Habitat Research for a Least Chub Refuge at the Ogden Nature Center

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Introduction

The least chub, *Iotichthys phlegethontis*, is an endemic minnow only found in the Bonneville Basin of Utah, where it was once very common and widely distributed (U.S Fish and Wildlife Service, 1995). Its historic habitats consisted of headwater streams, lakes, springs, ponds, and marshes. However, since their population numbers started to decline due to human disturbances, including introductions of non-native species, least chub have become restricted to isolated springs and man-made refuges with cool stable temperatures, low, stable dissolved oxygen, and low conductivities (Perkins et al. 1998). Currently there are only seven refuge locations and six wild populations (Bailey et al., 2005). Due to their declining distribution and abundance, least chub are currently classified as a conservation species by the State of Utah (UDWR 2004). In 1998, the Conservation Agreement and Strategy for least chub in the State of Utah (Perkins et al. 1998) was developed in an effort to protect and expand least chub populations (UDWR 2005). In order to protect current least chub populations, the Utah Division of Wildlife Resources (UDWR) has taken several actions, including: monitoring water quality, surveying for new suitable least chub habitats, and controlling nonnative species.

The objective of this research project was to survey and asses three ponds located at the Ogden Nature Center for possible introduction of least chub. The Ogden Nature Center is an ideal location to start a refuge because the ponds of interest are more or less protected/ isolated from the public. Notably, these water bodies are protected from livestock grazing and trampling, which is a major threat (Fleischner, 1994). Water temperature, dissolved oxygen, conductivity, pH, salinity, and areal extent were monitored throughout the course of this survey. Should one of the ponds prove suitable, previously stocked fish will have to be removed; therefore detailed depth measurements were also taken to ensure that the proper amount of Rotenone is used.

Methods & Materials

Three ponds (Avocet, Blackbird, and Teal) were surveyed at the Ogden Nature Center (Fig. 1) between 6 May 2009 and 26 August 2009 to asses their suitability for a least chub refuge . A staff gage was set up at a fixed location to monitor fluctuating water levels. Water temperature, dissolved oxygen, conductivity, pH, and salinity were all monitored weekly? at four predetermined locations at each pond using a standard water quality meter. Temperature data loggers were also deployed at the staff gage to monitor water temperatures . Areal extent was monitored by using a surveyor's level . Substrate depth measurements were taken 26 August 2009 using a gage and measuring tape. Substrate depths were measured every 4 M in three directions to outline the bottom of the ponds .

To determine the presence/absence of fish, two 3-mm mesh minnow nets were placed at four predetermined locations for each pond, where water depth was sufficient to submerge trap openings. Dog food was used to entice fish into traps. All traps were left for two to four hours before being removed. Trap locations, total trapping times, and date traps were set were recorded at each site. All captured fish were positively identified and respected lengths were measured and recorded to the nearest mm.

Literature Cited

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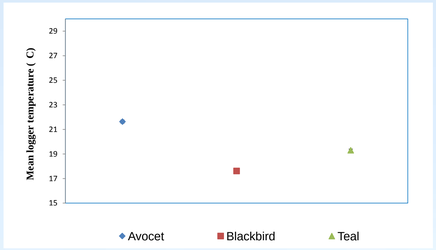


Figure 2. Mean logger temperature (C) in three ponds at the Ogden Nature Center.

Figure 3. Mean water temperatures (C) from weekly measurements (Give the time period for which the logger was deployed).

Figure 4. Mean dissolved oxygen mg/L in three ponds at the Ogden Nature Center.

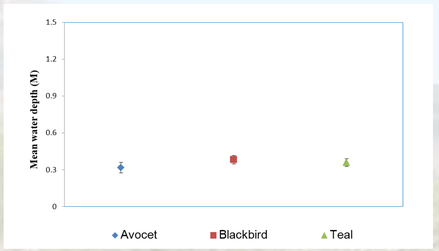


Figure 5. Mean water depth in three ponds at the Ogden Nature Center.

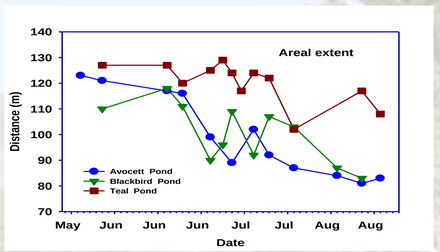


Figure 6. Areal extent of three ponds at the Ogden Nature Center over time.

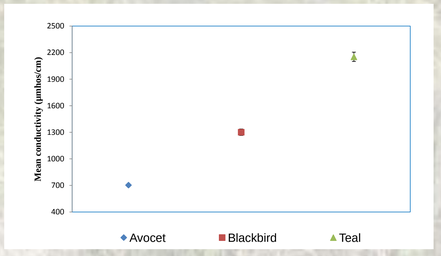


Figure 7. Mean conductivity µmhos/cm in three ponds at the Ogden Nature Center.

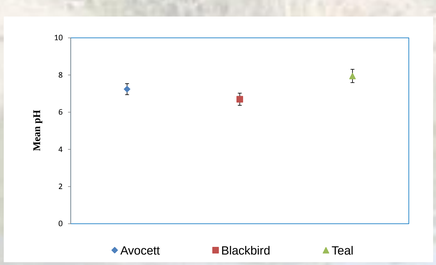


Figure 8. Mean pH in three ponds at the Ogden Nature Center.

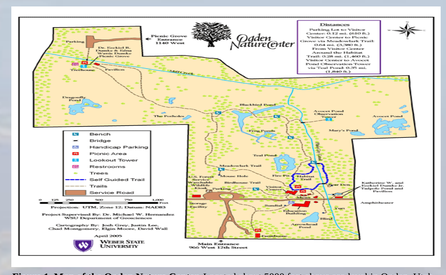
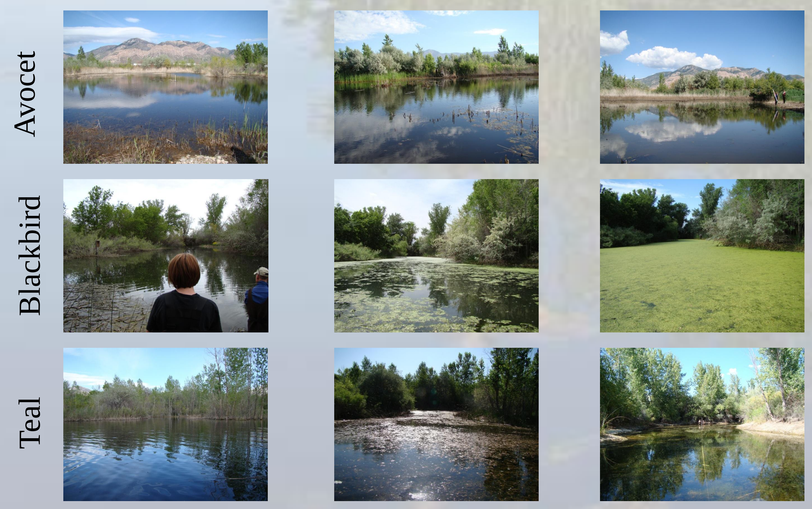


Figure 1. Map of the Ogden Nature Center. Located about 5000 feet above sea level in Ogden, Utah

Transition of Ponds



Results

Avocet

How did temperature and DO compare to other ponds? Temperature and DO are usually negatively correclated (colder water holds more oxygen) so it makes sense to present them together (Figs 2 - 4). It makes sense to present depth, areal extent, and conductivity together because the pond shrinks through evaporation which increases conductivity (Figs 5-7). How did pH compare to other ponds? (Fig 6).

Areal extent for Avocet was constant until July ,when it showed a sudden decrease in water level (Figure 10). Then from July to August it showed a gradual decrease in areal extent (Figure 10). Western mosquitofish (*Gambusia affinis*) accounted for 100% of fish captured ($N = 562$).

Blackbird

How did temperature and DO compare to other ponds? Temperature and DO are usually negatively correclated (colder water holds more oxygen) so it makes sense to present them together (Figs 2 - 4). It makes sense to present depth, areal extent, and conductivity together because the pond shrinks through evaporation which increases conductivity (Figs 5-7). How did pH compare to other ponds? (Fig 6).

Blackbird had the most varying areal extent (Figure 10). It showed large increases and decreases in water level throughout the summer. No fish were captured at Blackbird pond.

Teal

How did temperature and DO compare to other ponds? Temperature and DO are usually negatively correclated (colder water holds more oxygen) so it makes sense to present them together (Figs 2 - 4). It makes sense to present depth, areal extent, and conductivity together because the pond shrinks through evaporation which increases conductivity (Figs 5-7). How did pH compare to other ponds? (Fig 6).

Teal pond had the most constant areal extent out of the three ponds (Figure 10). The only major change in water level occurred at the end of July when areal extent decreased dramatically. Western mosquitofish accounted for 48.2% of fish captured ($N = 55$) ,green sunfish (*Lepomis cyanellus)* accounted for 27.2% ($N = 31$) and fathead minnows (*Pimephales promelas*) accounted for the remaining 24.6% ($N = 28$).

Discussion

A complete survey of Avocet, Blackbird, and Teal ponds revealed that Avocet and Teal ponds would likely both make suitable refuge locations for least chub. Avocet Pond had the highest water temperature, intermediate dissolved oxygen, rapidly declining areal extent and supported one fish species (western mosquitofish). Teal Pond had an intermediate water temperature, the highest dissolved oxygen, and the most constant areal extent. and supported three fish species, western mosquitofish, fathead minnows, and green sunfish. Why do these characteristics suggest least chub would survive?

Although Avocet and Teal ponds are likely suitable habitats, there are some concerns. Fish species found in both ponds would need to be eliminated before introduction of least chub. Why? Teal Pond was filled with thick vegetation, which could cause problems when Rotenone is administered to remove resident fishes because it could prevent the poison from sinking to the bottom pond bottom, leaving a refuge for fishes. Another concern with Avocet and Teal ponds is that ponds of the Nature Center are close together. If other ponds house mosquitofish or other nonnatives, their accidental or intentional transfer is a constant risk. For example, in a year with excessive precipitation, the ponds could connect, allowing fish to swim from one to another.

In spite of having intermediate water temperature and the lowest dissolved oxygen, Blackbird Pond supported no fish, despite being previously stocked with mosquitofish. Because Blackbird Pond supported no fish, I concluded that it would not be suitable for a least chub population. Blackbird Pond was covered by a thin layer of duckweed, which could also affect a least chub population. Why do you think Blackbird was fishless? What effect might duckweed have? What is the scientific name of duckweed? You might also want to mention that mosquitofish were stocked but not detected.

All you need is some concluding statements in a cohesive final paragraph.