

CONTRIBUTION OF STOCKED WALLEYE IN LAKE SANTEETLAH



Federal Aid in Sport Fish Restoration
Project F-108
Report Type: Final Report



A. Powell Wheeler
and
Amanda M. Bushon

Fishery Biologists

North Carolina Wildlife Resources Commission
Division of Inland Fisheries
Raleigh

2018

Keywords: Santeetlah, Walleye, stocking, gill net

This project was funded under the Federal Aid in Sport Fish Restoration Program utilizing state fishing license money and federal grant funds derived from federal excise taxes on fishing tackle and other fishing related expenditures. Funds from the Sport Fish Restoration Program are used for fisheries management and research, aquatic education, and boating access facilities. The program is administered cooperatively by the N.C. Wildlife Resources Commission and the U.S. Fish and Wildlife Service.

Abstract.— According to angler complaints, the Walleye *Sander vitreus* fishery in Lake Santeetlah has declined in recent years. In 2012, we began an experimental stocking of oxytetracycline-marked fingerling Walleye to determine if they could recruit to adulthood (age ≥ 1) and contribute to the adult population. We assessed the Walleye population with fall gill-net surveys in 2013, 2015, 2016, and 2017. Although the majority of Walleye from the stocked year classes were stocked, the overall gill-net catches remain very low. We propose to continue the experimental Walleye stocking until 2022, and in an effort to increase recruitment, we recommend moving the stocking location to the Cheoah Point Boating Access Area.

Lake Santeetlah is a small (1,159 ha), moderate elevation (591 m above mean sea level), oligotrophic, hydropower reservoir on the Cheoah River in Graham County, North Carolina (TVA 1954; NCDENR 2005). It was impounded in 1927 and Walleye *Sander vitreus* were first introduced in 1954 (Messer 1966). This initial introduction established a self-sustaining Walleye population and, until this study, there have been no additional stockings. The Walleye fishery is popular and a creel survey conducted between 1998 and 1999 estimated that Walleye attracted 23.9% of the directed angling effort, with anglers harvesting 975 Walleye annually (Yow et al. 2002).

Anglers perceive that the Walleye fishery in Lake Santeetlah has declined in recent years. However, we cannot verify angler opinions with Walleye population data because there are no comparable gill-net surveys before 2006. The potential causes of Walleye population decline are unknown. River herring *Alosa spp.* invasions are associated with Walleye recruitment problems in other North Carolina reservoirs including Lake James (Chris Wood, personal communication) and Lake Hiwassee (Wheeler et al. 2004). However, neither Blueback Herring *Alosa aestivalis* nor Alewife *Alosa pseudoharengus* have been collected in Lake Santeetlah.

In other North Carolina reservoirs, annual fingerling Walleye stockings have successfully compensated for poor and failed recruitment (Bushon et al. 2009; Wheeler and Bushon 2018a; Wheeler and Bushon 2018b; Chris Wood, personal communication), but in a reservoir without recruitment problems, stocking made no substantial contribution (Besler 2004). Our goal is to increase the Walleye population in Lake Santeetlah and our objective is to determine if stocked fingerling Walleye can recruit to adulthood (age ≥ 1) and contribute to the adult population.

Methods

In 2012, we began an experimental annual stocking of 15,000 fingerling Walleye in Lake Santeetlah. This rate of 13.0/ha is similar to Walleye stocking rates in other North Carolina reservoirs (NCWRC 2018). Each March, Walleye broodstock were collected with boat-mounted electrofishing equipment from Lake James and transported to Table Rock State Fish Hatchery in Morganton, North Carolina. Walleye were strip-spawned at the hatchery and the fertilized eggs were transferred to hatching jars. After hatching, the fry were transferred to outdoor ponds and reared to 25–38 mm TL. Walleye fingerlings were then transferred into indoor tanks where they were marked by immersion for 6 h in a solution of 500 mg/L of oxytetracycline hydrochloride (OTC) and 1,000 mg/L of sodium chloride which was buffered with tris. Within three days of harvesting, the marked Walleye were released upstream of the reservoir into the Cheoah River near the confluence of Long Creek (Figure 1).

We used gill-net surveys in October of 2013, 2015, 2016, and 2017 to sample the Walleye population. The gill-net dimensions were 2.4 x 76.3 m and consisted of consecutive, equal-length panels of 25-, 32-, 38-, 44-, and 51-mm bar mesh. The nearshore end (small or large mesh) of the nets was randomly selected and set perpendicular to the shore at 12 sites (Figure 1) for one 24-h period. The sites were spread throughout the reservoir and selected to avoid gill-net hazards such as submerged trees and private boat docks. All captured Walleye were bagged by site, placed on ice, transported to the lab where they were measured for TL (mm), weighed (g), and sexed within 24h. Sagittal otoliths were removed, placed in individually coded plastic vials, and stored in the dark.

Walleye ages were estimated by counting otolith annuli with a compound microscope. If the otoliths were \leq age-1, they were aged intact (without breaking or sectioning) whereas older otoliths were aged after removing two, 0.5-mm sections of the focus using a Buehler Isomet low-speed diamond wheel saw. Two readers evaluated the otoliths independently and then assigned ages after disagreements were discussed and resolved.

After aging, the otoliths were checked for OTC marks under a compound microscope with transmitted epifluorescent light. Sectioned otoliths were placed on a glass microscope slide and checked for OTC marks on both sides of the two, 0.5-mm sections. The foci of intact otoliths

were exposed by attaching them to microscope slides with cyanoacrylate glue and grinding with 800-grit sandpaper.

We calculated Walleye relative weight according to Murphy et al. (1990). The percentage of stocked Walleye in our samples was used as an estimate of the percentage of stocked Walleye in the entire reservoir and the Clopper and Pearson (1934) exact binomial method (R version 3.4.3) estimated 95% confidence intervals. Walleye growth was qualitatively assessed with traditional Tukey-style box plots.

Results and Discussion

We collected 126 Walleye during this investigation from 48 net-nights of effort (Table 1). The mean catch-per-unit-effort (number of Walleye caught per net-night) ranged from 1.2 to 4.6. North Carolina Wildlife Resources Commission District 9 (D-9) reservoirs typically average >5 Walleye per net night; however during this study Lake Santeetlah was consistently lower. We assigned ages, and therefore year-classes, to 125 of the Walleye. The year-classes in our samples ranged from 1997 to 2016 (Figure 2). Walleye fully recruited to our gill nets at age-1 and we caught very few (5) age-0.

Our samples included 43 Walleye from the stocked year-classes and 69.8% of these were verified as stocked by the presence of OTC marks. Walleye were collected from all the stocked year-classes that had recruited to the sampling gear except the 2016 year-class (Figure 2). The percent contribution of stocked Walleye to the entire population varied across sample years from 6.3 to 64.3% and there was no clear trend that the stocked Walleye were becoming more prevalent in the reservoir over all the years of sampling (Table 1; Figure 2). D-9 Walleye mean relative weights typically range between 80 and 95; Lake Santeetlah was typically within that range although the 2017 sample was lower (Table 1). Walleye growth was poor and very few individuals exceeded 500mm TL (Figure 3).

The stocked fingerling Walleye are surviving and successfully recruiting to the adult population. Although the majority of the stocked year classes are made up of stocked Walleye, the overall gill-net catches remain very low. Recently, an experiment on Lake James found that stocking location can influence the recruitment of fingerling Walleye to adulthood (D. Goodfred, personal communication). Specifically, the less productive and deeper side of the reservoir (Linville River) outperformed the more productive and shallow side (Catawba River). The Cheoah River arm of Lake Santeetlah is relatively shallow and more productive than other arms of the reservoir; and therefore, may be analogous to the Catawba River side of Lake James. In contrast, Cheoah Point Boating Access Area on Lake Santeetlah is near the dam, less productive, and deeper than our current stocking location. Therefore, Walleye stocked there may have higher rates of survival and make more substantial contributions to the adult population.

Management Recommendations

- 1.) Continue annual fingerling Walleye stocking in Lake Santeetlah until 2022 and change the stocking location to Cheoah Point Boating Access Area.

2.) Re-sample Lake Santeetlah in 2019, 2021, and 2023 to determine if the stocking is effective.

Acknowledgements

This research was a collaborative effort and would not be possible without the support of many within the Inland Fisheries Division. Specifically, we appreciate the annual efforts of the District-8 Fisheries Management staff who collect the broodfish and the Table Rock State Fish Hatchery staff who spawn, rear, mark, and stock the fingerlings. The edits and suggestions of S. Loftis improved this report.

References

- Besler, D. A. 2004. Contribution of stocked fingerling Walleyes in Lake James. North Carolina Wildlife Resources Commission, Federal Aid in Sport Fish Restoration, Final Report, Raleigh.
- Bushon, A. M., A. P. Wheeler, and D. L. Yow. 2009. Contribution of stocked Walleye fingerlings in Hiwassee Reservoir. North Carolina Wildlife Resources Commission, Federal Aid in Sport Fish Restoration, Final Report, Raleigh.
- Clopper, C. J., and E. S. Pearson. 1934. The use of confidence or fiducial limits illustrated in the case of the binomial. *Biometrika* 26:404-413.
- Messer, J. B. 1966. Mountain reservoirs - 1965 surveys. North Carolina Wildlife Resources Commission, Federal Aid in Sport Fish Restoration, Raleigh.
- Murphy, B. R., M. L. Brown, and T. A. Springer. 1990. Evaluation of the relative weight index (W_r) with new applications to Walleye. *North American Journal of Fisheries Management* 10:85-97.
- North Carolina Department of Environment and Natural Resources. 2005. Basinwide assessment report - Little Tennessee River Basin. Raleigh.
- North Carolina Wildlife Resources Commission (NCWRC). 2018. Warmwater stocking list. Raleigh.
- Tennessee Valley Authority (TVA). 1954. TVA water control projects and other major hydro developments in the Tennessee and Cumberland Valleys. Technical Monograph 55. Knoxville.
- Wheeler, A. P., and A. M. Bushon. 2018a. Contribution of stocked Walleye in Lake Glenville. North Carolina Wildlife Resources Commission, Federal Aid in Sport Fish Restoration, Final Report, Raleigh.
- Wheeler, A. P., and A. M. Bushon. 2018b. Contribution of stocked Walleye in Lake Hiwassee. North Carolina Wildlife Resources Commission, Federal Aid in Sport Fish Restoration, Final Report, Raleigh.
- Wheeler, A. P., C. S. Loftis, and D. L. Yow. 2004. Hiwassee Reservoir Walleye survey (2000-2003). North Carolina Wildlife Resources Commission, Federal Aid in Sport Fish Restoration, Final Report, Raleigh.
- Yow, D. L., C. S. Loftis, and E. Ganus. 2002. Creel surveys of Santeetlah, Cheoah, Calderwood, and Chilhowee Reservoirs, 1998-1999. North Carolina Wildlife Resources Commission, Federal Aid in Sport Fish Restoration, Final Report, Raleigh.

TABLE 1.—Catch per unit effort (CPUE; individuals/net night), total length range (TL mm), relative weight (W_r), and percent stocked for Walleye collected during this study. Standard deviations are reported for CPUE and W_r . A 95% confidence interval is reported for percent stocked.

Year	N	CPUE	TL range	W_r	Percent stocked
2013	32	2.7 (2.9)	235–602	93.0 (8.4)	6.3 (0.8–20.1)
2015	55	4.6 (4.1)	279–525	93.8 (9.7)	27.2 (16.1–41.0)
2016	14	1.2 (1.9)	368–470	84.8 (5.0)	64.3 (35.1–87.2)
2017	25	2.1 (1.9)	348–604	77.5 (15.8)	16.0 (4.5–36.1)

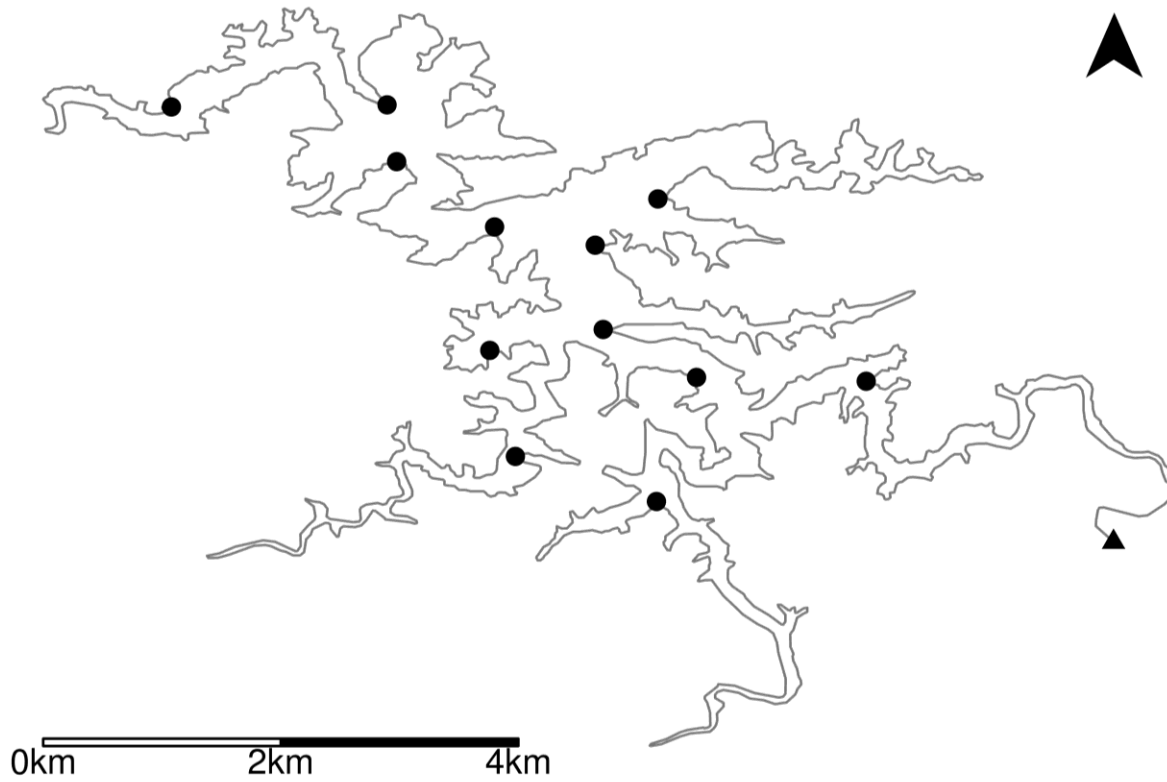


FIGURE 1.—Map of Lake Santeetlah, Graham County, North Carolina. The dots represent the 12 gill net locations used for Walleye collections in this study (2013–2017). The triangle represents the stocking point on the Cheoah River.

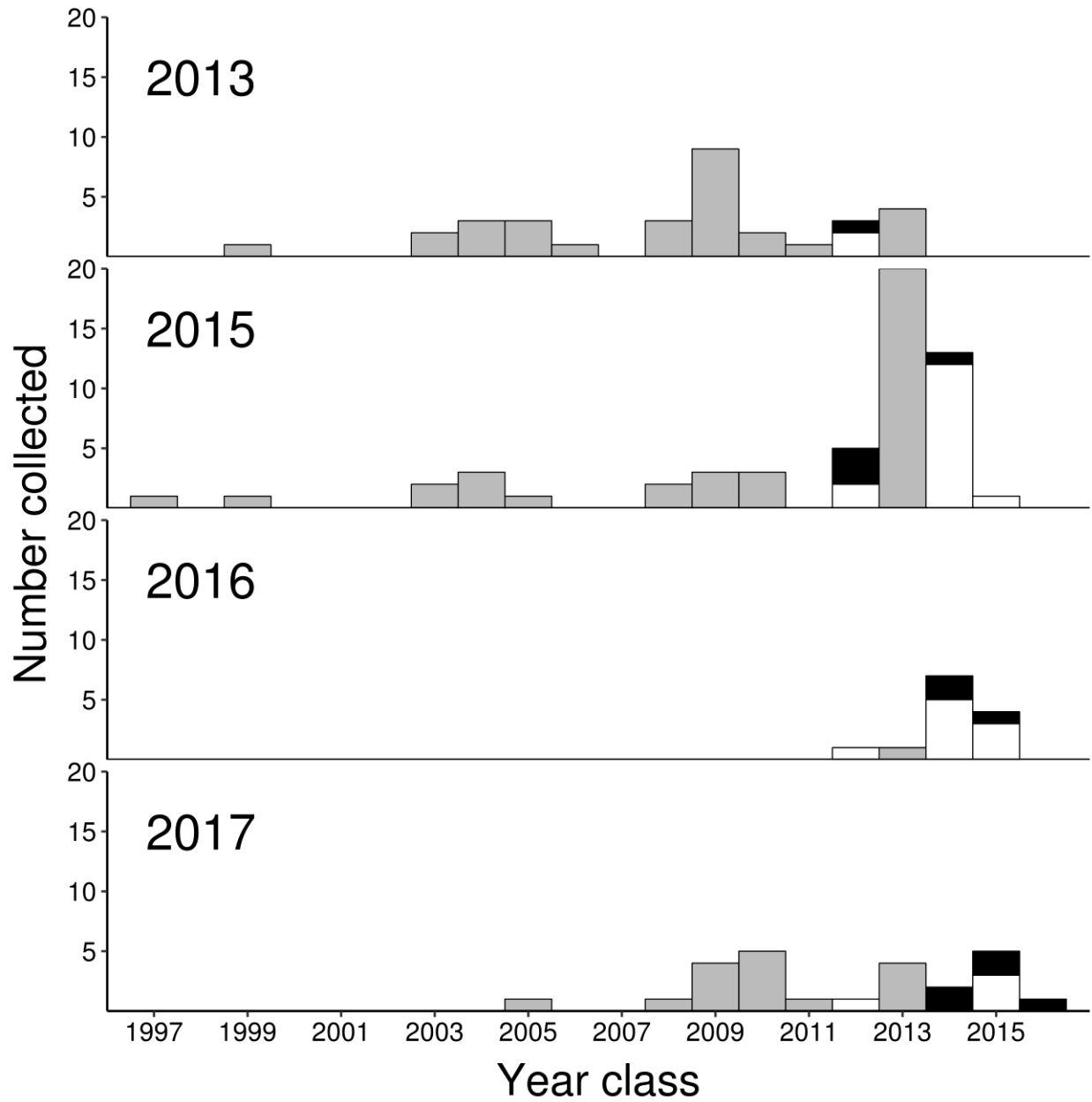


FIGURE 2.—The frequency distributions of Walleye year-classes collected in 2013, 2015, 2016, and 2017. Walleye from stocked year-classes (2012, 2014, 2015, and 2016) were checked for OTC marks. White shading represents OTC-marked Walleye and black shading represents unmarked Walleye. Year-classes ≤ 2011 and 2013 were not stocked and are shown in gray.

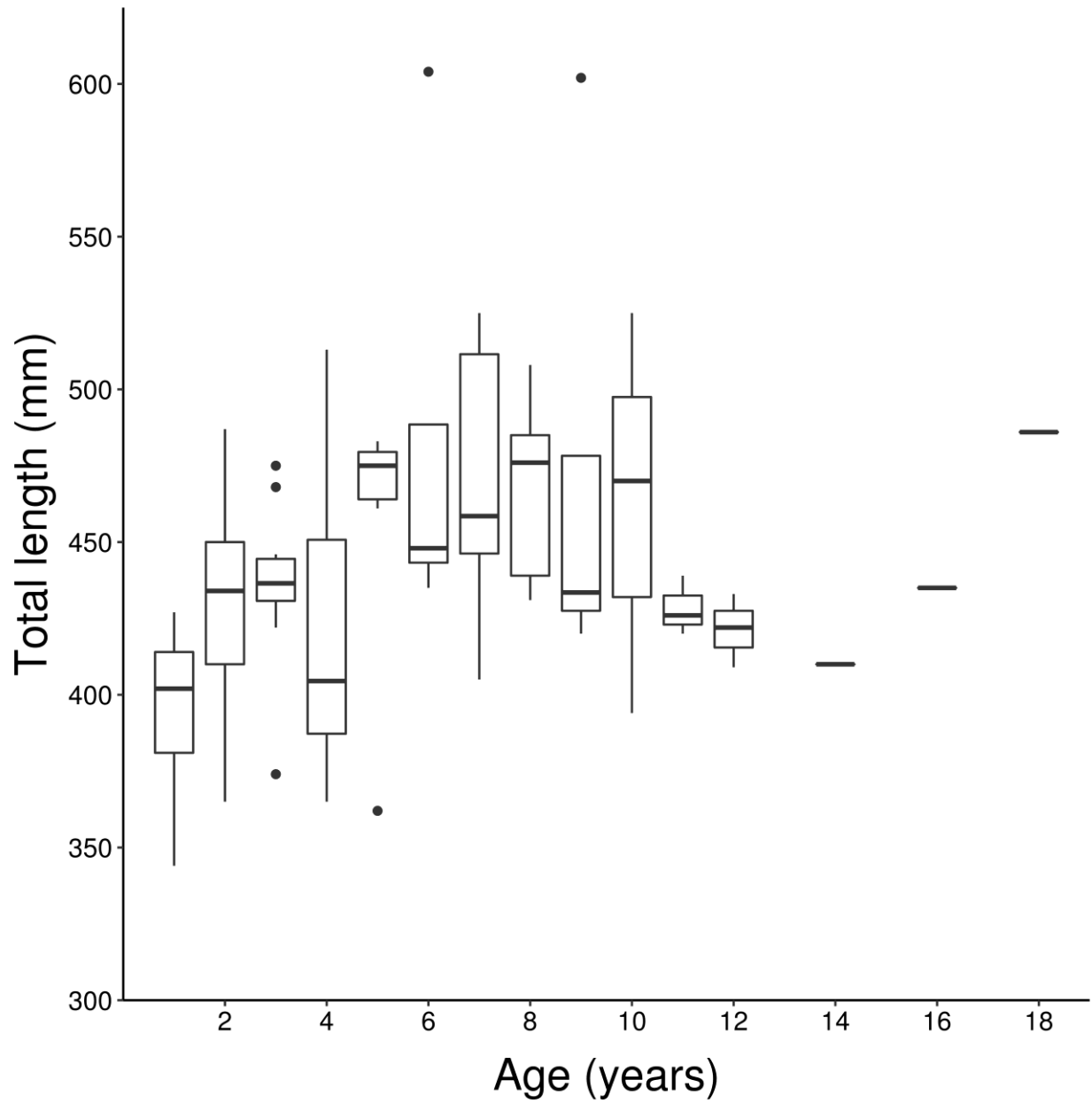


FIGURE 3.—Distribution of total length by age of all Walleye collected during this study. These are traditional Tukey boxplots: the dark line represents the median, the box represents the distance between the first and third quartiles, the whiskers show the range of observations within 1.5 quartiles of the box, and the dots are outlying values.