mately 52 km southwest of Cape Beale (Toochin and Fenneman 2008), but this was not authenticated, so the sighting reported here represents the first confirmed sighting for the province. There are 14 previous records of Great Shearwaters in the north Pacific if one discounts the unconfirmed BC sighting: ten off California, two off Washington, one off Alaska and one off Oregon (Pearce 2002, Gilson 2010).

The Great Shearwater is an Atlantic species, breeding primarily on three islands in the Tristan da Cunha archipelago (*c*. 5 million breeding pairs) with a further 50-100 pairs on the Falklands Islands (Brooke 2004). Breeding occurs from late-September to mid-April (Brooke 2004). They are trans-Equatorial migrants, and satellite tracking of birds from Tristan da Cunha (Martin and Ronconi 2010) shows that birds move westwards to stage on the Patagonian shelf, before migrating rapidly north in May/June to reach the Grand Banks in July. There they stage before crossing the Atlantic in early September and migrating rapidly south along the West African coast to return to their colony to breed. Hence, it appears likely that the Tofino bird rounded Cape Horn during the first staging period before the migration instinct took it north to latitudes that would have been expected for Atlantic birds at this time of year.

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An endangered population and roadside mortality: three western Yellow-breasted Chat fatalities in the south Okanagan valley, British Columbia

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Abstract: During 2001-2008, three western Yellow-breasted Chats *(Icteria virens auricollis*) were found dead along roadsides in the south Okanagan valley, British Columbia. It is suspected that these were casualties of vehicular impacts but other causes of death cannot be ruled out. All were found within relatively close proximity to riparian habitat and in two cases within 50 m of known breeding territories. Two of the specimens were banded, one of which was found 15 km south of its banding location. Blood was observed on the mouth lining of one specimen and a broken tibiotarsus was detected in another specimen. No obvious trauma was noted on the third specimen. Despite the skulking nature of this species and their tendency to remain in thickets, this identifies roads as a potential threat to Yellow-breasted Chats.

Key words: Yellow-breasted Chat, *Icteria virens auricollis*, roadkill, habitat fragmentation, mortality, dispersal, Okanagan valley, British Columbia

Wildlife habitat fragmentation caused by increasing density of roads is recognized as problematic for survival of wildlife populations in an increasingly urbanized world (Forman and Alexander 1998; Watts *et al*. 2007; Leu *et al*. 2008). One of the most common anthropogenic causes of avian mortality is collisions with vehicles (Harden 2002). In

the Netherlands, 653,000 bird casualties due to collisions with vehicles were recorded in a one year period (van der Zande *et al*. 1980). On a 2 mile stretch of English road 644 bird casualties were found in a single year (Hodson 1962). In Canada, on a 3.6 km section of a two-lane paved causeway adjacent to Big Creek National Wildlife Area on Lake Erie, 1302 birds including four species of warblers were found dead on the roadside during surveys in 1979-1980 and 1992–1993 (Ashley and Robinson 1996). The number of avian fatalities due to vehicular collisions is grossly underestimated due to a lack of accounting for injured birds that die away from roads and are quickly scavenged (Austin 1971; Slater 2002). This problem is a particular concern for special status species with extremely small populations located in limited geographic pockets (van der Zande *et al*. 1980; Forman and Alexander 1998; Purvis *et al*. 2000). Migratory species may be even more at risk because they travel long distances and are presumably exposed to more road-crossing events than non-migratory species (Harris and Scheck 1991).

The western Yellow-breasted Chat (*Icteria virens auricollis*) (hereafter chat), is a migratory riparian songbird of the Parulidae family. In British Columbia, Canada, the chat population is designated as federally endangered (COSEWIC 2000) and is red-listed provincially, with 72 known breeding pairs in the south Okanagan valley and only 152 breeding pairs estimated for the province (Environment Canada 2010). Habitat loss and fragmentation is a limiting factor for the chat population and specific factors contributing to this include river channelization, urbanization, agricultural development, and road development (Gibbard 1992; Cannings 1995; Zeeman 1997; Earth Wild International 2002; Environment Canada 2010). During a 7-year span, three dead chats (2 adults and 1 juvenile; approximately 1.4% of the breeding population in the south Okanagan valley) were found along roadsides in the south Okanagan valley (Figure 1). These birds were found inadvertently rather than by systematic surveys. Because previous research has established that deceased birds found near roads are likely to have collided with a vehicle (Harden 2002), this led us to examine our specimens in detail to determine their cause of death and to better document threats to this endangered chat population.

The first deceased chat specimen was found on 2001 June 16, on the road shoulder of highway 97 north of Oliver, B.C. (11U 315491/5456567) (Figure 1). Adjacent to this location is a mature black cottonwood (*Populus trichocarpa*) forest in the riparian zone beside the Okanagan River containing known chat breeding territories (Environment Canada 2010). Although this specimen was not collected, it was documented as an adult bird, unbanded and no obvious broken bones or physical trauma were observed (Hall 2001).

The second deceased chat specimen was found on 2005 August 22 on the roadside beside an orchard on Meadowlark Drive, Osoyoos, B.C. (11U 0318824/5434005) (Figure 1). This individual was colour banded and had an

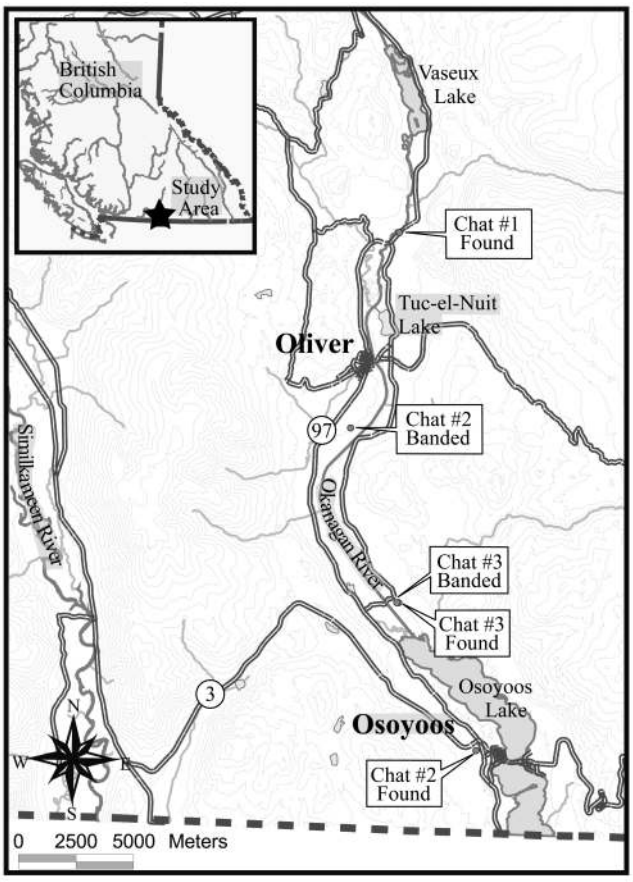

Figure 1. Map of South Okanagan valley, B.C., indicating where chat specimens were found and banded where applicable.

aluminum Canadian Wildlife Service band. By referencing banding records of a Canadian Wildlife Service research study on this population, we were able to determine this bird was banded on 18 June 2005 at 6 days of age within a territory on Sawmill Road, just south of Oliver, B.C. (11U 0313366/5448060). The location of the deceased bird indicates that after fledging, this chat dispersed 15.1 km in a little over 30 days (Figure 1). This specimen was retained and we were able to examine the whole body with a dental X-ray. This technique is able to resolve fine scale details including skull and other fractures, but despite the high resolution we were unable to detect any bone fractures. However, it was noted that this specimen had blood around the lining of the mouth. According to Williamson (2000) of the Bird Care and Conservation Society, blood around the nose and mouth may indicate internal haemorrhaging which is common after collisions with vehicles.

A complicating factor in assigning the cause of death to this specimen is that 3 days prior to the chat collection, 20 Canada Geese were found dead due to neurotoxic pesticide poisoning (MAFF 2005; Maxxam 2006) approximately 500 m south of where the chat was found. Given the proximity to the chat specimen and the large area sprayed within an or-

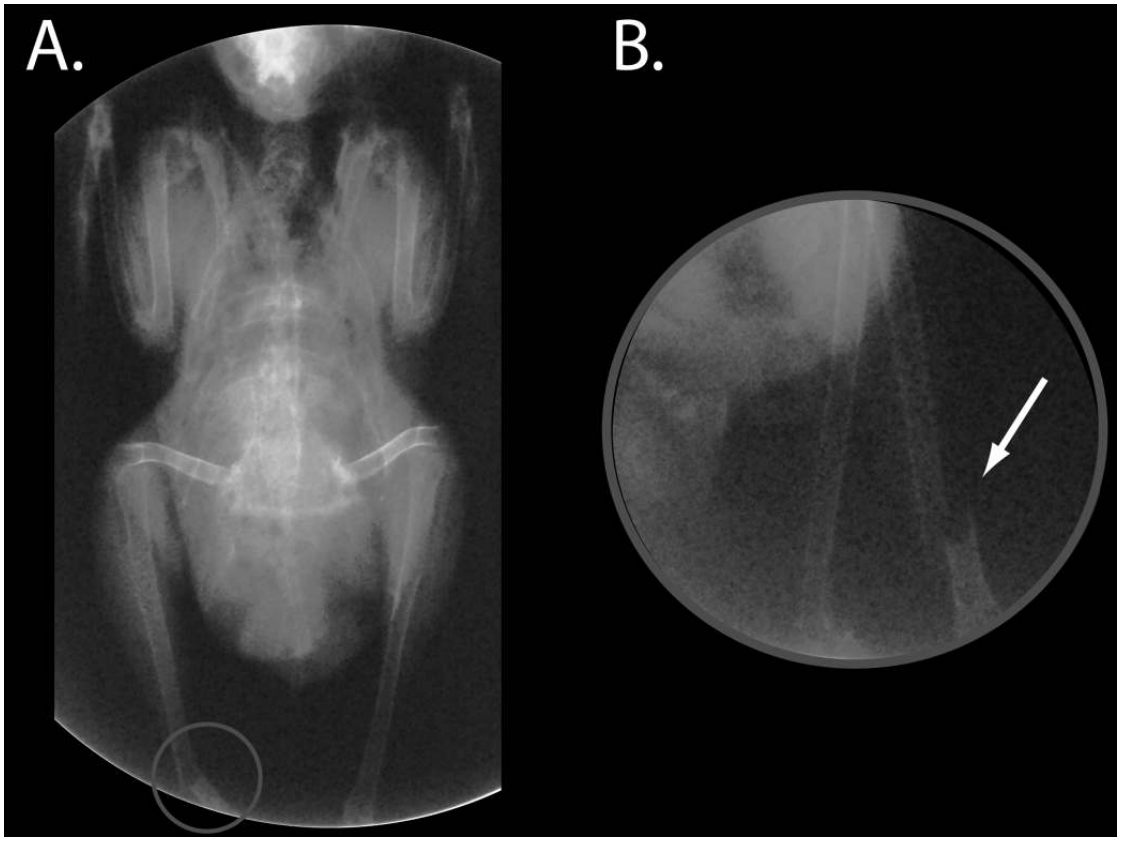

Figure 2. Dental X-ray of specimen #3 displaying broken tibiotarsus. Arrow indicates location of bone fracture.

chard, this raises the possibility that the chat may have been exposed to pesticides through inhalation, dermal exposure or insect consumption and consequently collided with a building, orchard trees or vehicle. Exposure to neurotoxic pesticides in wild birds can increase disorientation in passerines (Hart 1993) and can potentially increase the chance of collisions for these birds.

The third specimen was found on 2008 July 29 on the roadside of Black Sage Road south of Oliver, B.C. (11U 0315456/5440445) (Figure 1). This individual was identified as an after-second year female. Furthermore, this individual was colour banded and had an aluminum Canadian Wildlife Service band. By referencing banding records we determined the bird was banded at a Monitoring Avian Productivity and Survivorship (MAPS) station 3 days earlier on July 26, only 84 m west of Black Sage Road, Oliver, B.C. (11U 315373/5440446) (Figure 1). The specimen was also examined with a dental X-ray and a fractured right tibiotarsus was detected (Figure 2).

Although bone fractures were detected in only one of the two specimens x-rayed, the impact of a vehicle with a small bird doesn't always result in bone fractures (Vickerman 2009). Rather, these impacts often cause internal damage such as organ rupture and internal bleeding, ultimately causing death (Williamson 2000; Vickerman 2009). Bird collisions with windows always resulted in intracranial hemorrhaging while only a small percentage showed skeletal fractures (Klem 1990).

Despite the small sample size, three chat fatalities comprising 1.4% of the breeding population in the south Okanagan valley may be an underestimated source of mortality especially considering the difficulty of detecting roadkilled birds (Antworth *et al*. 2005; Seiler and Helldin 2006). Not surprisingly, the two birds killed during breeding season were found near riparian habitat known to hold nesting chats. The second specimen (a juvenile found 600m from riparian habitat) was likely in migration. In other species, juvenile dispersal has been linked to higher incidence of road mortality (Bonnet *et al*. 1999). As well, roads passing through or adjacent to riparian breeding habitat may pose a particular danger to chats in B.C. A more comprehensive study could potentially highlight specific road side characteristics that may be used to predict hot spots of road mortality for wildlife (Langen *et al*. 2009).

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