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2009 Humpback Whale Surveys in the Cairns/Cooktown Management Area of the Great Barrier Reef Marine Park

Kaufman, G.D., Macie, A., Hutsel, A., Jule, K.

Pacific Whale Foundation, 300 Ma'alaea Rd., Suite 211, Wailuku, Maui, HI, USA 96793

Contact email: greg@pacificwhale.org

ABSTRACT

This study is the first on-water survey and photo-identification effort of humpback whales in the Great Barrier Reef Marine Park Cairns/Cooktown Management Area. A total of 138.9 survey hours were logged on the ocean near Port Douglas/Cairns area covering 2540.96 km during 21 days in the field, 21 July – 16 August 2009. A total of 28 humpback whale groups were observed, comprised of 55 animals (33 adults, 12 sub-adults, 10 calves) with an average of 2.6 (total) animals and 1.3 pods observed per day. Twenty-four whales were individually identified, with an additional seven fluke ID images contributed by a Cairns whalewatch operator. Seven whales were resighted (22.6%) to Pacific Whale Foundations' 'Breeding Stock E/Area V Humpback Whale Catalogue'. Thirty percent of the groups observed during surveys contained newborn calves indicating this region may be an important nursery area for Breeding Stock E1 humpback whales. The early season, high percentage presence of mothers with newborn calves, and sub-adult whales suggests that migration patterns of east Australian humpbacks may not be as straightforward as previously reported.

KEYWORDS: SOUTHERN HEMISPHERE, AUSTRALIA, HUMPBACK WHALES,
PHOTO-ID, BREEDING GROUND, MIGRATION

INTRODUCTION

Humpback whales, *Megaptera novaeangliae*, which migrate along the east coast of Australia, are known to include animals from the Area V (130 E-170 E) Southern Ocean stock (Donovan 1991). In the western South Pacific, the International Whaling Commission recognizes several breeding stocks (BS) that feed in Area V and likely Area IV and western Area VI: east Australia (BS E1), New Caledonia (BS E2), Tonga/Fiji (BS E3), and Tahiti, Cook Islands and American Samoa (BS F) (IWC 2005).

Historically, it has been suggested that Area V humpback whales segregate after feeding in Antarctic waters and return along the east Australian and New Zealand coasts towards their northern breeding grounds during the austral winter (Dawbin 1966). Humpback whales are known to exhibit some temporal segregation in migration to the winter grounds on the basis of age, sex and reproductive status (Dawbin 1966, 1997; Nishiwaki 1966). Humpbacks migrating along the east coast of Australia are believed to breed in the northern tropical waters of the Great Barrier Reef Marine Park (Forestell *et al.* 2003).

The Great Barrier Reef Marine Park (GBRMP) stretches more than 2,300 km and occupies an area of 341,000 sq km along the northeast coast of Queensland, Australia (Hopley *et al.* 1989). About 30 species of whales and dolphins have been observed in the GBRMP waters with humpback whales commonly seen from June to October. Approximately 75% of humpback sightings are observed south of 19°S, mainly in the Whitsunday Island and Mackay/Capricorn Management Areas (Chaloupka and Osmond 1999).

Humpback whales have been reported as far north as 1°S in the Coral Sea during the austral winter season (Townsend 1935; Slijper 1964). Recent aerial surveys describe sightings northward to 12°S in the Cairns/Cooktown Management Area and proximate to the Torres Strait (Simmons and Marsh 1986; Chaloupka and Osmond 1999). The Cairns/Cooktown Management Area (CCMA) includes all reefs and islands offshore from Port Douglas and Cairns, and covers about 6% of the Great Barrier Reef Marine Park.

While the seasonal humpback migratory cycle along the east Australian coast is reasonably well documented, little is known of humpbacks found north of 19°S (Chittleborough 1965; Dawbin 1966, 1997; Paterson 1991; Brown *et al.* 1995; Forestell *et al.* 2003; Noad *et al.* 2008). In this study, vessel surveys were conducted during the austral winter of 2009 in the Port Douglas/Cairns region of the CCMA with the objectives of collecting identification photographs, documenting group types, behaviors, distribution, and recording song.

MATERIALS AND METHODS

Sample Collection

Daily opportunistic surveys were made from a 6.2 m rigid hull inflatable vessel equipped with a 150 hp outboard motor operating between Port Douglas, (16° 29 S, 145° 27.5 E) and Cairns, Queensland (16° 55.1 S, 145°46.9 E) from 21 July – 16 August 2009. Additional opportunistic surveys and photo ID efforts were conducted near the Whitsunday Islands (21-25/08/09), Hervey Bay (27/08 – 18/09/09), Queensland and Eden, NSW (23/09/09 – 22/10/09) (Figure 1). Data were collected opportunistically in the form of digital photographs, GPS coordinates, sea surface temperatures, group size/composition, and behavioral observations recorded on pre-formatted data sheets. Singers were located using an Aquarian H2a-XLR hydrophone, and song recorded using a Sony digital DAT recorder.

Digital fluke and lateral body photographs (when possible) were collected for each identified whale using established procedures and Canon 40D and Canon 5D digital cameras equipped with motor drives and 28-300mm or 70-200mm lenses (Kaufman *et al.* 1987; 1993; Forestell *et al.* 2003). Identification photographs were compared with identifications previously obtained off east Australia. To select individual identifications suitable for re-sight analysis, all images were

scored according to the Cascadia Research Collective's fluke image screening criteria (Calambokidis *et al.* 2008).

CURRENT CATALOG HOLDINGS

Since 1984, data has been collected by Pacific Whale Foundation and/or submitted from collaborators working in the following areas in eastern Australia, Oceania and Antarctica: Whitsunday Islands, Capricorn Bunker Group, Hervey Bay and Point Lookout, Queensland; Byron Bay, Coffs Harbour, Sydney, Eden, New South Wales; American Samoa, Tonga and Antarctica. To date, Pacific Whale Foundations' 'Breeding Stock E/Area V Humpback Whale Catalogue' contains fluke photo-identification records of 5,460 individuals (across all areas). Of these individuals, 747 are known mothers and an additional 109 are known females with no history of calves. Further details of our catalog holdings are presented in Table 1.

RESULTS

Vessel Surveys

A total of 138.9 hours were spent on the ocean near Port Douglas/Cairns area covering 2540.96 km during 21 days in the field, 21 July – 16 August 2009 (Figure 2). Twenty-eight groups of whales were observed comprised of 55 animals (33 adults, 12 sub-adults and 10 calves). An average of 2.6 (total) animals were observed each day. The average number of groups observed per day was 1.3, with a mean group size of 1.96 whales. Calves were observed in 10 groups (30%) all of which contained only one calf. Singleton groups were mainly sub-adults (70%). Single adults ($n = 3$) were not observed until 13 August, with one recorded singing. Using photographic identification techniques, 24 whales were individually identified (16 adults, 6 sub-adults and 2 calves). Five of the 16 adults identified were mothers —females accompanied by newborn calves (light grey/white, folded dorsal fins, and <5m).

Habitat preference and reproductive parameters

Mean depth for all whales observed was 26.7 m and ranged from 18.8-37.5 m. Depth preference differed in calf pods versus non-calf pods. For pods with calves, mean depth was 27.7 m and for non- calf pods mean depth was 30.8 m. The mean sea surface temperature was 24°C with a range between 23.3-25.1°C.

Locations of all pods observed were documented and plotted (Figure 3). Due to our interest in reproductive parameters, pods were designated as calf pods, non-calf pods, or singer. In one case, a singer was observed escorting a mother-calf pod, however, for our purposes the mother-calf pod designation superseded singer and therefore the individual was plotted in a mother-calf pod. All but one of the five pods observed in July had a calf. In order to gain a better understanding of which sex/class of animals were utilizing Port Douglas/Cairns waters, the frequency of pod types observed are graphed in Figure 4. Pods most frequently observed were mother-calf ($n = 10$) and sub-adult singleton ($n = 7$) pods. Figure 5 shows the percentage of total adults, sub-adults and calves observed at one-week intervals in Port Douglas for the 2009 season.

Song recordings

Singing behavior was observed on five different daily sampling sessions, with songs recorded on three occasions. All acoustical recordings were of a high quality and are currently being analyzed by Libby Eyre of Macquarie University, NSW.

Re-sight analysis

During the course of the study, 1,419 digital images were collected yielding 24 unique individual humpback whales. An additional 7 whales were opportunistically identified by Cairns whalewatch operator 'Reef Magic' and added to our catalogue. These animals were compared to Pacific Whale Foundation's 'Breeding Stock E/Area V Humpback Whale Catalogue'. All images were scored according to the Cascadia Research Collective's fluke image screening criteria (Calambokidis *et al.* 2008).

Seven whales photographed off Port Douglas/Cairns were affirmed as re-sights to the Catalogue (22.6%). The seven re-identified individuals consisted of an adult male ("Migaloo" E1210, an all-white humpback whale – Forestell *et al.* 2001), one adult female and five adults of unknown sex. Two animals, E3954 (unknown sex) and E4000 (female) were re-sighted later, in October, off Eden, NSW (Table 2). Only one animal (sub-adult) was re-sighted within the Port Douglas area on two separate occasions, 12 and 14 August 2009, and was not matched to the Catalog.

DISCUSSION

Chaloupka and Osmond (1999) suggested the Whitsunday Islands Management Area comprises a broad expanse of isolated waters important for calving during late-July and early August. Similarly, Jenner *et al.* (2001) found humpbacks over-wintering off West Australia peaked in late-July or early August in waters 15° S (near Camden Sound). Our findings also confirm the presence of humpbacks in the Cairns/Cooktown Management Area (some 550 km north of the Whitsundays) during the late-July or early-August period. The mean sea surface temperature (SST) was 24°C (range 23.3-25.1°C) and is consistent with SST found in wintering areas worldwide, 21.8 – 28.3 °C (Rasmussen *et al.* 2007).

Humpback whales observed offshore of the Port Douglas/Cairns region of the CCMA were located on the leeward side of large named reef structures and east of the Cairns shipping lane. The data are consistent with what has been observed elsewhere for terminal wintering grounds in relation to depth preferences and mother-calf distribution patterns, with non-calf pods located in deeper, less protected waters (Herman *et al.* 1980; Forestell 1989; Smultea 1994; Clapham 2000; Jenner *et al.* 2001; Forestell *et al.* 2003).

The presence of small, light grey colored newborn calves in this study is remarkable. Thirty percent of the groups observed contained a calf, compared with previous findings of 11.1% in the Whitsunday Islands -- a previously described calving/breeding area (Forestell *et al.* 2003). The higher frequency of pods containing a calf contrasts to findings of Whitsunday Island area where a higher proportion of pods are singletons (presumed males) are observed (Forestell *et al.* 2003). Based on the high number of calf sightings, this region may be an important emerging nursery area for Breeding Stock E1 humpback whales.

Humpback whales are not known to appear in the CCMA before July 15 (A. Birtles, pers. comm) and migrate south by mid-September (T. North, pers. comm). Forestell *et al.* (2003) found peak number of adult and sub-adult whales in the Whitsunday Islands (some 550 km south of Port Douglas/Cairns) occurred the last two weeks of July, followed by an increase in mother/calf pods peaking in mid-August. The early presence of mothers with young calves, along with a high percentage of sub-adult whales suggests that migration patterns of east Australian humpbacks may not be as straightforward as previously reported (Chittleborough, 1965; Dawbin 1966, 1997). The high proportion of mother-calf pods observed near Port Douglas/Cairns in July also contradicts findings by Brown *et al.* (1995), who reported males typically lead the migration to the breeding areas and outnumber females by a ratio of 2.4:1.

It is widely held that humpbacks migrate each year during autumn from polar feeding grounds to over-wintering grounds in tropical waters and then return to polar waters during spring (Dawbin 1966, 1997). However, historical records of humpback whales off east Australia, Indonesia and adjacent waters detail the presence of humpback whales during austral summer months: December to March (Townsend, 1935; Slijper *et al.* 1964; Kahn 2002; Mustika 2009). Simmons and Marsh (1986), based on the observations of local Torres Strait Islanders and aerial surveys, suggested humpbacks may reside year-round in northern Australian waters. Chaloupka and Osmond (1999) reported that many sightings in northern Great Barrier Reef waters (11° to 16°S) were recorded during the austral summer and also suggested the possibility of a year-round resident stock in northern Australian waters.

While a year-round resident stock may exist, the resighting histories of seven individuals identified offshore of Port Douglas/Cairns supports inter-change between the Whitsundays, Hervey Bay and Eden, which is consistent with previous movements along the east Australian migratory corridor (Forestell *et al.* 2003, Rock *et al.* 2006, Gibson *et al.* 2009). In addition, all animals have been observed at one time in Hervey Bay, with Hervey Bay sightings ranging from early August to October. These findings are further evidence of consistent site fidelity for Hervey Bay (Forestell *et al.* 2003, in press).

Aerial surveys are planned for 2010 to augment vessel surveys to refine distribution and abundance of humpback whales in the Port Douglas/Cairns region of the CCMA. Pacific Whale Foundation continues to make our 'Breeding Stock E/Area V Humpback Whale Catalogue' available to other research groups for comparison. We are currently in discussions with the South Pacific Whale Research Consortium regarding limited regional analysis of our combined holdings, and are in the planning phase for a collaborative effort with the College of the Atlantic (Allied Whale) to establish a comprehensive Southern Ocean Catalogue for humpback whales.

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TABLES

Table 1. Current Pacific Whale Foundation BS-E/Area V Catalogue (reconciled through 2009)

Location	Time Span	No. of IDs	Notes
Whitsunday Islands	1990-1999, 2009	402	
Capricorn Bunker Group	1984-1990,	110	
Hervey Bay	1987-2000, 2002, 2004-2009	3801	
Point Lookout	1984-1991	402	
Byron Bay	1996-1997	106	1
Coffs Harbour	1985-1989	19	
Sydney	2005-2006	23	2
Eden	1993-2009	1581	3
Tonga	1985-1986, 2003-2007	87	
American Samoa	1994	1	
Antarctica	1983, 1986, 1988-1989	5	
Port Douglas/Cairns	2009	25	

(1) Submitted by David Paton

(2) Submitted by Libby Eyre and Scott Portelli

(3) Includes images submitted by Ros Butt, Cat Balou

Table 2. Whales Identified off Port Douglas/Carins 2009, matched to Pacific Whale Foundation's BS-E/Area V catalogue.

<u>Location</u>	<u>Animal ID</u>	<u>Sightings (Year day/month, Location, Identification, Source)</u>
Port Douglas/Cairns	E0591	1988 (4/10), Hervey Bay, Adult, PWF 2009 (14/8), Port Douglas, Adult, PWF
	E1210 Male	1992 (13/9), Hervey Bay, Adult, PWF 1993 (30/8), Hervey Bay, Sub-adult, PWF 1998 (2/10), Hervey Bay, Adult, PWF 2009 (13/8), Port Douglas, Adult, PWF
	E2407	2002 (12/9), Hervey Bay, Adult, PWF 2009 (9/8), Cairns, Adult, PWF
	E2880	2004 (6/9), Hervey Bay, Unknown, PWF 2009 (14/8), Port Douglas, Adult, PWF
	E3066	2005 (21/8), Hervey Bay, Sub-adult, PWF 2006 (28/9), Eden, Adult, Donation (Cat Balou) 2009 (15/8), Port Douglas, Adult, PWF
	E3954	2007 (31/8), Hervey Bay, Sub-adult, PWF 2009 (22/7), Cairns, Unknown, Donation (Reef Magic) 2009 (17/10), Eden, Donation (Cat Balou)
	E4000 Female	2007 (4/8), Hervey Bay, Adult, PWF 2009 (12/8), Port Douglas, Mother, PWF 2009 (16/10), Eden, Mother, PWF

FIGURES

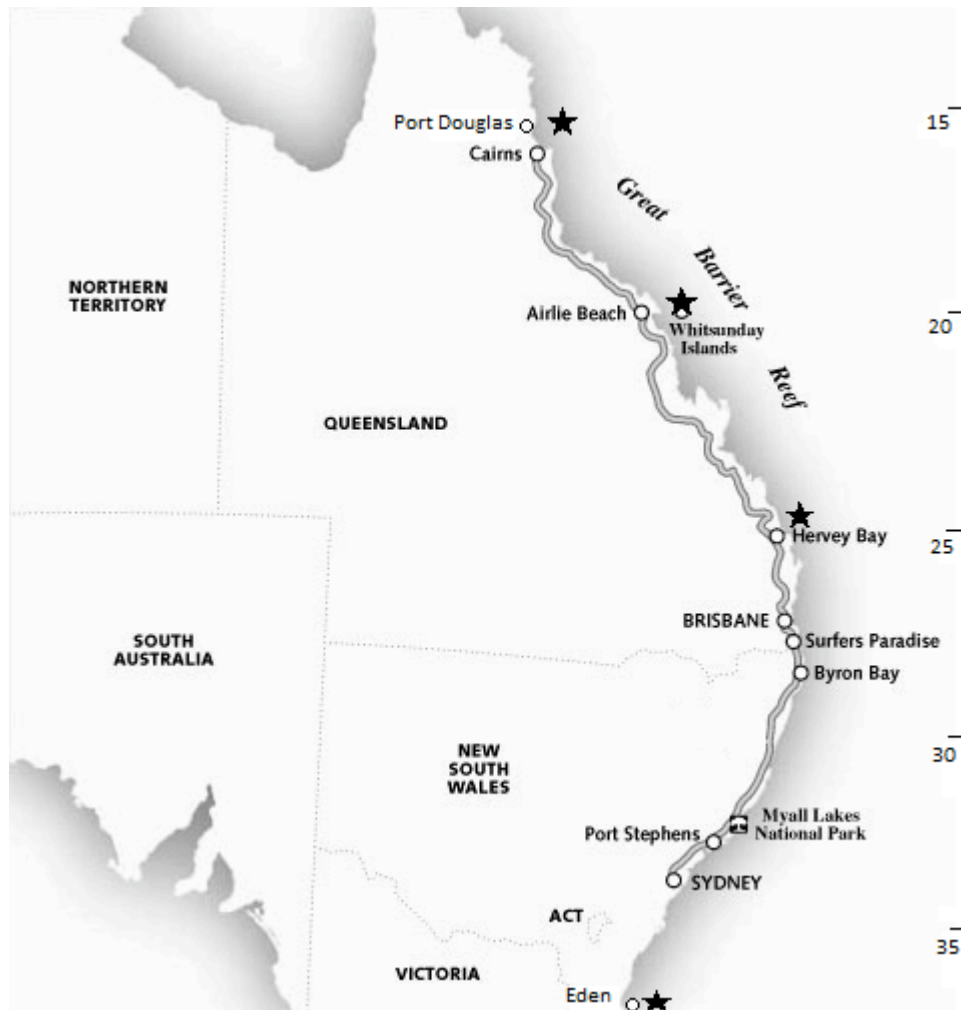


Figure 1. Study sites along the East Coast of Australia (as indicated by black stars), working southward: Port Douglas/Cairns QLD, Whitsunday Islands QLD, Hervey Bay QLD, & Eden NSW.

Figure 2. 2009 vessel survey tracks for Port Douglas/Cairns area.

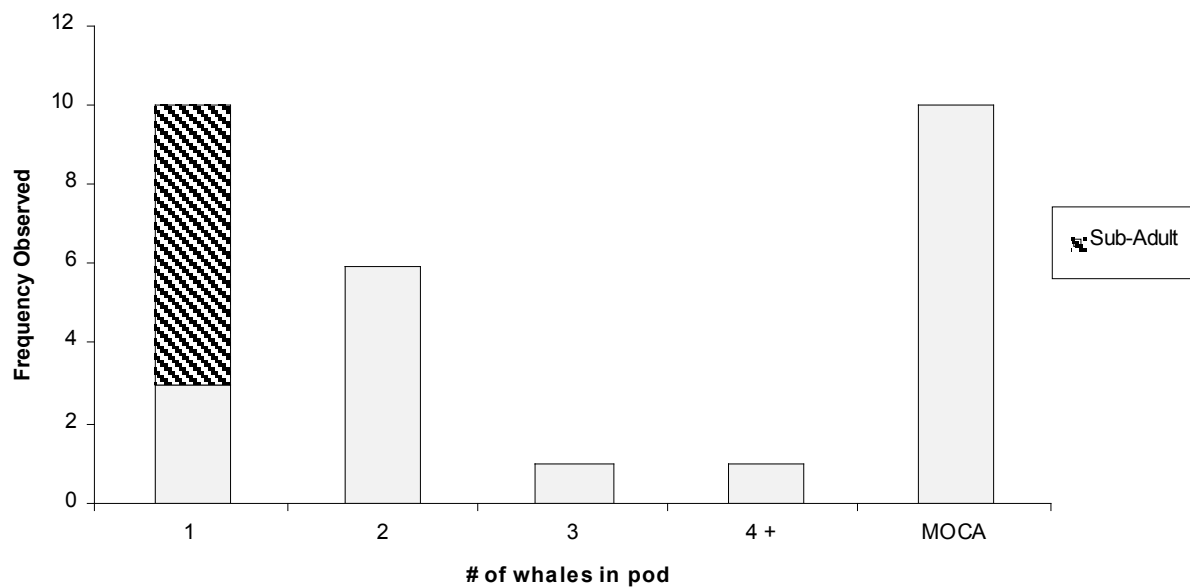


Figure 4. Frequency of animals in pod (MOCA = pod containing a mother and calf)

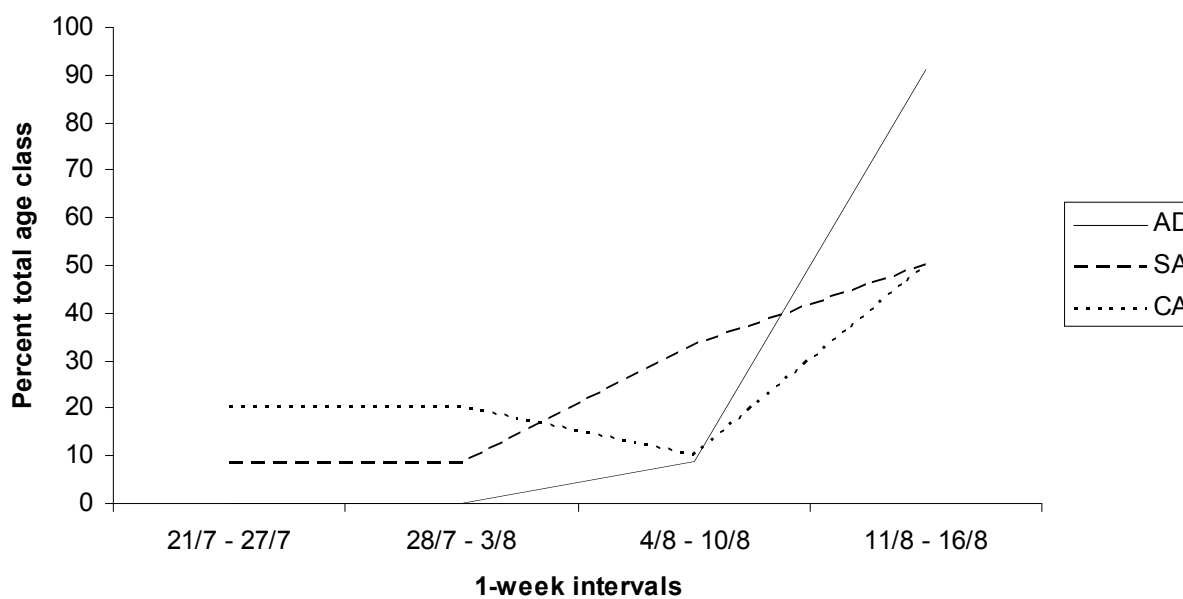


Figure 5. Percent of total adults (AD), sub-adults (SA) and calves (CA) observed at one-week intervals (July –August 2009) off Port Douglas/Cairns. (Note: AD count does not include mothers accompanying calves).