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1 **Structure of a toothed cetacean community around a tropical island** 2 **(Mayotte Island, Mozambique Channel)**

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15
16 We describe the structure of a toothed cetacean community around the island of Mayotte
17 (South-West Indian Ocean, 45°10'E, 12°50'S), using data collected from small boat-based
18 surveys conducted between July 2004 and June 2006. In all, 16 odontocete species were
19 recorded. Diversity (Shannon-Weaver index) was particularly high along the outer slope of
20 the barrier reef. Patterns of spatial distribution underscore the existence of three main
21 cetacean habitat types: the inner lagoon (Indo Pacific bottlenose dolphin *Tursiops aduncus*,
22 and humpback dolphin *Sousa chinensis*), the outer reef slope (Spinner dolphin *Stenella*
23 *longirostris*, Pantropical spotted dolphin *S. Attenuate* and melon-headed whale
24 *Peponocephala electra*) and oceanic waters deeper than 500 m (e.g. Blainville's beaked
25 whale *Mesoplodon densirostris*). Group characteristics were highly variable among species,
26 with oceanic small delphinids characterised by larger group sizes than strictly coastal and
27 non-delphinid oceanic species. The outer slope of the barrier reef appears to be of primary
28 importance in terms of density and diversity of odontocetes around Mayotte. Results support
29 the hypothesis that a number of cetacean species, particularly several delphinid species, are
30 dependant on coral reef complexes.

31
32 **Keywords:** barrier reef slope, cetaceans, community composition, distribution, encounter
33 rates, Indian Ocean, Mayotte, odontocetes

37 **Introduction**

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39

40 A biological community can be defined as the populations of organisms that co-exist in an
41 ecosystem (or habitat). Descriptions of biological communities may consider all taxonomic
42 groups in an ecosystem or be limited to a single functional or taxonomic group (e.g. marine
43 top predators or cetaceans respectively). Characterising biological communities is necessary
44 not only for understanding ecosystem structure and functioning (including trophodynamics),
45 but for providing baseline information against which effects of ecosystem changes can be
46 gauged and to identify critical areas for conservation management. Cetaceans perform a role
47 as top predator in various marine ecosystems (e.g. coastal, slope-associated and oceanic,
48 etc.). The distribution, diversity and group characteristics of cetacean communities have
49 been described for marine ecosystems from polar to tropical waters, including Antarctic
50 waters (Thiele et al. 2000), the Mediterranean Sea (Gannier 2005), off the Bahamas
51 (MacLeod et al. 2004), the Gulf of Mexico (Maze-Foley and Mullin 2006), the South-West
52 Atlantic (Moreno et al. 2005) and in French Polynesia (Gannier 2000, 2002). These studies,
53 conducted at the scale of oceanic basins, regions or archipelagos, have shown that cetacean
54 species partition their habitat according to a number of abiotic and biotic environmental
55 variables, such as physiography and primary production. Most cetacean habitat studies have
56 found that depth was one of the primary environmental features explaining cetacean
57 distribution (e.g. Cañadas et al. 2002).

58

59 The diversity and density of marine top predators including cetaceans at local (insular or
60 archipelago) scales appears to be high relative to ocean-basin or regional scales (Gannier
61 2000, 2002, Baird et al. 2003). Similar to continental margins, where the land plunges to the
62 deep oceanic waters, insular slopes potentially provide more abundant resources and
63 perform essential functions such as nutrient cycling (Levin and Dayton 2009). Turbulence
64 and vertical mixing in island channels are believed to create nutrient-rich conditions around
65 archipelagos (Gilmartin and Revelante 1974). The formation of these isolated, nutrient-rich
66 regions, especially in the oligotrophic regimes of the tropics where ocean productivity is
67 generally low, is the primary reason why islands and archipelagos can serve as 'oases' of
68 biodiversity. These oases are of critical importance for conservation and management
69 actions that require examination over a range of spatial and temporal scales. Despite this,
70 relatively few studies of cetacean community structure around tropical islands and atolls
71 have been conducted thus far (MacLeod et al. 2004, Anderson 2005, Dulau-Drouot et al.
72 2008, Hermans and Pistorius 2008).

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Mayotte is characterised by diverse ecosystems that are in close proximity to each other, i.e. mangroves, fringing reefs, a large semi-closed lagoon, barrier and double-barrier reef systems, and deep oceanic waters within a few kilometres from shore (Quod et al. 2000). The cetacean community is mostly composed of delphinids but it also includes large odontocetes (e.g. ziphiids, kogiids, physeterids), blue whales *Balaenoptera musculus* and humpback whales *Megaptera novaeangliae*. Although some of the species recorded are rare, all are present year-round, with the exception of humpback whales.

In view of the growing need to identify critical areas for marine biodiversity conservation, both locally and regionally, this paper describes the general structure of the odontocete community encountered around the island of Mayotte. We present the diversity of species occurring in the island’s surrounding waters in relation to the main habitat types and provide details on the spatial distribution and encounter rates of the most common species.

Materials and methods

Study area

Mayotte (45°10'E, 12°50'S) is situated in the northern Mozambique Channel and is part of the Comoros archipelago (Figure 1). The island is almost entirely surrounded by a 197 km long barrier reef, with a second double-barrier in the south-west and the immersed reef complex of Iris Bank in the north-west. There are a series of deep passes through the reefs, some of which are the sites of ancient rivers (Quod et al. 2000). The area of the lagoon and surrounding reef complexes is about 1 500 km² with an average of 20 m and a maximum depth of 80 m in the western, older region of the lagoon. There are some 20 small islets in the lagoon, ranging from 1 ha to 242 ha, each of which is surrounded by fringing reefs. There are approximately 670 ha of mangrove forests around the main island, especially in protected bays (Quod et al. 2000). The insular slope on the exterior of the barrier reef is very steep and contains many submarine canyons. Broad canyons, with numerous volcanoes and landslides, deeply incise the slope (Audru et al. 2006).

111 **Data collection**

112

113 Between July 2004 and June 2006, small boat-based surveys were undertaken in the waters
114 surrounding Mayotte. Several types of boats were used: a 7-m catamaran equipped with two
115 four-stroke, 60-hp outboard engines; a 7-m boat equipped with two two-stroke, 40-hp
116 outboard engines; and a 6.4 m cabin boat equipped with one four-stroke, 150-hp outboard
117 engine. Surveys were conducted throughout the study period during daylight hours between
118 07:00h and 18:00h, in sea conditions not exceeding Beaufort 3. Survey vessels did not follow
119 pre-defined transects but every attempt was made to sample each habitat type within the
120 surrounding waters of Mayotte, i.e. coastal areas (mangrove fronts, fringing reef), lagoon
121 waters, barrier reef-associated areas (inner and outer slopes) and oceanic/slope waters
122 (>500 m). Constant GPS logging was used to collect geographic positions every five seconds
123 between departure from and return to the harbour, using a hand-GPS Garmin Gecko®.
124 When cetaceans were encountered, standard sighting data were recorded; i.e. species,
125 group size (maximum, minimum, best estimate) and geographic position. For small
126 aggregations of cetaceans, group size was defined as the number of animals at the surface
127 within five body lengths of each other (Smolker et al. 1992). Large aggregations of small
128 delphinids often consisted of a super group, comprised of several smaller animal units or
129 aggregations (typically 2-20), spaced several dozen-hundreds meters apart (typically 50-200
130 m), moving in the same direction and exhibiting similar patterns of behaviour. For these large
131 aggregations, group size reflects the size of the super group not the individual aggregations.

132

133 **Data analysis**

134

135 Only data for odontocetes were used in this study. Ten geographic zones were defined
136 around the island, based on their general location and environmental characteristics (see
137 Figure 1, Table 2). These geographic zones were grouped into three broad habitat categories
138 to assess cetacean diversity for each habitat type: inner lagoon, outer reef slope (depth <500
139 m) and oceanic waters (depth >500 m). Encounter rate was defined as the number of
140 sightings per unit of effort (N sightings/effort), expressed in hours. Species richness (S),
141 which is the number of species present in an area, was considered to be an inappropriate
142 measure of diversity on its own because it fails to take into account whether each species is
143 rare or common. Therefore the Shannon-Weaver index (H) was also employed. The
144 Shannon-Weaver index is one of several diversity indices used to measure diversity in
145 categorical data. This diversity measure is derived from information theory and measures the
146 order (or disorder) observed within a particular system. In ecological studies, this order is
147 characterised by the number of individuals observed for each species in the sample plot:

148

$$H = -\sum_{i=1}^S P_i \ln P_i$$

149 where P_i is the relative abundance of each species. The Shannon-Weaver index was
150 calculated for the whole study area and for each of the three broad habitat categories.

151

152 Values of the median, minimum and inter-quartile ranges of depth are provided to describe
153 bathymetric preferences for each species. Depth data provided by *Service Hydrographique*
154 *et Océanographique de la Marine* were associated with each sighting location using an
155 overlay technique in a GIS. After GPS track data were downloaded a track point for each
156 second was estimated using interpolation. The tracking data were then post-processed to
157 isolate portions of track spent 'on effort', which were subsequently used to calculate the effort
158 within each 2 km² and geographic zone (Table 2, Figure 2).

159

160 **Results**

161

162 **General**

163

164 Between July 2004 and June 2006, more than 441 hours were spent in 'search mode',
165 actively searching for marine mammals around Mayotte. Search effort did not vary across
166 months and years (Kruskal-Wallis test: $H = 4.167$; $df = 3$; $p = 0.244$). Because the main
167 harbour is located on the north-east coast, observation effort was greater off the east coast,
168 in the south and the north. The western portion of the lagoon and deep oceanic waters were
169 surveyed less (Table 1, Figure 1). Melon-headed whales *Peponophala electra*, pantropical
170 spotted dolphins *Stenella attenuata* and spinner dolphins *S. Longirostris* had the largest
171 group sizes (mean = 287.8, 70.9 and 72.8 respectively; Table 1), and were frequently
172 encountered on the outer reef slope. More coastal species, such as Indo-Pacific humpback
173 whales *Sousa chinensis* (mean = 2.4) and bottlenose dolphins *Tursiops aduncus* (mean =
174 6.5), had the smallest group size (Table 2).

175

176 *Diversity and distribution*

177

178 During this study, 16 odontocete species were recorded (species Richness), including 11
179 *Delphinidae* belonging to nine genera, two *Ziphiidae*, two *Kogidae* and one *Physeteridae*
180 (Table 1). The Shannon-Weaver index of diversity for the entire region was 1.76, but the
181 index varied between geographic zones: $H = 0.57$ for the inner lagoon (four species
182 recorded), $H = 1.31$ for the outer reef slope (five species) and $H = 0.62$ for the oceanic
183 waters (12 species). The higher index for the outer-reef slope area was due to equitability in

184 abundance between the species present in this area (reflected in their group sizes) – a
185 community with an equitable distribution of abundances between species is more diverse
186 than a community with variable species abundances. Conversely, in oceanic waters, there
187 was greater variability in group sizes between species (high group size in delphinids vs. low
188 in the largest toothed whales), lowered the index. Spatial distribution of cetaceans
189 encountered around Mayotte was highly variable. Spinner and pantropical spotted dolphins
190 had similar distributions along the outer-reef slope and on the Iris Bank and were rarely
191 observed inside the lagoon (Figure 2). Indo-Pacific bottlenose and humpback dolphins *Sousa*
192 *chinensis* were observed mainly inside the lagoon and the former were also regularly
193 observed on the Iris Bank, in waters <40 m (Figure 3a, Table 3). Melon-headed whales were
194 found on the outer reef slope area and in the shallower waters of the Iris Bank, but were
195 never sighted inside the lagoon (Table 1 and 3, Figure 3b).

196
197 The other delphinids were oceanic species and were observed farther offshore, including
198 common bottlenose dolphins (mean depth at encounter, MDE=509 m), Risso's dolphins
199 *Grampus griseus* (MDE=1,150), Fraser's dolphins *Lagenodelphis hosei* (MDE=336 m), false
200 killer whales *Pseudorca crassidens* (MDE=1 168 m), short-finned pilot whale *Globicephala*
201 *macrorhynchus* (MDE=996 m) and pygmy killer whales *Feresa attenuata* (MDE=1,593 m,
202 Figure 3b). Although rarely encountered, larger toothed whales such as Blainville's beaked
203 whale *Mesoplodon densirostris*(Table 3), pygmy sperm whales *Kogia breviceps* (MDE=705
204 m), dwarf sperm whales (*K. sima*) (MDE=919 m) and Longman's beaked whales *Indopacetus*
205 *pacificus* (MDE=1 945 m), were also observed in deep waters off the barrier reef and over
206 the slope (Figure 3c).

207

208 **Encounter rates**

209

210 Encounter rates were derived for the coastal species (Indo-Pacific bottlenose and humpback
211 dolphins), pantropical spotted and spinner dolphins, melon-headed whales, oceanic
212 delphinids, and the large toothed whales (beaked and sperm whales) in each geographic
213 zone (Table 2). Although search effort varied between geographic zones, certain trends were
214 apparent, especially for the most common species, once sightings were standardised for this.
215 For coastal species, the highest encounter rate was in the western portion of the lagoon
216 ($0.36 \text{ group h}^{-1}$), in the south-eastern lagoon ($0.25 \text{ group h}^{-1}$) and on the Iris Bank (0.22 group
217 h^{-1}). Spinner dolphins were encountered regularly on the eastern outer slope ($1.04 \text{ group h}^{-1}$),
218 but more frequently along the southern slope ($1.94 \text{ group h}^{-1}$). A similar trend was found for
219 pantropical spotted dolphins in the latter area ($0.93 \text{ group h}^{-1}$). Beaked whales were rarely
220 encountered and only in waters deeper than 500 m.

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Discussion

To date, at least 31 cetacean species have been recorded in the south-west Indian Ocean, including 23 odontocetes (Kiszka et al. 2009). The odontocete community around Mayotte has a number of notable characteristics. Species richness within the area is high, especially in waters deeper than 500 m (12 species recorded vs. five in the outer-reef slope area and four inside the lagoon). The Shannon-Weaver index was significantly lower in oceanic waters (>500 m) and inside the lagoon, because of the high variability of abundance among species in these regions. For example, in oceanic waters, delphinids have a significantly higher abundance (defined by group size) than beaked whales and sperm whales. Conversely, on the outer- reef slope, species richness is lower (five species) but abundance there is more similar among species, making the outer-reef slope community more diverse.] A previous description of cetacean diversity around Mayotte by Kiszka et al. (2007) documented the presence of 17 species, of which 15 were odontocetes. There was also an unsubstantiated sighting (photographic evidence lacking) of a ginkgo-toothed beaked whale *Mesoplodon ginkgodens*. Our study did not confirm the presence of *M. ginkgodens* but added the pygmy sperm whale *Kogia breviceps* to the species list for Mayotte waters. In addition, the killer whale *Orcinus orca* has been observed on several occasions by whale-watching operators in the recent years (N Bertrand, Sea Blue Safari, pers. comm.). The species richness of the odontocete community around Mayotte is high relative to other tropical islands and archipelagos such as La Réunion in the Mascarenes (eight odontocete species; Dulau-Drouot et al. 2008), Great Abaco in northern Bahamas (seven odontocete species; MacLeod et al. 2004), Aldabra in southern Seychelles (12 odontocete species; Hermans and Pistorius 2008), and the whole Hawaiian archipelago (14 odontocete species; Baird et al. 2003). However, certain oceanic species that have been recorded in the South-West Indian Ocean have not yet been recorded around Mayotte. These include Cuvier's beaked whale *Ziphius cavirostris*, the rough-toothed dolphin *Steno bredanensis* and the striped dolphin *Stenella coeruleoalba*. Their absence in this study may be an artefact of lower observation effort undertaken in offshore waters. Overall, the high diversity of odontocetes recorded around the island may be linked to the diversity of habitat types encountered there, especially in comparison to other oceanic islands that do not have lagoon or/and extended coral complexes. However, it remains difficult to compare study areas directly, because the number of species recorded is also linked to the spatial and temporal distribution of effort.

Detailed descriptions of the distributions of four delphinid around Mayotte are provided by Gross et al. (2009). Our study confirms that around the island, the Indo-Pacific bottlenose

258 dolphin has a coastal and shallow-water distribution. The coastal affinity of this species has
259 been documented in other areas of the south-west Indian Ocean, such as at La Réunion
260 (Dulau-Drouot et al. 2008) and off the south coast of Zanzibar (Stensland et al. 2006).
261 Another species documented in our study, the Indo-Pacific humpback dolphin, was
262 encountered infrequently, which precluded detailed analysis of its distribution and habitat
263 characteristics. Along the outer-reef slope, spinner and pantropical spotted dolphins were
264 encountered regularly; these were the most abundant cetacean species found around
265 Mayotte. A comparative habitat analysis by Gross et al. (2009) confirmed that these two
266 species overlap in their distributions, as well as in their isotopic niches, which could indicate
267 possible competition between these sibling species. Habitat features of spinner dolphin
268 around Mayotte are slightly different from those in other areas. In French Polynesia, Hawaii,
269 and the Maldivian atolls, these dolphins enter atolls, sheltered bays and lagoons through reef
270 channels in the morning and leave in the afternoon to feed overnight (Würsig et al. 1994,
271 Anderson 2005, Gannier and Petiau 2006). Around Mayotte, the spinner dolphins under
272 study generally inhabited the outer-reef slope, within a greater depth range than has been
273 previously reported (Norris et al 1994, Gannier and Petiau 2006). In addition, their mean
274 school size of 72.8 animals was slightly higher than in other areas, such as La Réunion
275 (mean = 51.2) and in the Maldives (mean = 58.2) (Anderson 2005). The reasons why spinner
276 dolphins do not regularly use lagoonal waters around Mayotte, even though the habitat
277 conditions appear to be ideal for this species, remain uncertain. One possibility is that they
278 are excluded from the lagoon by the presence of Indo-Pacific bottlenose dolphins, a larger,
279 and possibly more dominant, territorial species. Pantropical spotted dolphins demonstrate a
280 wide range of distribution and habitat characteristics around Mayotte, utilising both shallow
281 and oceanic waters along the outer-reef slope. This species was most frequently observed
282 close to the reef on the outer-reef slope. In Golfo Dulce, along the Pacific coast of Costa
283 Rica, pantropical spotted dolphin occur in shallow waters (mean = 92.7 m; Cubero-Pardo
284 2007), whereas at La Réunion, the species is only encountered in relatively deep waters
285 (mean = 881 m; Dulau-Drouot et al. 2008).

286

287 Melon-headed whales have been reported at a number of island groups, including the Hawaii
288 archipelago, the Philippines, French Polynesia and in the Indian Ocean (Gannier 2000, 2002,
289 Baird et al. 2003, Anderson 2005, Dolar et al. 2006, Kiszka et al. 2007, 2010, Dulau-Drouot
290 et al. 2008, and Brownell et al. 2009). They are generally accepted as having a global
291 distribution, preferring deep tropical and warm-temperate waters (Perryman 2002). In
292 contrast to areas such as Hawaii, La Réunion and the Gulf of Mexico, melon-headed whales
293 around Mayotte were encountered in shallower waters, in the vicinity of the barrier reef
294 where they appeared to engage in resting/socialising behaviour. This daylight behaviour,

295 which has been observed in other areas throughout the species' range (Brownell et al. 2009),
296 suggests that melon-headed whales use shallower waters to rest and socialise, but feed in
297 deeper waters (probably on the slope).

298
299 Several large oceanic delphinids (e.g. Risso's dolphin, short-finned pilot whale, false killer
300 whale), beaked whales (e.g. Blainville's beaked whale) and sperm whales (sperm whale,
301 dwarf and pygmy sperm whales) were encountered during our study, but relatively
302 infrequently. These species are found throughout the south-west Indian Ocean (Leatherwood
303 and Donovan 1991, Kiszka et al. 2009), preferring the slope and oceanic waters (Baird et al.
304 2003, Whitehead 2003, MacLeod and Zuur 2005). However, the encounter rate for
305 Blainville's beaked whales was particularly high around Mayotte (0.09 groups h⁻¹ in waters
306 >500 m), similar to the rate as observed off Little Bahama Bank in the Caribbean (0.07
307 groups h⁻¹, MacLeod and Zuur 2005) but higher than in the main Hawaiian Islands (0.012
308 groups h⁻¹; RW Baird, pers. comm. Cascadia Research Collective). The abundance of
309 beaked whales encountered around Mayotte could be attributed to the number of broad
310 submarine canyons that deeply incise the outer slope of the island, which may concentrate
311 the main prey of these teuthophageous predators (MacLeod et al. 2003, Audru et al. 2006).

312
313 It is evident that the outer-reef slope is of primary importance in terms of density and diversity
314 of odontocetes around Mayotte. This particular habitat (or collection of habitats) provides
315 resting and foraging areas for several species, such as spinner dolphins, pantropical spotted
316 dolphins and melon-headed whales (Norris and Dohl 1979, Würsig et al. 1994, Brownell et
317 al. 2009). Many oceanic species also make regular incursions into these habitats, including
318 the short-finned pilot whale, which have been observed in close proximity to the barrier reef
319 around Mayotte while resting. Shallow waters that provide protected areas with few
320 predators, in close proximity to oceanic foraging habitats, apparently provides an attractive
321 environment for cetaceans. The affinity of cetaceans for the outer reef slope suggests
322 probable dependence of the cetaceans on coral reef systems as major feeding and resting
323 areas. The current decline of coral reefs, both at the global and regional scale in the western
324 Indian Ocean (MacClanahan et al. 2007), should be considered as a possible long-term loss
325 of toothed cetacean habitat.

326 327 **Conclusion**

328
329 The lagoon and adjacent outer-slope waters of Mayotte support a high diversity of toothed
330 cetaceans, particularly delphinids. This community includes coastal, semi-pelagic/oceanic
331 and oceanic species. The high diversity of species combined with the sizes of aggregations

332 underline the importance of Mayotte to cetaceans. It is noteworthy that there is a large
333 overlap in the distribution of several delphinid, especially in species living along the outer-
334 reef slope, as shown by Gross et al. (2009). Because species should occupy their own niche,
335 some fine-scale segregation processes should occur, which need to be assessed through in-
336 depth habitat analyses. Our results provide important, previously unavailable, descriptive
337 information that is critical for conservation and management efforts. Human activities,
338 especially maritime traffic fishing pressure and disturbances from commercial whale and
339 dolphin watching activities, are escalating in the coastal and lagoon waters of Mayotte.
340 Further effort is needed to assess the spatial and temporal interactions between maritime
341 human activities and cetaceans around this rapidly developing island.

342
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Table 1: The number of sightings, cumulative number of individuals and group size characteristics of cetaceans encountered around Mayotte from July 2004 to June 2006

Species	Common name	Number of sightings	Frequency sightings (%)	Number of individuals (cumulative)	Frequency of cumulated individuals (%)	Mean group size	Range	SD
<i>Stenella longirostris</i>	Spinner dolphin	177	48.5	9 242	59.7	72.8	3–500	87.1
<i>Stenella attenuata</i>	Pantropical spotted dolphin	85	23.3	2 553	16.5	70.9	3–300	71.9
<i>Tursiops aduncus</i>	Indo-Pacific bottlenose dolphin	64	17.5	414	2.7	6.5	1–15	3.5
<i>Peponophala electra</i>	Melon-headed whale	9	2.5	2 590	16.7	287.8	140–450	84.2
<i>Sousa chinensis</i>	Indo-Pacific Humpback dolphin	7	1.9	17	0.1	2.4	1–3	0.8
<i>Mesoplodon densirostris</i>	Blainville's beaked whale	6	1.6	14	0.1	2.3	1–5	1.6
<i>Grampus griseus</i>	Risso's dolphin	5	1.4	44	0.3	8.8	2–20	6.8
<i>Tursiops truncatus</i>	Common bottlenose dolphin	2	0.5	160	1	80	40–120	–
<i>Pseudorca crassidens</i>	False killer whale	2	0.5	250	1.6	125	100–150	–
<i>Kogia sima</i>	Dwarf sperm whale	2	0.5	3	0.01	1.5	1–3	–
<i>Kogia breviceps</i>	Pygmy sperm whale	1	0.3	6	0.03	6	–	–
<i>Mesoplodon pacificus</i>	Longman's beaked whale	1	0.3	1	0.006	1	–	–
<i>Physeter macrocephalus</i>	Sperm whale	1	0.3	11	0.07	11	–	–
<i>Globicephala macrorhynchus</i>	Long-finned pilot whale	1	0.3	60	0.4	60	–	–
<i>Lagenodelphis hosei</i>	Fraser's dolphin	1	0.3	120	0.8	120	–	–
<i>Feresa attenuata</i>	Pygmy killer whale	1	0.3	4	0.03	4	–	–
TOTAL		365	100	15 489	100	53.8	1–500	

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572**Table 2:** Search effort, number of sightings and encounter rates (in parentheses) of cetaceans encountered around Mayotte, July 2004-June 2006

Geographic zone	Number of sightings						
	Effort (h)	Bottlenose and humpback dolphins	Spinner dolphin	Pantropical spotted dolphin	Melon-headed whale	Large toothed whales	Other delphinids
Eastern slope	48.2	0	50 (1.04)	19 (0.39)	2 (0.04)	0	0
Iris Bank	46	10 (0.22)	40 (0.87)	20 (0.43)	1 (0.02)	0	0
North-eastern lagoon	75.7	12/3 (0.2)	0	1 (0.01)	0	0	0
Northern slope	14.4	0	6 (0.42)	2 (0.14)	0	0	1 (0.07)
Northern lagoon	32.5	6 (0.18)	13 (0.4)	3 (0.09)	0	0	0
South-eastern lagoon	52.6	12/2 (0.25)	2 (0.04)	2 (0.04)	0	0	0
Southern slope	23.7	0/1 (0.04)	46 (1.94)	22 (0.93)	0	0	0
Southern lagoon	56.8	16/1 (0.28)	6 (0.11)	2 (0.04)	0	0	0
Western slope	4.8	0	1 (0.21)	1 (0.21)	1 (0.21)	0	1 (0.21)
Western lagoon	22	8 (0.36)	2 (0.09)	1 (0.05)	0	0	0
Total	376.8	64/7 (0.18)	166 (0.44)	73 (0.19)	4 (0.01)	0	2 (0.01)
Entire survey area	441.9	64/7 (0.16)	177 (0.40)	85 (0.19)	9 (0.02)	11 (0.02)	12 (0.03)

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Table 3: Depth preferences of the most frequently sighted cetacean species around Mayotte from July 2004-June 2006

Species	Common name	Depth (m)					
		Mean	SD	Range	Median	Q1	Q3
<i>Stenella longirostris</i>	Spinner dolphin	123.7	187.3	3–1 335	54	25	128.5
<i>Stenella attenuata</i>	Pantropical spotted dolphin	193.7	255.7	5–1 301	74	24	268.3
<i>Tursiops aduncus</i>	Indo-Pacific bottlenose dolphin	23	16	1–57	21	10	35
<i>Peponephala electra</i>	Melon-headed whale	383	286.4	20–845	400	118	560
<i>Tursiops aduncus</i>	Indo-Pacific humpback dolphin	17	7.7	7–28	14	12	22.5
<i>Grampus griseus</i>	Risso's dolphin	1 150	385	762–1 784	1 121	953	1 129
<i>Mesoplodon densirostris</i>	Blainville's beaked whale	1 000	365.5	482–1 524	1 070	782.5	1 143.5

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608 **Figure legends**

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610 **Figure 1:** Mayotte Island, showing (a) the subareas defined for encounter rate calculations and (b)
611 spatial representation of search effort during July 2004-June 2006

612

613 **Figure 2:** Spatial distribution of (a) spinner dolphins *Stenella longirostris* and (b) pantropical spotted
614 dolphins *Stenella attenuata* encountered around Mayotte during July 2004-June 2006, in relation to
615 search effort

616

617 **Figure 3:** Spatial distribution of (a) coastal dolphins (*Tursiops aduncus* and *Sousa chinensis*), (b)
618 oceanic dolphins and (c) the large toothed whales encountered around Mayotte during July 2004-June
619 2006, in relation to search effort

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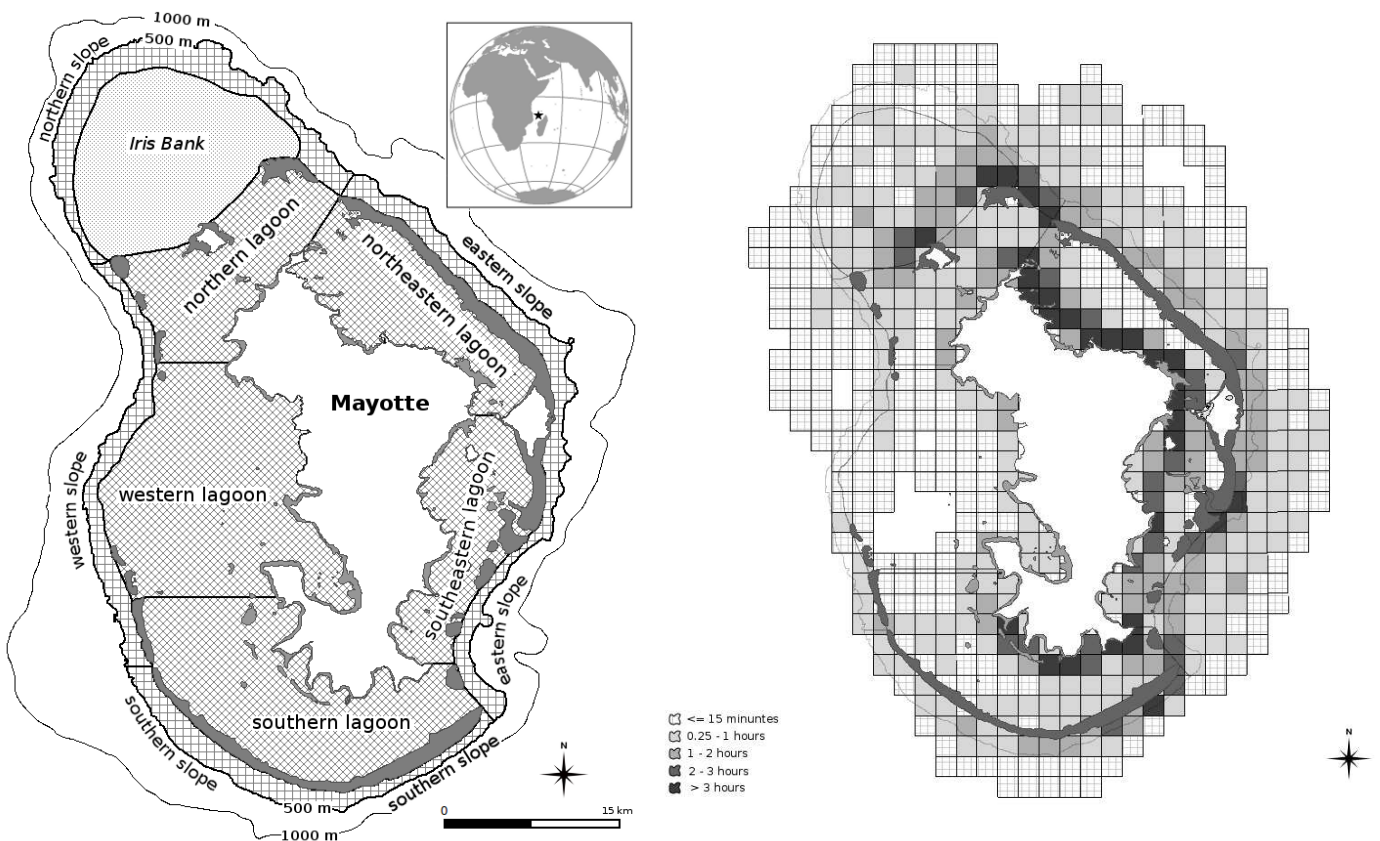
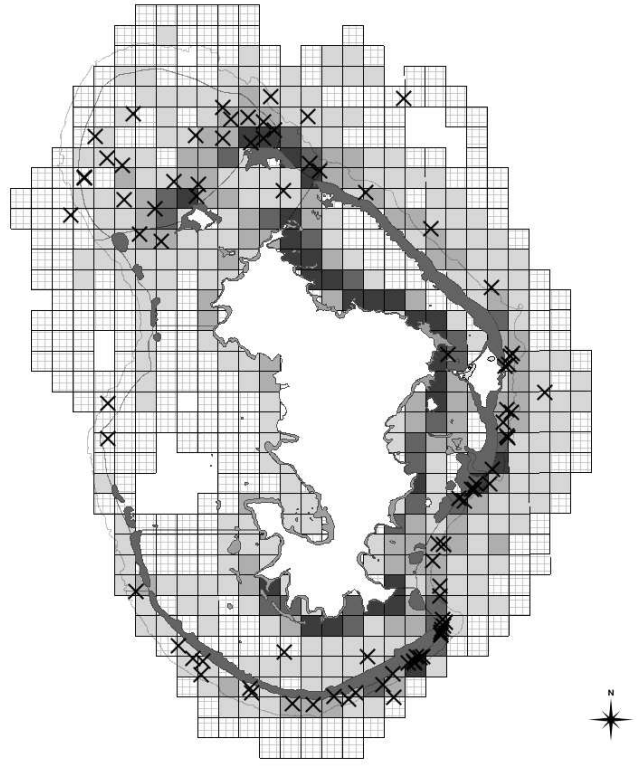
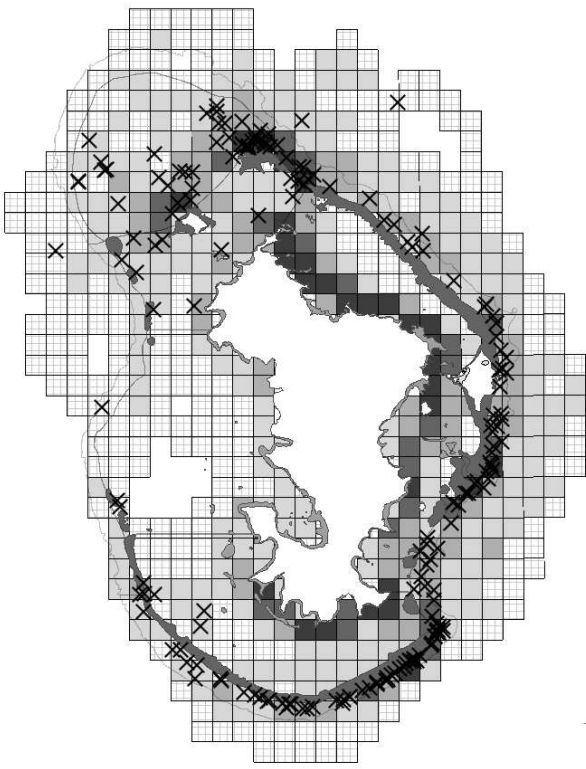
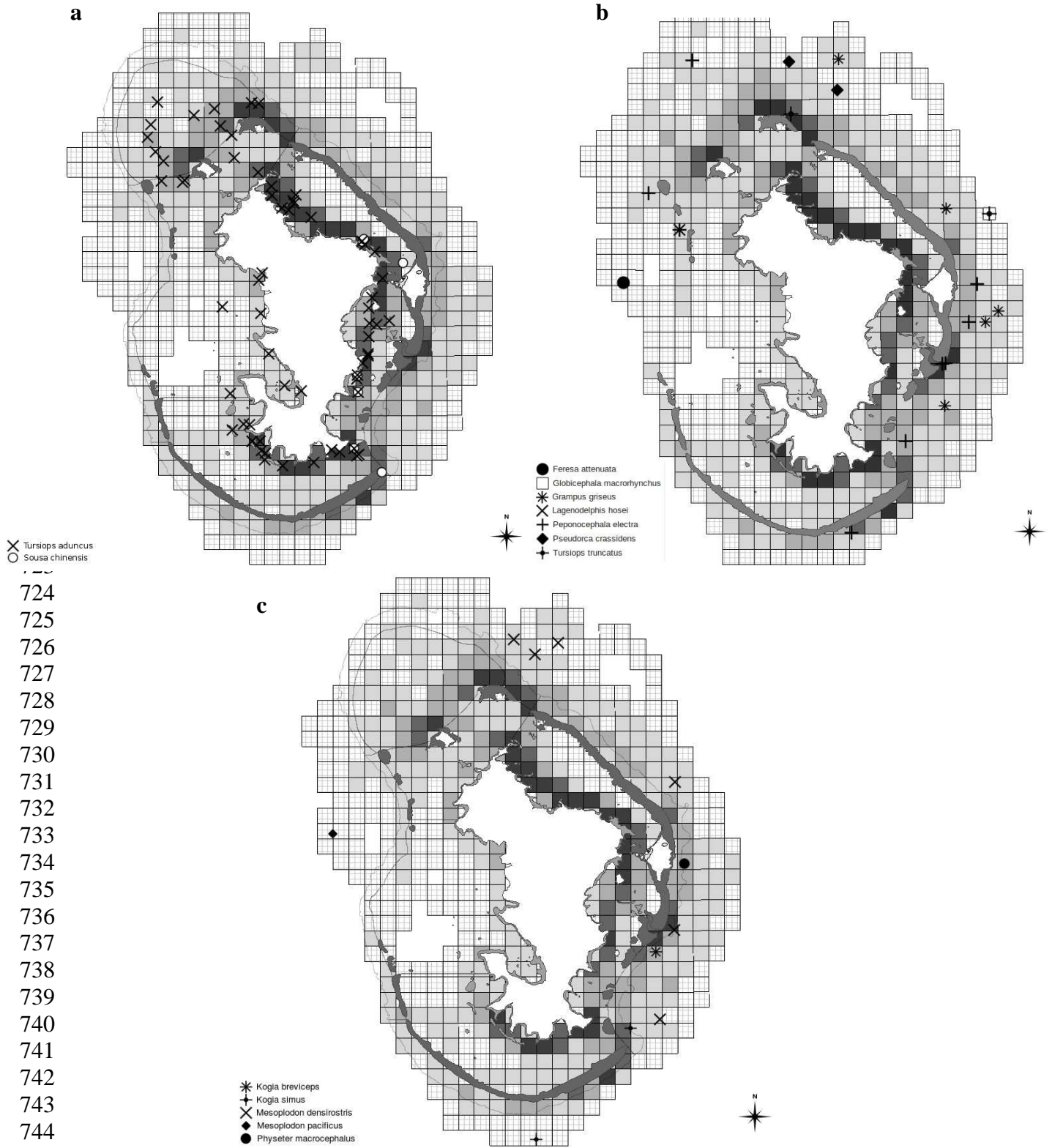


Figure 1



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Figure 3