Latin American Journal of Aquatic Mammals
www.lajamjournal.org
Online ISSN: 2236-1057

Introduction to the Special Volume on *Tursiops* in the Southwest Atlantic Ocean

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Article Info

Manuscript type	Editorial
Article history	
Received	27 November 2015
Received in revised form	23 December 2015
Accepted	24 April 2016
Available online	29 December 2016

Citation: Fruet, P.F., Laporta, P., Di Tullio, J.C., Secchi, E.R., Morteo, E., Tezanos-Pinto, G., Möller, L.M., Marmontel, M. and Palacios, D.M. (2016) Introduction to the Special Volume on *Tursiops* in the Southwest Atlantic Ocean. *Latin American Journal of Aquatic Mammals* 11(1-2): 1-15. http://dx.doi.org/10.5597/lajam00212

Introduction

The genus *Tursiops* currently includes two recognized species inhabiting inshore, nearshore and offshore waters of the World's oceans. The common bottlenose dolphin *Tursiops truncatus* (Montagu, 1821) is cosmopolitan to temperate and tropical waters (see review by Wells and Scott, 2009), while the Indo-Pacific bottlenose dolphin *Tursiops aduncus* (Ehrenberg, 1833) is restricted to coastal waters and ranges discontinuously in the Indo-Pacific region (Wang and Yang, 2009). A third species, *Tursiops australis,* has been proposed for coastal waters off southern Australia (Charlton-Robb *et al.*, 2011), however its validity as a separate species is still debatable (Society for Marine Mammalogy Committee on Taxonomy, 2014).

In the Southwest Atlantic Ocean (SWAO) bottlenose dolphins are found in diverse environments, including coastal and oceanic waters. Although the taxonomic history of the genus *Tursiops* is one of the most controversial among cetaceans, and one that continues to be unresolved, genetic studies of *Tursiops* in the SWAO suggest that it belongs to the *truncatus*-type. Analysis of the mitochondrial DNA (mtDNA) control region of southern Brazil samples within a global comparison that included sequences of *T. truncatus, T. aduncus* and *T. australis* types resulted in the Brazilian animals grouping with the *truncatus*-type phylogroup[1] (Wang *et al.*, 1999).

[1]Tezanos-Pinto, G., Oremus, M., Krutzen, M. and Baker, C.S. (2009) The *Tursiops* conundrum: one species or a complex of species. Talk presented at the "*Tursiops aduncus*" workshop. *18th Biennial Conference on the Biology of Marine Mammals*, 12-16 October, Quebec, Canada.

The distribution of *T. truncatus* in coastal regions of the SWAO appears to be discontinuous, ranging from the Amazon River mouth, Brazil (Siciliano *et al.*, 2008), to northern Patagonia, with occasional records in Tierra del Fuego, Argentina, and the Falkland Islands (Bastida *et al.*, 2007). From southern Brazil to Argentina, small regional populations of the coastal ecotype are commonly found associated with river mouths, bays, estuaries and islands, where they overlap with a number of potentially harmful human activities (*e.g.* Simões-Lopes and Fabian, 1999; Flores and Fontoura, 2006; Barbosa *et al.*, 2008; Vermeulen and Cammareri, 2009; Fruet *et al.*, 2012).

Despite this widespread vulnerability to human impacts in the region, little attention has been given to addressing relevant conservation issues for bottlenose dolphins in the SWAO. This situation is perhaps due to most research and conservation efforts in the region being devoted to the franciscana (*Pontoporia blainvillei*), a small dolphin species endemic to the SWAO that has faced high levels of incidental mortality in fishing nets for over 60 years (*e.g.* Ott *et al.*, 2002; Secchi, 2010; 2014).

Historical Perspective

In 1804, Bernard Germain de Lacépède first described a specimen from the Parisian Veterinary School as *Delphinus nesarnack*, although this description was later ignored due to the specimen's disappearance. In 1821 George Montagu described another specimen stranded in the United Kingdom as *Delphinus truncatus.* In 1843 John Edward Gray changed the name of the genus and renamed the species as *Tursiops truncatus.* However, during the second half of the 19th century there were ambiguities regarding the species concept, which led to more than 20 species being described for this genus (Hershkovitz, 1966). Subsequently, a more conservative view was adopted and only one polytypic species, *T. truncatus*, was recognized, despite some authors' view that supported the existence of multiple species (*e.g.* Hershkovitz, 1966; Pilleri and Gihr, 1972; Cockroft and Ross, 1990). After a long period of acceptance of one species within *Tursiops*, which was characterized by cline variations in morphology, findings from modern morphological studies led to the validation of a second species, *T. aduncus,* for the Indo-Pacific region (Rice, 1998). Later, a remarkable study showed a strong congruence between morphological (external and skeletal morphology) and genetic (mtDNA) differences, suggesting that two sympatric but reproductively isolated morphotypes (*truncatus*-type and *aduncus*-type) occurred in Chinese waters (Wang *et al.*, 1999; 2000*a*, *b*). Further evidence from morphologic and genetic analyses conducted in Australia and Japan supported the assertion that two species occurred in the Indo-Pacific region (Hale *et al.*, 2000; Möller and Beheregaray, 2001; Kakuda *et al.*, 2002; Kemper, 2004; Kurihara and Oda, 2006; 2007; Oremus *et al.*, 2015). The results of these studies led to the acceptance of two species (*T. truncatus* and *T. aduncus*). More recently, an additional claim was made for the recognition of a third species, the Burrunan dolphin (*T. australis*), endemic to southern Australian coastal waters (Charlton-Robb *et al.*, 2011). However, its validity as a separate species is uncertain (Society for Marine Mammalogy Committee on Taxonomy, 2014).

One subspecies has been recognised to date, the Black Sea bottlenose dolphin, *T. truncatus ponticus* (Birkun, 2006). This classification was based on evidence from morphology, coloration, ecology and genetics. There were considerable differences between Black Sea bottlenose dolphins and *T. truncatus* from Atlantic and Pacific populations (Barabasch-Nikiforov, 1960; Geptner *et al.*, 1976), as well as from the eastern and western Mediterranean waters and from the Northeast Atlantic Ocean (Natoli *et al.*, 2005; Viaud-Martinez *et al.*, 2007).

In some regions, two distinct ecotypes of *T. truncatus*, coastal (or inshore/nearshore) and offshore (or oceanic), are currently identified. Studies conducted along the Western North Atlantic (WNA) have found marked differences in multiple ecological and biological traits between ecotypes, including fixed genetic differences (Hersh and Duffield, 1990; Hoelzel *et al.*, 1998). However, it appears that most of the differences reported in these studies stand from the assumption that the coastal WNA ecotype (as described in Hoelzel *et al.,* 1998) is 'representative' of the species, when in fact two worldwide studies of mtDNA sequences concluded that the coastal WNA ecotype is highly differentiated and restricted to this region (Natoli *et al.*, 2004). This supports previous studies based on ecology (distribution, foraging, and parasite load), morphology, and genetics that proposed this ecotype could in fact represent a different species or subspecies (Mead and Potter, 1990; Kingston and Rosel, 2004). However, whether the differences between these ecotypes or geographical forms translate into units below the level of taxonomically recognized species is still under debate among scientists. Therefore, it is possible that additional species/subspecies may be recognized in the near future, as there has been a pronounced increase in morphological and genetic data becoming available.

For the SWAO, an early study found morphological differences between bottlenose dolphins from Argentina and *Tursiops* specimens collected in the Northern Hemisphere. This difference led naturalist Fernando Lahille to consider the Southern Hemisphere animals as a different species, *Tursiops gephyreus* (Lahille, 1908). However, it is unknown if Lahille compared the Argentinean specimen with a coastal or pelagic WNA specimen. Given the considerable differences in morphology between ecotypes and among populations, it is not surprising that differences were found.

Based on cranial measurements and preliminary mtDNA control region sequence analyses, the subspecies *T. truncatus gephyreus* was proposed for dolphins inhabiting southern Brazil, Uruguay and Argentina (Barreto, 2000). However, these molecular analyses may have been biased by small sample size (northern Brazil = 3 and southern Brazil = 14) or fine-scale population structuring, as observed for the SWAO (Fruet *et al.*, 2014) and elsewhere (*e.g.* Krützen *et al.*, 2004; Sellas *et al.*, 2005). Therefore, further analyses of both nuclear and mitochondrial markers should be conducted using a larger number of samples, including comparisons to other populations worldwide (*e.g.* Tezanos-Pinto *et al.*, 2009) and incorporating independent lines of evidence. Despite variations in morphology among some *Tursiops* in the SWAO, there is not yet sufficient information to consider these dolphins as an additional species or subspecies.

Until the early 1970s most information available on the biology of bottlenose dolphins was obtained from research on captive animals (*e.g.* McBride and Kritzler, 1951; Norris *et al.*, 1961; Caldwell and Caldwell, 1965). Resightings and observations of tagged dolphins in Florida (USA) provided some initial insights into dolphin behavior, distribution and movements in the wild (Irvine and Wells, 1972). Nevertheless, the suitability of photo-identification to bottlenose dolphin studies (*i.e.* individually identifying animals using natural markings; Würsig and Würsig, 1977) combined with rapid

Figure 1. Biopsy sampling of a male coastal bottlenose dolphin (*Tursiops truncatus*) photo-identified by permanent nicks on the trailing edge of the dorsal fin. Biopsy samples obtained from wild dolphins are useful for a series of analyses including genetics, stable isotopes, fatty acids and contaminant loads. © R.C. Genoves 21 December 2011, adjacencies of the Patos Lagoon Estuary, southern Brazil.

advances in techniques such as mark-recapture, telemetry, radio tagging, acoustics, genetics, geographic positioning systems, and stable isotope analyses, has led to a better understanding of the biology and ecology of wild populations (Figure 1).

In Sarasota Bay (Florida, USA), where systematic research has been conducted on a resident community of *T. truncatus* for over four decades, the life history of the species has been studied in detail (Wells, 2014). Through a long-term resighting and live capture program, unique individuals are tracked from birth until death, providing solid information on calving season, female age at first reproduction, fecundity, interbirth intervals, female reproductive success and age of individuals (*e.g.* Scott *et al.,* 1990; Wells, 2014). In addition, such longitudinal data have provided information on patterns of social relationships and the mating system. Long-term systematic studies have only been carried out for *T. truncatus* in a few other places worldwide, including the Moray Firth in Scotland (Wilson *et al.*, 1999), Doubtful Sound and Bay of Islands in New Zealand (Williams *et al.*, 1993; Constantine, 2001; Currey *et al.*, 2009; Tezanos-Pinto *et al.*, 2013), the Adriatic Sea (Bearzi *et al.*, 1997), and the Patos Lagoon Estuary (PLE) and Laguna in southern Brazil (*e.g.* Castello and Pinedo, 1977; Simões-Lopes and Fabian, 1999; Daura-Jorge *et al.,* 2012; 2013; Fruet *et al.*, 2012; 2014; 2015*a, b*).

The first studies on wild bottlenose dolphin in the SWAO were carried out in late 1970s in Patagonia, Argentina (Würsig and Würsig, 1977; 1979). Repeated observations of naturally well-marked individuals based on photo-identification techniques allowed the authors to determine the size and composition of groups of bottlenose dolphins in San José Gulf, as well as to describe some behavioral and ecological aspects. In 1974 a photo-identification monitoring program of bottlenose dolphins was initiated at the PLE in southern Brazil (Castelo and Pinedo, 1977). The authors reported resightings of marked individuals in the estuary and suggested a population size of about 100 dolphins inhabiting the area. During the 1980s a decline in the occurrence of bottlenose dolphins along the La Plata River off Argentina and Uruguay was observed (Lázaro and Praderi, 2000; Bastida *et al.*, 2007). It was suggested that overfishing and habitat degradation of coastal environments could have led to a population decline in this region (Lázaro and Praderi, 2000; Bastida *et al.*, 2007). However, little research was conducted on wild bottlenose dolphins during this period in the SWAO.

In the mid 1990s, dedicated studies on bottlenose dolphins were conducted along the SWAO, especially in southern Brazil. Among others, Simões-Lopes (1991) and Simões-Lopes *et al.* (1998) described in detail the cooperative behavior of bottlenose dolphins with fishermen in three

distinct localities of southern Brazil (Laguna, Mampituba and Tramandaí rivers). Movements of photo-identified individuals between areas in southern Brazil were first reported in 1995[2]. Dalla Rosa (1999) applied mark-recapture models for closed populations on photo-identification data and provided a robust abundance estimate for the population inhabiting the PLE. Later, Simões-Lopes and Fabian (1999) used photo-identification techniques to investigate the residence patterns and site fidelity of bottlenose dolphins in the Laguna and Tramandaí rivers.

While important information was generated by field studies carried out in the 1990s, the discontinuity in data collection in subsequent years hampered the use of more robust approaches to investigate other important ecological and biological aspects of these populations. Since the mid 2000s, however, systematic long-term field studies with consistent data collection were finally established at some sites in southern Brazil (Cagarras Island, PLE, Laguna), representing a turning point in the understanding of relevant aspects of the species ecology in the SWAO (*e.g.* Daura-Jorge *et al.*, 2012; 2013; Lodi and Monteiro-Neto, 2012; Fruet *et al.*, 2012; 2014, 2015*a, b;* Lodi *et al.*, 2014).

First Workshop on the Research and Conservation of Tursiops truncatus*: Integrating knowledge about the species in the Southwest Atlantic Ocean*

Since the early 2000s, a growing number of incidental captures and strandings reported in coastal areas inhabited by small resident bottlenose dolphin populations in the SWAO region raised serious concern among scientists from the Atlantic coast of South America (Fruet *et al.*, 2012). At the *XIII Meeting of Specialists on Aquatic Mammals of South America*, held in Montevideo, Uruguay, in October 2008, researchers identified that the lack of basic scientific information on the ecology and threats hampered a proper assessment of the conservation status of bottlenose dolphins at the intraspecific level. Researchers agreed that knowledge about bottlenose dolphins in South America was scant and much of it remained in the gray literature or unpublished. Furthermore, it was also agreed that the establishment of coordinated research priorities aiming at collecting robust scientific data to be used in conservation plans was urgently needed.

In response to these needs, an *Organizing Committee* formed by Pedro F. Fruet, Paula Laporta, Juliana C. Di Tullio and Eduardo R. Secchi convened the *First Workshop on the Research and Conservation of* Tursiops truncatus*: Integrating knowledge about the species in the Southwest Atlantic Ocean*. The Workshop was held at Atlântico Hotel, Cassino Beach, Rio Grande, Brazil, from 21 to 23 May 2010. The organizing institutions of the *Workshop* were the Museu Oceanográfico *Prof. Eliézer de C. Rios*, the Instituto de Oceanografia (at the Universidade Federal de Rio Grande, FURG, Brazil), and Cetáceos Uruguay (Faculty of Science, Universidad de la República). Local and international organizations including Yaqu Pacha (Germany), Cetacean Society International (USA), Bianchini SA (Brazil) as well as the *IV Brazilian Meeting of Oceanography* (Brazil) generously provided funding for the workshop. The non-governmental organization Kaosa also provided logistical support.

The three-day workshop brought together 32 invited participants from Brazil, Uruguay and Argentina (see Figure 2 and Appendix 1). The specific objectives outlined during the workshop were to: 1) compile the available information about the species in the SWAO, 2) identify the main threats to bottlenose dolphins in the SWAO, 3) identify the most threatened populations, 4) determine research priorities for the species along the SWAO, 5) make public all the compiled information by publication, and 6) articulate multi-institutional research collaborations aiming at the conservation of bottlenose dolphins in the SWAO.

The first two days of the Workshop were dedicated to the presentation of 44 working papers[3,4]. On the last day, six *Working Groups* were designated and they devoted their time to reviewing all available information and consolidating them into reports dealing with the main topics: 1) distribution and behavior: occurrence, residency, movements, behavior and habitat use; 2) biology and ecology: diet, pathology, and reproduction; 3) vital and demographic parameters: abundance estimates, reproductive rates, age and growth; 4) stock identification: morphological, geographic and genetic variation; 5) anthropogenic interactions: fishery, behavior, tourism and contamination; 6) ethnoecology. The progress of each *Working Group* was presented in a plenary session on the final day, when consensus was reached that there was a great deal of available information and that a proposal should be made to the Editor of the *Latin American Journal of Aquatic Mammals* to publish a Special Volume on *Tursiops* in SWAO.

Contents of the Special Volume

After the workshop, participants were invited to submit their working papers for publication in this Special Volume. Not all papers presented at the Workshop were submitted, and additional manuscripts from authors not present at the Workshop were also carefully considered for publication according to their relevance. In this Special Volume we synthesize all basic information available on the biology and

[2]Möller, L.M., Simões-Lopes, P.C., Secchi, E.R. and Zerbini, A.N. (1994) Uso de fotoidentificação no estudo do deslocamento de botos *Tursiops truncatus* (Cetacea, Delphinidae) na costa sul do Brasil. Pages 5-8 *in* Anais, *6ª Reunião de Trabalho de Especialistas em Mamíferos Aquáticos da América do Sul*, 24-28 October, Florianópolis, SC, Brazil.

[3]Fruet, P., Laporta, P., Di Tullio, J. and Secchi, E. (2010) Book of working papers, *South American Workshop of Research and Conservation of* Tursiops truncatus. [Documentos de Trabalho, *I Encontro Sul Americano de Pesquisa e Conservação de* Tursiops truncatus - *Integrando conhecimento sobre a espécie no Atlântico Sul Ocidental*], 21-23 May 2010, Rio Grande, Brazil. 553 pp.

[4]The List of Papers is reprinted as Appendix 2 to this introductory article.

Figure 2. Participants of the First Workshop on Research and Conservation of *Tursiops truncatus*, held at Atlântico Hotel, Cassino Beach, Rio Grande, Rio Grande do Sul, Brazil, 21-23 May 2010: From left to right, standing: (1) Marcos César O. Santos, (2) Ignácio B. Moreno, (3) Paulo César Simões-Lopes, (4) Julio Loureiro, (5) Eduardo R. Secchi, (6) Jonatas Prado, (7) Salvatore Siciliano, (8) André Barreto, (9) Luciano Dalla Rosa, (10) Ana Carolina Meirelles, (11) Paulo H. Ott, (12) Els Vermeulen, (13) Luara Lopes, (14) Clarêncio Baracho, (15) Silvina Botta, (16) Lucas M. de Carvalho, (17) María Marchesi, (18) Paulo A.C. Flores, (19) Jailson F. Moura, (20) Paula Laporta, (21) Liliane Lodi, (22) Janaína C. Wickert, (23) Lílian S. Hoffmann, (24) Cristiane C. Albuquerque Martins; bottom left: (25) Rodrigo C. Genoves, (26) Juliana C. Di Tullio, (27) Sérgio Morón; bottom right: (28) Camila Domit, (29) Larissa Oliveira and (30) Camilah A. Zappes. Pedro F. Fruet took the photograph.

conservation of bottlenose dolphins in SWAO, as well as recommendations made by experts for future coordinated research priorities.

The Special Volume contains 20 contributed manuscripts (one editorial, eight workshop reports, nine articles and two notes) covering a broad range of topics. The first section of the Special Volume contains the reports from the working groups on taxonomy and stock identity; distribution; habitat use; behavioral ecology; biology and ecology; population parameters and demography; interactions between humans and bottlenose dolphins; ethnobiology and environmental education. Ott *et al.* compile the current information on morphology, genetics, stable isotopes, acoustics and parasites of bottlenose dolphins along the SWAO, and briefly review the proposed taxonomy for the genus along this area. Lodi *et al.* report on the current and fragmented knowledge about the seemingly continuous spatial distribution of bottlenose dolphins (coastal and oceanic) from Amapá State (northern Brazil) to the province of Tierra del Fuego (southern Argentina). Laporta *et al.* review the knowledge on coastal bottlenose dolphin habitat preferences in relation to environmental characteristics along the Southwest Atlantic. Domit *et al.* present a compilation of the behavioral patterns of bottlenose dolphins and social structure throughout the SWAO, discussing issues as behavioral activities, social structure, acoustic behavior and intra- and interspecific interactions. Laporta *et al.* summarize the current knowledge on ecological (feeding habits, predation) and biological (growth, pathologies) features of bottlenose dolphins in the SWAO and identify challenges for future studies. Fruet

et al. provide a summary of information on age structure of stranded dolphins, life span, reproduction (birth rate, fecundity, birth seasonality, inter-birth interval, age at sexual maturation), and the abundance and survival estimates for some well-studied populations of bottlenose dolphins in the SWAO. Fruet *et al.* review and discuss the past and current human-related threats to bottlenose dolphins, which include topics on direct takes, incidental captures, bioaccumulation of pollutants, habitat modification, interactions with tourism activities and boat traffic and risks of cooperative behavior between dolphins and artisanal fishery. Zappes *et al.* discuss the importance of traditional knowledge on dolphins in the SWAO, from a still incipient enthnobiological perspective, compared to geographically focused environmental education programs.

Fruet *et al.* analyze behavioral responses and potential impacts of a biopsy sampling program on bottlenose dolphin individuals and groups. Daura-Jorge and Simões-Lopes present the results of a pilot study specifically designed for testing the effectiveness between mark-recapture and line transect methods for detecting trends in abundance of the small resident population of bottlenose dolphins in Laguna, southern Brazil. Laporta *et al.* present, based on mark-recapture models for open populations, the first attempt at abundance estimation for a coastal population of bottlenose dolphins in Uruguay. A photo-identification study carried out by Giacomo and Ott documents the population size and site fidelity of bottlenose dolphins in the Tramandaí Estuary. Oliveira *et al.*, based on genetic analyses, calculate effective population size and determine sex for bottlenose dolphins around the São Pedro and São Paulo Archipelago, off northeastern Brazil. Failla *et al.* discuss dolphin occurrence and mid- to long-distance movements along the northeastern Patagonian coast of Argentina. Moura *et al.* provide insights into the feeding habits of *T. truncatus* through the study of males and females of different age classes stranded in the central-northern coast of Rio de Janeiro State, Brazil. Meirelles *et al.* review and update information on strandings and sightings for this species in northeastern Brazil. Lodi uses updated sighting and stranding records to investigate spatial and temporal distribution of bottlenose dolphins along Rio de Janeiro State. Barreto defines the age of attainment of cranial maturity and compares the growth rates of the different functional apparatuses of bottlenose dolphins found stranded along the coast of Brazil, Uruguay and Argentina. Physical maturity of the axial skeleton and morphological variation in the vertebral column are dealt with by Costa *et al.*, who also examined the little-studied anomalies in bony tissue.

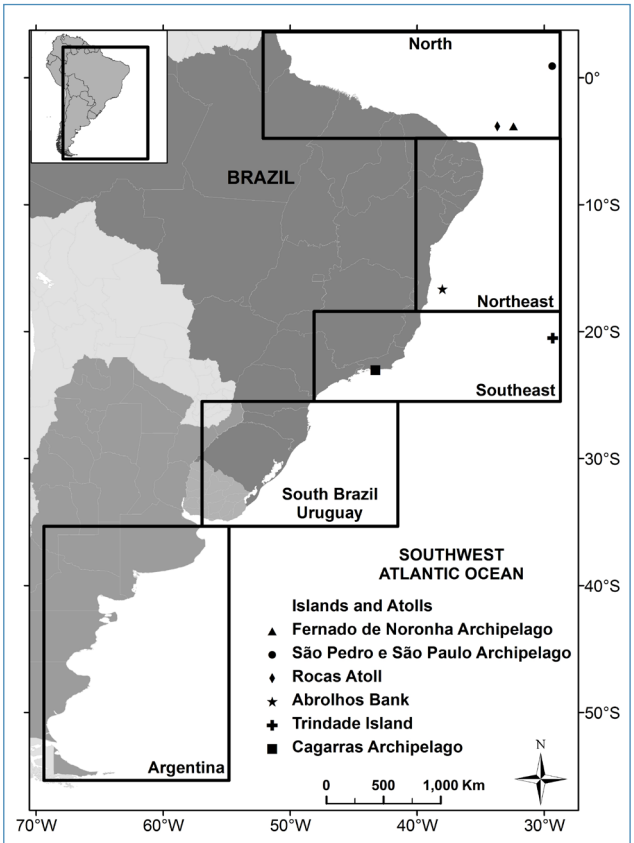

Figure 3. Regions, countries and localities considered along the Southwest Atlantic Ocean to organize and compile all information about bottlenose dolphins for the Special Volume of LAJAM.

Definition of the SWAO

The SWAO is considered as the region comprising the offshore and coastal zones of the Atlantic side of the South American continent between 4°N–56°S, 25°W–67°W (Figure 3). For the purposes of this Special Volume, the SWAO was divided into two zones: 1) insular and oceanic, and 2) coastal. The insular and oceanic zone includes the São Pedro and São Paulo Archipelago (00°56'N, 29°22'W), the Rocas Atoll (03°50'S, 33°39'W), the Fernando de Noronha Archipelago (03°50'S, 32°24'W) and the Trindade Island (20°30'S, 29°18'W). The coastal zone was further subdivided into five regions: northern Brazil, from northern Amapá to eastern Ceará states (04°26'N, 51°31'W–04°49'S, 37°15'W); northeastern Brazil, from western Rio Grande do Norte to southern Bahia states (04°49'S, 37°15'W–18°20'S, 39°39'W), including the Abrolhos Bank between southern Bahia and northern Espírito Santo states (17°20'S, 38°35'W–18°10'S, 39°20'W); southeastern Brazil, from northeastern Espírito Santo to southeastern São Paulo states (18°20'S, 39°39'W–25°18'S, 48°05'W), including the Cagarras Archipelago (23°01'S, 43°12'W–23°03'S, 43°12'W); southern Brazil and Uruguay, from northeastern Paraná State to southern Uruguay (25°18'S, 48°05'W–34°51'S, 57°08'W); and Argentina, from its northeastern coast to Tierra del Fuego (34°51'S, 57°08'W–54°40'S, 65°08W).

Final remarks

The main aim for the publication of this Special Volume was to attract and inspire South American researchers to

publish relevant scientific research on bottlenose dolphins that was still in the gray literature. This idea came up during the *First Workshop on the Research and Conservation of* Tursiops truncatus *in SWAO*, which brought together most researchers studying the species in the region at that time. The participants agreed that the available information, if put together, would represent a significant advancement in knowledge about the species and an important contribution to marine mammal science in general. This Special Volume represents a coordinated effort among many researchers to gather these data and provides the reader with the most up-to-date information on the biology, ecology and conservation of *Tursiops truncatus* in the SWAO.

While the taxonomy of bottlenose dolphins in the SWAO remains unresolved, morphological and genetic studies suggest differentiation between at least two regional ecotypes. There is increasing evidence supporting the notion that the abundance of coastal bottlenose dolphins has been generally reduced and that dolphin injuries, diseases and deaths caused by direct or indirect human interferences appear to be increasing. Some small local populations of dolphins are potentially declining, and for others insufficient information is available to evaluate population trends.

The accomplishment of the *First Workshop on the Research and Conservation of* Tursiops truncatus *in SWAO*, together with the publication of this Special Volume, symbolize a crucial point for the future of research and conservation of bottlenose dolphins in South America. However, they also suggest that we are only at the start of a much longer scientific-based conservation journey, which will certainly benefit from a coordinated, multi-collaborative international research program.

Acknowledgments

The photograhp on the cover of this Special Volume was taken by Rodrigo Genoves and is used with her permission. The authors wish to express their deep gratitude to all involved with this Special Volume, in particular to Dr. Carlos Olavarría, who capably led the initial editorial processing of the manuscripts submitted. We also acknowledge the additional work done by *LAJAM* Associate Editors Federico Riet, Fernando Félix, Maritza Sepúlveda, Miriam Marmontel and Nataly Castelblanco-Martínez during the production of this Special Volume. We are grateful to the many scientists who undertook the job of critically reviewing the manuscripts and Working Group reports. Special thanks to B. Würsig, R. Wells and K. Van Waerebeek who kindly reviewed the draft of this introductory document. Finally, we thank all authors who contributed papers and reports to this Special Volume for their patience and support through the prolonged editorial process. The Guest Editors would like to acknowledge the financial contributions provided by the Organization for the Conservation of South American Aquatic Mammals - Yaqu Pacha e.V. and by Cetacean Society International for the publication of this Special Volume.

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Appendix 2. Working Papers

Distribution and behavior: occurrence, residency, movements, behavior and habitat use

Bastida, R. Información disponible sobre *Tursiops truncatus* recopilada en décadas pasadas por Ricardo Bastida.

Da Silva, T.T., Flores, P.A.C. and Barreto, A.S. Matching photo-identified bottlenose dolphins between two coastal areas off Santa Catarina State, south Brazil. WP62

Daura-Jorge, F.G. e Simões-Lopes, P.C. Padrões espaciais do boto-da-tainha (*Tursiops truncatus*) em Laguna, sul do Brasil: estratégias de forrageio e *insights* sobre aspectos sociais. WP03

Di Tullio, J.C., Fruet, P.F. e Secchi, E.R. Uso do habitat do boto, *Tursiops truncatus*, no estuário da Lagoa dos Patos e águas costeiras adjacentes, RS, Brasil. WP53

Domit C., Weber Rosas, F.C., Rosso-Londoño, M.C., Ougo, G., Bracarense, A.P.F.R., Domiciano, I.G., Beloto, N. e Monteiro-Filho, E.L.A. Ocorrência de *Tursiops truncatus* (Montagu, 1821) no litoral do estado do Paraná, no período de 1997/1999 e 2007/2009. WP15

Genoves, R.C., Fruet, P.F., Di Tullio, J.C. e Secchi, E.R. Padrões de associação do boto *Tursiops truncatus* no estuário da Lagoa dos Patos, RS, Brasil. WP60

Hoffmann, L.S., Ferlin, E. and Freitas, T.R.O. Comparison between extraction methods of acoustic parameters of the whistles of bottlenose dolphins *Tursiops truncatus* (Montagu, 1821) (Cetacea, Delphinidae) in Tramandaí lagoon, Rio Grande do Sul, southern Brazil. WP19

Hoffmann, L.S., Ferlin, E., Fruet, P.F., Genoves, R.C., Valdez, F.P., Di Tullio, J.C., Caon, G. and Freitas, T.R.O. Whistles of bottlenose dolphins: group repertoires and geographic variations in Brazilian waters. WP24

Laporta, P., Di Tullio, J.C. e Secchi, E.R. Uso do habitat do boto *Tursiops truncatus* (Montagu, 1821) em La Coronilla e Cabo Polonio (Rocha, Uruguai). WP65

Laporta, P., Fruet, P.F., Di Tullio, J.C. e Secchi, E.R. Padrão de residência e movimentos do boto *Tursiops truncatus* na costa atlântica uruguaia e o sul do Brasil. WP56

Lodi, L. Características de grupo de *Tursiops truncatus* (Cetacea, Delphinidae), no Arquipélago das Cagarras, Rio de Janeiro, sudeste do Brasil. WP20

Lodi, L. Organização social de *Tursiops truncatus* (Cetacea, Delphinidae), no Arquipélago das Cagarras, Rio de Janeiro, sudeste do Brasil. WP18

Lodi, L. Padrão de residência de *Tursiops truncatus* (Cetacea, Delphinidae) no Arquipélago das Cagarras, Rio de Janeiro, sudeste do Brasil. WP05

Lodi, L. Revisão do conhecimento: registros de encalhes e avistagens de *Tursiops truncatus* (Cetacea, Delphinidae) no estado do Rio de Janeiro, entre 1980 e 2010. WP10

Marchesi M.C., Torres, M., Bayer, S., García Peredo, M., Benegas, L.G. and Goodall, R.N.P. The southernmost records of *Tursiops* sp. WP06

Meirelles A.C.O, Campos, T.M., Marcondes, M.C.C., Souto, L.R.A., Socorro Reis, M., Martins da Silva Júnior, J., Normande, I., Pazin, V., Nascimento, L.F. e Silva, F.J.L. Registros de encalhes e avistagens de *Tursiops truncatus* no nordeste do Brasil. WP07

Moura, J.F., Secco, H.K., Sholl, T.G. e Siciliano, S. Encalhe de golfinhos-nariz-de-garrafa (*Tursiops truncatus*, Montagu 1821) na costa centro-norte do estado do Rio de Janeiro, Brasil. WP09

Sousa, M.E.M., Arcoverde, D.L., Costa, A.F., Emin-Lima, N.R., Santos, G.M.A., Martins, B.M., Rodrigues, A.L.F., Siciliano, S. e Silva Júnior, J.S. O golfinho-nariz-de-garrafa (*Tursiops truncatus*) na Costa Norte do Brasil. WP13

Biology and Ecology: diet, pathology, and reproduction

Carvalho, L.M., Moreno, I.B., Tavares, M., Santos, R.A e Ott, P.H. Ecologia alimentar do boto, *Tursiops truncatus* (Montagu, 1821), no litoral norte do Rio Grande do Sul, sul do Brasil. WP54

Faisal, F., Migliorisi, A., Loureiro, J., Madoz, V., Ramiro, F., Igal, S., Rebollo, J., Jurado, S. y La Sota, R. Descripción ultraestructural del espermatozoide de delfín nariz de botella (*Tursiops truncatus*). WP27 [abstract only]

Flores, P.A.C., Zago, L. and Wells, R.S. Insights on residency and skin disorders on bottlenose dolphins (*Tursiops truncatus*) off Baia Norte, Santa Catarina State, southern Brazil. WP64

Fruet, P.F., Dalla Rosa, L., Freitas, T.R.O. e Valiati, V.H. Caracterização genética da região controladora do DNAmt da população de botos (*Tursiops truncatus*) do estuário da Lagoa dos Patos e sua aplicação para o estudo da mortalidade da espécie no litoral do Rio Grande do Sul, Brasil. WP70

Laeta, M., Souza, S.M.F.M. e Siciliano, S. Lesões ósseas traumáticas em um exemplar de *Tursiops truncatus* da costa centro-norte fluminense, RJ, Brasil - nota prévia. WP33

Lopez, L.A., Di Tullio, J.C., Fruet, P.F. e Secchi, E.R. Alimentação do boto, *Tursiops truncatus*, no litoral sul do Rio Grande do Sul, Brasil. WP59

Loureiro, J.D., Migliorisi, L., Morón, S.G., Rebollo, J. e Rodríguez Heredia, S. Programa de reproducción de delfines nariz de botella (*Tursiops truncatus gephyreus*) en el Oceanario Mundo Marino, San Clemente del Tuyú, Argentina. WP28

Moreno, I.B., Ott, P.H., Tavares, M., Oliveira, L.R., Borba, M.R., Driemeier, D., Nakashima, S.B., Heinzelmann, L.S., Siciliano, S. and Van Bressem, M-F. Mycotic dermatitis in *Tursiops* spp. from southern Brazil, with a confirmed record of lobomycosis disease. WP31

Vital and demographic parameters: abundance estimations, reproductive rates, age and growth

Barreto, A.S. Growth of the skull of the bottlenose dolphin, *Tursiops truncatus*, in the Southwestern Atlantic. WP35

Daura-Jorge, F.G. e Simões-Lopes, P.C. Estimativa de parâmetros populacionais do boto-da-tainha (*Tursiops truncatus*) em Laguna, sul do Brasil. WP44

Demessiano, K.Z. e Barreto, A.S. Estimativa populacional de *Tursiops truncatus*, da Foz do Rio Itajaí, SC, a partir da técnica de foto-identificação e de modelos de marcação-recaptura. WP42

Fruet, P.F., Secchi, E.R., Di Tullio, J.C. and Kinas, P.G. Abundance estimation of bottlenose dolphins, *Tursiops truncatus*, inhabiting the Patos Lagoon estuary, southern Brazil: implications for conservation. WP43

Fruet, P.F., Secchi, E.R., Di Tullio, J.C. e Kinas, P.G. Aspectos reprodutivos do boto, *Tursiops truncatus*, no estuário da Lagoa dos Patos, Rio Grande do Sul, Brasil. WP65

Genoves, R.C., Fruet, P.F., Di Tullio, J.C., Hoffmann, L., Caon, G., Pedone, F., Barcellos, L.J.P. e Freitas, T.R.O. Tamanho mínimo da população de golfinhos-nariz-de-garrafa, *Tursiops truncatus*, associada ao Arquipélago de São Pedro e São Paulo, Brasil. WP61

Giacomo, A.B. e Ott, P.H. Tamanho populacional e padrão de residência dos botos, *Tursiops truncatus* (Montagu, 1821), no estuário do Rio Tramandaí, RS, Brasil. WP52

Laporta, P., Fruet, P.F. e Secchi, E.R. Abundância da população de botos *Tursiops truncatus* na costa atlântica uruguaia (Cabo Polonio e La Coronilla), Rocha-Uruguai. WP57

Oliveira, L.R., Severo, M.W.O., Almeida, R.S., Ott, P.H., Moreno, I., Tavares, M., Siciliano, S. e Bonatto, S.L. Tamanho efetivo da população do golfinho-nariz-de-garrafa do Arquipélago de São Pedro e São Paulo, Brasil. WP45

Stock identification: morphological, geographic and genetic variations

Barreto, A.S., Moreno, I.B. and Miranda, C.M. Geographic variation of the genus *Tursiops* in Southwestern Atlantic. WP46

Botta, S., Hohn, A.A., Macko, S., Santos, M.C.O. and Secchi, E.R. Regional and local variation in carbon and nitrogen stable isotopes ratios in *Tursiops truncatus* from south/southeastern Brazil. WP58

Ott, P.H., Tavares, M., Moreno, I.B., Oliveira, L.R. e Danilewicz, D. Os cetáceos do Arquipélago de São Pedro e São Paulo, Brasil. WP55

Santos, M.C.O., Rosso, S. and Ramos, R.M.A. Bottlenose dolphins (Genus *Tursiops*) in southeastern Brazil: insights on geographic variation based on skull morphology. WP51

Anthropogenic interactions: fishery, behavior, tourism and contamination

Britto, M.K. and Barreto, A.S. Effects of human activities on the behavior of bottlenose dolphins (*Tursiops truncatus*) in the Itajaí river mouth. WP39

Flores, P.A.C., Pretto, D.J. and Rocha, H.J.F. A note on a stranded bottlenose dolphin with intensive fishing gear. WP63

Fruet, P.F., Kinas, P.G., da Silva, K.G., Di Tullio, J.C., Monteiro, D.S., Dalla Rosa, L., Estima S.C. and Secchi, E.R. Temporal trends in mortality and effects of fishing bycatch on bottlenose dolphins, *Tursiops truncatus*, in southern Brazil. WP37

Ethnoecology

Zappes, C.A. Etnoecologia do golfinho nariz-de-garrafa (*Tursiops truncatus* Montagu, 1821) na visão de pescadores artesanais do Arquipélago das Cagarras, Rio de Janeiro, Brasil. WP47

Zappes, C.A., Andriolo, A. e Di Beneditto, A.P.M. O boto (*Tursiops truncatus* Montagu, 1821) e sua interação com a pesca artesanal na barra de Imbé /Tramandaí, Lagoa dos Patos e áreas adjacentes, RS, Brasil. WP41

Zappes, C.A., Andriolo, A. e Di Beneditto, A.P.M. A 'pescaria do boto' (*Tursiops truncatus*, Montagu, 1821) e sua influência na pesca dos tarrafeiros da barra de Imbé/ Tramandaí, RS, Brasil. WP38

Zappes C., Novo Gatts, C.E., Lodi, L.F., Andriolo, A. e Di Beneditto, A.P.M. Descrição do comportamento do golfinho-nariz-de-garrafa (*Tursiops truncatus* Montagu, 1821) através da Etnoecologia e da Lógica Fuzzy. WP25

Zappes C.A., Novo Gatts, C.E., Lodi, L., Andriolo, A. e Di Beneditto, A.P.M. Interações entre o golfinho-nariz-de-garrafa (*Tursiops truncatus*, Montagu, 1821) e a pesca artesanal no Arquipélago das Cagarras e áreas adjacentes, RJ. WP40