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MOVEMENTS OF RESIDENT KILLER WHALES IN SOUTHEASTERN ALASKA AND PRINCE WILLIAM SOUND, ALASKA

Two forms of killer whale (*Orcinus orca*), termed “resident” and “transient,” have been identified in the nearshore waters of Puget Sound, British Columbia, and southern Alaska (Bigg 1982, Leatherwood *et al.* 1984, Bigg *et al.* 1990, Leatherwood *et al.* 1990). Numerous behavioral differences between the two forms have been described, including apparent dietary specializations (Bigg *et al.* 1987, Morton 1990, Saulitis 1993). Resident killer whales are piscivorous, and transients prey upon marine mammals. The two forms also exhibit differences in sounds produced (Ford 1991) and genetic dissimilarities (Stevens *et al.* 1989, Hoelzel and Dover 1991). Resident killer whales remain in their natal pod for life, while transient killer whales appear to have a more fluid social structure (Bigg *et al.* 1990). Resident and transient killer whales have not been observed traveling together (Morton 1990, Saulitis 1993, Matkin *et al.* 1994, Ford *et al.* 1994).

Extensive ranges have been demonstrated for transient killer whales (Goley and Straley 1994); however, movements of both transient and resident killer whales are poorly understood (C. Matkin and Saulitis 1994). This note describes the observation of two resident killer whale pods (AF and AG) in southeastern Alaska and Prince William Sound over a 12-yr period and suggests reasons for movements between these areas.

The observations reported here are based on identification photographs taken between 1983 and 1994 and primarily from April to October, although some photographs were obtained in southeastern Alaska from November to March. Dedicated boat-based killer whale surveys included 1,288 d of effort and 566 encounters with killer whales in Prince William Sound and over 394 d of effort and 143 encounters off southeastern Alaska. Some aspects of this work have been reported elsewhere (Leatherwood *et al.* 1984, von Ziegeler *et al.* 1986, Leatherwood *et al.* 1990, D. Matkin 1990, C. Matkin *et al.* 1994, D. Matkin and Dahlheim 1995).

Identification of individual whales was made by the technique described in detail by Bigg *et al.* (1986). Whales were grouped in pods as defined by Bigg *et al.* (1990).

Table 1. Resident pods identified in Prince William Sound.

Pod	#whales (1993)	Sighting frequency
AB	26	regular
AI	6	regular
AE	15	regular
AK	11	regular
AJ	33	regular
AN10	15	regular
AN20	25 ^a	irregular ^c
AD	18	irregular
AY	11	irregular
AX ^d	54 ^a	rare
AS	15 ^a	rare
AG	21	rare ^b
AF	28 ^a	rare ^b
Total	278	

Regular = photographed in 80% or more of the years.

Irregular = photographed in 50–80% of the years.

Rare = photographed in less than 50% of the years.

^a Number in pod is approximate.

^b Regular sightings in southeastern Alaska.

^c Regular sightings until 1991.

^d Designation as pod provisional. May be aggregations of pods.

During the 12-yr study, 414 encounters with resident pod(s) were recorded in Prince William Sound. Thirteen resident pods, containing approximately 278 whales in 1993, have been identified (Table 1). Through 1992, seven resident pods were resighted frequently enough to permit annual recording of their recruitment and mortality rates (C. Matkin *et al.* 1994). Other pods were encountered less frequently or only rarely. AX pod contained at least 54 individuals in 1991 (Heise *et al.* 1992). Its designation as a pod should be considered provisional due to the few encounters with the group. Some of the whales in AX pod were identified in photographs taken in waters near Kodiak Island, approximately 500 km south of Prince William Sound. Members of another occasionally encountered pod, AD, also have been photographed as far southwest as Kodiak Island. Two other resident pods, AF and AG, photographed infrequently in Prince William Sound (19 encounters), have been regularly photographed (66 encounters) in southeastern Alaska over 750 km to the southeast. AG and AF pods were encountered either singly or together on 76 occasions off southeastern Alaska and are the only resident pods frequently observed in that region. (D. Matkin and Dahlheim 1995, Ellis 1987). None of the other resident pods identified in Prince William Sound was encountered off southeastern Alaska.

Encounters with resident pods AG and AF in both Prince William Sound and southeastern Alaska regions are summarized in Table 2. At least part of AF pod was photographed in Prince William Sound in five different years.

Table 2. Sightings of AF and AG pods in southeastern Alaska and Prince William Sound, 1983–1994.

	Prince William Sound		Southeastern Alaska	
	Dates	Assoc. pods	Dates	Assoc. pods
		AF pod		
1983 ^a	8/12	—	—	—
1984	8/4, 5, 6, 14	AB, AI, AN	5/27; 7/16, 21; 8/28; 9/2	—
1985 ^a	8/5, 6, 7, 8	AB, AI, AD	8/?	—
1986 ^a	8/4, 9; 10/1	AB, AI, AD	8/18; 9/2, 5	AG
1987	—	—	—	—
1988	—	—	8/11, 15, 24	AG
1989	—	—	4/13; 6/23; 7/4	—
1990	—	—	8/6, 11, 29; 9/5	AG
1991	—	—	5/4; 9/12, 27; 10/12	—
1992 ^a	8/27	AB, AI, AN	7/26; 8/18, 19, 23, 24, 27; 9/3; 10/3, 13	—
1993	—	—	7/12, 27; 8/28; 10/11; 11/3	—
1994	—	—	9/10; 10/1; 11/4	—
		AG pod		
1983	—	—	dated only 83	—
1984	—	—	6/4, 26; 9/8	—
1985	—	—	—	—
1986	—	—	8/18	AF
1987	—	—	7/30	—
1988	—	—	8/11	AF
1989	—	—	6/7	—
1990	—	—	8/6, 29; 9/5; 10/21; 11/5	AF
1991	—	—	4/23; 8/13, 20, 21; 9/3; 10/7	—
1992	7/24; 8/17, 8/19	AB, AI, AN, AD, AY, AS	3/15; 7/18; 10/2, 6, 26; 11/2	—
1993	7/30	AJ, AY	5/14, 27; 6/6, 29, 8/10; 9/6, 14; 12/25	—
1994	8/2, 6	AB, AI, AS, AK, AJ	1/21; 4/7; 6/4	—

^a Only part of pod photographed in Prince William Sound.

Note: 1984 data from Leatherwood *et al.* 1984.

The entire pod was photographed in Prince William Sound only in 1984. AG pod was not photographed in Prince William Sound until 1992. The entire pod was photographed in Prince William Sound in 1992, 1993, and 1994.

Killer whales may move rapidly between areas. AG pod was photographed in Icy Strait, southeastern Alaska, on 18 July 1992 and in Montague Strait,

Prince William Sound, six days later, for a minimum average speed of 5.1 km/h for the direct route distance of 740 km.

In 1986 a subgroup of AF pod was photographed in western Prince William Sound on 9 August and was subsequently photographed approximately 950 km away in Frederick Sound, southeastern Alaska, on 5 September. Three of the same individuals were again photographed in Prince William Sound on 1 October, indicating that they had made at least two visits to Prince William Sound in a period of two months.

AF and AG pods were often part of multiple-pod encounters ("superpods") when observed in southwestern Prince William Sound during July and August (Matkin *et al.* 1994). Pods irregularly observed in Prince William Sound such as AX, AD, AS, and AY were often photographed during this period as well, and all of these pods except AX were observed swimming with AF or AG pods (Table 2).

The genetic and social relationships between AG and AF and other resident pods that use Prince William Sound are not yet clear. Acoustic behavior may reveal relatedness of pods. Shared calls between resident killer whale pods suggest a common lineage along matriline, and historic relationships may be reflected in the degree of call sharing (Ford 1991). AF and AG pods are very similar acoustically, as they share many of the same discrete calls. However, both AF and AG pods appear to share calls with Prince William Sound pods (J. Ford, personal communication), suggesting a genetic relationship along matriline among these resident pods.

The movement of resident pods between southeastern Alaska and Prince William Sound may enhance feeding or breeding opportunities. From scale samples collected at fish kills, it appears resident pods in Prince William Sound were feeding primarily on coho salmon (*Onchorhynchus kisutch*) during the periods when AG and AF pods were observed (E. Saulitis, unpublished data). Commercial fish catches indicate that, on average, this species and other salmon species were at least as abundant in northern portions of southeastern Alaska at that time (Rigby 1991, Donaldson *et al.* 1995). Although food may be abundant in Prince William Sound, we suspect that killer whales move into the area and form multipod aggregations for social reasons.

The arrival of AF and AG pods may coincide with breeding opportunities. Temporary mixing of individuals among pods occurs at this time. When photographed in Prince William Sound, both AF pod and AG pod were observed mixing with several other resident pods (Table 2), including AD pod. In 1993 and 1994 only a single mature male from AJ pod, AJ17, was present when AG pod was photographed as part of multipod groups in Prince William Sound, although the rest of its natal pod may have been nearby. During multipod encounters in late July and August, other mature bulls such as AN1, AK4, and AB5 also have been observed temporarily traveling apart from their natal pods closely following reproductive females from other pods. Social and sexual activity is frequently observed at these times. Based on the gestation period of 17 mo (Walker *et al.* 1988), an estimated mean date of conception in British Columbia of late July–early August (Olesiuk *et al.* 1990), and the

presence of all but one young of the year when our observations began in mid-April or thereafter, it is likely that successful matings occur in July and August.

There is clearly social interaction among resident killer whales that are found in the waters of southeastern Alaska, Prince William Sound, and as far southwest as Kodiak Island. In addition to the movements of AF and AG pods, members of AD pod were photographed on several occasions in Kachemak Bay, 340 km southwest of Prince William Sound, and in Kodiak Island waters, 520 km southwest of Prince William Sound (Leatherwood *et al.* 1984).

Preliminary genetic analysis indicates either that genetic mixing occurs between Prince William Sound residents and northern and southern residents in British Columbia or that these groups have recently diverged from a common ancestor (L. Barrett-Lennard, personal communication). This, coupled with our observations, suggests the possibility of gene flow among resident killer whales from British Columbia through the Kodiak Island region, although no single pod has been observed to range through that entire area.

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