

## First record of an established population of the convict cichlid (*Archocentrus nigrofasciatus*) in California

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In June of 2007 a large population of convict cichlid (*Archocentrus nigrofasciatus*) was discovered in the Bouquet Canyon Water District outflow into the Santa Clara River, Los Angeles County, California. This population extended from the mouth of the outflow, just below the Bouquet Canyon bridge (34° 27' 39.2" N, 118° 30' 53.3" W) to approximately 800 m downstream (34° 25' 22.1" N, 118° 33' 29.5" W) where the flow becomes subsurface. Surveys conducted after the discovery revealed abundant cichlids of all size classes (25-144 mm TL), indicating a reproducing population. While there have been reports of *A. nigrofasciatus* occupying warm-water effluent in other states (Fuller et al. 1999, as *Cichlasoma nigrofasciatum*), to the best of our knowledge this is the first documented presence of that species within California (Dill, et al. 1997). Anecdotal observations by others (Thomas Haglund [2007] and Dan Duncan [2007], City of Santa Clarita, personal communications) suggest this population may have been present for several years.

The convict cichlid (Figure 1) is a member of the Cichlidae family and is native to Central America, along the eastern coast from Guatemala to Costa Rica and along the western coast from Honduras to Panama. The species is omnivorous and feeds on crustaceans, insects, small fish, various worms, and aquatic plants, and readily adapts to the existing food base when translocated. Due to ease of culture, *A. nigrofasciatus* has become a very popular species with aquarists and has been in the aquarium trade since the 1930s.

So far the Bouquet population appears to be isolated thermally in the small tertiary-treated outflow where the temperature is consistently 27°C. No fish have been observed in the perennial portions of the Santa Clara River proper, where water temperatures range from 14.0–18.0°C. This water temperature preference is inconsistent with water temperatures in most drainages in southern California and is likely the reason specimens have not been

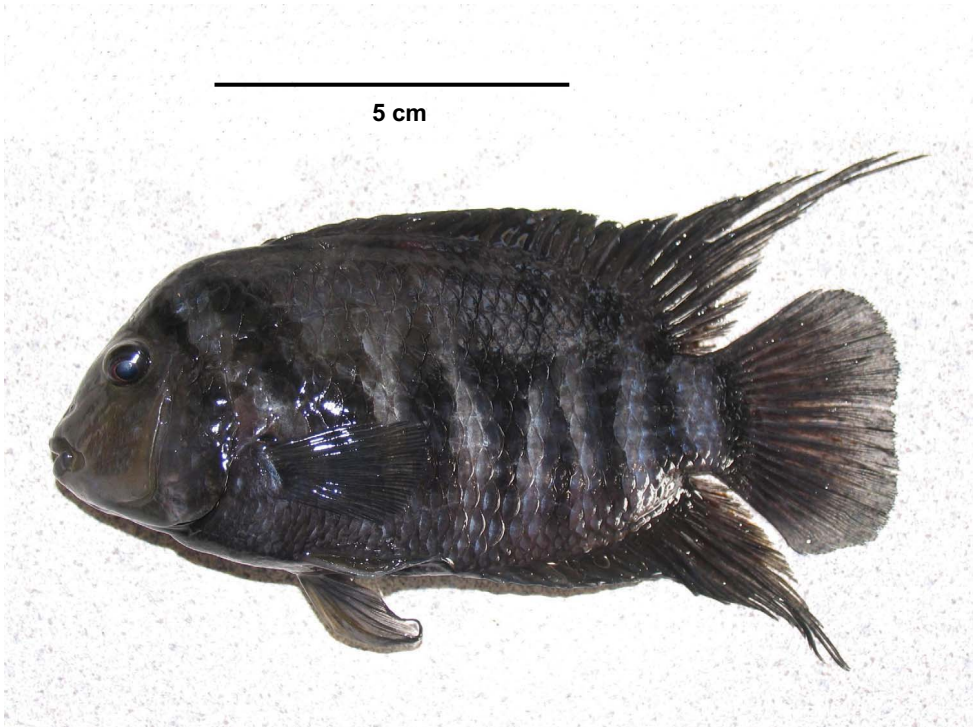


FIGURE 1.—A male, adult convict cichlid (*Archocentrus nigrofasciatus*) (124 mm TL) collected from the Bouquet Canyon Water District outflow into the Santa Clara River, Los Angeles County, California, June 2007. Photograph by T. E. Hovey.

discovered further downstream in the main stem of the Santa Clara River. Populations of convict cichlids in other states, and several populations of species of *Oreochromis* (cichlids originally from Africa) in coastal southern California are established in warmer waters of treatment water outflows, power plant cooling water outflows, and thermal springs (Swift et al 1993; Fuller et al. 1999). While some authorities suggest that established populations of convict cichlids in warm springs around Lake Mead, Nevada, have the potential to move downstream to colonize the Colorado River in California and Arizona (Minckley and Marsh 2009), we believe their preference for warmer waters will preclude them from migrating and surviving in colder temperatures.

A second small group of *Archocentrus nigrofasciatus* was detected in Montecito Creek, Santa Barbara County, in March 2008 (34° 26' 18.2" N, 119° 38' 42.7" W). Approximately 20 specimens of *A. nigrofasciatus* of various sizes were discovered dead several feet upstream of a road crossing in a small pool. The condition of the specimens and the presence of colorful tank gravel suggested those cichlids were the result of a recent aquarium release. Montecito Creek is a native trout stream and its recorded temperature at the time the cichlids were discovered was 12–14°C, well outside the reported temperature tolerance of *A. nigrofasciatus* (20–27°C) (Minckley and Marsh 2009), and is likely the reason the fish had died. No other convict cichlids have been observed in Montecito Creek.

An additional specimen of convict cichlid (40 mm SL) was taken during seining surveys of Machado Lake, Los Angeles County (33° 47' 13.8" N, 118° 17' 39.0" W), on 3 September 2008. No other individuals were collected among an abundance of bluegill (*Lepomis macrochirus*), green sunfish (*Lepomis cyanellus*), and mosquitofish (*Gambusia affinis*). This specimen was collected along the southwestern shore of the lake near the opening of a concrete box culvert entering the lake. This specimen (preserved in ethyl alcohol) is catalogued as LACM 56885-1. We presume this specimen became available as the result of release of  $\geq 1$  aquarium fish. No thermal refuges are known in the area, and convict cichlids would not be expected to survive the winter in this lake.

Fifty-six specimens of *A. nigrofasciatus* collected from the Bouquet outflow population were deposited in the Fish Collection, Natural History Museum of Los Angeles County as follows: LACM 56801-1, 25 specimens, 30 to 108 mm SL (formalin preserved originally) and 56801-2, 31 specimens, 28–67 mm SL (ethyl alcohol preserved originally). These fish closely match the description of this species provided by Bussing (1998) and other more popular aquarium accounts.

Measurements taken on seven specimens included standard length, head length, body depth, and caudal peduncle depth. The latter three were 29.6–32.6%, 45.0–51.4%, and 16.4–23.7% of standard length, respectively. Meristics from the same fish were: dorsal fin (XIV, 9), anal fin (X, 7 in 4; IX, 7 in 1, IX, 8 in 2); pectoral fin (14,14), lateral line scales (27 in 1; 28 in 3; 29 in 2; 30 in 1), caudal peduncle circumference scales (16 in 1; 17 in 2; 18 in 4), and gill rakers on first left gill arch (2 or 3 [upper limb] + 6 or 7 [lower limb]). Small scales extended out on to the basal one quarter of the soft dorsal, caudal, and anal fins. The posterior edges of the operculum and branchiostegal membranes were black. The body, outer surface of dentaries, and anterior operculum were grey while the fins were dusky to black with slight spotting basally on the caudal, anal, and dorsal fins. The larger individuals had elongated and trailing dorsal and anal fin rays extending back in profile to the middle of, or beyond, the end of the caudal fin. Six evenly spaced vertical dark bars occur from the shoulder to the caudal base, and the first one forks dorsally into the V or Y shape on the nape, a characteristic of *A. nigrofasciatus*. The vertically elongate caudal dark spot was centered on the basal caudal rays, farther posterior than in other *Archocentris* species, and also is characteristic for *A. nigrofasciatus*. The teeth were conical and pointed, with a single outer row 3–4 times larger than the few rows of inner conical teeth. The outer teeth are also slightly larger anteriorly than those laterally and more posterior. We use the generic name *Archocentris* for this taxon as currently recognized by Bussing (1998) and Miller et al. (2005), rather than *Cichlasoma* as used by the earlier American Fisheries Society Checklist (Nelson et al. 2004).

Convict cichlids are omnivorous and prolific and, thereby, could make this exotic species a serious threat to native species in California. A preference for warm water temperatures suggests, however, that it can survive and thrive only in heated environments such as treatment water outflows. Since their discovery, no cichlids have been detected downstream of the Bouquet outflow in the Santa Clara River despite the existence of one wastewater outfall about 3.2 km downstream having water temperatures of about 22°C. The Santa Clara River is usually dry above and below the Bouquet outfall harboring this population of cichlids. Only during exceptional winter storms do flows occur, and then it is usually cold ( $\leq 15^\circ\text{C}$ ) and flows only for days or, at most, a few weeks. Downstream river flows supporting native, federally endangered unarmored threespine stickleback

(*Gasterosteus aculeatus williamsoni*) emerge from groundwater wells below the point where the warmer Bouquet wastewater disappears into the stream bed.

A singular effort to eradicate this population occurred during July, 2007. The flow was stopped at the source and fish were removed as the water disappeared in the outflow channel. Despite the efforts of more than a dozen fisheries personnel over a period of 10 days, and what appeared to be complete removal at the time, the population again was extant about six months later. It is not known whether some fish went undetected or if fish were reintroduced to the site. Despite its limited thermal range, exotic parasites that this species may carry also are cause for concern, as they could become re-distributed in native drainages as a result of aquarium releases. The convict cichlids described herein illustrate the continuing need to educate the public on the detrimental effects of releasing exotic aquatic species into native drainages.

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