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Bottlenose Dolphin (*Tursiops truncatus*) Abundance, Site Fidelity, and Group Dynamics in the Marlborough Sounds, New Zealand

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Abstract

Bottlenose dolphins (*Tursiops truncatus*) are consistently observed in the Marlborough Sounds, New Zealand. However, prior to the present study, no research has previously focused on this species within these waters, despite the potential for human impacts. Photo-identification undertaken during boat-based surveys conducted between 2003 and 2005 were used to assess occurrence, abundance, and movement patterns of bottlenose dolphins in the Marlborough Sounds. Long-term site fidelity was evident, with the majority of individuals resighted over multiple years. Lagged identification rates showed consistency over a 4-y period, with some individuals remaining for longer periods, while others frequently interchanged between different areas of the Marlborough Sounds. Migration rates were high, with approximately 25% leaving and entering the 890 km² region annually. Bottlenose dolphins in the Marlborough Sounds appear to form part of a larger, open, coastal population consisting of 385 individuals, with 211 (95% CI = 195 to 232) dolphins utilizing the region per annum. While their occurrence within these waters is frequent, the Marlborough Sounds appear to be only a section of a much larger home range for this bottlenose dolphin population.

Key Words: mark-recapture, site fidelity, group size, movements, group composition, Marlborough Sounds, New Zealand, bottlenose dolphin, *Tursiops truncatus*

Introduction

Bottlenose dolphins (*Tursiops truncatus*) are one of the most comprehensively studied cetaceans, primarily due to their coastal proximity and adaptability in captivity (Reeves et al., 2002). Ranging from temperate to tropical waters, they show extreme diversity in abundance, distribution, and habitat use. Previous studies conducted in New Zealand have primarily focused on two populations: (1) Bay of Islands, Northland (e.g., Constantine, 2002; Mourão, 2006), and (2) Doubtful Sound, Fiordland (e.g., Williams, 1992; Schneider, 1999; Lusseau, 2002). However, this species also occurs in other regions around New Zealand, (e.g., Marlborough Sounds and Hauraki Gulf, Auckland), although little is known about the bottlenose dolphins inhabiting these waters. This is particularly evident in the Marlborough Sounds, a study site which from a latitudinal perspective, sits geographically intermediate between the two previously studied populations. Recently, it has been suggested that the Marlborough Sounds dolphins are genetically differentiated from the other New Zealand populations although connected to other worldwide populations through long-distance gene flow (Tezanos-Pinto et al., 2009). Data detailed here represent the first dedicated effort to assess bottlenose dolphins in the Marlborough Sounds. Several anthropogenic activities occur within these waters; therefore, it is pertinent to assess the use of this region by bottlenose dolphins. We determined the annual abundance of bottlenose dolphins using the Marlborough Sounds in order to establish their frequency within this region. Group dynamics, site fidelity, and movement patterns of individuals were also assessed.

Materials and Methods

Study Area

The Marlborough Sounds (41º S, 174º E) is a series of rias adjacent to the Cook Strait and Tasman Sea, located along the Northern coast of South Island, New Zealand (Figure 1). The region comprises 890 km² of diverse sounds and estuaries that vary in depth, topography, and salinity (Potton, 1986). Our data represent surveys conducted in three main areas of the Sounds: (1) Queen Charlotte Sound (QCS), (2) Pelorus Sound (PS), and (3) Admiralty Bay (AB) (Figure 1). Queen Charlotte Sound is the most eastern region and is the main ferry terminus between New Zealand's North and South Island. Pelorus Sound/Havelock is the most land-locked region, exhibiting high levels of fresh water inflow (Heath, 1974). Admiralty Bay/Current Basin, the most western part of the Marlborough Sounds, is separated by French Pass, a narrow passage that runs between Cook Strait and the Tasman Sea (Potton, 1986).

Data Collection

Nonsystematic, boat-based surveys were conducted from 2003 to 2005 in the Marlborough Sounds using a 5.6-m research vessel powered with a 100-hp, 4-stroke outboard motor. Surveys were conducted during daylight hours between 0700 to 1800 h (New Zealand Standard Time [NZSTD]), in Beaufort sea states of 3 or less. Typically, search effort lasted between 4 to 7 h/survey (mean = 5.35 h). Vessel speed during survey effort was approximately 15 km/h. A LCX-15 Sonar/GPS (Lowrance Electronics, USA) was used to record latitude, longitude, depth (m), and speed of travel (km/h). Experienced observers conducted observations with their naked eye using continuous scanning methods (Mann, 1999).

Upon sighting a group of bottlenose dolphins, survey effort ceased, and the vessel slowly maneuvered to approach the group. Once within approximately 10 m of the animals, latitude, longitude, time, and environmental data (e.g., sea surface temperature, depth, wind speed and direction, swell height and direction, tide state, and salinity) were recorded. Group size and composition were also noted at this time.

Group Dynamics

Group size was estimated based on the initial count of individuals observed to surface at one time. Dolphin groups were defined by spatial proximity using the 10-m chain rule (Smolker et al., 1992). Group composition was determined by counting the minimum number of adults, juveniles, and calves present. Age class definitions followed those by Mann & Smuts (1998) and Mann et al. (2000) (Table 1). Field count estimates were later adjusted based on photo-identification data by increasing the minimum number of individuals

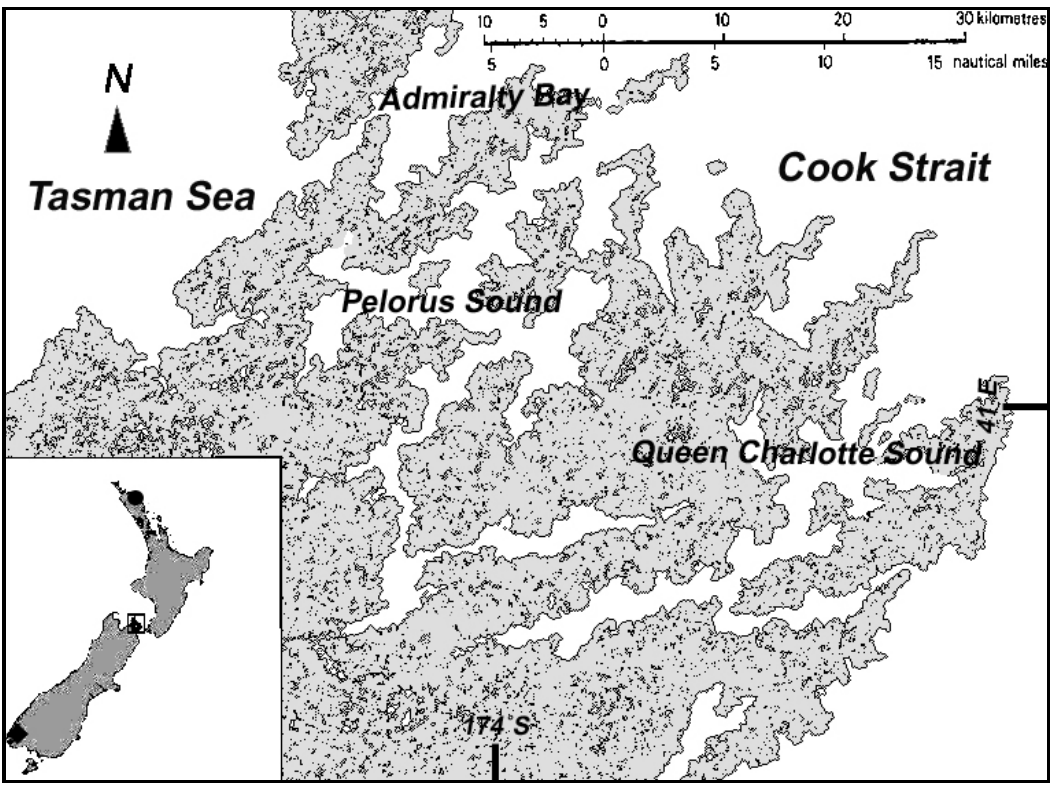

Figure 1. The Marlborough Sounds, South Island, New Zealand, with insert map of New Zealand showing locations of Bay of Islands (circle), Marlborough Sounds (square), and Doubtful Sound (diamond) populations.

Table 1. Age classes used to determine group composition of bottlenose dolphins (*Tursiops truncatus*) in the Marlborough Sounds, New Zealand; definitions derived from Mann & Smuts (1998) and Mann et al. (2000).

Age class	Definition
Calf	Presence of foetal folds; this stage lasts up to 3 mo and is denoted by uncoordinated surfacing behavior. Individuals were also classified as calves if they were one-half the size of an adult dolphin and often observed swimming alongside an adult animal in echelon or nursing positions.
Juvenile	Two-thirds the size of an adult; often observed in close association with an adult but never observed in the nursing position.
Adult	Large marked or unmarked individuals that are 3.0 m in length; smaller females were also classified as adults if observed nursing a calf.

present if more marked individuals were photographed than the field estimate obtained.

Photo-Identification

Abundance was assessed using previously established photo-identification techniques (Würsig & Jefferson, 1990). Opportunistic photographs of bottlenose dolphins were originally taken in the Marlborough Sounds region between 1998 and 2000 (Markowitz & Harlin, unpub. data). These images, along with other opportunistically collected photographs (I. Visser & G. de Tezanos-Pinto, unpub. data), initiated a bottlenose dolphin photo-identification catalogue for the Marlborough Sounds. All opportunistic data collected in 1992, 1995, and between 1997 and 2003 were included in the following analyses.

Photographic images collected during 1998 and 1999 were digitized prior to analysis. From 2000 to 2005, photographs were captured using Nikon D1 and D100 cameras fitted with 100 to 300, 70 to 300, and 80 to 400 mm lenses, respectively. Photo-identification efforts ended when at least two images of all individuals present were obtained or when either avoidance behavior of the focal animals (Bejder et al., 1999; Lusseau, 2002) or poor weather conditions precluded further data collection. Photographs were evaluated for suitability and graded excellent, good, or poor based on predetermined criteria, including the angle of the dorsal fin, contrast, and focus (Slooten et al., 1992). Photographs were then catalogued in *FINSCAN 1.5.4* (Araabi et al., 2000; Hillman et al., 2003) and compared manually (Markowitz et al., 2003). All groups represent independent encounters based on date and geographic locality.

Abundance

A total of 316 photographic records of 182 individuals between 1992 and 2002 established the Marlborough Sounds bottlenose dolphin catalogue. From 2003 to 2005, 1,127 photographic records were collected, cataloguing a further 153 new individuals. To determine the status (i.e., open or closed) of this population, a discovery curve was generated using photographs deemed to be of good or excellent quality. Using POPAN in *SOCPROG 2.3* (developed in MATLAB by H. Whitehead; programs available at http://myweb.dal.ca/hwhitehe/social.htm), population abundance estimates were calculated and fitted with three population models: (1) Schnabel, (2) Mortality, and (3) Mortality + Trend (Whitehead, 2009). Parameters for these models are detailed in Gowans et al. (2000). Model selection was based on Akaike's Information Criterion (AIC), which estimates the models' likelihood based on the number of parameters and the probability of obtaining the observed data (Akaike, 1973). Models with the lowest AIC value were chosen as the best-fit model (Whitehead, 2009). Photographic data collected from 1992 to 2005 and from 2003 to 2005 were examined independently to take into consideration differences in photographic effort.

Mark rate, defined as the percentage of permanently marked individuals, was determined from quality photographs (deemed excellent or good; n = 2,173) collected from a series of independent test days. Total population size was calculated using estimates generated from the best-fit model and adjusted in accordance with the mean mark rate for the population.

Site Fidelity

Site fidelity was determined by the resight rate, with sampling intervals defined by day, month, and year. To ensure individuals were photographed randomly across the study area, a Poisson distribution (Zar, 1996) was generated from photo-identification observations obtained from 2003 to 2005. A χ^2 test was then applied to compare the observed and expected values to determine if individual dolphins display a level of site fidelity to the Marlborough Sounds (i.e., where the observed distribution deviates significantly from the expected).

Residence Times

The amount of time individuals spent within the Marlborough Sounds was examined by calculating lagged identification rates (LIRs) in *SOCPROG*

2.3 (Whitehead, 2009). The LIR is the probability that an individual identified in the study area at time X will be identified again within the study area after a certain time lag (Whitehead, 2009).

Photo-identification data of all individuals sighted between 2003 and 2005 were included in the LIR analyses. This resulted in the removal of 101 individuals, leaving 234 individuals and 1,131 records used in the analysis. LIRs were calculated for the entire study area and subsequently compared to the expected LIRs from exponential mathematical models—Emigration/Mortality and Emigration + Reimmigration—to assess residency patterns (Whitehead, 2009). Quasi-AIC (QAIC) values were calculated for all models, with the lowest values used to determine the best-fit models (Whitehead, 2009).

Movement Patterns
Transition probabilities for movements between all areas within the Marlborough Sounds (QCS, PS, and AB) and all external areas (i.e., waters outside of the Marlborough Sounds) were calculated in *SOCPROG 2.3* (Whitehead, 2009) using a parameterized movements among areas Markov model. This model generates estimates for each time unit in which individuals have a certain probability of moving from one region to another while accounting for permanent emigration from all study areas in a single day (Whitehead, 2009).

Results

Survey Effort
Survey effort consisted of 578 h over 125 d between October 2003 and August 2005 (Table 2). A total of 132 surveys were conducted in the Marlborough Sounds, with QCS receiving the greatest survey effort and consequently the most bottlenose dolphin sightings in comparison to other regions. However, sighting rates (defined as the number of sightings/h of search effort) revealed a similar sighting rate for QCS and AB, and a slightly lower sighting rate for PS in comparison (Table 2).

Photo-Identification Effort
Photo-identification was conducted during 40 surveys between 2003 and 2005, resulting in 21 h of photographic effort. Five additional opportunistic encounters (T. Markowitz & G. de Tezanos-Pinto, unpub. data) between 2003 and 2004 added further data which are included within the present analyses.

Group Dynamics
Group size and composition were examined for 45 independent groups encountered between 2003 and 2005. Group size ranged from 3 to 172 individuals (median = 12, SD = 38, ± SE = 0.84), with most groups (n = 34) encountered containing ≥ 11 animals (Figure 2). Group composition revealed 83% (± SE = 1.63) of the individuals encountered in groups were deemed adults, with a remaining 17% categorised as either juveniles (10%, ± SE = 0.80) or calves (7%, ± SE = 1.26) (Figure 3).

Abundance Estimates
Overall, 1,443 quality photographs obtained from 80 independent dolphin groups occurring between 1992 and 2005 were used to develop a digitized photo-identification catalogue resulting in 335 uniquely marked individuals (Figure 4).

Abundance estimates calculated for 1992 to 2005 and from 2003 to 2005 were similar (Table 3), suggesting an annual population size of 184 (± SE = 8.4) marked individuals, with an interannual migration rate of 25% (± SE = 0.02%). An 87% (± SD = 5.9) mark rate for mature animals indicated an annual population estimate of 211 (95% CI = 195 to 232) dolphins occurring in the Marlborough Sounds. Based on AIC values, mortality was selected as the most appropriate model. This open population model estimates the maximum likelihood for the population size while accounting for both immigration and emigration.

Site Fidelity
A total of 160 catalogued individuals (n = 335, 47%) were resighted during more than 1 y, several (n = 18) of which span over 5 y (Figure 5). The average number of photographic recaptures per individual was four, with 13 individuals resighted over 10 mo. Individual I44 (Aurbie) was first documented in 1995 in QCS and subsequently resighted 14 times during different months in all regions of the Marlborough Sounds (QCS, PS, and AB) over a 10-y period. Approximately

Table 2. Number of bottlenose dolphin sightings and effort for each area surveyed in the Marlborough Sounds, New Zealand, from 2003 to 2005.

Area	No. of surveys	No. of sightings	% of sightings	Effort (h)	% of effort	Sightings rate
QCS	82	30	66.7	354	61	0.08
PS	25	8	17.8	141	21	0.05
AB	25	7	15.5	83	18	0.08

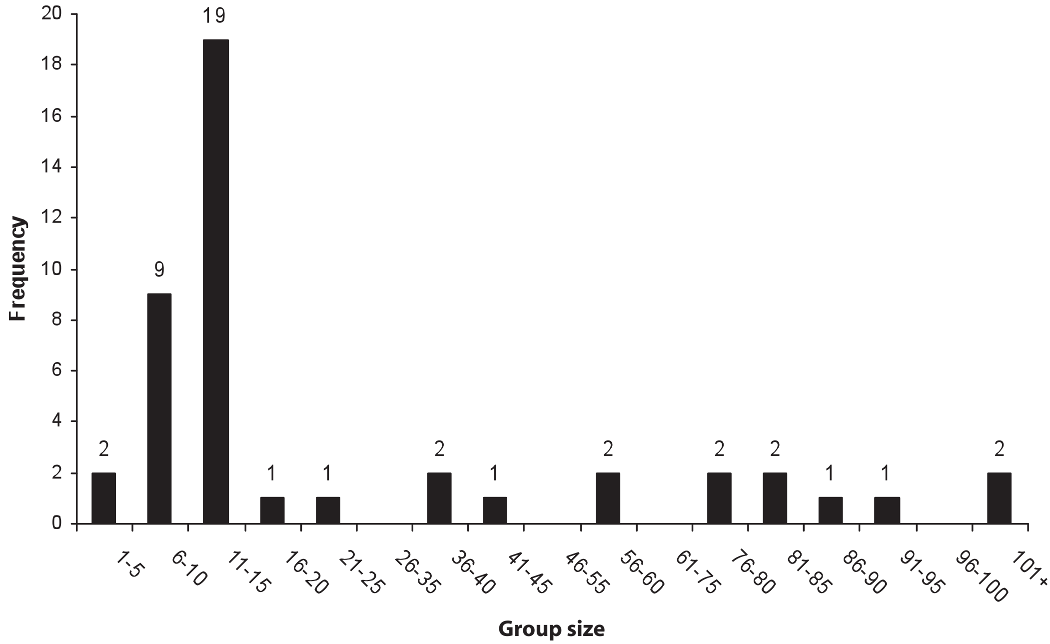

Figure 2. Estimated group size of bottlenose dolphins based on minimum photo-identification and field counts for 2003 to 2005 in the Marlborough Sounds, New Zealand; group size ranged from 3 to 172 individuals (median = 12, SD = 38.0), with most groups (n = 34) encountered containing ≥11 dolphins.

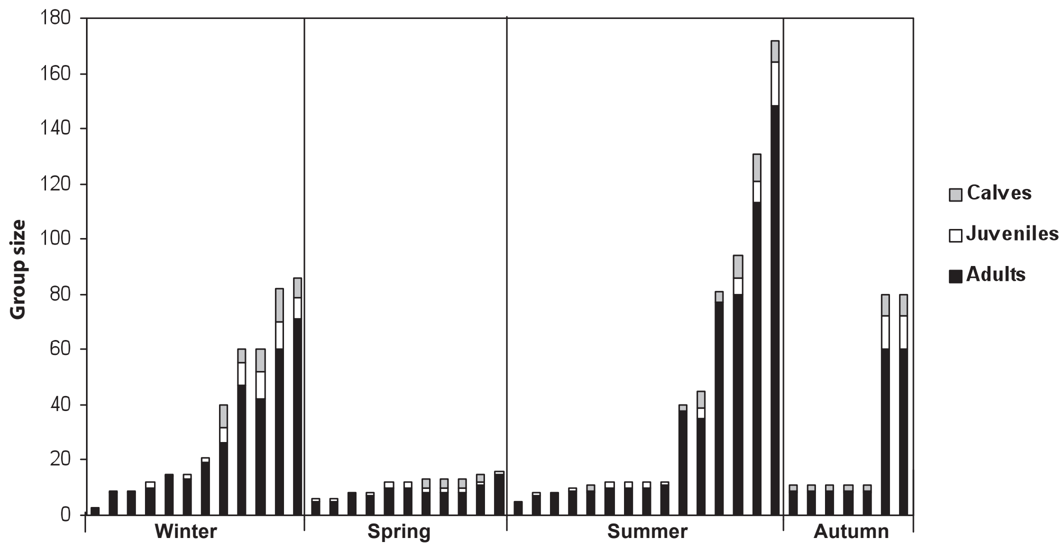

Figure 3. Group size and composition for groups (n = 45) of bottlenose dolphins encountered from 2003 to 2005 presented by season and ordered by group size. **Note:** Each bar = one observation.

one-third of resighted individuals (n = 91, 27%) were sighted in more than 3 y (Figure 5).

A significant difference was evident in the observed *vs* expected resight rate (χ^2 = 306.44, df = 9, $p < 0.000$) (Figure 6). The Poisson-generated values revealed that a high number of individuals were photographed only once (n = 56) compared to the expected value (n = 14), and a high number of individuals were photographed more than 7 times (n = 22) compared to the expected value

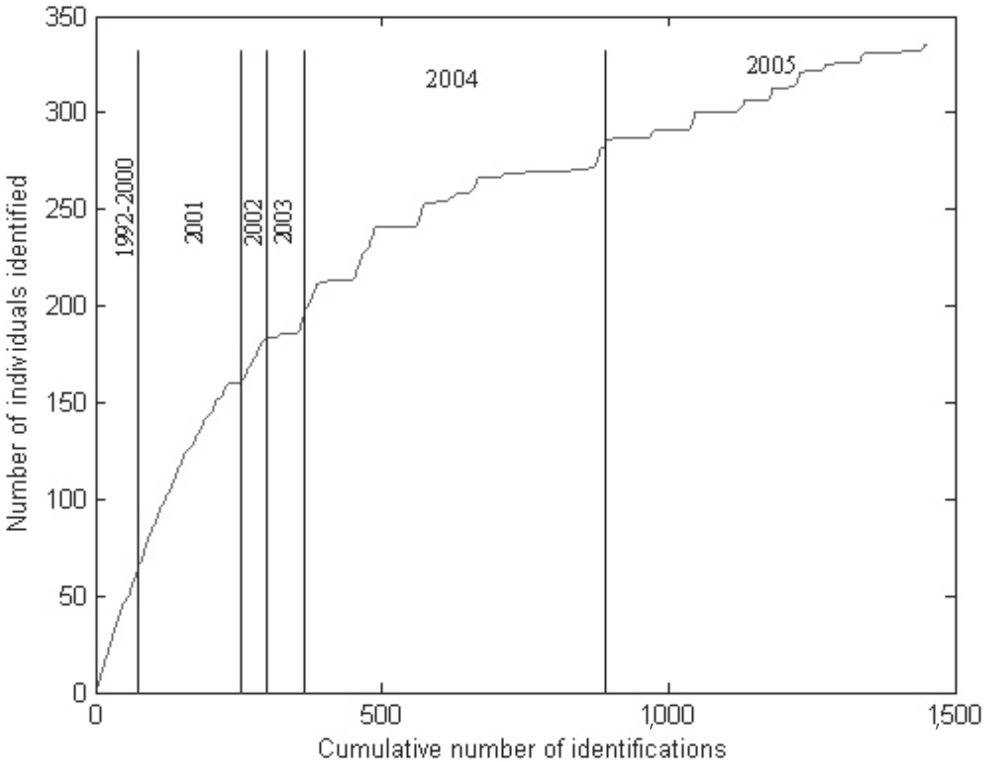

Figure 4. Discovery curve showing number of marked bottlenose dolphins (n = 335) identified between 1992 and 2005.

Table 3. Bootstrapped (n = 100) *SOCPROG* Model results for 1992 to 2005 (n = 335 individuals, 11 sampling periods) and 2003 to 2005 (n = 234 individuals, three samplings periods) for bottlenose dolphins observed in the Marlborough Sounds, New Zealand.

Model	Est. pop. size	± SE	95% CI	Est. mortality rate	± SE	95% CI	Log likelihood	AIC value
1992-2005								
Closed Schnabel	377	9.8	364-404	--	--	--	-577.8973	1,117.7945
Mortality	184	8.4	170-202	0.25	0.02	0.20-0.30	-408.3306	820.6613
Mortality + Trend	183	77.9	134-335	0.25	0.07	0.10-0.28	-408.2685	822.5375
2003-2005								
Closed Schnabel	243	4.8	237-255	--	--	--	-139.7271	281.4542
Mortality	184	7.8	173-205	0.24	0.04	0.13-0.32	-129.9202	263.8404
Mortality + Trend	184	9.0	172-206	0.24	0.06	0.08-0.29	-130.0152	266.0304

(n = 17). Where the observed values exceeded the expected value (≥ 7), an individual's use of the Marlborough Sounds region was considered to be more frequent than others and, thus, these individuals were classified as frequent users. Of the 56 individuals photographed only once, 51.7% (n = 29) were first captured in 2005, with 48.3% (n = 14) of those first identified in the last month of the study.

Lagged Identification Rates

Lagged identification rates (LIRs) revealed individuals were sighted multiple times in the Marlborough Sounds over a 4-y period. The best-fit model for the LIR within the study area was the Emigration + Reimmigration Model (QAIC = 4,074.35) (Figure 7). Seventy-four of the 234 identified individuals used in this analysis spent an average of 7 d in the Marlborough Sounds before leaving for 11 d (Table 4).

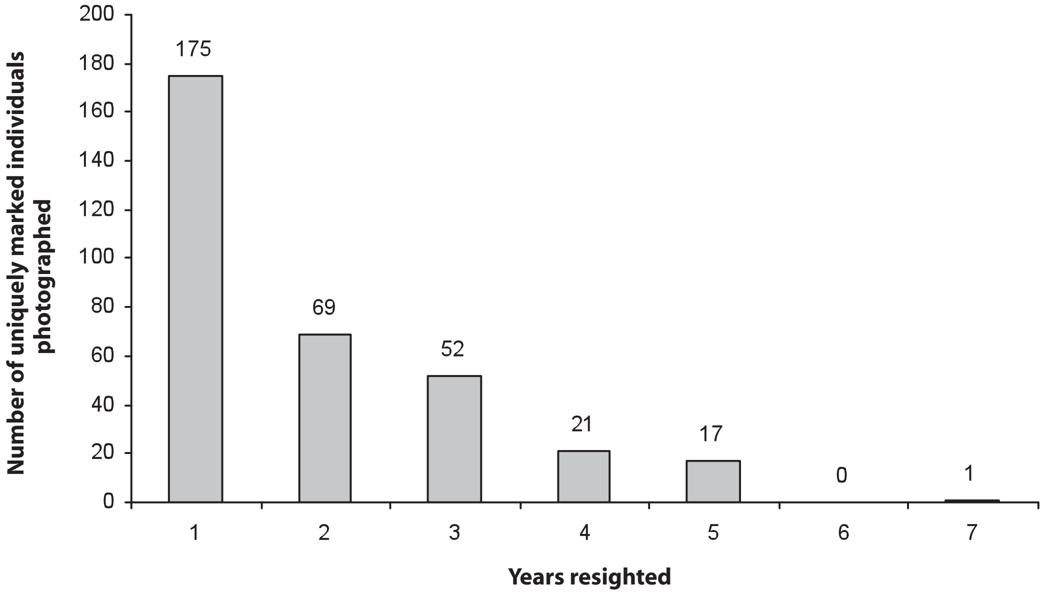

Figure 5. Number of uniquely marked adult bottlenose dolphins in the Marlborough Sounds *vs* the number of years photographed between 1992 and 2005.

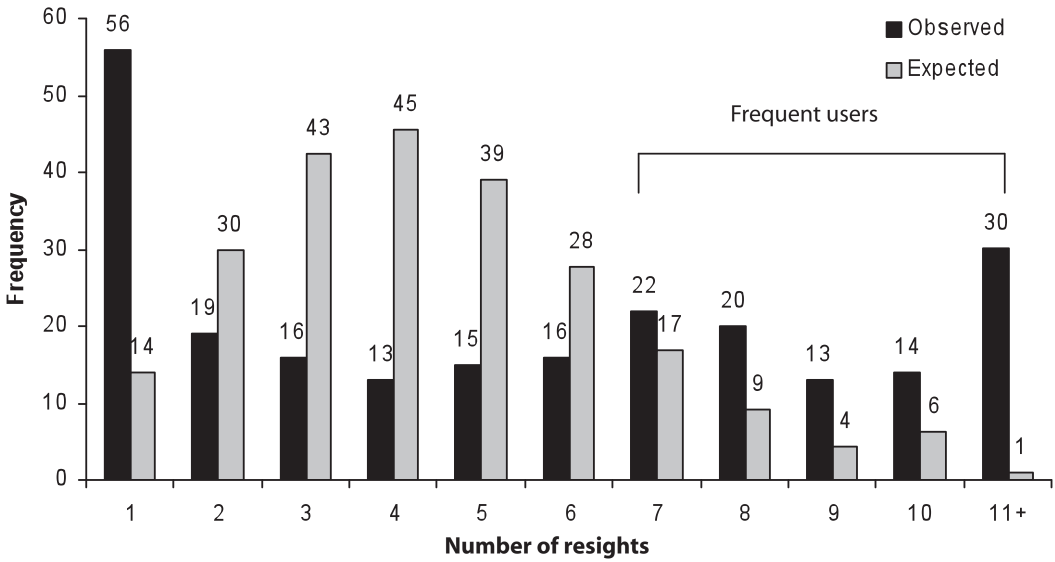

Figure 6. Observed *vs* expected Poisson distribution of the number of resights for individual bottlenose dolphins in the Marlborough Sounds, New Zealand, from 2003 to 2005. **Note:** Frequent users are shown by the horizontal bar.

Movement Patterns

Transition probabilities for movements between all areas within the Marlborough Sounds and an undefined external area within 1 d were estimated with corresponding standard errors (Table 5). Movement from AB to PS and from PS to QCS followed a linear (W to E) pattern with respect to the geographic layout of the region (see Figure 1). Movements from QCS to other areas were nonlinear, with movements to AB being higher than movements to PS. Pelorus Sound, which is located between AB and QCS, showed higher probabilities of movement to QCS and outer areas (areas outside the Marlborough Sounds) than movements to AB. Movements from the outer areas back into the study site were higher for AB than PS or QCS.

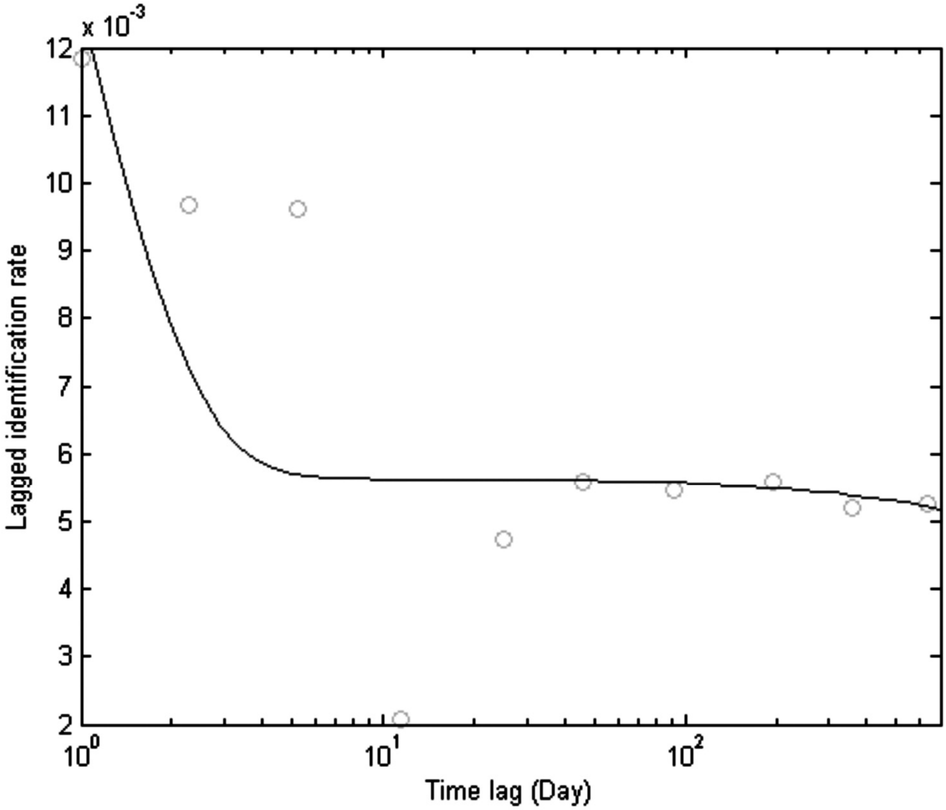

Figure 7. Lagged identification rates (LIRs) for all individual bottlenose dolphins sighted in the Marlborough Sounds, New Zealand, between 2003 and 2005; graph depicts the probability that a dolphin photographed at time "0" will be identified again at time x within the study area. Data points are represented as circles and the best-fit model (Emigration + Reimmigration) is displayed as the dark line.

Discussion

Group Sizes

Group sizes in the Marlborough Sounds were considerably larger than those previously reported for other *Tursiops* populations. Twenty-one percent of groups encountered in the Marlborough Sounds contained ≥ 81 individuals. One group consisted of at least 172 animals as determined by the number of unique photo-identifications achieved. This number is unusually high for bottlenose dolphins inhabiting nearshore coastal environments (e.g., Baird et al., 2001 [range = 1 to 16, median = 6]; Hubard et al., 2004 [range = 1 to 50, median = 4]; Bearzi, 2005 [range = 1 to 57, mean = 10.1]; Speakman et al., 2006 [range = 1 to 60, mean = 7.81]). Few studies report mean group sizes higher than 15 in bottlenose dolphins (e.g., Saayman & Tayler, 1973 [range = 3 to 1,000, mean = 140.3]; Defran & Weller, 1999 [range = 2 to 90, mean = 19.8]); likewise, even fewer report group size ranges similar to those detailed here for the Marlborough Sounds.

In New Zealand, groups encountered in the Bay of Islands ranged from 2 to 50 (median = 8 to 12) (Constantine, 2002). This is smaller than groups encountered in the Marlborough Sounds. However, the median group size reported in the Bay of Islands (Constantine, 2002) is similar to the median group size observed in the Marlborough Sounds (median = 12). Group sizes in Doubtful Sound ranged from 2 to 60 (mean = 26.7). Differences in group size between the three populations might be related to the topography of the differing habitats. Lusseau et al. (2003) suggest that basic oceanographic factors such as isolated regions, sea surface temperatures, and depth could influence bottlenose dolphin social organization in Doubtful Sound. Hence, these factors might also influence group size. Differences in habitats may be a contributing factor in the occurrence of large group sizes in the Marlborough Sounds population. However, many factors such as prey availability, openness of habitat, and predation have been reported to influence group size in bottlenose

Table 4. Models fit to LIRs for bottlenose dolphins observed within the Marlborough Sounds, New Zealand; residence times and movements between the regions and outside areas for all individuals between 2003 and 2005 (*n* = estimated population size in study area). * Marks the model fitted to the LIR graph.

Model	Maximum-likelihood value for parameters	QAIC value	Summed log likelihood
Closed (1/a1)	*n* = 177	14,490.9293	-20,913.0769
Emigration/Mortality (1/a1)*exp(-td/a2)	*n* = 161	14,486.7170	-20,904.1114
*Emigration + Reimmigration	*n* = 74	14,450.1525	-20,848.4557
(1/a1)*((1/a3)+(1/a2)*exp(-(1/a3+1/a2)*td))/(1/a3+1/a2)	mean residence time in = 7.6 d		
	mean residence time out = 11.6 d		

Table 5. Probabilities of individual bottlenose dolphins moving between Queen Charlotte Sound (QCS), Pelorus Sound (PS), Admiralty Bay (AB), and areas outside the Marlborough Sounds (OUT) within 1 d (± SE).

To From	QCS	PS	AB	OUT
QCS	--	0.00 (0.03)	0.03 (0.01)	0.00 (0.02)
PS	0.32 (0.07)	--	0.00 (0.11)	0.23 (0.10)
AB	0.00 (0.08)	0.27 (0.09)	--	0.08 (0.03)
OUT	0.00 (0.07)	0.01 (0.12)	0.04 (0.13)	--

dolphins (Shane et al., 1986; Würsig, 1986; Wells et al., 1987; Smolker et al., 1992). Thus, results presented here are more likely to be driven by a combination of influences rather than just the size and structure of the Marlborough Sounds alone.

Population Estimates and Site Fidelity

Photo-identification indicates that at least 385 individuals used the Marlborough Sounds region between 1992 and 2005. A total of 211 (95% CI = 195 to 232) individuals visited the region annually, with a relatively high interannual migration rate of 25%. This suggests that the bottlenose dolphins found in these waters likely form part of a larger population that frequent the northern coast of the South Island, New Zealand, a hypothesis further supported by the absence of a plateau in the discovery curve. Data also reveal that at least a proportion (42%) of the population exhibit site fidelity to the Marlborough Sounds. Increases in the discovery curve between 1992 and 2002 represent elevated opportunistic encounters by researchers working in this region. By 2005, the discovery curve was still on an incline, with 21 new individuals added to the catalogue in the final month of fieldwork. This indicates further photo-identification effort is still required within these waters.

In comparison to other bottlenose dolphins studied in New Zealand, Marlborough Sounds animals are most similar to the Bay of Islands population in regards to the proportion of marked individuals (81.5%), estimated abundance (*n* = 446), and year-round occurrence (Constantine, 2002). However, Bay of Islands bottlenose dolphins were initially classified as a closed population (Constantine, 2002), although recent evidence now indicates these animals range further along the northeast coast than previously reported (Berghan et al., 2008). The Doubtful Sound population is closed, yet considerably smaller, comprising only 56 individuals (Currey et al., 2007) that exhibit site fidelity (Schneider, 1999). Long-term site fidelity (up to 5 y) was observed in a small number of individuals (*n* = 18) occupying the Marlborough Sounds. The mark rate in Doubtful Sound bottlenose dolphins differed considerably from that reported here, with 20% fewer marked individuals. A higher proportion of marked adults in the Marlborough Sounds may reflect the extensive anthropogenic activities that occur in these waters compared with Doubtful Sound.

LIRs for 74 individual bottlenose dolphins within the Marlborough Sounds were consistent over a 4-y period. This corresponds with the individuals noted as having high site fidelity from the Poisson distribution (Figure 6).

Movement Patterns

Movement probabilities suggest rapid movement between all areas. However, standard errors were high, and survey effort was elevated in QCS. Therefore, movement patterns are likely under-represented for other areas. Nonetheless, the Marlborough Sounds appear to be an important part of this population's home range, with individuals migrating in and out every 7 d. It remains unknown where the dolphins go during the estimated 11 d that they are absent from the region, although anecdotal evidence suggests bottlenose dolphins occur in the Abel Tasman National Park and off the southern coast of the North Island. Such movement patterns appear feasible given that bottlenose dolphins in the Bay of Islands reportedly travel up to 240 km south to the Hauraki Gulf over a period of days (Berghan et al., 2008). This markedly differs from the bottlenose dolphins in Doubtful Sound that appear locally resident within a small (40.3 km) area (Schneider, 1999; Lusseau, 2003). However, due to the expanse of the Marlborough Sounds, it is also equally possible that dolphins are missed as they simply move into an adjacent sound.

Marlborough Sounds bottlenose dolphins appear to use the region as only one section of a much larger home range, with movements likely to extend at least 80 km out of the area. Movements between the different sounds show individuals regularly transverse distances of 200 km. Potential explanations for such movements may include declines in prey availability (Davey et al., 2008) or anthropogenic disturbance. The lower sighting rate observed in PS may reflect the sheer expanse of this sound (290 km^2) in comparison to the other surveyed regions. An alternative hypothesis involves the displacement of bottlenose dolphins in this region as a result of elevated aquaculture activity. Chinnock salmon (*Oncorhynchus tschawytscha*) and green-lipped mussel (*Perna canaliculus*) farms are present in all of the sounds, although they are more prominent in PS. The presence of oyster aquaculture facilities in Shark Bay, Australia, is known to adversely affect bottlenose dolphins (*T. aduncus*) by displacing mother/calf pairs (Watson-Capps & Mann, 2005). Fish farm sea cages of gilthead seabream (*Sparus auratus*) have also been found to alter the foraging behavior of bottlenose dolphins in the eastern Ionian Sea (Bearzi et al., 2004). In New Zealand, dusky dolphins (*Lagenorhynchus obscurus*) in the Marlborough Sounds appear to be restricted in the use of their wintering area by the green-lipped mussel farm industry (Markowitz et al., 2004). Extensive aquaculture and industrial activities operating within this region clearly warrant the need for robust demographic data for all marine mammal populations within these waters. While valuable first insights into a virtually unstudied bottlenose dolphin population are offered here, future photo-identification must involve cross comparisons between the Bay of Islands, Hauraki Gulf, and Doubtful Sound catalogues if the entire range of this population is to be determined.

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