

Effects of tourism operations on the behavioural patterns of dolphin populations off the Azores with particular emphasis on the common dolphin (*Delphinus delphis*)

Tese de Doutoramento

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Unless we change direction, we are likely to end up where we are going

Chinese proverb

All big things are made up of trifles. My entire life has been built on trifles.

Mahatma Gandhi



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CONTENTS



Porpoising Atlantic spotted dolphins off the south coast of São Miguel Island

CONTENTS

CONTENTS	III
ACKNOWLEDGEMENTS	V
RESUMO	VII
ABSTRACT	XI
LIST OF FIGURES	XIII
LIST OF TABLES.....	XVI
I. INTRODUCTION	2
1.1 TOURISM IMPACTS ON WILDLIFE: THE SPECIAL CASE OF CETACEANS	2
1.1.1 Short-term effects	4
1.1.2 Long-term effects	11
1.1.3 The conservation perspective.....	14
1.2 CETACEANS TOURISM IN THE AZORES.....	15
1.2.1 The Azores Archipelago.....	15
1.2.2 The tourism activity	15
1.2.3 Target species	17
1.3 AIM AND OBJECTIVES.....	20
2. METHODOLOGY	26
2.1 STUDY AREAS	26
2.2. DATA COLLECTION.....	28
2.2.1 Baseline behavioural patterns of common dolphins.....	28
2.2.2 Effects of tour boats on common dolphins' behaviour	34
2.2.3 Swim-with-dolphins operations and dolphins' response.....	34
2.3. DATA ANALYSIS	35
2.3.1 Baseline behavioural patterns of common dolphins.....	35
2.3.2 Effects of tour boats on common dolphins' behaviour	37
2.3.3 Swim-with-dolphins operations and dolphins' response.....	39
3. RESULTS.....	42
3.1 BASELINE BEHAVIOURAL PATTERNS OF COMMON DOLPHINS.....	42
3.1.1 Field effort.....	42
3.1.2 Distance from shore.....	42
3.1.3 Activity budget.....	43
3.1.4 Group size.....	44

3.1.5 Active surface behaviour	45
3.2 EFFECTS OF TOUR BOATS ON COMMON DOLPHINS' BEHAVIOUR	47
3.2.1 Field effort.....	47
3.2.2 Effects of boat interactions.....	47
3.2.3 Compliance with whale watching guidelines.....	50
3.3 SWIM-WITH-DOLPHINS OPERATIONS AND DOLPHINS' RESPONSE	51
3.3.1 Target species and approach techniques.....	51
3.3.2 Compliance with regulations.....	52
3.3.3 Effects of swim-with-dolphins operations.....	54
4. DISCUSSION	60
4.1 BASELINE BEHAVIOURAL PATTERNS OF COMMON DOLPHINS.....	60
4.1.1 Distance from shore.....	60
4.1.2 Activity budget.....	60
4.1.3 Group size.....	62
4.1.4 Active surface behaviour	63
4.2 EFFECTS OF TOUR BOATS ON COMMON DOLPHINS' BEHAVIOUR	64
4.3 SWIM-WITH-DOLPHINS OPERATIONS AND DOLPHINS' RESPONSE	67
4.3.1 Species and group selection.....	67
4.3.2 Effects of swim-with-dolphins operations.....	67
4.3.3 Compliance with regulations.....	69
5. CONCLUDING REMARKS	72
5.1 MAIN CONCLUSIONS	72
5.2 MANAGEMENT RECOMMENDATIONS.....	74
5.3 FUTURE RESEARCH.....	75
6. REFERENCES	79

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RESUMO

Nos Açores encontram-se cerca de 30% das espécies de cetáceos atualmente conhecidas. Esta grande diversidade constitui um suporte para o desenvolvimento de atividades marítimas recreativas como a observação de cetáceos e a natação com golfinhos. Estas atividades começaram nos Açores nos anos 1990 com uma só empresa na ilha de Pico mas atualmente é desenvolvida por 24 empresas distribuídas em quatro ilhas. O crescimento contínuo das atividades recreativas com cetáceos aumenta a probabilidade de que estas tenham efeitos negativos nas populações alvo. Existem vários estudos a nível internacional sobre os efeitos a curto prazo que se podem detetar durante as interações com barcos turísticos. Estes incluem alterações de comportamento, como mudanças de direção e velocidade de deslocamento, de coesão dos grupos ou das vocalizações usadas na comunicação e na ecolocalização. Estas alterações por si só podem levar a um aumento individual do dispêndio energético assim como a uma diminuição da energia adquirida durante a atividade de alimentação, se esta for interrompida. A longo prazo, porém, poderão os impactos individuais refletir-se negativamente ao nível populacional.

A atividade está regulamentada nos Açores, estando a revisão da legislação a ser discutida com os operadores. Estes regulamentos visam evitar que as atividades de observação e de natação sejam prejudiciais para as populações de cetáceos. Porém, para a elaboração de uma legislação eficaz é fundamental o conhecimento da ecologia e do comportamento de base das espécies exploradas e os Açores ainda carecem destas informações, assim como dos efeitos das atividades turísticas atuais. Entre as espécies mais avistadas e mais representativas do turismo local encontramos o golfinho comum (*Delphinus delphis*) que, apesar do seu nome e de ser relativamente abundante nas águas do Arquipélago, permanece uma espécie cujo comportamento é ainda muito pouco conhecido. Outros golfinhos comumente avistados são o roaz (*Tursiops truncatus*) e o pintado (*Stenella frontalis*).

Neste sentido o presente estudo visa (1) descrever pela primeira vez os padrões comportamentais do golfinho comum, com particular atenção na variabilidade temporal do balanço de atividade, (2) estudar mudanças comportamentais desta espécie durante a interação com os barcos turísticos, sejam estes de observação ou de natação, (3) avaliar a resposta comportamental das três espécies de golfinho durante as atividades de natação, (4) usar os resultados para sugerir medidas e apoiar decisões de gestão em matéria de conservação dos recursos naturais e de desenvolvimento sustentável das atividades turísticas.

Os padrões comportamentais dos golfinhos comuns foram estudados durante duas épocas em 2013 e 2014 utilizando binóculos e uma câmara digital a partir de uma plataforma em terra, na costa sul de São Miguel. Os dados relativos aos estados comportamentais foram recolhidos através de seguimentos focais com técnica de amostra instantânea, enquanto os eventos comportamentais de superfície foram amostrados com a técnica de amostra contínua, sendo estes tipicamente de breve duração.

O balanço de atividade revelou que os golfinhos comuns passam a maior parte do tempo em alimentação (2013) ou em deslocação (2014). Variações temporais foram detetadas também a nível mensal e diário, com a deslocação registando um pico nos meses de junho e julho e a atividade de alimentação diminuindo na faixa horária do meio-dia. Grupos maiores foram observados principalmente durante os meses de verão e durante a atividade de alimentação. Os golfinhos comuns exibiram vários comportamentos de superfície como saltos, *porpoising*, batimentos da cabeça na superfície da água e batimentos caudais. Estes comportamentos foram registados durante as atividades de alimentação, deslocação e socialização, sugerindo que podem ter funções diversificadas dependendo do contexto em que são usados.

A mesma metodologia foi utilizada para registar mudanças de comportamento durante interações com barcos turísticos. Os resultados indicam que os golfinhos comuns interagem com as atividades turísticas durante 10% do seu tempo, uma percentagem ainda baixa se comparados com outras populações da mesma espécie, por exemplo da Nova Zelândia. Porém, estas interações demonstraram ter efeitos no comportamento, sendo que na presença de barcos os golfinhos diminuíram o tempo passado em alimentação e aumentaram o tempo de socialização. Também o tempo necessário para voltar à atividade antecedente foi afetado pela interação, aumentando no caso da alimentação e diminuindo no caso da socialização. De igual modo, a duração média das atividades foi afetada: a fase de alimentação registou uma redução temporal na presença de barcos em comparação com situações de controlo. A falta de informação acerca dos padrões de residência desta espécie não permite avaliar o impacto cumulativo que esta espécie poderia sofrer com o aumento das atividades turísticas.

Para avaliar os efeitos das atividades de natação e em particular das interações nadadores-golfinhos, recolheram-se dados a partir de embarcações turísticas durante três épocas, de 2013 a 2015. A colaboração com duas empresas com base em dois portos da costa sul de São Miguel, Ponta Delgada e Vila Franca do Campo, permitiu obter uma amostra que abrangeu toda a área tipicamente utilizada pelas empresas durante estas atividades. Através do método de *scan sampling* registou-se que as três espécies de golfinhos mostraram uma maioria de respostas

neutras ou de evasão, e muito poucas de aproximação. Os golfinhos pintados foram aqueles que registraram uma maior percentagem de respostas evasivas, mas também maior aproximação, surgindo esta espécie como a mais flexível em termos de interações com humanos. Registaram-se as estratégias utilizadas pelos operadores para aproximar os grupos de golfinhos de forma a largar os nadadores. As mais frequentes foram pôr o barco paralelo ao grupo, cortar o rumo do grupo colocando o barco transversalmente e entrar no meio do grupo. Independentemente da espécie, a estratégia de cortar o rumo aos grupos foi aquela que gerou mais comportamentos de evasão, levando a uma redução do tempo de permanência dos nadadores na água. Uma redução do tempo de interação nadadores-golfinhos foi também observada quando os golfinhos estavam a descansar ou em deslocação, e com grupos mais pequenos. Os operadores geralmente cumpriram a legislação em vigor em termos de número de nadadores na água e da duração máxima das interações, mas excederam o número de tentativas de largada por cada grupo. Com base nestes resultados, sugere-se que os regulamentos da atividade de natação com golfinhos incluam evitar a estratégia de “corte do rumo” dos grupos escolhidos para a atividade, evitar largar nadadores com grupos em descanso e evitar grupos que incluam recém-nascidos, sendo estes particularmente vulneráveis.

As mudanças comportamentais e a elevada percentagem de respostas de evasão detetadas durante as atividades, seja de observação que de natação, sugerem que, mesmo que este sector de turismo nos Açores seja ainda relativamente limitado, já estão a ocorrer perturbações. O ritmo de crescimento desta indústria sugere a necessidade de medidas de gestão que tenham em conta a importância da área para as várias espécies de golfinhos, revendo a atual legislação da natação nos termos descritos acima. Além disso, considera-se necessário um esforço de monitorização contínuo, especialmente para clarificar os padrões de residência dos golfinhos e assim avaliar melhor potenciais impactos cumulativos.

ABSTRACT

The cetacean diversity observed in the Azores accounts for around 30% of currently known cetacean species. This high level of diversity has supported the development of commercial recreational activities such as whale watching and swim-with-dolphin programs. Both operations are regulated by law, which is currently under revision. In order to produce effective management strategies and avoid detrimental impacts, an assessment of the populations targeted by such activities is imperative. This becomes even more critical in light of the poor, often absent, baseline information currently available for local populations. The short-beaked common dolphins (*Delphinus delphis*) is the most common species, encountered year-round, and thus is one of the most representative species in this industry. Other dolphin species such as the bottlenose (*Tursiops truncatus*) and the Atlantic spotted dolphin (*Stenella frontalis*) are also exposed to swim-with programs. Hence, the objectives of the present study are to (1) describe for the first time the normal undisturbed behavioural patterns of common dolphins, (2) measure behavioural changes resulting from whale watching (common dolphins), (3) investigate swimming-with-dolphins interactions (common, bottlenose and Atlantic spotted dolphins) and (4) provide suggestions for guidelines, especially the swim-with operations, which are considered more invasive and thus potentially have a greater impact.

Focal group follows and predominant group activity sampling was undertaken between 2013 and 2014 from a land-based station in São Miguel Island. The activity budget of common dolphins revealed that they use the area primarily for foraging and travelling. Travelling peaked during the summer months; foraging decreased around midday. Larger groups were observed during summer and during foraging. Common dolphins showed a variety of surface active behaviours such as breaches, porpoising, head and tail slaps when engaged in foraging, travelling and socializing, suggesting different functions of these behaviours depending on the context they are used in.

Common dolphins were found interacting with tour boats during 10% of their time, a relatively low percentage when compared to other common dolphin populations such as those in New Zealand. Nonetheless interaction with tourism activities revealed changes in the behavioural patterns of common dolphins, with less time spent foraging and more time socializing. The time to resume a preceding activity after a tour boat interaction was also affected, with dolphins taking longer to restart foraging and less time to re-engage in socializing. Similarly, the average foraging bout length was shorter in the presence of tour boats compared with control scenarios.

Boat-based sampling was conducted between 2013 and 2015 to assess the response of dolphin groups to swim-with programs. The three dolphin species observed showed mainly neutral or avoidance responses. The bottlenose dolphins showed higher neutral responses than the common dolphins, and Atlantic spotted dolphins tended to avoid and approach more often than the other two species, suggesting a higher variability in response to human activities. Among the three main strategies used to approach dolphin groups, intersecting the dolphin's path was the most disruptive method and more likely to result in avoidance behaviour and in shorter swimmer-dolphin interactions. Irrespective of species, the duration of swimmer-dolphin encounters was also shorter when dolphins were resting or travelling and when they were in small groups. Compliance with legal regulations was generally good except in the number of swim attempts per dolphin group. This averaged six whereas a maximum of only three attempts is allowed. Suggestions to improve the current legislation include not intersecting the path of dolphins when approaching groups, and avoiding swimming with resting groups and with groups which include new-borns, due to their particularly vulnerable nature.

Behavioural changes and the high avoidance responses detected in the three target species suggest that, although cetacean tourism in the Azores is still far from being considered a large industry, disruptive effects are already occurring. The likely increase in the number of tourists requires effective management that takes into account the importance of the area for dolphins and their susceptibility to tourism interactions. Enhancing monitoring efforts is also fundamental to clarifying site fidelity patterns and hence the potential for cumulative impact.

LIST OF FIGURES

Introduction

Figure 1.1 Swim-with-dolphins operations in the Azores. Swimmers are solely equipped with snorkelling gear. 10

Figure 1.2 Overview of the area most used for commercial activities off the south coast of São Miguel Island, Azores. Black lines are tracks of whale watching boats during 2014 and 2015 seasons departing from the two main harbours, Ponta Delgada and Vila Franca do Campo 17

Methodology

Figure 2.1 Study area covered for data collection starting from the observation point in Ponta Garça (N37°42'50.76", W25°22'23.16"), São Miguel Island. 27

Figure 2.2 Study area of the boat-based data collection and dolphin groups encounters (grey dots) during swim-with-dolphins operations starting from the two main harbours, Ponta Delgada and Vila Franca do Campo on the south coast of São Miguel Island. 28

Figure 2.3 Land-based data collection from the station in Ponta Garça during the seasons 2013-2014 off the south coast of São Miguel Island (left, photo by E. Madeira). the wooden support enabled binoculars to rotate and adjust up and down during focal follows (right, photo by A. Cecchetti) 29

Figure 2.4 Stick used to calibrate the focal length of the camera during focal follows. Located at 5m distance from the stationary support, it shows three different measures accounting for camera adjustments (left). Example of camera shot during a focal follow (right). 30

Figure 2.5 Example of the online tabular format of data collected in the field using Epicollect+. Data are ready to be downloaded in excel format for analysis. 33

Figure 2.6 Example of distance range calculation with PanguardBeta. The blue line indicates the measure is taken using the horizon as referee point. 36

Results

- Figure 3.1 Distances from shore of dolphin groups per month. Different letters indicate significant differences between variables. Grey dots represent mean values, horizontal lines within the box the median, and whiskers the standard errors.....42
- Figure 3.2 Activity budgets of common dolphins during 2013 and 2014 seasons off São Miguel Island. Photos show foraging common dolphins in associations with Cory's shearwaters and yellow-legged gulls (top) and porpoising dolphins during fast travelling (down).43
- Figure 3.3 Breakdown of the activity budget of common dolphins by day (a) and seasons (b) off São Miguel Island, Azores.44
- Figure 3.4 Common dolphin group size in relation to activity state. Different letters indicate significant differences as per post-hoc test. Grey dots represent mean values, horizontal lines within the box the median and the whiskers the standard errors.45
- Figure 3.5 Variation of group size for each activity state among different months, a) foraging, b) travelling, c) socializing, d) low activity. Different letters indicate differences as per post-hoc test. Different scales used for clarity. Grey dots represent mean values, horizontal lines the median, and the whiskers the standard errors.....46
- Figure 3.6 Transition probabilities calculated for both control (a) and interaction (b) scenarios. Thicker arrows refer to transition with higher probabilities. Values are percentages (from Cecchetti et al. 2017).47
- Figure 3.7 Effects of boat interactions on activity state transitions, based on differences in transition probabilities. The graph is divided into four parts delimited by vertical lines and representing a preceding activity state. Bars indicate succeeding activity states. Those marked by ★ are significantly different. Negative values indicate that the transition of the control chain is superior to that of the interaction chain(from Cecchetti et al. 2017).48
- Figure 3.8 Time dolphins spent in each activity state during control and interaction scenarios. Error bars represent 95% confidence intervals (from Cecchetti et al. 2017).49
- Figure 3.9 Effects of tour boat traffic intensity on common dolphin activity budget. Z-test p-values of the difference between cumulative and control budgets. The grey horizontal line indicates the level of significance set at $p < 0.05$ (from Cecchetti et al. 2017).50

Figure 3.10 Boat placement strategies used to approach dolphin groups in the Azores: a) in path, b) parallel, c) in the middle, d) to the front, e) to the back.53

Figure 3.11 The three most frequent boat placement strategies as a function of dolphins group size for each species. M= in the middle, P= parallel, IP= in path. Horizontal lines are medians, vertical lines are the range of values, and boxes are the interquartile ranges.53

Figure 3.12 Dolphins response during swim-with dolphins operations in relation to species (a), behavioural state (b) and boat placement (c). Dd = *Delphinus delphis*, Tt = *Tursiops truncatus*, Sf = *Stenella frontalis*; M = in the middle, P = parallel, IP = in path.56

Figure 3.13 Swim episodes' duration in relation to group size (a), boat placement (b) and behavioural state (c). M = in the middle, P = parallel, IP = in path. Horizontal lines are medians, vertical lines are the range of values and boxes are the interquartile ranges.57

LIST OF TABLES

Methodology

Table 2.1 Definitions of behavioural categories considered in the present study, from Neumann (2001a) and Stockin et al. (2009).....31

Table 2.2 Definitions of active surface behavioural events used in the present study, adapted from Weaver (1987) and Bearzi et al. (1999).....32

Results

Table 3.1 Probabilities of staying in a particular activity state (π_j), relative average number of time units $E(T)_j$ taken to return to an activity state after boat approached and time needed to return to that activity state. Control/Interaction values are reported.....49

Table 3.2 Average bout length t_{ii} (minutes) for each activity state in both control and interaction scenarios (from Cecchetti et al. 2017).....49

Table 3.3 Differences between group sizes of dolphins approached for swim operation (SWD) and those recorded during regular whale watching (WW). Group size is given as median (1st interquartile, 3rd interquartile). Percentage of calves and newborns observed during swim operations are reported for each species. Dd = *D. delphis*, Tt = *T. truncatus*, Sf = *S. frontalis*.51

Table 3.4 Compliance with current and proposed (*) guidelines during swim-with-dolphins operations between 2013 and 2015 off São Miguel Island, Azores.54

Table 3.5 GEE model for multinomial responses with time.exch correlation structure. N = neutral, Av = Avoidance. Approach was taken as reference for the response variable. References for the explanatory variables are Dd for species, in the middle for boat placement and socializing for behavioural state.....55

Table 3.6 GEE model with exchangeable correlation structure. References for the explanatory variables are socializing for behavioural state and in the middle for boat placement.....57