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CORRELATION OF MATURE WALLEYE RELATIVE ABUNDANCE TO EGG DENSITY

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CORRELATION OF MATURE WALLEYE RELATIVE ABUNDANCE TO EGG DENSITY —Knowledge of spawning areas can benefit fisheries management (Marsden et al. 1991). Identification of spawning areas allows managers to protect, enhance, and/or restore critical habitat (Gunn et al. 1996, Thompson 2009), examine important biotic and abiotic conditions necessary for reproduction (Quist et al. 2003), and to efficiently collect broodstock for production (Satterfield and Flickinger 1996).

The most effective method to directly identify spawning areas of fish with demersal eggs is to sample the substrate for eggs (Marsden et al. 1991). This method has been used to locate spawning areas of several species (Michaletz 1984, Zorn et al. 1998, Martin 2008). However, direct estimation of egg deposition is time consuming and requires specialized equipment which often makes this method impractical. A more practical approach may be to indirectly identify spawning areas by sampling congregations of mature fish during the spawning season.

Mature male walleye (*Sander vitreus*) will congregate during the spawning season on the spawning grounds and remain there for the duration of the spawn (Scott and Crossman 1973). In contrast, mature female walleye will stage near the spawning grounds before moving onto the spawning ground to release their eggs, and will then return to the staging area within a single night (Scott and Crossman 1973, Thompson 2009). This sex-specific behavior suggests that locating male walleye as opposed to females may be more reliable for locating where egg deposition is occurring.

Sampling sex-specific congregations would allow either male or female walleye to be targeted. For example, electrofishing over spawning grounds is biased for collecting male walleye while using 5.1 cm mesh (bar measure) gill nets is biased for collecting females (Koupal et al. 1997). If a relationship exists between egg deposition and mature walleye relative abundance, implementing these gears would provide managers a more practical approach to identifying spawning areas. Our study objective was to determine if relative abundances of mature male walleye and mature female walleye were correlated to egg density.

We conducted this study at Sherman Reservoir, Nebraska during the walleye spawn (late-March to mid-April) 2007–2009. Sherman Reservoir is an off-stream irrigation reservoir located near Loup City, Nebraska. Water for the reservoir is diverted from the Middle Loup River and travels to the reservoir through a canal system where it is stored until needed by irrigators. At conservation pool, the reservoir covers 1,151 ha and stores 8,520 ha-m of water.

We estimated the relative abundance of mature male and female walleye and walleye egg density weekly at three sampling areas (randomly selected sites at each area) located throughout the reservoir. The sampling areas were hypothesized to have a wide range of mature walleye usage and egg deposition based on previous walleye broodstock collection efforts on Sherman Reservoir.

We collected mature male walleye using an electrofishing boat generating pulsed-DC current. We conducted 1 to 3 electrofishing runs with 2 dippers at each sampling site each week as conditions and catch rates would allow. We began electrofishing runs approximately 30 minutes after sunset. We considered male walleye mature if milt was expelled from the vent when pressure was applied to the abdomen (Satterfield and Flickinger 1996). We indexed relative abundance of mature male walleye as mean catch per unit effort (CPUE) for each sampling site each week. We standardized electrofishing CPUE as the number of mature male walleye captured per hour of electrofishing.

We sampled mature female walleye with gill nets that were 61.0 m long, 1.8 m deep and had 5.1 cm mesh (bar measure). We considered female walleye mature if they were gravid (Satterfield and Flickinger 1996). We set gill nets approximately 30 minutes after sunset and allowed them to fish for 90–150 minutes. We made multiple net sets at each sampling site until each site had a minimum of 2 net sets each week. We indexed relative abundance of mature female walleye as mean CPUE for each sampling site each sampling week. We standardized gill net CPUE as the number of mature female walleye captured per hour of gill netting.

We used egg sampling disks to sample walleye eggs (Katt et al. 2011). We deployed egg sampling disks in arrays of 10 disks with 3 arrays deployed at each sampling site. We checked disks weekly for the presence of eggs by placing each disk in a tub of water and scrubbing the entire surface of the disk twice. We poured the water from the tub through a 500 micron sieve and enumerated collected eggs. We derived a weekly egg density (number of walleye eggs/m^2/night) for each sampling site.

We used Pearson correlations to test the relationship between mature male electrofishing CPUE and mature female gill net CPUE to egg density (α=0.05). To meet assumptions of normality, we $\log_{10}$+1 transformed our data. We paired data points by week and represent the mean mature male electrofishing CPUE, mean mature female gill net CPUE and mean egg density from 2007–2009. We only used sampling weeks when all 3 variables were collected (n = 19).

Mature male walleye electrofishing CPUE was significantly correlated (r_p = 0.89, P < 0.001) to egg density while mature female walleye gill net CPUE was not significantly correlated (r_p = 0.42, P = 0.07) to egg density (Fig. 1).

Our results suggested that mature male walleye electrofishing CPUE was a better indicator of where eggs were deposited than mature female walleye gill net CPUE. Similar results were found in Sandusky Bay, Lake Erie, Ohio where male walleye had a higher probability of occurring over identified spawning substrates than female walleye (Thompson 2009). The location of male walleye during spawning is likely a better indicator of egg deposition because of walleye sex-specific spawning behavior. By locating important walleye spawning areas, managers can protect critical habitats of walleye as well as locate habitats which can be restored or enhanced (Thompson 2009).

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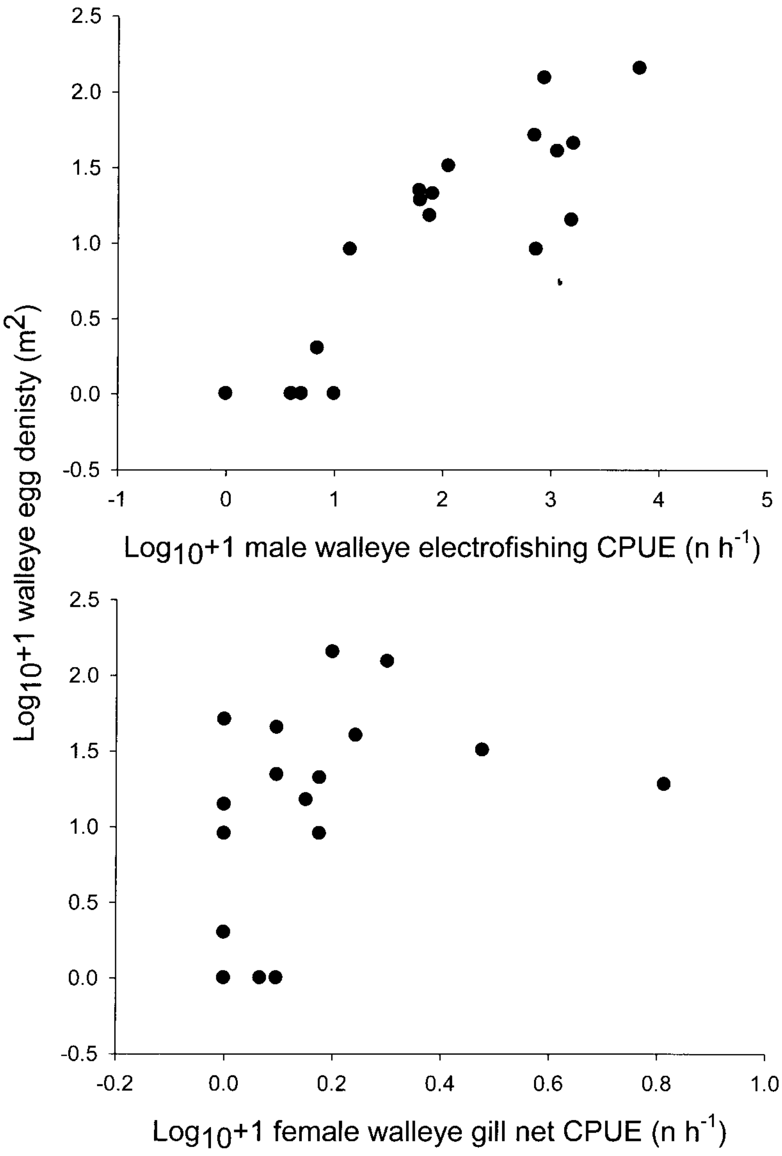

Figure 1. Relationship between mature male walleye electrofishing CPUE and walleye egg density (above) and between mature female walleye gill net CPUE and walleye egg density (below) in Sherman Reservoir, Nebraska 2007–2009. All data were $\log_{10}+1$ transformed.

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