

First Records of the Yellow Bullhead, *Ameiurus natalis*, a Loricariid Catfish, *Panaque suttonorum*, and a Silver Pacu, *Piaractus* cf. *P. brachypomus*, in British Columbia

G. F. HANKE^{1,2}, M. C. E. McNALL¹, and J. ROBERTS³

¹Royal British Columbia Museum, 675 Belleville Street, Victoria, British Columbia V8W 9W2 Canada

²e-mail ghanke@royalbcmuseum.bc.ca; corresponding author

³Fish and Wildlife – Science and Allocation, Ministry of Environment, Lower Mainland Region, 10470-152 Street, Surrey, British Columbia V3R 0Y3 Canada

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In Canada, there are no native catfish west of the continental divide and until recently, the list of extant exotic catfishes in British Columbia only included introduced Black Bullhead (*Ameiurus melas*) and Brown Bullhead (*Ameiurus nebulosus*). We report that a single Yellow Bullhead (*Ameiurus natalis*) was collected from Silvermere Lake in the Lower Fraser River drainage. This represents the first record of the Yellow Bullhead in western Canada, and its introduction likely was accidental with a shipment of Largemouth Bass (*Micropterus salmoides*) rather than dispersal from Washington. Warm, eutrophic, weedy habitat in the Fraser Delta provides ample habitat for Yellow Bullheads and other exotic fishes. A Blue-eyed Panaque (*Panaque suttonorum*), a loricariid catfish found in 1995 in Shawnigan Lake, Vancouver Island, probably represents a single, illegally released aquarium fish, as does a large Silver Pacu (*Piaractus* cf. *P. brachypomus*), which was found in Green Lake on Vancouver Island in 2004.

Key Words: Yellow Bullhead, *Ameiurus natalis*, Blue-eyed Panaque, *Panaque suttonorum*, Silver Pacu, *Piaractus* sp., exotic introductions, British Columbia.

Most populations of native species were established in British Columbia during and after deglaciation, but this slow process of natural colonization and dispersal pales in comparison to the wave of accidental and intentional species introductions in the province since the arrival of Europeans. Escaped pets, intentionally released pets, the illegal and intentional release of exotic game fishes by local fishermen, intentional release of game fishes by government agencies, contaminants in poorly sorted shipments of game fish, and northward dispersal of fishes introduced in Washington, now are the principal sources of exotic freshwater fishes in British Columbia. The pathways used to enter the province and the dispersal potential once present, varies with each species.

Carl and Guiguet (1957), Carl et al. (1967), Scott and Crossman (1973), Hart (1973), Crossman (1991), Coad (1995), Moyle (2002), and Wydoski and Whitney (2003) detail the exotic fish species (or hybrids) known to have been introduced into British Columbia prior to this report (Table 1). Approximately 7.4% of the exotic fishes in Table 1 are ornamental (including Mosquitofish [*Gambusia affinis*] and Fathead Minnows [*Pimephales promelas*] introduced for mosquito control; Fathead Minnows also may be introduced illegally as live bait, or dispersed into the province via the Peace River drainage [Smith and Lamb 1976]), 24.1% are non-game fishes (e.g., stickleback, Redside Shiners [*Richardsonius balteatus*]), and 68.5% are game/

food fishes and hybrids between game fish species. In many cases, fishes that are native to the province (or their hybrids) are legally stocked in new locations to enhance local fisheries and satisfy anglers (e.g., Wall-eye [*Sander vitreus*], Rainbow Trout [*Oncorhynchus mykiss*], West-slope Cutthroat [*O. clarki lewisi*], and Pacific salmon [*O. gorbuscha*, *O. nerka*, *O. keta*, *O. kisutch*, *O. tshawytscha*]), and in others, game fishes are illegally introduced to new waterbodies by private individuals (e.g., Northern Pike [*Esox lucius*], Smallmouth Bass [*Micropterus dolomieu*]) (McPhail and Carveth 1994). While most fishes released in this province are game fishes, it is likely that the number of exotic aquarium fishes released in British Columbia will grow with the burgeoning pet trade (see Padilla and Williams 2004).

Species Accounts

Silver Pacu (*Piaractus* cf. *P. brachypomus*) – Family Characidae (tetras)

On 4 June 2004, a large pacu was caught by a Federal Fisheries Officer angling in Green Lake (~49°13'50"N, 124°03'39"W) near Nanaimo (Figure 1). This fish likely is a Silver Pacu (Figure 2), although initially it was thought to be a piranha (*Serrasalmus* sp./*Pygocentrus* sp.) and subsequent media reports called the fish a Red-bellied Pacu (a commonly used name in the pet trade). The species identity as used in this report cannot be verified unless the body is located

TABLE 1. Fishes introduced British Columbia according to Wydoski and Whitney (2003), Moyle (2002), Coad (1995), Crossman (1991), Hart (1973), Scott and Crossman (1973), Carl et al. (1967), and Carl and Guiguet 1957, and Royal British Columbia Museum (RBCM) collection records; EX = exotic introductions, NA = native populations also in BC, MM = man-made hybrids or hybrids in nature due to stocking of exotics.

Family	Species	Common Name	Status
Petromyzontidae	species not mentioned		?
Acipenseridae	<i>Acipenser transmontanus</i>	White Sturgeon	NA
Amiidae	<i>Amia calva</i>	Bowfin	EX
Hiodontidae	<i>Hiodon alosoides</i>	Goldeye	NA
Clupeidae	<i>Alosa sapidissima</i>	American Shad	EX
Cyprinidae	<i>Couesius plumbeus</i>	Lake Chub	NA
	<i>Platygobio gracilis</i>	Flathead Chub	NA
	<i>Notropis hudsonius</i>	Spottail Shiner	NA
	<i>Pimephales promelas</i>	Fathead Minnow	EX
	<i>Richardsonius balteatus</i>	Redside Shiner	NA
	<i>Tinca tinca</i>	Tench	EX
	<i>Cyprinus carpio</i>	Common Carp	EX
	<i>Carassius auratus</i>	Goldfish	EX
Catostomidae	<i>Catostomus catostomus</i>	Longnose Sucker	NA
	<i>Catostomus commersoni</i>	White Sucker	NA
Ictaluridae	<i>Ameiurus melas</i>	Black Bullhead	EX
	<i>Ameiurus nebulosus</i>	Brown Bullhead	EX
	<i>Ictalurus punctatus</i>	Channel Catfish	EX
Salmonidae	<i>Oncorhynchus mykiss</i>	Rainbow Trout	NA
	<i>Oncorhynchus mykiss aguabonita</i>	California Golden Trout	EX
	<i>Oncorhynchus clarki lewisi</i>	West-slope Cutthroat	NA
	<i>Oncorhynchus clarki lewisi</i> × <i>O. mykiss</i>		NA MM
	<i>Oncorhynchus keta</i>	Chum Salmon	NA
	<i>Oncorhynchus nerka</i>	Sockeye Salmon	NA
	<i>Oncorhynchus tshawytscha</i>	Chinook Salmon	NA
	<i>Salvelinus alpinus</i>	Arctic Charr	EX
	<i>Salvelinus fontinalis</i>	Brook Trout	EX
	<i>Salvelinus malma</i>	Dolly Varden	NA
	<i>Salvelinus fontinalis</i> × <i>S. malma</i>		MM
	<i>Salvelinus fontinalis</i> × <i>S. confluentus</i>		MM
	<i>Salvelinus fontinalis</i> × <i>S. namaycush</i>		MM
	<i>Salvelinus namaycush</i> × <i>S. malma</i>		MM NA?
	<i>Salvelinus namaycush</i> × <i>S. confluentus</i>		MM NA?
	<i>Salmo salar</i>	Atlantic Salmon	EX
	<i>Salmo trutta</i>	Brown Trout	EX
	<i>Thymallus arcticus</i>	Arctic Grayling	NA
	<i>Coregonus clupeaformis</i>	Lake Whitefish	NA
Esocidae	<i>Esox lucius</i>	Northern Pike	NA
Gasterosteidae	<i>Culaea inconstans</i>	Brook Stickleback	NA
	<i>Gasterosteus aculeatus</i>	Threespine Stickleback	NA
Gadidae	<i>Lota lota</i>	Burbot	NA
Percopsidae	<i>Percopsis omiscomaycus</i>	Troutperch	NA
Poeciliidae	<i>Gambusia affinis</i>	Western Mosquitofish	EX
	<i>Poecilia reticulata</i> (?)	Guppy	?
	<i>Xiphophorus helleri</i>	Swordtail	EX
Moronidae	<i>Morone saxatilis</i>	Striped Bass	EX
Centrarchidae	<i>Micropterus dolomieu</i>	Smallmouth Bass	EX
	<i>Micropterus salmoides</i>	Largemouth bass	EX
	<i>Lepomis macrochirus</i>	Bluegill	EX
	<i>Lepomis gibbosus</i>	Pumpkinseed	EX
	<i>Pomoxis nigromaculatus</i>	Black Crappie	EX
Percidae	<i>Perca flavescens</i>	Yellow Perch	EX
	<i>Sander vitreus</i>	Walleye	NA
Cichlidae	<i>Tilapia</i> sp.	Tilapia	EX

and examined in detail. Furthermore, only estimates of size can be taken from images and notes provided by staff of British Columbia, Ministry of Water, Lands, and Air Protection (now Ministry of Environment). The fish measured about 40 cm total length, and 35 cm fork length, and had been feeding on aquatic vegetation based on its gut contents (milfoil was the dominant item in the gut) [M. deLaronde, personal communication, 2005].

Blue-eyed Panaque

(*Panaque suttonorum*) – Family Loricariidae (suckermouth armoured catfishes)

The Royal British Columbia Museum fish collection contains a single Blue-eyed Panaque (RBCM 996-190-001) (Figure 3), which was collected in 1995 from a ditch where Royce Road crosses Shawnigan Creek (approximately at 48°40'05", 123°37'32") (Figure 1). The creek leads into the north end of Shawnigan Lake, Vancouver Island. The specimen is 21.8 cm total, and 19.2 cm fork length. This specimen originally was misidentified as *Hypostomus plecostomus* when it was received in 1996.

Yellow Bullhead

(*Ameiurus natalis*) – Family Ictaluridae (North America Freshwater Catfishes)

The first Yellow Bullhead found in British Columbia (Figure 4) was collected on 21 July 2005, by electrofishing the southeast corner of Silvermere Lake (49°10'01"N, 122°24'27"W) (Figures 1 and 5). The Yellow Bullhead was in stained but clear water about 10 cm deep, and emerged from a clump of submerged, algae-covered terrestrial grass which was approximately 30 cm offshore; the water in the bay was 29.5°C at the surface. The specimen (RBCM 005-079-001) was anaesthetized/euthanized with 2-phenoxy ethanol, prior to fixing in 10% formaldehyde. It is possible that other Yellow Bullheads have been caught in this lake, but were not recognized as different from Black or Brown Bullheads by local anglers. The specimen is 12.9 cm total length and 10.7 cm standard length. The following features from identification keys in Scott and Crossman (1973, page 589), Becker (1983, pages 143-145), Moyle (2002, pages 85-86), and Wydoski and Whitney (2003, pages 153-154), confirm the identification of the Yellow Bullhead from Silvermere Lake: body lacks spots or blotches; lower jaw does not project beyond upper jaw; distance between isthmus and lower jaw notch is less than the distance between the lower jaw notch and the tip of the lower jaw (see illustrations in Scott and Crossman 1973, page 589); mental barbels yellow-white without melanophores; depressed anal fin overlaps leading edge of caudal fin; and caudal fin with round trailing margin.

Yellow Bullheads are native to Atlantic and Gulf Slope drainages from New York to Mexico, the St. Lawrence River, the Great Lakes, and the Mississippi River Basin from North Dakota to the Gulf of Mexi-

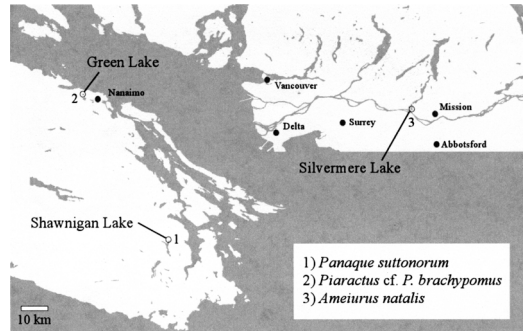


FIGURE 1. A map showing the general location of the three new records mentioned in this report, relative to southern Vancouver Island and the Fraser River delta; scale bar = 10 km.

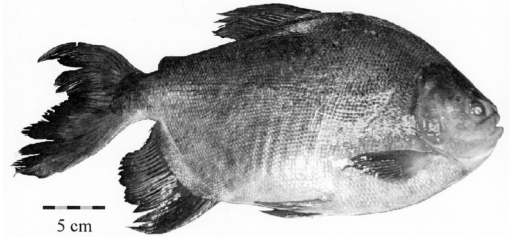


FIGURE 2. The single Silver Pacu (*Piaractus* cf. *P. brachyptomus*) taken from Green Lake, Vancouver Island, 4 June 2004; surrounding parts of image (stainless-steel tabletop) cropped to simplify the illustration. Scale bar = 5 cm.

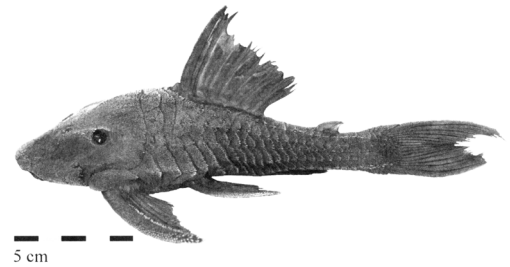


FIGURE 3. A photograph of the preserved *Panaque suttonorum* specimen (RBCM 996-190-001) collected from the Shawnigan Lake area, Vancouver Island; surrounding parts of image (dissection tray) cropped to simplify the illustration. Scale bar = 5 cm.

co (Scott and Crossman 1973; Lee et al. 1980), and they have been introduced to at least 14 states outside of their native range (Fuller et al. 1999). They also are known from headwaters of the Hudson Bay drainage in Minnesota but have not been found downstream in Manitoba to date (Koel and Peterka 1994; Stewart et al. 2001; Stewart and Watkinson 2004).

Discussion

Two of the three species documented in this report are not threatening to the ecology of British Columbia, especially since they are tropical and appear to result from the release of single fish rather than groups, which could form breeding populations. However, all three species are unnecessary additions to the provincial ichthyofauna, and there always is a risk that exotic introductions may carry unknown pathogens which may infect native fishes (e.g., Dove and Ernst 1998; Yamamoto and Tagawa 2000; Font 2003).

In British Columbia, a large portion of the northern waterways are fast-flowing, cool to cold glacier-fed streams and oligotrophic lakes running through montane areas, and as such, are inhospitable to warm water adapted exotic organisms. However, many exotic species can survive in the southwestern region for a summer or longer, and fortunately, cold meltwater from higher elevation may limit their long-term survival and dispersal. In some regions (e.g., the Okanagan, the Lower Fraser River Valley, and southern Vancouver Island), there are many ponds, ditches, reservoirs, and slowly flowing low-gradient streams running through agricultural land that may support a range of exotic species, and in places, may be warm enough in summer to allow tropical species to breed. The mild climate of southwestern British Columbia already is hospitable to a wide range of organisms presently in the pet trade (e.g., fishes such as *Lepisosteus osseus*, *L. platostomus*, *L. oculatus*, *Ictalurus punctatus*, *Clarias* sp., *Tanichthys albonubes*, *Rhodeus* sp., *Cyprinella lutrensis*, *Carassius auratus*, *Cyprinus carpio* [koi], *Myxocyprinus asiaticus*, *Misgurnus anguillicaudatus*, *Gastromyzon* sp., and some hillstream loaches [Homalopteridae] or fishes imported live to Canada for human consumption (e.g., *Tilapia* sp., *Sarotherodon* sp., *Oreochromis* sp., *Channa* sp., *Hypophthalmichthys* sp., and *Monopterus* sp.). Given predictions of warming aquatic environments in North America (Mandrak 1989; Meisner 1990; Rahel et al. 1996; Eaton and Scheller 1996; Schindler 2001; Stefan et al. 2001; Jackson and Mandrak 2002; Vander Zanden et al. 2004) it is likely many more exotics could become established in the waterways of this province; those that already are present in Canada likely will expand their range northward where habitat and water flow permits.

Characid Fishes

The large size of most pacu and related "silver dollar" species limits their suitability for home aquaria, and likely is the reason why they are occasionally released in North America. Fuller et al. (1999) discuss a variety of pacu and silver dollars (*Colossoma* sp., *Metynnis* sp., *Myleus* sp., *Piaractus* sp.), which have been found outside of captivity in many of the United States including Washington. Coad (1995, page 11) noted that a specimen of *Colossoma bidens* was found in Ontario (although the location was not given), and Renaud and Phelps (2001) mention another pacu

which was found in the Rideau Canal, Ontario. It is not known if there are any wild/naturalized reproducing populations of pacu and silver dollars in North America (Fuller et al. 1999).

Apparently the Silver Pacu found in Green Lake on Vancouver Island was the second pacu to be collected in British Columbia; the first was taken from the Lower Mainland a few years earlier (R. Dolighan, personal communication, 2005), but no detailed reports or literature references to this fish exist. It has been suggested that the Silver Pacu from Green Lake was from a large display aquarium in a local restaurant. The other pacu in the display aquarium also may have been released when the restaurant closed down, but attempts to locate other specimens in Green Lake were unsuccessful. The intentional release of large, unwanted aquarium pets (including large piranha [probably *Pygocentrus nattereri*] which may have been released into Langford Lake on Vancouver Island [T. Duce, personal communication, 2005]) is a continuing threat to British Columbia's waterways, and a threat which is difficult if not impossible to control. Piranhas such as *P. nattereri* have been found in the wild as far north as Minnesota, Idaho, and the Columbia River in Washington (Fuller et al. 1999). Fortunately pacu and piranha usually are kept in small numbers or singly, and so any released specimens are unlikely to find mates and reproduce, even if they survive in British Columbia's waters.

Loricariid Catfishes

Some loricariid fishes ("plecostomus") can tolerate cool water aquaria and commonly are kept with goldfish in home aquaria, as are weatherloaches (*Misgurnus anguillicaudatus*), and surprisingly, it is the expensive *Panaque* species, not the inexpensive *Hypostomus*, which have been found in the wild in Canada. In addition to the single Blue-eyed Panaque from British Columbia, a single specimen of the Royal Panaque or Royal "Pleco" (*Panaque nigrolineatus*), is known from southern Ontario (Coad 1995, page 11). Both the Royal Panaque and the Blue-eyed Panaque are native to South America and are unlikely to survive long in Canada's present climate, unless they are released downstream of hot springs or near warm industrial effluent (the same can be said for most tropical fishes, including pacu). Illegally released tropical aquarium fishes persist in Alberta downstream of hot springs despite cold winters in that province (Nelson and Paetz 1992), and the possibility of tropical fish introductions is a persistent threat to hot springs in British Columbia.

Ictalurid Catfishes

Washington state waterways contain several ictalurid species, including: Blue Catfish (*Ictalurus furcatus*), Channel Catfish (*I. punctatus*), Tadpole Madtom (*Noturus gyrinus*), Flathead Catfish (*Pyloodictis olivaris*), White Catfish (*Ameiurus catus*), Yellow Bullhead (*A. natalis*), Black Bullhead (*A. melas*), and Brown Bull-

head (*A. nebulosus*) (Wydoski and Whitney 2003). None of these fishes are native to the state and exhibit varying degrees of success in Pacific slope drainages. Black, Brown, and Yellow Bullhead catfishes now are found all over Washington (Wydoski and Whitney 2003), but since casual observers find the three species difficult to differentiate, it is likely that the true range of each is underestimated.

Carl et al. (1967), Scott and Crossman (1973), McPhail and Lindsey (1986), McPhail and Carveth (1994), and Coad (1995) detail the distribution of catfishes in British Columbia and until this year, researchers thought that only the Black Bullhead and Brown Bullhead existed in this province. As in Washington, the range of Black and Brown bullheads likely is underestimated because of the difficulty of identification, and limited survey sampling in appropriate habitat.

Yellow Bullheads are hardy, and given their presence in the Columbia River system and the Olympic Peninsula in Washington (Wydoski and Whitney 2003), it was only a matter of time before they appeared in British Columbia. It is possible that Yellow Bullheads were introduced to British Columbia as a contaminant in an unsorted or poorly sorted shipment of Largemouth Bass. The electrofishing sample from Silvermere Lake taken on 21 July 2005 contained the single Yellow Bullhead, 1 Brown Bullhead, 5 Pumpkinseeds (*Lepomis gibbosus*), 28 Prickly Sculpins (*Cottus asper*), 30 Black Crappie (*Pomoxis nigromaculatus*), and 57 Largemouth Bass (*Micropterus salmoides*). Note that only one species (*Cottus asper*) in the six caught in Silvermere Lake is native to the Fraser River drainage, and that single native species made up only 23% of the catch.

The date of introduction of Brown Bullheads into British Columbia is unknown, but they were stocked in Washington from 1874 onwards, and those on Vancouver Island date back to 1906 (Carl and Guiguet 1957; Carl et al. 1967; Wydoski and Whitney 2003). According to anecdotal evidence, the initial stocking in Beaver Lake on Vancouver Island was accomplished from the window of a passing train, and these few bullheads were from an aquarium displayed in a local restaurant (Carl and Guiguet 1957; Carl et al. 1967). Langford Lake and other lakes were stocked soon after, from the Beaver Lake population. It is possible that Black Bullheads were a contaminant in the early stocks of Brown Bullhead since the two species can be difficult to differentiate, especially when young (Becker 1983; Lever 1996). However, if present, Black Bullheads failed to reproduce and were extirpated while the Brown Bullhead survived on Vancouver Island.

Bullhead catfish have not spread far in British Columbia because the warm, eutrophic conditions they require are found only in lakes and ponds of southern Vancouver Island, the Fraser River Delta, and the southern portions of the Columbia River drainage in

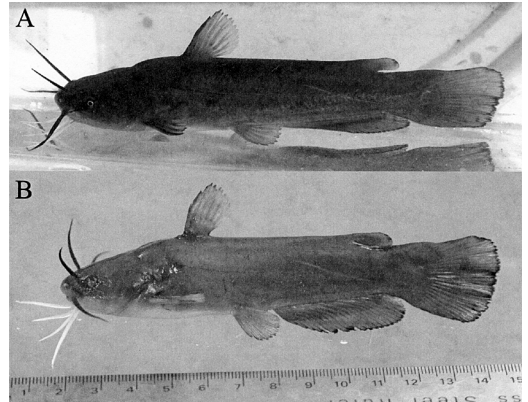


FIGURE 4. Photographs of (A) the live Yellow Bullhead (*Ameiurus natalis*) just after capture, and (B) the same specimen once preserved (RBCM 005-079-001); ruler in (B) is in centimetres.

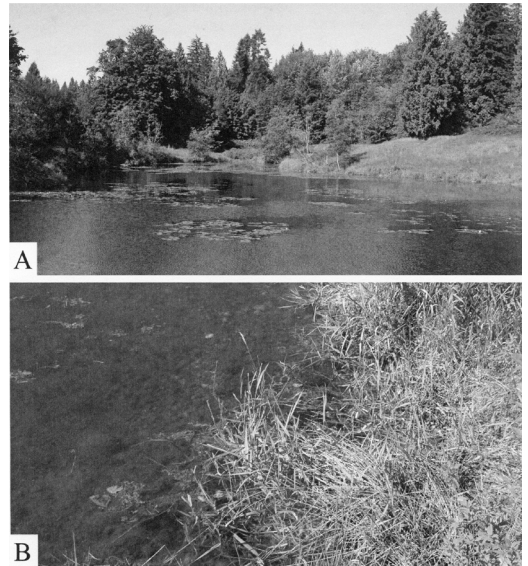


FIGURE 5. The southeast bay on Silvermere Lake just north of Highway 7 (A) and detail of shoreline habitat (B) where the Yellow Bullhead was collected.

this province. Where they have been introduced, bullheads are reputed to be effective nest predators, and have been implicated in the elimination of Threespine Stickleback (*Gasterosteus aculeatus*) populations in smaller lakes along the coast (McPhail and Lindsey 1986). Male stickleback cannot repel intruding adult bullheads, and in one lake near Mission, a large population of sticklebacks went extinct only two years after bullheads were introduced (McPhail and Lindsey 1986; Wydoski and Whitney 2003). The addition of the Yellow Bullhead (*Ameiurus natalis*) to

British Columbia's aquatic biota is not to be celebrated, and probably represents one more case of a contaminant species accidentally released with a transplant of game fish.

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