310	261	0	0	0	0	0	0
CIMA Research Foundation	Savona - Bastia Nice - Calvi	Italy-France	2086	39	1152	10	42	16	32	70	725	0	0	0	0	0	0
Università di Genova - DISTAV	Liguria E, Elba Island	Italy	49	49	0	0	0	0	0	0	0	0	0	0	0	0	0
Delfini Metropolitani	Pelagos N, Liguria E	Italy	283	233	39	4	2	0	2	2	4	0	0	0	0	0	0
CE.TU.S. Cetacean Research Centre	Tuscany	Italy	503	428	54	7	4	0	0	3	11	0	0	0	0	0	1
Università di Pisa (LIBA)	Livorno - Bastia FLT	Italy-France	330	114	160	6	2	0	0	6	44	0	0	0	0	0	0
Università di Pisa (LIGA)	Livorno - Olbia FLT	Italy	321	79	183	3	3	0	5	10	38	0	0	0	0	0	0
Accademia del Leviatano ONLUS	Rome - Barcelona FLT	Italy-Spain	1006	44	490	5	16	2	16	38	394	0	0	0	0	1	0
Oceanomare Delphis Onlus	Rome, Naples	Italy	1084	103	521	33	26	2	0	359	40	0	0	0	0	0	0
Bottlenose Dolphin Reasearch Institute	Sardinia NE	Italy	1660	1637	14	3	0	0	0	0	6	0	0	0	0	0	0
SEA ME Sardinia onlus	Sardinia NE	Italy	469	0	271	2	4	0	64	10	117	0	0	0	1	0	0
MareTerra Onlus	Sardinia NW	Italy	218	217	1	0	0	0	0	0	0	0	0	0	0	0	0
Associazione CRAMA	Sardinia NW	Italy	27	24	0	0	0	0	0	0	3	0	1	0	0	0	0
Ketos	Civitavecchia - Catania FLT Civitavecchia - Tunis FLT Palermo - Tunis FLT	Italy Italy-Tunisia	596	150	339	56	17	1	2	7	23	1	0	0	0	0	0
Associazione Me.Ri.S.	Agrigento	Italy	8	7	0	1	0	0	0	0	0	0	0	0	0	0	0
Università di Torino - DBios	Lampedusa Island	Italy	209	209	0	0	0	0	0	0	0	0	0	0	0	0	0
Morigenos	Gulf of Trieste	Slovenia	456	456	0	0	0	0	0	0	0	0	0	0	0	0	0
Gaia Research Institute Onlus	Ancona - Patras FLT	Italy-Greece	98	49	47	0	0	0	2	0	0	0	0	0	0	0	0
Thalassa	Ionian Greece, Gulf of Corinth	Greece	175	36	128	17	1	0	0	0	0	0	0	0	0	0	0
Tethys Research Institute - Ionian Dolphin Project	Gulf of Ambracia	Greece	859	838	5	16	0	0	0	0	0	0	0	0	0	0	0
Marine Mammal Research Association - DMAD	Montenegro coast Boshporus, Turkey coast SW	Montenegro Turkey	163	113	1	19	0	0	4	0	0	0	0	26	0	0	0
Istanbul University and Turkish Marine Research Foundation	Turkey coast W Beirut	Turkey Lebanon	114	63	29	21	2	0	0	1	0	0	0	0	0	0	0
the Tunisian Dolphin Project	Bizerte	Tunisia	39	39	0	0	0	0	0	0	0	0	0	0	0	0	0

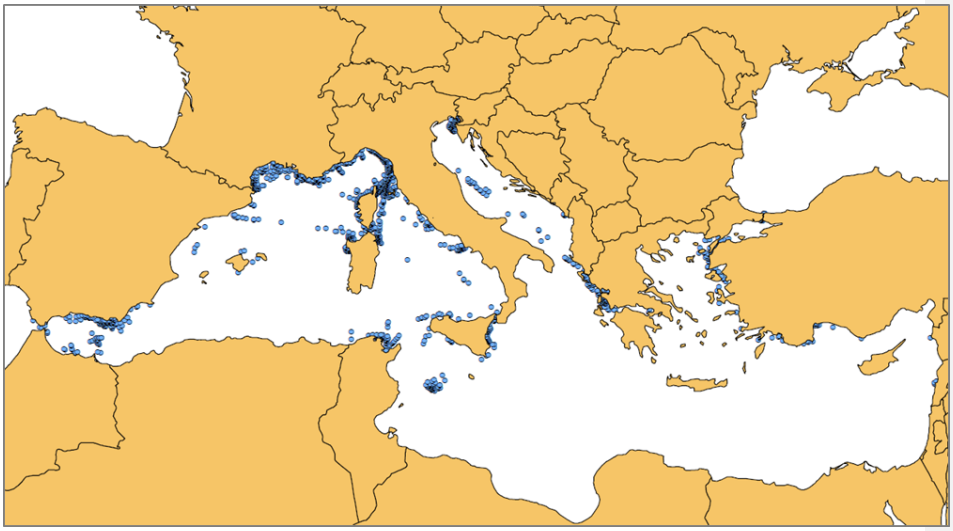

Figure 1 - Bottlenose dolphin sightings shared on the Intercet platform within the TursioMed project (5550 sightings).

Include the results from ASI (summer 2018).

Information gaps/needs:
There seem to be a lack of data over a large portion of the continental shelf in the southern Mediterranean, especially in the eastern hemisphere (Libya and Egypt). We could presume that the bottlenose dolphin is present also in these areas, but due to the lack of data this is just an hypothesis. It would be crucial to verify the presence of the species also in these regions.

Habitat:
As already reported, the bottlenose dolphin, in the Mediterranean context, can be found mostly within the bathymetric border of the continental shelf (Bearzi *et al.*, 2009). Genetic investigation seem to suggest the presence of two ecotypes of bottlenose dolphin, coastal and pelagic, also in the Mediterranean Sea, as reported in the Atlantic (see the section Population structure). However most recent studies, based on sightings localization on a large scale and photo-ID data, strength the idea that the bottlenose dolphin finds its habitat mainly on the continental platform, while sightings in deeper waters seem to be occasional (Gnone et al., 2011; ASI, ….). In relation to the data coming from the TursioMed network, this pattern in the (macro)habitat preference seems consistent in all the areas covered by the network (see tab. …).

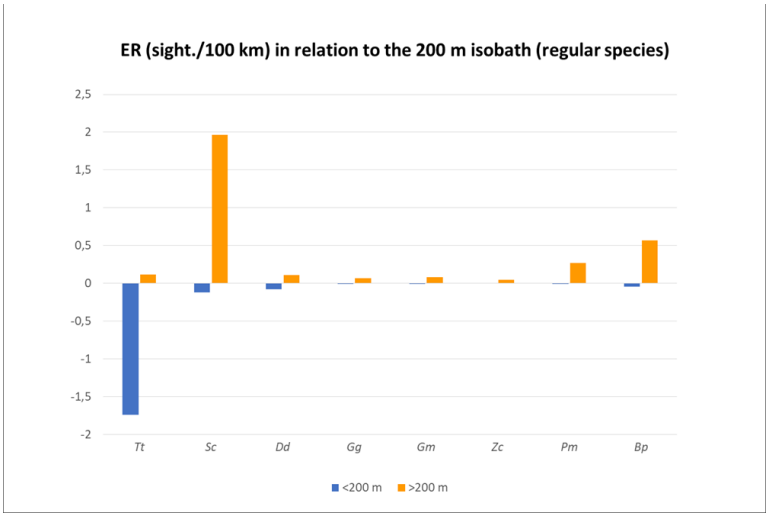

Figure 10 – Encounter rate (sightings/100 km) outside the continental shelf border (>200 m isobath) and within it (<200 m isobath). Tt: *Tursiops truncatus* - Sc: *Stenella coeruleoalba* - Dd: *Delphinus delphis* - Gg: *Grampus griseus* - Gm: *Globicephala melas* - Zc: *Ziphius cavirostris* - Pm: *Physeter macrocephalus* - Bp: *Balaenoptera physalus*.

Within the continental shelf border, the bottlenose dolphin can inhabit a large variety of habitats, such as rocky coasts, large sandy platforms, archipelagos, enclosed seas, lagoons, etc. (…), including highly anthropized contexts such as ports and channels (…). This plasticity in the habitat choice seem to be relate to a high level of behavioural plasticity, producing local specialization on the residency habitat (…), and should be considered as a characteristic feature of the species (see below).

Local specializations, possibly in feeding techniques, seem to produce a segregation between neighbouring dolphins and a clusterization of the (meta)population in geographical units or subpopulations (Gnone et al., 2011). The connectivity through the units seems to retrace the landscape traits and its habitat breakages (Carnabuci et al., 2016; Vassallo et al., 2020). Analogous results, on a larger scale, come from the TursioMed project, suggesting that this kind of distribution of the species along the continental shelf, and its structuring in discrete geographical (and demographical) units, may represent a model for the entire Mediterranean.

This finding is fundamental when designing a proper conservation and management plan, as the single geographical units show different and peculiar local specialization (depending on the geomorphological and ecological traits of the area of residence) and should be considered as the first target for conservation.

Information gaps/needs:
Collection of (genetic) samples on stranded and free ranging individuals, coupled with the photo-ID data, could help to better understand the possible genetic differentiation of the Mediterranean bottlenose dolphin in relation to the habitat and the area of residence.

Behavioural ecology:
Bottlenose dolphins are found in a wide variety of habitats, and habitat use by resident populations differs between locations. This heterogeneity in habitat preference is associated with a behavioural flexibility; these dolphins are able to display a variety of tactics and strategies to capture different preys in different habitats, ranging from individual to highly coordinated group hunting techniques (Wells and Scott, 2002). These local specializations are most probably culturally transmitted through a matrilineal route (Barros and Odell 1990; Kopps et al. 2014), allowing a more efficient exploitation of local resources and a transgenerational update to environmental changes. The plasticity in foraging behaviour is accompanied with plasticity in the pattern of association, a flexible social model which was defined as "fission–fusion society" (Connor et al., 2000).
As part of this opportunistic behaviour, bottlenose dolphins can learn to obtain fish from trawlers, gillnets and aquaculture fish cages, which can become an integral part of their feeding strategies. This behaviour can generate a partial dependence on human activity, triggering conflicts with fishermen and is a concern in many areas of the world including the Mediterranean Sea (Chilvers and Corkeron, 2001; Lauriano et al., 2004; Diaz Lopez, 2006, 2019; Gonzalvo et al., 2008; Barros and Odell, 1990; Blasi and Boitani, 2012; Brotons et al., 2008; Corkeron et al., 1990; Fertl and Leatherwood, 1997; Bearzi et al., 1999; Pace et al., 2003; Milani et al., 2017a; Buscaino et al., 2009; Genov et al., 2019; Milani et al., 2019; Papale et al., 2020; Buscaino et al., 2021).

Gill-net fisheries and finfish aquaculture introduced spatial habitat complexity and fragmentation, leading to an increase in bottlenose dolphins' food availability (either directly though anthropogenic food (e.g., farmed fish and fish entangled in gillnets, Díaz López 2006, 2017, 2019) but also indirectly in the form of modified habitat that could be favorable for feeding (e.g., increase input of nutrients from aquaculture activities; Díaz López et al. 2008; Piroddi et al., 2011).

Information gaps/needs:
The opportunistic interaction between bottlenose dolphins and fishing gears is a common problem in many areas of the Med Sea (see also …). Nevertheless, the real extension of this problem (both in space and time) and the economic consequences on the fishing industries are still largely unknown. A proper mapping and monitoring of this phenomenon in space and time, with the aid of automatic acoustic devices, would be auspicious and could help to find strategies to mitigate the conflict with fishermen (see also…).

Fig XX Effort (left) and Mean annual predicted densities expressed as individuals per 25 km² (right) over the period 1998-2015 (Mannocci et al., 2018)

Home range and movements

Most of the studies based on photo-identification data are consistent in describing the bottlenose dolphin as a resident species (…). As already described in previous sections, this species colonize the continental platform forming geographical resident units, with a certain level of isolation, according to the geographical and ecological distance (see…). According to Gnone et al. (2011), studying the bottlenose dolphin spatial behaviour in the context of the Pelagos Sanctuary, the dolphins here perform maximum displacement of about 50 kms (on average), but a minority of individuals (the so called "long traveller"), can make displacements of more than 400 km. Bearzi described the 265 km displacement of 9 individuals in western Greece, (Bearzi et al., 2011), confirming that some individuals may perform longer displacement outside the area of residence. These "long travellers", despite being a minority, may represent a means of continuity between the different geographical units (…).

According to the results of the TursioMed project (Gnone *et al*., 2021), the home range of the different geographical units, measured as the average of the individual minimum convex polygons (MCP), may change greatly, according to the geomorphological and ecological traits of the area of residence (see tab …). Also the density and the average number of the groups seem to change according to the area of residence, possibly as a strategy to better exploit the local food resources (Molinari, 2021).

CLUSTER	AREA	N. INDIVIDUALS	MCP (km^2)
1	Alboran Sea (Spain)	95	666
2	Gulf of Lion (France)	163	6410
3	Liguria-Tuscany (Italy)	289	2874
4	Elba (Italy)	12	111
5	Corsica W (France)	65	272
6	Sardinia NE (Italy) - Corsica S (France)	36	132
7	Sardinia NW (Italy)	51	50
8	Rome-Naples (Italy)	61	90
9	Catania (Italy)	3	159
10	Agrigento (Italy)	2	20
11	Lampedusa (Italy)	2	36
12	Slovenia	6	100
13	Gulf of Ambracia (Greece)	113	104
14	Bosphorus (Turkey)	9	18
15	Antalya (Turkey)	3	126
16	Bizerte (Tunisia)	5	91

Table 5 - MCPs (average) of the main clusters/geographical units (individuals with at least 4 captures, 915 in total).

Information gaps/needs:
The data aggregation on the Intercet platform (sampling effort, sightings position and photo-ID data) through different national and international projects since 2010 (GIONHA, Dolphin Without Borders, … TursioMed, InterMed) has proven to be a valuable strategy to improve our knowledges on the Mediterranean bottlenose dolphin, in terms of distribution, habitat, abundance, movements, connectivity, home range. It would be useful to increase, to the possible extent, the data flow to the platform, including new partners to the Intercet network and implementing field research campaign in those areas poorly covered (especially in the southeastern portions of the basin).

3.3 BASIC BIOLOGY

3.3.1 FEEDING

The shallow water preference of the bottlenose dolphin in the Mediterranean waters could be related to the feeding habits of the species, preying mostly on benthic and demersal fishes (Voliani and Volpi, 1990; Orsi Relini et al., 1994; Miokovi ć et al., 1999; Blanco et al., 2001; Milani et al., 2017a, Giménez et al., 2017).

Bottlenose dolphin preys include the hake (*Merluccius merluccius*) and a variety of other fishes species (*Diplodus annularis, Pagellus erythrinus, Spicara flexuosa, Lesurigobius sp.*) and cephalopods (*Eledone cirrhosa*) (Scuderi *et al*., 2011).

As already reported (see …) bottlenose dolphins may include in their feeding habits the opportunistic exploitation of gillnets, trawlers and fish cages (see …). In some context these feeding strategies may become predominant in the feeding economy of the dolphins, triggering conflict with fishermen (…).

Information gaps/needs:
Research on the stomach contents of stranded dolphins may be very useful to better know the feeding habits of the bottlenose dolphins in the different seasons and geographical contexts and should be increased and extended on a wider range.

3.3.2 LIFE HISTORY

Bottlenose dolphins are quite long-lived animals: studies on dentin and cementum rings (Hohn et al, 1989) have shown that females can live more than 57 years, while males up to 48 (Wells and Scott, 1999). The age at which females begin to reproduce varies from individual to individual (Connor et al., 2000), but sexual maturity generally occurs between 7 and 12 years of age (Mann et al., 2000). The males, on the other hand, mature after the females, around the age of 13 (Wells and Scott, 2009).

It would seem that once sexual maturity is reached the female bottlenose dolphin remains fertile for the entire duration of its life (Cockroft and Ross, 1990), in fact the females up to 48 years of age have given birth to young and have successfully raised them (Wells and Scott, 1999). As for males, paternity tests in Florida have shown that individuals are capable of producing offspring between 13 and 40 years of age (Duffield and Wells 2002; Wells, 2003).

Gestation lasts just over a year: 12.3 months or 347 days (Cockroft and Ross, 1990). Bottlenose dolphins, like all cetaceans, in which twin births are very rare, give birth one offspring at a time (Mann *et al*., 2000; Notarbartolo di Sciara and Demma, 2004), but if the baby dies premature, the female is immediately ready for a new gestation (Cockroft and Ross, 1990; Mann *et al*., 2000).

There are very few studies investigating the reproductive parameters of the bottlenose dolphin in the Mediterranean Sea. According to Rossi *et al*. (2017), analysing the data of a long-lasting research program in the eastern Ligurian Sea, the fertility rate was 0.29-0.41, the calving interval 2.45-3.45 and the cub mortality rate (the mortality rate within the first year) 0.25.

Information gaps/needs:

Researches investigating the reproductive parameters are very important to assess the conservation status of a management unit and to evaluate its resilience to mortality events. It would be crucial to extend and increased these kind of studies.

3.4 ABUNDANCE AND TRENDS

According to Bearzi *et al*. (2004) deliberate killing, overfishing (prey depletion), and habitat degradation may have caused a considerable reduction (about 50%) of the bottlenose dolphin population in the northern Adriatic Sea. Bearzi and Fortuna (2006) and Bearzi *et al*. (2009) suggest a similar reduction should be applicable to the whole of the Mediterranean basin, with a current total population of less than 10,000 animals, representing a decrease of about 30% in the last 60 years. However, more recent studies suggest these estimates could be over conservative.

Fortuna et al. …, estimated a total of … bottlenose dolphins only in Italian waters, while according to Gnone et al. (2021), analysing the data coming from the TursioMed network, the Mediterranean (meta)population of bottlenose dolphins might exceed the 15.000 individuals (more conservative estimate) and could reach 40.000 individuals.

However these estimates still present significant uncertainties and must be taken with due caution.

Include the results from ASI (summer 2018).

Other abundance estimates from aerial surveys (Adriatic Sea)

In tab. … are resumed some independent estimates produced on different management units through the Mediterranean Sea.

Geographic Area	**Study area** (km2)	**Sampled Area**	**Years**	**Density** (animals / km2)	**N**	**CV**	**95% CI**	**Estimation method**	**Source**
Strait of Gibraltar	500	in- & offshore	2005	0.51	258	0.08	226-316	Mark-recapture (closed population)	De Stephanis *et al.*, 2005
Alboran Sea (Spain)	11,821	in- & offshore	2000-2003	0.049	584	0.28	278–744	Distance sampling & GAMs	Cañadas & Hammond, 2006
Almeria (Spain)	4,232	in- & offshore	2001-2003	0.066	279	0.28	146–461	Distance sampling & GAMs	Cañadas & Hammond, 2006
Almeria (Spain)	-	-	2010-2011	-	812	0,12	655-1039	Mh jackknife	J. L. Murcia (unpublished)
Asinara island National Park (Italy)	480 2004	inshore	2001	0.05	22	0.26	22–27	Mark-recapture (closed population)	Lauriano *et al.*, 2003
North Eastern Sardinia (Italy)	750	inshore	2005 - 2013	0.016 – 0.09	12 - 68	-	12 – 13 62 - 87	Mark-recapture (Robust Pollock Open/closed population)	Díaz López 2019
North Western Sardinia (Italy)	200	inshore	2008 - 2011	0.275	55	-	45 - 70	Mark-recapture model (Open population)	Díaz López et al., 2013
Balearic Islands & Catalonia (Spain)	86,000	in- & offshore	2002	0.088	7,654	0.47	1,608-15,766	Distance sampling	Forcada *et al.*, 2004
Alboran sea and Murcia	17,987	in- & offshore	2004-2005	0.072	1288	-	-	Distance sampling & GAMs	Cañadas, unpublished
Gulf of Vera (Spain)	6,164	in- & offshore	2003-2005	0.042	256	0.31 1	88–592	Distance sampling & GAMs	Cañadas, unpublished
Valencia (Spain)	32,270	in- & offshore	2001-2003	0.041	1,333	0.31 739-	2,407	Distance sampling	Gomez de Segura *et al.*, 2006
Tunisian waters	~ 750	inshore	2001 & 2003	0.19	-	-	-	Distance sampling (uncorrected)	Ben Naceur *et al.*, 2004
Lampedusa island (Italy)	200	inshore	1996-2000	-	140				
Lampedusa island (Italy)	2500	in- & offshore	2003-2006	-	135		**70-320**	Mark-recapture (open population)	Azzolin et al., 2007
Israeli Mediterranean coast (Israel)	-	inshore	1999-2004	-	85				
Ionian Sea (Greece)	480	inshore	1993-2003	-	48				
Ionian Sea (Greece)	5500	in- & offshore	2008-2010	-	94			Mark-recapture (open population)	

Commenté [h1]: New estimates:

Tenan, S., Hernández, N., Fearnbach, H., de Stephanis, R., Verborgh, P., & Oro, D. (2020). Impact of maritime traffic and whale-watching on apparent survival of bottlenose dolphins in the Strait of Gibraltar. *Aquatic Conservation: Marine and Freshwater Ecosystems*, *30*(5), 949-958.

"Population size rangedfrom a minimum of 123 individuals (range: 98–158) in 2002, to amaximum of 234 individuals (range: 207–265) in 2005 (median and95% CRI; Figure 4a)"

Commenté [A2]: Valore medio per i 4 anni

Commenté [A3]: Stiamo lavorando ad un manoscritto in cui sono inseriti anche i dati degli anni successivi

Amvrakikos Gulf (Greece)	400	inshore	2001-2005	0.38	152	-	136-186		
North Aregean Sea (Greece)	2000	in- & offshore	2005-2013	-	377	18.37	289–465	Distance sampling & GAMs	Milani et al., 2017b
Central Adriatic Sea (Kornati & Murtar Sea, Croatia)	300	inshore	2002	-	14				
North-eastern Adriatic Sea (Kvarneric, Croatia)	800	inshore	1990-2004	-	120				
North-eastern Adriatic Sea (Kvarneric, Croatia)	1,000	inshore	1997	0.06	113				
North-eastern Adriatic Sea (Kvarneric, Croatia)	2,000	inshore	2003	0.05	102				
North Adriatic Sea (Gulf of Trieste, Slovenia)	600	inshore	2002-2004	0.08	47				
Pelagos Sanctuary	87,500	in- & offshore	2006	-	1,023	-	848-1234	Mark-recapture (closed population)	Gnone *et al.*, 2011
Western Mediterranean Sea		in- & offshore	2010-2011	0.005	1,676	0.3825	804-3492	Distance sampling (aerial survey)	Lauriano *et al.*, 2014
French Mediterranean continental shelf	2,350	inshore	2013-2015				1,827-3,135	Mark-recapture (closed population)	Labach et al. In press

Commenté [AA4]: This number is quite low, might be, but just checking☺

Tab. 1 - Summary of abundance of bottlenose dolphins in the Mediterranean basin from Bearzi and Fortuna, 2006 (integrated with data from Gnone et al., 2011; Lauriano et al., 2014; Milani et al., 2017b; Díaz López 2019; Díaz López et al., 2013; …).

In relation to abundance tendency in recent years, there seem to be very few research context where the data available (and their continuity over time in historical series) could allow to test for significant trends.

Within the TursioMed project, only for two geographical units the continuity of sampling (≥ 8 years) allowed to carry out a trend analysis: the small unit residing across Corsica and Sardinia (Sardinia NE-Corsica S) and the larger unit of Liguria-Tuscany. In the first case, no significant trend emerges (2005-2013), while in the case of Liguria-Tuscany a statistically significant positive trend has been detected (2004-2016).

It is important to remind that, due to the diversity of the Mediterranean basin and the habit of the bottlenose dolphin to live in different ecological contexts, it is not possible to generalize this positive trend to other areas.

Information gaps/needs:

As the single geographical units of bottlenose dolphin are the basic target of the conservation effort, the size and size trend of these units should be monitored over time. Research activity in the field should be encouraged and supported to improve the data collection.

The survey effort should be strongly increased in those area poorly covered, such as the southeastern basin (where there are virtually no data available).

To detect possible trends in abundance, at some geographical units across the Med Sea should be monitored over time with enough continuity (≥ 8 years).

3.5 ATTRIBUTES' OF THE POPULATION(S) TO BE MONITORED

In line with the main legislative framework (e.g. MSFD, HD, EcAp..) the attribute to be monitored intends to give indication to assess the status of the population in the Mediterranean basin to be linked to the anthropogenic pressures that can adversely affect its long-term viability.

The bottlenose dolphin is distributed over the Mediterranean continental shelf with distinct geographical (and demographical) units, inhabiting a certain area and with a potential local specialization on the (micro)habitat and/or the ecological context of the area of residence (including human activity). For a proper CMP implementation and monitoring it is crucial to identify these units, their area of residence (and its geographical borders), their size consistency and trend and possibly also the level of genetic differentiation. At the present time, these knowledges are partially available only for some of geographical units, located mostly (but not only) in the northern portion of the Mediterranean Sea (see tab. 1).

Great effort should be implemented to increase the data coverage on a Mediterranean level.

Attributes to be monitored:

- Distribution area of the target species (km^2)
- Habitat exploited (theoretical %)
- Encounter rate (sightings/km)
- Abundance rate (individuals/km)
- Resident area (home range) of the geographical units under observation
- Abundance estimate and trend of the geographical units under observation
- Density of the geographical units under observation (abundance estimate/home range)
- Demographic and reproductive parameters of the same units.

4 SUMMARY OF ACTUAL AND POTENTIAL ANTHROPOGENIC THREATS

4.1 ACTUAL AND POTENTIAL ANTHROPOGENIC THREATS

The Bottlenose dolphin, thanks to its behavioural flexibility and opportunistic habit, seems able to adapt to a changing environment, with expanded anthropogenic presence, to survive to the present time. Still it is possible to identify potential threats to its good conservation status, based on literature available and precautionary principles.

Following a survey conducted in 2013 within the ACCOBAM framework (see annex 1) through the subarea coordinators, asking to rank the potential threats for the bottlenose dolphin in their area of competence, overfishing, chemical pollution and boat traffic (including noise) were indicated as the most impacting threats for the species.

Conflict with fisherman (possibly resulting in deliberate killing) and bycatch are a problem in many areas of the basin (Ref.).

Epidemics may represent an unpredictable phenomenon that can affect severely some demographic units or subpopulations.

However, it may be very difficult to measure the real impact (on a long term) of the above-mentioned threats on a geographical unit. A lethal threat (like bycatch) may be easier to detect, but its impact on the monitored unit could be overestimated if compared with more devious threats such as prey depletion or chemical pollution.

Table 1

Initial draft summary of information on actual and potential threats

Actual/potential threat	Human activity	Strength of evidence	Possible impact	Priority for action	Relevant actions
Major threats (lethal or sub-lethal)					
HABITAT CHANGE, REDUCTION AND FRAGMENTATION					
OVERFISHING AND PREY DEPLETION					
CONFLICT WITH FISHERMEN COASTAL AQUACULTURE AND BYCATCH					
CHEMICAL POLLUTANTS					
EPIZOOTICS					
CLIMATE CHANGES					
Other threats					

4.1.1 HABITAT CHANGE, REDUCTION AND FRAGMENTATION

In the Mediterranean context the bottlenose dolphin seems to find its preferential habitat over the continental shelf, being the only Mediterranean dolphin sighted mostly in shallow waters <200m. This species seems to be able to exploit all the shelf waters right to the coastline (Bearzi et al., 2009; Gnone et al., 2011) but anthropogenic pressure in its habitat has strongly increased in the last century, due to the new potential of exploitation produced by the industrial revolution and its technological conquests, first of all the petrol engine and its progressive implementation in fishing industry, maritime transport and tourism. This has produced a quick change in the marine environment and most probably a reduction of the habitat potentially exploitable by the bottlenose dolphin. We here refer particularly to the rapid growth of maritime traffic, which has probably reached its peak in the last decade. In the summer, touristic season, pleasure boating may reach very high level in some portions of the coastal marine band, producing a (temporary) reduction and fragmentation of the habitat potentially exploited by the bottlenose dolphin in its vital activities, such as foraging, breeding and nursing (David, 2001; Papale et al., 2011; La Manna et al., 2013). In some areas, where the continental shelf is very narrow, pleasure boating may almost saturate the bottlenose dolphin habitat, breaking its continuity and forcing the animals to aggregate in other areas (ref.). The impact is given by acoustic pollution produced by the engines but also (and possibly more heavily) by the direct disturbance caused by the boats, especially high-speed boats. Continued vessel traffic can make it difficult to exploit a large portion of habitat, since the animals have to keep continuous attention to vessels to avoid collisions and harassment. The disturbance increases as the speed of the boats increases, forcing the ability of the dolphins to get safely away. However, since touristic activity is not traditionally associated to negative impact to wild animals, there is no limitation to the presence of pleasure boating, neither limitation to the speed of the boats (with very few exceptions). Even the EU Marine Strategy Framework Directive does not mention pleasure boating has a potential impact for wild marine population and no limitations are foreseen in this respect. Still the impact of pleasure boating in some sensitive areas of the bottlenose dolphin habitat may be significant and a further (and uncontrolled) development of this human activity should be of concern in the Tt-CMP.

Information gaps/needs:

4.1.2 OVERFISHING AND PREY DEPLETION

The new technologies in marine fishery also produced a great increase in the exploitation potential of the marine resources during the last century. This, together with the new techniques for fish conservation and transportation, has produced a strong increase in the fish request and consumption. Overfishing has led to a drastic reduction of some fish stocks, overexploited with new and more efficient fishing techniques, including some bottlenose dolphin preys such as the Mediterranean hake (*Merluccius merluccius smiridus*) (Orsi Relini et al., 2002), which is usually fished with trawlers (ref.). However, the bottlenose dolphin has learned to feed opportunistically on trawlers wake, taking advantage of the collection action of the net. In this context it may be difficult to understand if the advantage coming from the opportunistic feeding on trawlers could overcome the negative effect of overfishing (see also mitigation actions).

Information gaps/needs:

4.1.3 CONFLICT WITH FISHERMEN, COASTAL AQUACULTURE AND BYCATCH

Interactions between cetaceans and fisheries have been documented for centuries and have been reported to be increasing in frequency and intensity in recent decades (Read *et al.*, 2006). Because of their opportunistic behaviour, bottlenose dolphins may be perceived as competitors by the fishermen. Furthermore, their opportunistic action on the nets can cause damages to the fishing gear and exacerbate the conflict (Diaz Lopez, 2006; Milani et al., 2017a; Snape *et al.*, 2018; Milani et al., 2019; Giménez *et al.*, 2021). Fishers may therefore adopt brutal solutions to discourage the dolphins and protect their fishing activity. Deliberate killing, as the most extreme action, could impact on small demographic units. Bycatch may also be a consequence of the opportunistic activity of the dolphins on the fishing gears (Cuvertoret-Sanz *et al.*, 2020)

Moreover, the pressures of incidental catches in (anti)predator nets to reduce bottlenose do attacks on coastal aquaculture may add to existing by-catches caused by fisheries (Díaz López and Shirai, 2007).

Commenté [GG5]: Nelle reti anti-predatori?

Information gaps/needs:

4.1.4 CHEMICAL POLLUTANTS

Preying mostly on benthic and demersal fish, bottlenose dolphins are exposed more than other Cetaceans to chemical pollution from persistent organic pollutants, through bioaccumulation and biomagnification mechanisms. High level of PCB, DDT and heavy metals were found in the tissues of bottlenose dolphins sampled in the Mediterranean Sea, when compared with Atlantic individuals (Marsili and Focardi, 1997; Aguilar *et al.*, 2002; Fossi and Marsili 2003; Storelli *et al.*, 2007; Shoham-Frider *et al.*, 2009; Romanić *et al.*, 2014; Barón *et al.*, 2015a; Barón *et al.*, 2015b; Genov et al., 2019). These pollutants may cause a decrease of the fitness of the individual on a long term, causing immunodeficiency, decreased fertility and an increase in neonatal mortality (since the mother will release pollutants with lactation). The pollution of the food chain may therefore take part in decreasing the survival potential of the bottlenose dolphin Mediterranean (meta)population.

Physical harassment by marine litter is also cause of concern for the species and entangle and ingestion of marine debris is reported also for bottlenose dolphin with potential detrim consequences, such as physical injuries, reduced mobility and predation success, digestive blockages, and malnutrition (e.g. Poeta et al. 2017, Claro et al. 2019).

Commenté [AA6]: Poeta, G., Staffieri, E., Acosta, A. T., & Battisti, C. (2017). Ecological effects of anthropogenic litter on marine mammals: A global review with a "black-list" of impacted taxa. *Hystrix, the Italian Journal of Mammalogy*, *28*(2), 253-264.
Claro F., Fossi M.C., Loakeimidis C., Baini M., Lusher A.L., Mc Fee W., McIntosh R.R., Pelamattig T., Sorcei M., Galgani F., Hardesty B.D. (2019). Tools and constraints in monitoring interactions between marine litter and megafauna: Insights from case studies around the world. Marine Pollution Bulletin 141. 147–160

Information gaps/needs:

4.1.5 EPIZOOTICS

Epizootics such as Morbillivirus can cause mortality in bottlenose dolphin, especially on those individuals already debilitated by malnutrition and/or pollution persistent organic pollutants. Local demographic units could be severely impacted by these epizootic outbreaks (Birkun, 2006).

Morbillivirus is known to be lymphotropic, causing potentially compromising immune response to other opportunistic infections (Van Bressem *et al*., 2014). Epidemiological studies on c Mediterranean dolphins show co-infections with other pathogens, such as *Brucella Toxoplasma* (e.g. Profeta *et al*., 2015). These pathogens are commonly found in human assoc animals, and there is evidence that they can be discharged into the sea from urban and indu runoff with high lethality to susceptible wildlife (e.g. Shapiro *et al*., 2019). Therefore, populations showing high site-fidelity to coastal areas with high human density, coul particularly vulnerable to this type of threat.

Information gaps:

Commenté [7]: Full reference:

Van Bressem M-F, Duignan P, Banyard A, et al (2014) Cetacean Morbillivirus: Current Knowledge and Future Directions. Viruses 6:5145–5181.

Commenté [8]: Full reference:

Profeta F, Di Francesco CE, Marsilio F, et al (2015) Retrospective seroepidemiological investigations against Morbillivirus, Toxoplasma gondii and Brucella spp. in cetaceans stranded along the Italian coastline (1998–2014). Res Vet Sci 101:89–92.

Commenté [9]: Full reference:

Shapiro K, VanWormer E, Packham A, et al (2019) Type X strains of Toxoplasma gondii are virulent for southern sea otters (Enhydra lutris nereis) and present in felids from nearby watersheds. Proc R Soc B 286:.

4.1.6 CLIMATE CHANGE

The potential effects of global climate change or ocean acidification on Bottlenose dolphin i Mediterranean, are unknown, but cannot be neglected and need further investigation monitoring.

Commenté [10]: Much more can be said about this, so this is just an example on how we could expand this. Happy to help, as I am currently doing some research on this topic (from a genetics point of view, but still somewhat familiar with the broader literature).

Information gaps:

4.1.7 CUMULATIVE AND SYNERGETIC EFFECTS

The above sections discuss threats individually. However, it is clear that some or all of them may interact temporally and/or spatially (Maglio et al., 2015, 2016). An initial approach to determine threat hot spots is to map threats against distribution (IWC-IUCN-ACCOBAMS report April 2019). Indexes of risk could also be calculated considering the cumulative effect of different threats and the parameters that increase the sensitivity of the species (e.g. area/season of biological importance for the species, presence of juveniles, particular concentration of animal, high site fidelity, etc..)

Cumulative and synergistic effects can be considered as the loss of suitable habitat, changes in reproduction and/or survivorship that negatively affect population dynamics and thus status as a result of repeated exposure to the same stressor(s) over time or the combined effects of multiple stressors. Developing robust ways to evaluating this is a complex problem. An ecosystem approach is needed (Pavan et al., 2016) to understand the complex relationship among all the components of the sea environment. Perhaps the best-developed framework to date is the Population Consequences of Disturbance (PCoD) model (New et al. 2014) which has been extended to consider the Population Consequences of Multiple Stressors (PCoMS) (National Academies of Sciences, Engineering, and Medicine 2017). This approach moves through the

effects of stressors on individuals' behaviour and physiology which is converted to effects on vital rates and then on population trends and sustainability. However, the approach is extremely data demanding and requires quantitative temporal and spatial information on whales (distribution, demographics and physiology), their prey and environment, human activities and models linking these - this complexity also contains inherent large levels of predictive uncertainty. In view of this, the present iteration of the CMP focuses initially on addressing individual threats whilst recognising the need ultimately to work towards evaluation of cumulative effects should mitigation measures on the individual threats proves insufficient.

4.2 MONITORING

Monitoring is a fundamental component of the Tt-CMP, to assess the conservation status of the target species, to evaluate the goodness and effectiveness of the mitigation measures implemented and to identify the knowledge gaps. The Tt-CMP Monitoring system should be able to observe possible trend or deviation in the attributes selected for the target species and to report these to the Coordination Centre, which works as an operational tool of the Steering Committee.

To perform this function, it is important that the data collected on a local level could be aggregated in a network being able to produce results on a Mediterranean scale. Following the zonation of ACCOBAMS (fig. 8), with its 14 subareas and coordinators, a monitoring network will be implemented. The subarea coordinators will have a critical role in promoting the flow of data from their zone of competence to the Coordination Centre. The data collected in each subarea will be shared and aggregated on a Web-GIS platform, which will serve as a common tool for the network implementation and activity.

At least in the starting phase of the Tt-CMP, we should expect an inhomogeneous covering of the Mediterranean area; especially in the southern portion of the basin some areas may have no data available. The system however will allow monitoring the data production over space/time and possibly to plan and support specific local campaigns to fill the gaps. At the same time the monitoring system will allow to plan scientific research on specific items such as genetic, toxicology, pathology, other.

Within the network material and methods for data collection should be normalized as possible and the results produced over time (possibly on a yearly basis) should be consistent enough to be compared in historical series, to observe possible trends and deviation in the attributes. The data will be analysed at subarea and basin level, according to the survey effort performed.

The Monitoring system should be able to detect a deviation in the attributes of… ?.

It would be important that the monitoring and research systems developed for the Bottlenose dolphin could be integrated as much as possible with the research and monitoring system designed and implemented for the other Cetacean species, to optimize the CMPs costs (especially in data collection) and to improve the results (as each species may work as a control for the others).

The data collected on free ranging animals should be integrated with the data coming from stranded animals to identify possible epidemics and their causes. This will involve a further work of connection with local stranding network.

5 MITIGATION MEASURES

At the present state of the knowledge the Tt-CMP does not identify new specific conservation actions (a part from those already in place), believed that a strict compliance of the regulations already in force should guarantee the protection of the Bottlenose dolphin (meta)population at the present level. The mitigation actions are directed on three main items: a) political regulatory; b) stakeholder engagement; c) education and awareness (which should also in the valorisation of the natural environment).

Commenté [AA11]: I have difficulty to understand this sentence but this might be my english☺ Does it mean there are already regulations in place (i know none in my region that is applied☺), or there should be regulations in place with the CMP? Maybe need to be clarified

5.1 HABITAT CHANGE, REDUCTION AND FRAGMENTATION

a. Political and regulatory
   - Promote a stricter regulation regarding pleasure boating, acting on local, national and supranational level, with special reference to navigation speed (enforce speed limit in the coastal zones in critical habitats of bottlenose dolphins).
   - Avoid a further anthropization of the coasts limiting the construction of new marinas, acting on local, national and supranational level (MSFD – descript. 1, 11).

b. Stakeholder engagement
   - Local, national and supranational decision makers.
   - Port Authorities and Coast Guard.
   - Boaters and related trade associations.
   - Whale watching operators
   - Research organizations
   - MPA and ASPIM
   - NGOs
   - Schools (see education and awareness)

c. Education, awareness and valorisation
   - Develop and promote an education and awareness campaign focused on the bottlenose dolphin to be disseminated to and through the stakeholders (ecology, threats, and relationships with man). The awareness campaign should also be aimed at valorising the marine environment, outputting the importance of the Cetacean fauna in this regard.
   - Develop an education and awareness campaign to outline and promote a sea tourist respectful of the sea environment and its fauna, with special focus on cetaceans and potential impact of human activity on its habitat.

5.2 OVERFISHING AND PREY DEPLETION

a. Political and regulatory
   - Promote a stricter compliance of the regulations already in force to guarantee a sustainable fish taking (fishing stop, maximum size of the net, minimum size of the fish, etc.), control and prosecute illegal and destructive practices, acting at local, national and supranational level (MSFD - descript. 3, 4).

b. Stakeholder engagement
   - Local, national and supranational decision makers
   - Fishermen and related trade associations
   - Port Authorities and Coast Guard
   - Research organizations
   - MPA and SPAMI
   - NGOs
   - Schools (see education and awareness)

c. Education, awareness and valorisation
   - Work in close relationship with fishers and related trade associations to promote sustainable fish taking and limit overfishing.
   - Develop and promote an education and awareness campaign focused on the bottlenose dolphin to be disseminated to and through the stakeholders (ecology, threats, and relationships with man). The awareness campaign should also be aimed at valorising the marine environment, outputting the importance of the Cetacean fauna in this regard.

5.3 CONFLICT WITH FISHERMEN, COASTAL AQUACULTURE AND BYCATCH

a. Political and regulatory
   - Promote a stricter compliance with the regulations already in force that prohibit harming cetaceans to limit as far as possible deliberate killing, acting at local, national and supranational level.
   - Improve the monitoring activity of the interactions between bottlenose dolphins and fishing gears/coastal aquaculture and related bycatch events.
   - Promote possible reimbursement for damaged fishing gears (after verifying the origin of the damage), acting at local, national and supranational level.
   - Promote sustainable fishing methods.

b. Stakeholder engagement
   - Local, national and supranational decision makers
   - Fishermen and related trade associations
   - Aquaculture industry
   - Port Authorities and Coast Guard

- Research organizations
- MPA and SPAMI
- NGOs
- Schools (see education and awareness)

c. Education, awareness and valorisation
   - Work in strict relationship with fishermen to mitigate the conflict with the dolphins and develop new (feasible) methods to limit the damages on the fishing gears.
   - Develop and promote an education and awareness campaign focused on the bottlenose dolphin to be disseminated to and through the stakeholders (ecology, threats, and relationships with man).

5.4 CHEMICAL POLLUTANTS

a. Political and regulatory
   - Promote a stricter compliance with the regulations already in force that ask to keep contaminants levels in the marine environment and sea food within safety limits (MSFD - descript. 8, 9).

b. Stakeholder engagement
   - Local, national and supranational decision makers.
   - Port Authorities and Coast Guard.
   - Zoo Prophylactic Inst.
   - Research organizations.
   - MPA and SPAMI.
   - NGOs
   - Schools (see education and awareness).

c. Education, awareness and valorisation
   - Develop and promote an education and awareness campaign focused on the Bottlenose dolphin to be disseminated to and through the stakeholders (ecology, threats, and relationships with man). The awareness campaign should also be aimed at valorising the marine environment, outputting the importance of the Cetacean fauna in this regard.

5.5 EPIZOOTICS

Epidemics are quite unpredictable events (especially when caused by novel pathogens) that may affects demographic units or (sub)populations, causing the death of a certain percentage of individuals. It may be very difficult to prevent this kind of events, even if some researches from Striped dolphins shows that Morbillivirus epizootics have occurred with a certain regularity (i.e. Gaspari *et al*., 2019). The level and direction of dispersal should depend on the level of connectivity between neighbouring geographical units, particularly for pathogens with a direct

transmission mechanism (such as Morbillivirus). It is therefore important to determine these level of connectivity between units with some degree of resolution, to possibly predict the epizootic dispersal (see also Carnabuci *et al*., 2016). However, a (sub)population in good health (in terms of the quality of the habitat, good food supply, low contaminants levels) has higher probabilities to support and overcome an epizootic event. The best mitigation action in relation to this threat is then to act successfully on habitat deterioration and constriction, overfishing and contaminants pollution. The collection and analysis of data on stranded animals should allow to recognize these events and possibly to identify the pathogenic agent (see **Monitoring system** section).

6 PUBLIC AWARENESS, EDUCATION AND CAPACITY BUILDING

To be developed

7 EXECUTIVE SUMMARY OF ACTIONS

COoRD-01: establishment of a CMP for Mediterranean Common Dolphins Coordinator and Steering Committee

7.1 DEALING WITH INADEQUATE DATA

While ideally, all CMPs and associated management actions are based on adequate scientific data, there are occasions when the potential conservation consequences of waiting for confirmatory scientific evidence mean that it is better to take action immediately whilst collecting the necessary information. This has become known as following the "precautionary principle" or taking a "precautionary approach." However, application of this principle must be carefully considered and well justified.

7.2 MONITORING

Establishing baseline information as a scientific reference for conservation actions is an important step towards effective conservation. Once this is achieved, monitoring (of the species or population, human activities, implementation and effectiveness of mitigation measures) **must** be an integral and essential part of management, not an optional extra.

7.3 LIFE OF THE CMP

Any CMP needs to be reviewed periodically so that the actions called for can be adjusted as appropriate in response to new information or changed circumstances. Once a coordinator has been appointed and a steering committee is functioning, it is expected that a regular review and revision process will be implemented. It is suggested that this CMP would be reviewed every two years and that an in-depth review would be conducted every four six years (to match the work-programme time frame of ACCOBAMS).

7.4 IMPLEMENTATION OF THE CMP; CO-ORDINATION, INVOLVEMENT OF STAKEHOLDERS

Experience has shown that in order to be effective, CMPs must have a recognized Coordinator, who is either hired half-time under contract for the role or is situated professionally such that his or her investment of time and other resources (e.g. travel costs) is paid for as part of a salaried position. This is particularly true where effective conservation requires action (including legislative or regulatory action) by multiple stakeholders including, for example, intergovernmental and national authorities, scientists from several disciplines, representatives from industry, local communities, and NGOs. In the case of the Risso's dolphin, at the beginning, this position could be combined with the coordination of other CMPs until the work is too much and may be split with another coordinator. Ideally, the Coordinator should have a strong scientific and management background and be capable of communicating effectively with the various stakeholders. The importance of actively involving stakeholders, especially those whose livelihoods are likely to be affected by management measures, cannot be overemphasized. The Coordinator should report to a small Steering Committee appointed after consultation with appropriate authorities.

CMP are developed under the umbrella of ACCOBAMS. All relevant bodies of ACCOBAMS must be involved : strong links with the Scientific Committee, the Secretariat and regular information to National Focal Point (ACCOBAMS Res. 6.21) and other relevant stakeholders.

Amongst other things, the Coordinator and Steering Committee would be expected to:

- promote and coordinate implementation of the CMP (including investigating and pursuing funding opportunities and options), giving particular attention to stakeholders;
- make efforts to ensure that implementation of all high- and medium-priority actions has been initiated;
- determine and track the state of implementation of actions the results obtained, the objectives reached, and the difficulties encountered;
- communicate this information through regular reporting in an open, accessible format;
- appoint a group of experts to evaluate effectiveness and update the CMP every three years on a 6 years cycle. The conclusions of this group should be made public in some way.

Finally, we stress that a CMP will not be effective without sufficient funding. At the very least, funds must be available to allow the Coordinator and the Steering Group to function.

7.5 TABLE OF ACTIONS

Coordination actions

Nr.	Action	Impor-tance	Feasibi-lity	Crossref.
CORD-01	Implementation of the CMP: Coordinator and Steering Committee *(Need to check for mutualisation with other CMP)*	ESSENTIAL	HIGH	ALL

CORD-02	Development of a governance and monitoring structure including the sub-area coordinators. *(Need to check for mutualisation with other CMP)*	ESSENTIAL	HIGH	ALL
CORD-03	Consolidation of a "capillary" network for data collection and monitoring (on the model of the TursioMed project), connected through a common Web-GIS platform (www.intercet.it). The network should be considered as the bearing structure for the proper implementation of the research and monitoring activities of the CMP) *(Need to check for mutualisation with other CMP)*	ESSENTIAL	HIGH	

Capacity building and public awareness actions

Nr.	Action	Impor-tance	Feasibi-lity	Crossref.
CBPA-01	Development of a strategy to increase stakeholders' awareness and build capacity in range states with a focus on: (1) Occurrence; (2) Threats and mitigation *(Need to check for mutualisation with other CMP)*	HIGH	HIGH	CORD-01 CORD-02 CORD-03

Research actions essential for providing adequate management advice

Nr.	Action	Impor-tance	Feasibi-lity	Crossref.
RES-01	Identify the geographical/management units of bottlenose dolphin within the ACCOBAMS area: area of residence, size consistency, size trend, connectivity, genetic differentiation.	HIGH	HIGH	ALL
RES-02	Improve knowledges on the use of the (micro)habitat, also in relation to human activity (using also passive acoustic techniques).	HIGH	HIGH	
RES-03	Support research campaigns in poorly covered areas (especially in the southeast Med basin).	HIGH	MEDIUM	
RES-04	Map and monitoring the interactions between bottlenose dolphin and fishing	HIGH	MEDIUM	

	activities (possibly using automatic acoustic devices)			
RES-05	Connection with stranding network for cross analysis (genetic differentiation, toxicology, other).	HIGH	HIGH	

Monitoring actions

Nr.	Action	Impor-tance	Feasibi-lity	Crossref.
MON-01	Support the CMP network (see CORD-03) for long-term monitoring activities. The Monitoring network should be able to detect a deviation in the attributes and send an alert to the coordination system.	HIGH	HIGH	

Mitigation measure actions

Nr.	Action	Impor-tance	Feasibi-lity	Crossref.
MIT-01	Wider adoption and implementation of guidelines, resolutions… (such as IWC/ACCOBAMS/CMS) to mitigate adverse impact of anthropogenic activities affecting bottlenose dolphin	HIGH	HIGH	

8 ACTIONS

[just a few possible examples are provided below that will need reviewing and finalising]

The Actions are described below, with each action beginning on a new page. One of the first tasks for the Coordinator and Steering Committee will be to develop detailed specifications for each action and where appropriate, assign costings and likely sources of funding.

ACTION CORD-01: IMPLEMENTATION OF THE CMP: COORDINATOR AND STEERING COMMITTEE

Coordination Action Priority*:* **HIGH**

DESCRIPTION OF ACTION

- **Specific objectives:**
- **Rationale:**
- **Target:**
- **Timeline:**

	WHAT	WHO	WHEN
(1)			
(2)			
(3)			
(4)			
(5)			
(6)			
(7)			
(8)			

INITIAL BUDGET ITEMS TO BE CONSIDERED BY ISC

ACTORS

- **Responsible for coordination of action:**
- **Stakeholders:**

ACTION EVALUATION

PRIORITY

- **Importance:** high
- **Feasibility:** high

ACTION CORD-02: DEVELOPMENT OF A GOVERNANCE AND MONITORING STRUCTURE INCLUDING THE SUB-AREA COORDINATORS.

Co-ordination Action Priority: **HIGH**

DESCRIPTION OF ACTION

- **Specific objective**:

- **Rationale**:
- **Target:**
- **Timeline:**

	WHAT	WHO	WHEN
(1)			
(2)			
(3)			
(4)			
(5)			
(6)			
(7)			
(8)			

ACTORS

- **Responsible for coordination of action:**
- **Stakeholders**:

ACTION EVALUATION

PRIORITY

- **Importance:** high
- **Feasibility:** high

ACTION CORD-03: CONSOLIDATION OF A NETWORK FOR DATA COLLECTION AND MONITORING

Co-ordination Action Priority: **HIGH**

DESCRIPTION OF ACTION

- **Specific objective**:
- **Rationale:**
- **Target:**
- **Timeline:**

	WHAT	WHO	WHEN
(1)			
(2)			
(3)			
(4)			
(5)			
(6)			
(7)			
(8)			

INITIAL BUDGET ITEMS TO BE CONSIDERED BY ISC

ACTORS

- **Responsible for co-ordination of the action:**
- **Stakeholders**:

ACTION EVALUATION

PRIORITY

- **Importance**: high
- **Feasibility**: high

ACTION CABPA-01: DEVELOPMENT OF A STRATEGY TO INCREASE STAKEHOLDERS' AWARENESS AND BUILD CAPACITY IN RANGE STATES.

Public Awareness and Capacity Building Action Priority: **HIGH**

DESCRIPTION OF ACTION

- **Specific objective**:
- **Rationale:**
- **Target:**
- **Timeline:**

	WHAT	WHO	WHEN
(1)			
(2)			
(3)			
(4)			
(5)			
(6)			
(7)			
(8)			

ACTORS

- **Responsible for co-ordination of the action:**
- **Stakeholders**:

ACTION EVALUATION

PRIORITY

- **Importance:**
- **Feasibility:**

ACTION RES-01: IDENTIFY THE GEOGRAPHICAL/MANAGEMENT UNITS OF BOTTLENOSE DOLPHIN WITHIN THE ACCOBAMS AREA

Research Action *Priority: HIGH*

DESCRIPTION OF ACTION

- **Specific objective**:
- **Rationale:**
- **Target:**
- **Timeline:**

	WHAT	WHO	WHEN
(1)			
(2)			
(3)			
(4)			
(5)			
(6)			
(7)			
(8)			

INITIAL BUDGET ITEMS TO BE CONSIDERED BY ISC

ACTORS

- **Responsible for co-ordination of the action:**
- **Stakeholders**:

ACTION EVALUATION

PRIORITY

- **Importance:**
- **Feasibility:**

ACTION RES-02: IMPROVE KNOWLEDGES ON THE USE OF THE (MICRO)HABITAT, ALSO IN RELATION TO HUMAN ACTIVITY

Research Action *Priority: HIGH*

DESCRIPTION OF ACTION

- **Specific objective**:
- **Rationale:**
- **Target:**
- **Timeline:**

	WHAT	WHO	WHEN
(1)			
(2)			
(3)			
(4)			
(5)			
(6)			
(7)			
(8)			

INITIAL BUDGET ITEMS TO BE CONSIDERED BY ISC

ACTORS

- **Responsible for co-ordination of the action:**
- **Stakeholders**:

ACTION EVALUATION

PRIORITY

- **Importance:**
- **Feasibility:**

ACTION RES-03: SUPPORT RESEARCH CAMPAIGNS IN POORLY COVERED AREAS (ESPECIALLY IN THE SOUTHEAST MED BASIN).

Research Action *Priority: HIGH*

DESCRIPTION OF ACTION

- **Specific objective**:
- **Rationale:**
- **Target:**
- **Timeline:**

	WHAT	WHO	WHEN
(1)			
(2)			
(3)			
(4)			
(5)			
(6)			
(7)			
(8)			

INITIAL BUDGET ITEMS TO BE CONSIDERED BY ISC

ACTORS

- **Responsible for co-ordination of the action:**
- **Stakeholders**:

ACTION EVALUATION

PRIORITY

- **Importance:**
- **Feasibility:**

ACTION RES-04: MAP AND MONITORING THE INTERACTIONS BETWEEN BOTTLENOSE DOLPHIN AND FISHING ACTIVITIES

Research Action *Priority: HIGH*

DESCRIPTION OF ACTION

- **Specific objective**:
- **Rationale:**
- **Target:**
- **Timeline:**

	WHAT	WHO	WHEN
(1)			
(2)			
(3)			
(4)			
(5)			
(6)			
(7)			
(8)			

INITIAL BUDGET ITEMS TO BE CONSIDERED BY ISC

ACTORS

- **Responsible for co-ordination of the action:**
- **Stakeholders**:

ACTION EVALUATION

PRIORITY

- **Importance:**
- **Feasibility:**

ACTION RES-05: CONNECTION WITH STRANDING NETWORK FOR CROSS ANALYSIS (GENETIC DIFFERENTIATION, TOXICOLOGY, OTHER).

Research Action *Priority: HIGH*

DESCRIPTION OF ACTION

- **Specific objective**:
- **Rationale:**
- **Target:**
- **Timeline:**

	WHAT	WHO	WHEN
(1)			
(2)			

(3)			
(4)			
(5)			
(6)			
(7)			
(8)			

INITIAL BUDGET ITEMS TO BE CONSIDERED BY ISC

ACTORS

- **Responsible for co-ordination of the action:**
- **Stakeholders**:

ACTION EVALUATION

PRIORITY

- **Importance:**
- **Feasibility:**

ACTION MON-01: SUPPORT THE CMP NETWORK (SEE CORD-03) FOR LONG-TERM MONITORING ACTIVITIES (THE MONITORING NETWORK SHOULD BE ABLE TO DETECT A DEVIATION IN THE ATTRIBUTES AND SEND AN ALERT TO THE COORDINATION SYSTEM).

Research Action *Priority: HIGH*

DESCRIPTION OF ACTION

- **Specific objective**:
- **Rationale:**
- **Target:**
- **Timeline:**

	WHAT	WHO	WHEN
(1)			
(2)			
(3)			
(4)			
(5)			

(6)			
(7)			
(8)			

INITIAL BUDGET ITEMS TO BE CONSIDERED BY ISC

ACTORS

- **Responsible for co-ordination of the action:**
- **Stakeholders**:

ACTION EVALUATION

PRIORITY

- **Importance:**
- **Feasibility:**

ACTION MIT-01: WIDER ADOPTION AND IMPLEMENTATION OF GUIDELINES, RESOLUTIONS… (SUCH AS IWC/ACCOBAMS/CMS) TO MITIGATE ADVERSE IMPACT OF ANTHROPOGENIC ACTIVITIES

Research Action *Priority: HIGH*

DESCRIPTION OF ACTION

- **Specific objective**:
- **Rationale:**
- **Target:**
- **Timeline:**

	WHAT	WHO	WHEN
(1)			
(2)			
(3)			
(4)			
(5)			
(6)			
(7)			
(8)			

INITIAL BUDGET ITEMS TO BE CONSIDERED BY ISC

ACTORS

- **Responsible for co-ordination of the action:**
- **Stakeholders**:

ACTION EVALUATION

PRIORITY

- **Importance:**
- **Feasibility:**

9 REFERENCES

To be added on completion of draft

REFERENCES

Aguilar, A., Borrell, A. and Reijnders, P.J.H. 2002. Geographical and temporal variation in levels of organochlorine contaminants in marine mammals. Marine Environmental Research 53: 425-452.

Arcangeli, A., Campana, I., & Bologna, M. A. (2017). Influence of seasonality on cetacean diversity, abundance, distribution and habitat use in the western Mediterranean Sea: implications for conservation. *Aquatic Conservation: Marine and Freshwater Ecosystems*, *27*(5), 995-1010.

Azzolin A., Arcangeli A., Campana I., Crosti R., Giovannini A., Paraboschi M., Ramazio M., Turano E., Vlachogianni T., Zampollo A., Giacoma C. 2016. *Tursiops truncatus* and *Stenella coeruleoalba* conservation in the Adriatic and Ionian Sea. *Biol. Mar. Med.*, 23(1): 336-340.

Azzolin M., Galante I., Giacoma C., La Manna G. (2007). Action Plan for bottlenose dolphin (Tursiops truncatus) of the Pelagie Archipelago. (LIFE03 NAT/IT/000163). 83 pp.

Barón, E., Giménez, J., Verborgh, P., Gauffier, P., De Stephanis, R., Eljarrat, E., Barceló, D. 2015a. Bioaccumulation and biomagnification of classical flame retardants, related halogenated natural compounds and alternative flame retardants in three delphinids from Southern European waters. *Environmental Pollution*, 203: 107-115.

Barón, E., Hauler, C., Gallistl, C., Giménez, J., Gauffier, P., Castillo, J. J., Fernández-Maldonado C., de Stephanis R., Vetter W., Eljarrat E., Barceló D. 2015b. Halogenated natural products in dolphins: brain–blubber distribution and comparison with halogenated flame retardants. *Environmental science & technology*, 49(15): 9073-9083.

Barros N.B., Odell D.K., 1990. Food habits of bottlenose dolphins in the southeastern United States. In: Leatherwood S, Reeves RR (eds) The Bottlenose Dolphin. Academic Press, San Diego, pp 309-328.

a mis en forme : Police :Calibri, 11 pt, Italien (Italie)

Bayas-Rea R de los Á, Félix F, Montufar R (2018) Genetic divergence and fine scale population structure of the common bottlenose dolphin (Tursiops truncatus , Montagu) found in the Gulf of Guayaquil, Ecuador. PeerJ 6:e4589.

Bearzi G., Politi E., Notarbartolo di Sciara G. 1999. Diurnal behaviour of bottlenose dolphins in the Kvarneric, Marine Mammal Science.

Bearzi G, Fortuna C. 2006. Common bottlenose dolphin (Mediterranean subpopulation). In The Status and Distribution of Cetaceans in the Black Sea and Mediterranean Sea, Reeves RR, Notarbartolo di Sciara G (compilers and eds). IUCN Centre forMediterranean Cooperation:Malaga, Spain; 64–73.

Bearzi G., Fortuna C., Reeves R.R. 2009. Ecology and conservation of common bottlenose dolphins *Tursiops truncatus* in the Mediterranean Sea. *Mammal Review*, 39: 92-123.

Ben Naceur L., Gannier A., Bradai M.N., Drouot V., Bourreau S., Laran S., Khalfallah N., Mrabet R., Bdioui M. 2004. Recensement du grand dauphin *Tursiops truncatus* dans les eaux tunisiennes. Bull. Inst. Natn. Scien. Tech. Mer de Salammbô 31:75-81.

Blanco C, Salomón O, Raga, JA. 2001. Diet of bottlenose dolphin (*Tursiops truncatus*) in the wester Mediterranean Sea. Journal of the Marine Biological Association of the United Kingdom 81: 1053–1058.

Blasi M., Boitani L., 2012. Modelling fine-scale distribution of the bottlenose dolphin Tursiops truncatus using physiographic features on Filicudi (southern Thyrrenian Sea, Italy). Endag. Species Res. 17, 269-288.

Birkun, A. 2006. Common bottlenose dolphin (*Tursiops truncatus ponticus*): Black Sea subspecies. In: R. R. Reeves and G. Notarbartolo di Sciara (eds), The status and distribution of cetaceans in the Black Sea and Mediterranean Sea, pp. 74-83. IUCN Centre for Mediterranean Cooperation, Malaga, Spain.

Brotons J.M., Grau A.M., Rendell L., 2008. Estimating the impact of interactions between bottlenose dolphins and artisanal fisheries around the Balearic Islands. Mar Mamm Sci 24:112-127.

Brotons JM, Islas-Villanueva V, Alomar C, et al (2019) Genetics and stable isotopes reveal non-obvious population structure of bottlenose dolphins (*Tursiops truncatus*) around the Balearic Islands. Hydrobiologia 842:1–15.

Buscaino et al. 2009. Pinger affects fish catch efficiency and damage to bottom gill nets related to bottlenose dolphins. *Fisheries Science*, 75(3): 537–544.

Buscaino et al. 2021. Artisanal fishing, dolphins, and interactive pinger: A study from a passive acoustic perspective. *Aquatic Conserv: Mar Freshw Ecosyst*. 1–16.

Cagnolaro L, Di Natale A, Notarbartolo di Sciara G. 1983. Cetacei. Guide per il riconoscimento delle specie animali delle acque lagunari e costiere italiane. AQ/1/224, 9. Consiglio Nazionale delle Ricerche: Genova, Italy.

Cañadas A., Hammond P.S.2006. Model-based abundance estimates for bottlenose dolphins off southern Spain: implicationsfor conservation and management. Journal of Cetacean Research and Management 8: 13-27.

Cañadas A, Sagarminaga R, Garcia-Tiscar S. 2002. Cetacean distribution related with depth and slope in the Mediterranean waters off southern Spain. Deep-Sea Research I 49: 2053–2073.

Carnabuci, M., Schiavon, G., Bellingeri, M., Fossa, F., Paoli, C., Vassallo, P., and G. Gnone. 2016. Connectivity in the network macrostructure of Tursiops truncatus in the Pelagos Sanctuary (NW Mediterranean Sea): does landscape matter? Population ecology, 58: 249-264.

Charlton-Robb K., Gershwin L., Thompson R., Austin J., Owen K., McKechnie S., 2011. A New Dolphin Species, the Burrunan Dolphin Tursiops australis sp. nov., Endemic to Southern Australian Coastal Waters. PLoS One, 6(9): e24047. doi: 10.1371/journal.pone.0024047.

Chen I, Nishida S, Yang W-C, et al (2017) Genetic diversity of bottlenose dolphin (Tursiops sp.) populations in the western North Pacific and the conservation implications. Mar Biol 164:202.

Chilvers B.L., Corkeron P.J., 2001. Trawling and bottlenose dolphins'social structure. Proc. R. Soc. Lond. 268, 1901-1905.

Claro F., Fossi M.C., Loakeimidis C., Baini M., Lusher A.L., Mc Fee W., McIntosh R.R., Pelamattig T., S M., Galgani F., Hardesty B.D. (2019). Tools and constraints in monitoring interactions between m litter and megafauna: Insights from case studies around the world. Marine Pollution Bulletin 141. 147–160

Connor R.C., Wells R.S., Mann J., Read A.J., 2000. The bottlenose dolphin: social relationships in a fission-fusion society. In: Mann J, Conner RC, Tyack PL, Whitehead H (eds) Cetacean societies: field studies of dolphins and whales. University of Chicago Press, Chicago, pp 91-126.

Corkeron P.J., Bryden M.M., Hedstrom K.E., 1990. Feeding by bottlenose dolphins in association with trawling operations in Moreton Bay, Australia. In: Leatherwood S, Reeves RR (eds) The bottlenose dolphin. Academic Press, San Diego, pp 329-336.

Cuvertoret-Sanz M., López-Figueroa C., O'Byrne A., Canturri A., Martí-Garcia B., Pintado E., Pér Ganges L., Cobos A., Abarca M.L., Raga J.A., Van Bressem M-F., Domingo M. 2020. Causes of ceta stranding and death on the Catalonian coast (western Mediterranean Sea), 2012–2019. *Diseas Aquatic Organisms*, 142: 239-253. https://doi.org/10.3354/dao03550

David, L. 2002. Disturbance to Mediterranean cetaceans caused by vessel traffic. In Notarbartolo di S G. (ed.) Cetaceans of the Mediterranean and Black Seas: state of knowledge and conserv strategies. A report to the ACCOBAMS Secretariat, Monaco, February 2002, Section 11, 21 pp.

de Stephanis R., Verborgh P., Pérez Gimeno N., Sánchez Cabanes A., Pérez Jorge S., Esteban Pavo R., N., Urquiola E., Guinet C. 2005. Impactos producidos por el tráfico marítimo en las poblacion cetáceos en el estrecho de Gibraltar. Situación actual y previsiones de futuro. Dirección General la Biodiversidad del Ministerio de Medio Ambiente. 140 pp.

Díaz López B. 2006. Interactions between Mediterranean bottlenose dolphins (*Tursiops truncatus* gillnets off Sardinia, Italy. *ICES Journal of Marine Science*, 63: 946–951.

Díaz López, B. 2019. 'Hot deals at sea': Responses of a top predator (bottlenose dolphin, *Tur truncatus*) to human-induced changes in the coastal ecosystem. Behavioral Ecology, 30(2), 291e3

Díaz López B, Shirai JAB. 2007. Bottlenose dolphin (*Tursiops truncatus*) presence and incidental capt a marine fish farm on the north-eastern coast of Sardinia (Italy). J Mar Biol Ass UK. 87:113–117.

Díaz López B, Bunke M, Shirai JAB. 2008. Marine aquaculture off Sardinia Island (Italy): ecosystem e evaluated through a trophic mass-balance model. Eco Modell. 212:292–303.

Díaz López, B., Addis, A. and Fabiano, F. 2013. Ecology of common bottlenose dolphins along the N western Sardinian coastal waters (Italy). Thalassas: An international journal of marine sciences, pp.35-44.

Duffield D.A., Ridgway S.H., Cornell L.H., 1983. Haematology distinguishes coastal and offshore for dolphins (Tursiops). Canadian Journal of Zoology 61, 930-933.

Fertl D., Leatherwood S., 1997. Cetacean interactions with trawls: a preliminary review. J Northwest Atl Fish Sci 22:219-248.

Forcada J., Gazo M., Aguilar A., Gonzalvo J., Fernandez-Contreras M. 2004. Bottlenose dolphin abundance in the NW Mediterranean: addressing heterogeneity in distribution. Mar. Ecol. Prog. Ser. 275:275-87.

Fossi, M.C. & Marsili, L. 2003. Effects of endocrine disruptors in aquatic mammals. Pure and Applied Chemistry 75(11-12): 2235-2247.

Gaspari S, Holcer D, Mackelworth P, et al (2015a) Population genetic structure of common bottlenose dolphins(Tursiops truncatus) in the Adriatic Sea and contiguous regions: implications for international conservation. Aquat Conserv Mar Freshw Ecosyst 25: 212–222.

Gaspari S, Marsili L, Natali C, et al (2019) Spatio-temporal patterns of genetic diversity in the Mediterranean striped dolphin (Stenella coeruleoalba). *J Zool Syst Evol Res*, 57: 721–734.

Gaspari S, Scheinin A, Holcer D, et al (2015b) Drivers of Population Structure of the Bottlenose Dolphin (Tursiops truncatus) in the Eastern Mediterranean Sea. Evol Biol 42: 177–190.

Genov, T., Centrih, T., Kotnjek, P. et al. Behavioural and temporal partitioning of dolphin social groups in the northern Adriatic Sea. Mar Biol 166, 11 (2019). https://doi.org/10.1007/s00227-018-3450-8

Genov T., Jepson P.D., Barber J.L., Hace A., Gaspari S., Centrih T., Lesjak J., Kotnjek P. 2019. Linking organochlorine contaminants with demographic parameters in free-ranging common bottlenose dolphins from the northern Adriatic Sea. *Science of The Total Environment,* 657: 200-212.

Giménez, J., Authier, M., Valeiras, J., Abad, E., Marçalo, A., Coll, Gauffier P., Santos M.B., de Stephanis, R. 2021. Consumption rates and interaction with fisheries of Mediterranean common dolphins in the Alboran Sea. *Regional Studies in Marine Science*, 45, 101826.

Giménez, J., Marçalo, A., Ramírez, F., Verborgh, P., Gauffier, P., Nicolau L, González-Ortegón E., Baldó F., Vilas C., Vingada J., Forero M.G., de Stephanis R. 2017. Diet of bottlenose dolphins (*Tursiops truncatus*) from the Gulf of Cadiz: Insights from stomach content and stable isotope analyses. *Plos One*, 12(9), e0184673.

Gnone G, Bellingeri M, Dhermain F, Dupraz F, Nuti S, Bedocchi D, Moulins A, Rosso M, Alessi J, McCrea RS, Azzellino A, Airoldi S, Portunato N, Laran S, David L, Di Meglio N, Bonelli P, Montesi G, Trucchi R, Fossa F, Wurtz M. 2011. Distribution, abundance and movements of the bottlenose dolphin (*Tursiops truncatus*) in the Pelagos Sanctuary MPA (north-west Mediterranean Sea). Aquatic Conservation 21, 372-388.

Gnone *et al*. 2021. TursioMed - Final Scientific Report - June 2020 (unpublished).

Gnone G, Caltavuturo G, Tomasini A, Zavatta V, Nobili A. 2005. Analysis of the presence of the bottlenose dolphin (*Tursiops truncatus*) along the Italian peninsula in relation to the bathymetry of the coastal band. Atti Società Italiana di Scienze Naturali Museo civico di Storia Naturale di Milano 146: 39–48.

Gomez de Segura A., Crespo E.A., Pedraza S.N., Hammond P.S., Raga J.A. 2006. Abundance of small cetaceans in the waters of the central Spanish Mediterranean. Mar. Biol. 150: 149-160.

Gonzalvo J, Lauriano G, Hammond PS, et al (2016) The Gulf of Ambracia's Common Bottlenose Dolphins, Tursiops truncatus: A Highly Dense and yet Threatened Population. Adv Mar Biol 75:259–296.

Gonzalvo J, Valls M, Cardona L, Aguilar A. 2008. Factors determining the interactions between bottom trawlers off the Balearic Archipelago (western Mediterranean Sea). Journal of Experimental Marine Biology and Ecology 367: 47–52.

Hale P.T., Barreto A.S., Ross G.J.B., 2000. Comparative morphology and distribution of the aduncus and truncatus forms of bottlenose dolphin Tursiops in the Indian and Western Pacific Ocean. Aquatic Mammals 26, 101-110.

Hoelzel, A.R., Potter, C.W. & Best, P. 1998. Genetic differentiation between parapatric 'nearshore' and 'offshore' populations of the bottlenose dolphin. *Proc. Royal Soc. B.* **265**:1-7

~~Hoelzel R.A., 1998. Genetic structure of~~ cetacean ~~populations in sympatry, parapatry and mixed assemblages: implications for conservation policy. Journal of Heredity 89, 451-458.~~

Hersh S.L., Duffield D.A., 1990. Distinction between northwest Atlantic offshore and coastal bottlenose dolphins based on haemoglobin profile and morphometry. In the Bottlenose Dolphin, Leatherwood S, Reeves RR (eds). Academic Press: San Diego, CA; pp. 129-139.

Hershkovitz P., 1966. A catalogue of living whale. Bulletin of the United States National Museum 246: 1-259.

Jedensjö M, Kemper CM, Milella M, et al. 2020. Taxonomy and distribution of bottlenose dolphins (Genus tursiops) in australian waters: An osteological clarification. *Can J Zool*, 98: 461–479.

Kopps A.M., Ackermann C.Y., Sherwin W.B., Allen S.J., Bejder L., Krützen M., 2014. Cultural transmission of tool use combined with habitat specializations leads to fine-scale genetic s\tructure in bottlenose dolphins. Proc R Soc B Biol Sci 281, 20133245.

La Manna G., Rako Gospi´ N., Manghi M., Picciulin M., Sarà G. 2017. Assessing geographical variation on whistle acoustic structure of three Mediterranean populations of common bottlenose dolphin (*Tursiops truncatus*). *Behavior* (2017). DOI:10.1163/1568539X-00003435

Laran S., Pettex E., Authier M., Blanck A., David L., Dorémus G., Falchetto H., Monestiez P., Van Canneyt O., Ridoux V., 2017. Seasonal distribution and abundance of cetaceans within French waters- Part I: The North-Western Mediterranean, including the Pelagos sanctuary. Deep Sea Research Part II: Topical Studies in Oceanography 141, 20-30.

Lauriano G., Fortuna C.M., Moltedo G., Notarbartolo di Sciara G., 2004. Interactions between common bottlenose dolphins (Tursiops truncatus) and the artisanal fishery in Asinara Island National Park (Sardinia): assessment of catch damage and economic loss. J. Cetacean Res. Manag. 6, 165-173.

Lauriano G., Mackelworth P., Fortuna C.M. 2003. Densità e abbondanza relativa del tursiope (*Tursiops truncatus*) nel parco nazionale dell'Asinara, Sardegna. Biol. Mar. Medit. 10(2):717-720.

Lauriano G, Pierantonio N, Donovan G, Panigada S. 2014. Abundance and distribution of *Tursiops truncatus* in the Western Mediterranean Sea: an assessment towards the Marine Strategy Framework Directive requirements. Mar. Environ. Res. 100: 86-93. DOI: 10.1016/j.marenvres.2014.04.001.

Louis M., Viricel A., Lucas T., Peltier H., Alfonsi E., Berrow S., Brownlow A., Covelo P., Dabin W., Deaville R., de Stephanis R., Gally F., Gauffier P., Penrose R., Silva M.A., Guinet C., Simon-Bouhet B. 2014. Habitat-driven population structure of bottlenose dolphins, Tursiops truncatus, in the North-East Atlantic. *Molecular Ecology*, 23(4) : 857–874. https://doi.org/10.1111/mec.12653

Marsili, L. and Focardi, S. 1997. Chlorinated hydrocarbon (HCB, DDTs and PCBs) levels in cetaceans stranded along the Italian coasts: an overview. Environmental Monitoring and Assessment 45: 129-180.

Mead J.G., Potter C.W., 1995. Recognizing two populations of the bottlenose dolphin (Tursiops truncatus) off the Atlantic coast of North America: morphologic and ecologic considerations. IBI Reports 5, 31-44.

Milani, C., Vella, A., Vidoris, P., Christidis, A., Koutrakis, E., & Kallianiotis, A. 2017a. Cetacean strandings and diet analyses in the North Aegean Sea (Greece). Journal of the Marine Biological Association of the United Kingdom, 98, 1011–1028. https://doi.org/10.1017/S0025315417000339

Milani, C., Vella, A., Vidoris, P., Christidis, A., Koutrakis, E., Sylaios, G., & Kallianiotis, A. 2017b. Abundance and distribution of bottlenose dolphins in North Aegean (Greece). Journal of Black Sea/Mediterranean Environment, 23(2), 101–120.

Milani, C., Vella, A., Vidoris, P., Christidis, A., Kamidis N., & Lefkaditou E. 2019. Interactions between fisheries and cetaceans in the Thracian Sea (Greece) and management proposals. Fisheries Management and Ecology, 00: 1-15. https ://doi.org/10.1111/fme.12370

Mioković D, Kovačić D, Pribanić S. 1999. Stomach contents analysis of one bottlenose dolphin (*Tursiops truncatus* Montagu, 1821) from the Adriatic Sea. Natura Croatica 8: 61–65.

Mirimin L, Miller R, Dillane E, et al (2011) Fine-scale population genetic structuring of bottlenose dolphins in Irish coastal waters. Anim Conserv 14:342–353.

Moore, D.M. 2020. An investigation into the environmental drivers of evolution in marine predators. PhD Thesis, Department of Biosciences, Durham University.

Moura, A.E., Nielsen, S.C.A., Vilstrup, J.T., Moreno-Mayar, J.V., Gilbert, M.T.P., Gray, H., Natoli, A., Moller, L. & Hoelzel, A. R. 2013. Recent diversification of a marine genus (*Tursiops spp.*) tracks habitat preference and environmental change. *Syst. Biol.* **62**, 865-877.

Moura, A.E., Shreves, K., Pilot, M., Andrews, K.R., Moore, D.M., Kishida, T., Moller, L., Natoli, A., Gaspari, S., McGowen, M., Chen, I., Gray, H., Gore, M., Culloch, R.M., Kiani. M.S.Willson, M.S., Bulushi, A., Collins, T., Baldwin, R., Wilson, A., Minton, G., Ponnampalam L, & Hoelzel, A.R. 2020. Phylogenomics of the genus Tursiops and closely related Delphininae reveals extensive reticulation among lineages and provides inference about eco-evolutionary drivers. *Mol. Phylo & Evol.* 146, 106756

Natoli A, Birkun A, Aguilar A, Lopez A, Hoelzel AR. 2005. Habitat structure and the dispersal of mal female bottlenose dolphins (Tursiops truncatus). Proceedings of the Royal Society of London B 1217–1226.

Notarbartolo di Sciara G, Demma M. 1994. Guida dei Mammiferi Marini del Mediterraneo. Franco Muzzio Editore: Padova, Italy.

Orsi Relini L, Capello M, Poggi R. 1994. The stomach content of some bottlenose dolphins (Tursiops truncatus) from the Ligurian Sea. European Research on Cetaceans 8: 192–195.

Orsi Relini L., Papacostantinou C., Jukic-Peladic S., De Solas L. G., Piccinetti C. Kavadas S. and Rossi M. 2002. Distribution of the Mediterranean hake populations (*Merluccius merluccius smiridus* Rafinesque, 1810) (Osteichthyes: Gadiformes) based on six years monitoring by trawl-surveys: some implications for management. SCI. MAR., 66 (Suppl. 2): 21-38.

Pace D.S., Pulcini M., Triossi F., 2003. Interactions with fisheries: modalities of opportunistic feeding for bottlenose dolphins at Lampedusa Island. Eur Res Cetaceans 17, 132-135.

Papale E., Alonge G., Grammauta R., Ceraulo M., Giacoma C., Mazzola S., Buscaino G. 2020. Year-round acoustic patterns of dolphins and interaction with anthropogenic activities in the Sicily Strait, central Mediterranean Sea. *Ocean and Coastal Management*, 197. https://doi.org/10.1016/j.ocecoaman.2020.105320

a mis en forme : Police :Calibri, 11 pt, Anglais (Royaume-Uni)

a mis en forme : Police :Calibri, 11 pt, Anglais (Royaume-Uni)

a mis en forme : Police :Calibri, 11 pt, Anglais (Royaume-Uni)

a mis en forme : Police :Calibri, 11 pt, Anglais (Royaume-Uni)

Papale E., Azzolin M. and Giacoma C. 2011. Vessel traffic affects bottlenose dolphin (*Tursiops truncatus*) behaviour in waters surrounding Lampedusa Island, south Italy. *Journal of the Marine Biological Association of the UK* 92: 1877-1885. DOI: 10.1017/S002531541100083X

Papale E., Ceraulo M., Giardino G., Buffa G., Filiciotto F., Grammauta G., Maccarrone V., Mazzola S., Buscaino G. 2016. Association patterns and population dynamics of bottlenose dolphins in the Strait of Sicily (Central Mediterranean Sea): implication for management. *Population Ecology*. DOI 10.1007/s10144-016-0566-x

Parsons KM, Durban JW, Claridge DE, et al (2006) Population genetic structure of coastal bottlenose dolphins (Tursiops truncatus) in the Northern Bahamas. *Mar Mammal Sci*, 22:276–298.

Pilleri G, Gihr M. 1969. Uber adriatische Tursiops truncatus (Montagu, 1821) und vergleichende Untersuchungen über mediterrane und atlantische Tümmler. Investigations on Cetaceans 1: 66–73.

Piroddi, C., Bearzi, G., & Christensen, V. 2011. Marine open cage aquaculture in the eastern Mediterranean Sea: a new trophic resource for bottlenose dolphins. *Marine Ecology Progress Series*, 440: 255-266.

Poeta, G., Staffieri, E., Acosta, A. T., & Battisti, C. (2017). Ecological effects of anthropogenic litt marine mammals: A global review with a "black-list" of impacted taxa. *Hystrix, the Italian Journ Mammalogy*, *28*(2), 253-264.

Profeta F, Di Francesco CE, Marsilio F, et al (2015) Retrospective seroepidemiological investigations against Morbillivirus, Toxoplasma gondii and Brucella spp. in cetaceans stranded along the Italian coastline (1998–2014). *Res Vet Sci*, 101: 89-92.

Reeves R.R., Notarbartolo di Sciara G. (compilers and eds.), 2006. The status and distribution of Cetaceans in the Black Sea and Mediterranean Sea. IUCN Centre for Mediterranean Cooperation: Malaga, Spain.

Rice D.W., 1998. Marine Mammals of the World: systematics and distribution. The Society for Marine Mammology, Special publication 4: Lawrence, KS.

Romanić S.H., Holcer D., Lazar B., Klinčić D., Mackelworth P. and Fortuna C. M. 2014. Organochlorine contaminants in tissues of common bottlenose dolphins *Tursiops truncatus* from the northeastern part of the Adriatic Sea. *Environ Toxicol Pharmacol*, 38:469-79. DOI: 10.1016/j.etap.2014.07.017.

Ross G.J.B., Cockcroft V.G., 1990. Comments on Australian bottlenose dolphins and the taxonomic status of Tursiops aduncus (Ehrenberg, 1832). In The Bottlenose Dolphin, Leatherwood S, Reeves RR (eds). Academic Press: San Diego; pp. 101-128.

Rossi, A., Scordamaglia, E., Bellingeri, M., Gnone, G., Nuti, S., Salvioli, F., Manfredi, P. and G. Santangelo. 2017. Demography of the bottlenose dolphin *Tursiops truncatus* (Mammalia: Delphinidae) in the Eastern Ligurian Sea (NW Mediterranean): quantification of female reproductive parameters. *The European Zoological Journal*, 84: 294-302.

Scuderi A., Voliani A., Mancusi C., Pedà C., Romeo T. 2011. Stomach contents of bottlenose dolphins stranded along the coasts of Tuscany (North Western Mediterranean Sea). *25th Conference of European Cetacena Society*, 21 - 23 March 2011, Cadiz, Spain.

Segura-García I, Rojo-Arreola L, Rocha-Olivares A, et al (2018) Eco-Evolutionary Processes Generating Diversity Among Bottlenose Dolphin, Tursiops truncatus, Populations off Baja California, Mexico. Evol Biol 45:223–236.

a mis en forme : Police :(Par défaut) Calibri, 11 pt, Italien (Italie)

a mis en forme : Police :(Par défaut) Calibri, 11 pt

Shapiro K, VanWormer E, Packham A, et al (2019) Type X strains of Toxoplasma gondii are virulent for southern sea otters (*Enhydra lutris nereis*) and present in felids from nearby watersheds. Proc R Soc B 286:.

Shoham-Fridera E., Kressa N., Wynneb D., Scheininc A., Roditi-Elsarc M., Kerem K. 2009. Persistent organochlorine pollutants and heavy metals in tissues of common bottlenose dolphin (*Tursiops truncatus*) from the Levantine Basin of the Eastern Mediterranean. *Chemosphere*, 77: 621-627. DOI: 10.1016/j.chemosphere.2009.08.048

Storelli, M.M., Barone, G., Piscitelli, G., Storelli, A., Marcotrigiano G.O. 2007. Tissue-related polychlorinated biphenyls accumulation in Mediterranean cetaceans: assessment of toxicological status. Bulletin of Environmental Contamination and Toxicology 78: 206-210.

Torres LG, Rosel PE, D'Agrosa C, Read AJ (2003) Improving Management Of Overlapping Bottlenose Dolphin Ecotypes Through Spatial Analysis And Genetics. Mar Mammal Sci 19:502–514

Tezanos-Pinto G, Baker CS, Russell K, et al (2008) A worldwide perspective on the population structure and genetic diversity of bottlenose dolphins (Tursiops truncatus) in New Zealand. J Hered 100:11–24.

Van Bressem M-F, Duignan P, Banyard A, et al (2014) Cetacean Morbillivirus: Current Knowledge and Future Directions. *Viruses*, 6: 5145–5181.

Vassallo P., Marini C., Paoli C., Bellingeri M., Dhermain F., Nuti S., Airoldi S., Bonelli P., Laran S., Marie C. Santoni M.C., Gnone G. 2020. Species-specific distribution model may be not enough: the case study of bottlenose dolphin (*Tursiops truncatus*) habitat distribution in Pelagos Sanctuary. *Aquatic Conservation: Marine and Freshwater Ecosystems*, 30: 1689-1701.

Van Waerebeek K., Reyes J.C., Read A.J., McKinnon J., 1990. Preliminary observation of bottlenose dolphins from the Pacific coast of South America. In The Bottlenose Dolphin, Leatherwood S, Reeves RR (eds). Academic Press: San Diego, CA; pp. 143-154.

Voliani A, Volpi C. 1990. Stomach content analysis of a stranded specimen of Tursiops truncatus. Rapport du Congrès de la Commission Internationale pour l'Exploration Scientifique de la Mer Méditerranée 32.

Walker W.A., 1981. Geographic variation in morphology and biology of bottlenose dolphins (Tursiops truncatus) in the eastern North Pacific. NOAA/NMFS Southwest Fisheries Science Centre Administrative Report No. LJ-81-3c.

Wells R.S., Scott M.D., 2002. Bottlenose Dolphins. In: PERRIN WF, WÜRSIG B AND THEWISSEN JGM. (Eds), The Encyclopedia of Marine Mammals. New York: Academic Press, pp. 122-128.

Wells R.S., Scott M.D., 1999. Bottlenose dolphin Tursiops truncatus (Montagu, 1821). In Handbook of Marine Mammals, Volume VI. The Second Book of Dolphins and Porpoises, Ridgway SH, Harrison R (eds). Academic Press: San Diego, CA; pp. 137-182.

a mis en forme : Police :Calibri, 11 pt, Italien (Italie)