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ARTICLE

Movement Dynamics of Smallmouth Bass in a Large Western River System

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Abstract
The Snake River, Idaho, between Swan Falls and Brownlee dams supports a popular fishery for Smallmouth Bass *Micropterus dolomieu*. Recently, anglers have expressed concern about harvest of Smallmouth Bass associated with seasonal congregations in and near the lower reaches of several major tributaries. Little is known about Smallmouth Bass movement in the system, and a better understanding of movement dynamics will help to guide future management. From March to August 2016, Smallmouth Bass (≥260 mm; *n* = 1,131) were tagged with T-bar anchor tags to evaluate large-scale movement patterns. Movement was estimated from 63 angler-reported tags for which area descriptions provided sufficient detail to assign a recapture location. Extent of fish movement varied among segments and tributaries from 0 to 128 river kilometers (rkm). From March to May 2017, Smallmouth Bass (≥305 mm; *n* = 149) in the Snake, Boise, Payette, and Weiser rivers and in Brownlee Reservoir were implanted with radio transmitters. Of the 149 Smallmouth Bass that were released with radio transmitters, 107 were relocated at least once. Additionally, 79.6% of fish with radio transmitters had a maximum extent of movement of 5 rkm or greater and 42.6% had a maximum extent of 30 rkm or greater; one radio-tagged fish moved 167 rkm upstream. Average daily movement of Smallmouth Bass varied among river segments and was greatest in the spring and summer. Fish from the Snake River, tributaries (e.g., Boise River), and Brownlee Reservoir moved all around the study area, indicating an absence of clear population boundaries. As such, Smallmouth Bass in the study area appear to function as one large population as opposed to multiple subpopulations, thereby indicating that management as one population is likely appropriate.

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Understanding movement of fishes is critical for management, particularly when populations exhibit some degree of spatial structure (Larimore 1952; Pine et al. 2012). Knowledge of fish movement allows managers to identify changes in the occurrence and abundance of fishes and may provide insight on whether different life history strategies (e.g., adfluvial, fluvial, and resident) are present in a population. Although this information is useful for managing fisheries, information on movement also provides insight on the ecology of fishes, such as immigration and emigration rates, habitat selection, and factors regulating growth and reproduction (e.g., Graham and Orth 1986; Dobos et al. 2016).

The Smallmouth Bass *Micropterus dolomieu* is one of the most popular sport fishes in North America. Smallmouth Bass are native to portions of the central and eastern United States, but widespread introductions and habitat alterations have led to an expanded distribution, particularly in western North America (Robbins and MacCrimmon 1974; Schade and Bonar 2005; Stepien et al. 2007; Carey et al. 2011; Brewer and Orth 2015). Smallmouth Bass display high variability in movement across populations. Many studies have reported that movement of Smallmouth Bass is restricted to an area of less than 5 km (Larimore 1952; Fajen 1962), whereas other studies have reported more extensive movements exceeding 70 km (Munther 1970; Todd and Rabeni 1989; Langhurst and Schoenike 1990; Rubenson and Olden 2016). Much of the variation in movement of Smallmouth Bass across systems is undoubtedly related to seasonal movements associated with spawning and(or) responses to changing physical habitat conditions (Fajen 1962; Munther 1970; Montgomery et al. 1980; Todd and Rabeni 1989; Langhurst and Schoenike 1990; Gunderson VanArnum et al. 2004; Rubenson and Olden 2016). Nevertheless, the ability of Smallmouth Bass to survive in a variety of habitat conditions, coupled with an ability to move long distances, has resulted in the successful colonization of a variety of lotic and lentic habitats (Coble 1975; Schade and Bonar 2005).

Smallmouth Bass were reportedly first stocked in the western United States during the late 1800s and early 1900s (Lampman 1946; Munther 1970; LaVigne et al. 2008). Since that time, their distribution has expanded and their popularity among anglers has increased (Carey et al. 2011). One extremely popular Smallmouth Bass fishery is located on the Snake River, Idaho, between Swan Falls and Brownlee dams (Figure 1). Although Smallmouth Bass likely have been present in the system since the 1800s (Munther 1970), a dramatic increase has been observed in the abundance of Smallmouth Bass in the Snake River downstream of Swan Falls Dam since the early 1970s (Kozfkay et al. 2006). Increases in abundance coincided with reservoir development and altered hydrology following completion of the Hells Canyon Dam Complex. Recently, fisheries managers in Idaho have become interested in Smallmouth Bass movement. Not only is little known about the ecology of Smallmouth Bass in western river systems, but anglers and staff with the Idaho Department of Fish and Game (IDFG) have expressed concern about the harvest of Smallmouth Bass associated with seasonal congregations in and near the lower reaches of several major tributaries (e.g., Payette and Weiser rivers). The origin of adult Smallmouth Bass in seasonal congregations is unknown, and these congregations may contain a mixture of reservoir, river, and tributary fish.

The objective of this study was to determine seasonal movement dynamics of Smallmouth Bass in the Snake River. Two methods—angler reports of tagged fish and radiotelemetry—were used to evaluate fish movement. Describing movement of Smallmouth Bass in the study area provided information about when fish moved, seasonal changes in the spatial distribution of fish, and the spatial extent of movement in the system.

METHODS

Study Area

The Snake River originates in Yellowstone National Park, Wyoming, and flows south through western Wyoming before turning west and entering eastern Idaho through Palisades Reservoir near the town of Alpine, Wyoming. The river then travels west across the southern portion of the state until it reaches the Oregon border (Figure 1). From that point, it flows north and serves as the border between Oregon and Idaho until it reaches the Oregon–Washington border. The Snake River continues to serve as the border between Idaho and Washington until it reaches Lewiston, Idaho, where the river turns west and enters Washington. The Snake River eventually joins the Columbia River near Pasco, Washington. The downstream boundary of the study area (designated as river kilometer [rkm] 0) was Brownlee Dam (Figure 1). The upstream boundary of the study area was Swan Falls Dam (rkm 274). In addition to the main-stem Snake River, the study area also included the lower portions (20 rkm upstream from their confluence with the Snake River) of three major tributaries: the Boise, Payette, and Weiser rivers. The Boise River is the most southern of the three tributaries, contributes approximately $2.4 \times 10^9\ m^3$ of water annually to the Snake River, and meets the Snake River at rkm 169. The Payette River joins the Snake River at approximately rkm 126 and lies between the Boise and Weiser rivers. The Payette River contributes about $2.7 \times 10^9\ m^3$ of water annually to the Snake River—the greatest contribution among the three tributaries. The Weiser River is the northernmost tributary. It contributes

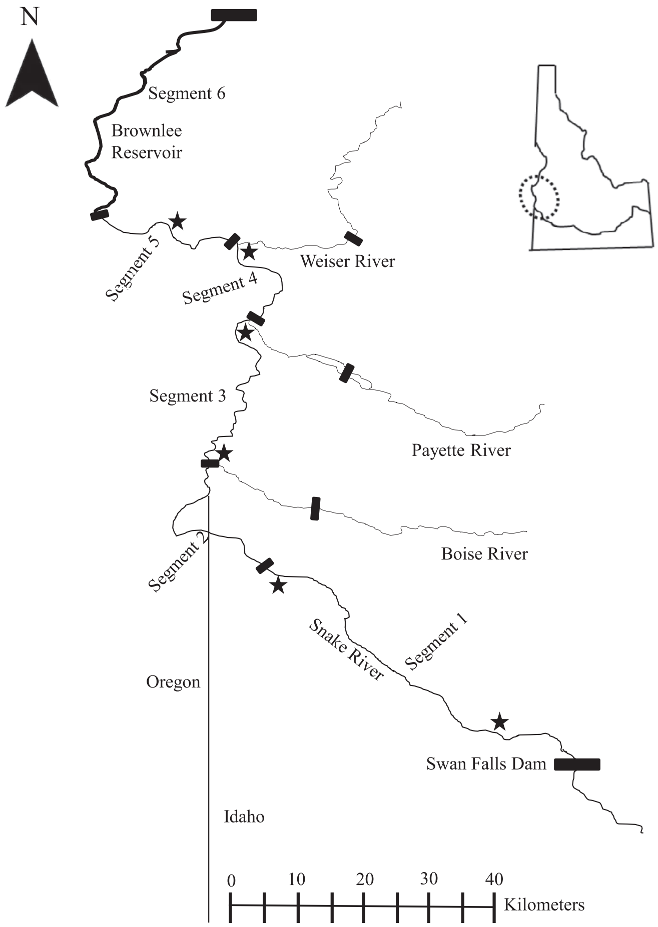

FIGURE 1. Map of the study area between Swan Falls Dam and Brownlee Dam, Idaho. The river flows from south to north. Small black boxes indicate segment breaks. Large black boxes indicate dams. Stars indicate fixed receiver sites.

the least amount of water to the system (0.9×10^3 m^3 annually) and joins the Snake River near rkm 103.

We divided the Snake River from Swan Falls Dam to Brownlee Dam into six segments, which were then used to describe patterns in movement (Figure 1; Table 1). Segments were delimited based on broad changes in stream geomorphology, potential population boundaries (e.g., major tributary confluences), and possible management units (e.g., access locations). The segments varied in length from 22.7 to 74.0 rkm. Segments 1–5 were on the Snake River (rkm 74–274). Segment 1 began at Swan Falls Dam and ended at Homedale, Idaho. Segment 1 is characterized by a high frequency of deep pool habitat and rocky substrate. Deep pools and rocky substrate are less common in segments 2–5. Additionally, irrigation return flows from agriculture tend to increase turbidity of the river during much of the year and contribute to fine-sediment deposition on the river bottom in segments 2–5. Segment 6 was Brownlee Reservoir. The segment began just downstream of Farewell Bend State Recreation Area, Oregon (rkm 73), and ended at Brownlee Dam (rkm 0). The lower portions (i.e., ~20 rkm upstream of the confluences) of the three major tributaries (i.e., Boise, Payette, and Weiser rivers) were also included in the study.

Sampling Design

T-bar anchor tags.— From March to August 2016, Smallmouth Bass ($n = 1{,}131$) were sampled using electrofishing in the Snake, Boise, Payette, and Weiser rivers and in Brownlee Reservoir. Total length (mm) was recorded for all tagged fish. Smallmouth Bass (≥260 mm) were tagged with T-bar anchor tags (Dell 1968; Guy et al. 1996). Each tag had a unique identification number and Web site address printed on one side and a toll-free phone number printed on the other side. Anglers could use either the Web site address or phone number to report the capture and(or) harvest of Smallmouth Bass to IDFG. Three-hundred and five Smallmouth Bass were tagged and released in Brownlee Reservoir (rkm 0–73) during several angling tournaments and one electrofishing event in March 2016. Eight-hundred and twenty-six Smallmouth Bass with tags were released in the Snake River (rkm 74–274) and lower portions of the Boise, Payette, and Weiser rivers between May and August 2016 during electrofishing surveys. A GPS waypoint was used to document the release location of individual fish. Descriptions from angler reports of recaptured fish (via hook and line) were used to determine distances from the initial tagging location. Only reports that included highly detailed descriptions of where a fish was caught (i.e., within 1 km of a major landmark) were used in the analysis.

Radiotelemetry.— During March–May 2017, we sampled fish by electrofishing and tagged 149 Smallmouth Bass in the Snake, Boise, Payette, and Weiser rivers and in Brownlee Reservoir. Radio tags were dispersed among the six segments to capture movement of fish throughout the study area (Table 2). Captured fish were placed in a holding tank on the boat. Total length (mm) and weight (g) were documented for all tagged fish. Fish were implanted with individually coded Lotek Wireless MST-930 radio transmitter tags (4.0 g; Lotek Wireless Fish and Wildlife Monitoring, Newmarket, Ontario) in the peritoneal cavity anterior to the pelvic girdle using a modified version of the technique described by Ross and Kleiner (1982). Radio transmitters were programmed with a burst rate of 8 s and allowed for individual fish identification using a single frequency (i.e., 151.380 MHz). Minimum expected battery life of the transmitters was 225 d. Only 305-mm and larger fish were tagged, and transmitters did not exceed 3.0% of the fish's body weight (Zale et al. 2005). Prior to implantation, the functionality of all tags was tested. Incisions were closed with two to three

TABLE 1. Coordinates for the beginning and ending locations of each segment used to describe movement of Smallmouth Bass in the Snake River, Idaho. Coordinates are in decimal degrees.

Segment	Segment length (rkm)	Beginning location	Ending location
1	69.0	Swan Falls Dam (43.243278, −116.379377)	Homedale, Idaho (43.619310, −116.923157)
2	35.4	Homedale, Idaho (43.619310, −116.923157)	Boise River confluence (43.815602, −117.021855)
3	43.4	Boise River confluence (43.815602, −117.021855)	Payette River confluence (44.091832, −116.952357)
4	22.7	Payette River confluence (44.091832, −116.952357)	Weiser River confluence (44.238751, −116.971676)
5	29.5	Weiser River confluence (44.238751, −116.971676)	Brownlee Reservoir (44.305340, −117.223064)
6	75.0	Brownlee Reservoir (44.305340, −117.223064)	Brownlee Dam (44.836458, −116.901528)

interrupted 3-0 nylon sutures. Following surgery, fish were placed in a holding tank and allowed to recover prior to release. Previous studies have reported low transmitter expulsion and low mortality using similar procedures (Martin et al. 1995; Zale et al. 2005). After recovery, fish were released near the point of capture and a waypoint was recorded using a GPS unit.

Fish were relocated using both fixed receiver stations and mobile techniques (i.e., jet boat or raft). Lotek Model SRX 400, SRX 600, and DL receivers were outfitted with either a fixed or folding three-element directional Yagi antenna. Fixed receivers were installed at six locations along the Snake River (rkm 258, rkm 207, rkm 169 [Boise River confluence], rkm 126 [Payette River confluence], rkm 103 [Weiser River confluence], and rkm 90; Figure 1). Mobile tracking occurred on the Snake, Boise, Payette, and Weiser rivers by jet boat or raft. Attempts were made to relocate fish twice per month from May to September and once per month from October to February. The entire river (including tributaries) was tracked, and tracking required approximately 12–13 d to complete. Brownlee Reservoir was not tracked, as radio transmitters were ineffective given the depth of the reservoir (>10 m). All fish relocations were georeferenced using a GPS unit.

Data Analyses

Distance of fish movement between relocations was measured using ArcMap GIS version 10 (Environmental Systems Research Institute, Redlands, California) and summarized. Initial release and recapture location data for fish with T-bar anchor tags were imported into ArcMap GIS version 10. Movement was calculated by subtracting the fish's point of relocation (i.e., recapture) from the initial release location (Dobos et al. 2016). Movement was expressed as the total distance (km) between the initial release location and the recapture location.

The initial release location and subsequent relocation data for Smallmouth Bass with radio tags were imported into ArcMap GIS version 10. Movement was summarized for all fish based on the various extents of movement. Extent of movement was defined as the difference between the farthest upstream and farthest downstream detections of individual fish during the entirety of the study (Langhurst and Schoenike 1990). Daily movement rate was estimated as the total distance moved (upstream or downstream) divided by the number of days between relocations. Downstream movement was expressed by a negative value, and upstream movements produced positive values (Dobos et al. 2016). Individual daily movement was averaged to quantify seasonal movement rates (i.e., spring, summer, fall, and winter). Seasons were defined in close alignment with the spring and fall equinox and the summer and winter solstice: March 16–June 20 (spring); June 21–September 22 (summer); September 23–December 21 (fall); and December 22–February 6 (winter), when tracking ceased.

RESULTS

Of the 1,131 Smallmouth Bass that were tagged with T-bar anchor tags, 117 tags were reported by anglers the following year. Movement information was estimated

TABLE 2. Release locations of Smallmouth Bass implanted with radio transmitters ($n = 149$) during 2017 in the Snake River (segments 1–5), Brownlee Reservoir (segment 6), and the three tributaries (i.e., Boise [B], Payette [P], and Weiser [W] rivers).

Tagging and release location (segment or tributary)	*n*
1	20
2	15
3	15
4	15
5	15
6	40
B	9
P	10
W	10

from 63 reports where the area descriptions provided sufficient detail to confidently assign a recapture location (Table 3). Extent of fish movement varied among segments and tributaries from 0.0 to 128.0 rkm (Figure 2). The longest movements of Smallmouth Bass with T-bar anchor tags occurred for fish that were tagged and released in Brownlee Reservoir; the shortest movements occurred for fish released in segment 3 and the lower Weiser River. The longest movement (128.0 rkm) was by a fish that moved from Brownlee Reservoir into the Payette River, where it was caught—but not harvested—by an angler in the spring (Table 3).

Of the 149 Smallmouth Bass that were released with radio tags, 107 were relocated at least once. One fish in the study was relocated 109 times, but this fish remained in close proximity to the fixed antenna at the mouth of the Payette River. Each segment and tributary had a relocation rate of at least 60%, except for segment 6 (Figure 3). Fish from segment 6 were only relocated if they were captured and reported by an angler or if they moved out of the reservoir. Extent of movement varied from 0.0 to 167.0 rkm for radio-tagged fish (Figures 4, 5). Many fish (28.7%) moved less than 10.0 rkm, but a majority (71.3%) moved more than 10.0 rkm; 42.6% moved 30.0 rkm or more. Similar to fish tagged with T-bar anchor tags, fish that were released in segment 6 had the greatest maximum extent of movement, with four fish moving more than 80.0 rkm and one fish moving 167.0 rkm upstream (Figure 5). Interestingly, a fish from segment 1 moved downstream more than 115.0 rkm to segment 5. Median movement of Smallmouth Bass in the Snake River varied from 13.0 to 38.0 rkm, with fish tagged in segment 6 exhibiting the greatest median movement.

TABLE 3. Movement of Smallmouth Bass sampled and tagged ($n = 63$) with T-bar anchor tags during 2016 in all five segments of the Snake River (segments 1–5), Brownlee Reservoir (segment 6), and the three tributaries (i.e., Boise [B], Payette [P], and Weiser [W] rivers).

Release location (segment or tributary)	n	Recapture location (segment or tributary)								
		1	2	3	4	5	6	B	P	W
1	20	20	0	0	0	0	0	0	0	0
2	0	0	0	0	0	0	0	0	0	0
3	1	0	0	1	0	0	0	0	0	0
4	2	0	0	0	0	0	0	0	1	1
5	1	0	0	0	0	1	0	0	0	0
6	27[a]	0	0	0	1	1	23	0	1	0
B	2	0	0	1	0	0	0	1	0	0
P	9	0	0	1	0	0	0	0	8	0
W	1	0	0	0	0	0	0	0	0	1

[a]One fish was recaptured downstream of the study area in the Hells Canyon Reservoir.

Fish tagged in tributaries (Boise, Payette, and Weiser rivers) had small maximum extents of movement (<40.0 rkm) in comparison with fish from the Snake River and Brownlee Reservoir (Figure 5). Median movement of fish that were radio tagged in tributaries varied from 10.0 to 17.0 rkm. The lowest median movement among the tributaries occurred in the Payette River, and the highest occurred in the Weiser River. Additionally, 59% of fish that were tagged and released in the tributaries eventually moved into the Snake River.

Average daily movement of Smallmouth Bass varied among river segments and seasons. In the spring, average daily movement indicated that fish from segments 1–3 generally moved downstream (Figure 6). In contrast, fish from segments 4–6 typically moved upstream during spring. In summer, fish that were tagged in segments 3 and 4 generally moved upstream. In fall, movement rates were relatively low, with several exceptions. Several high daily movement rates were recorded for fish in segments 1, 2, and 6. Fish tagged in Brownlee Reservoir that had entered the Snake River also appeared to move downstream toward the reservoir. By winter, many of the tags had failed and only 16 detections were recorded. Nevertheless, little daily movement upstream or downstream was recorded during winter.

DISCUSSION

Movement of Smallmouth Bass has been extensively studied and shown to be highly variable among systems (Larimore 1952; Munther 1970; Todd and Rabeni 1989;

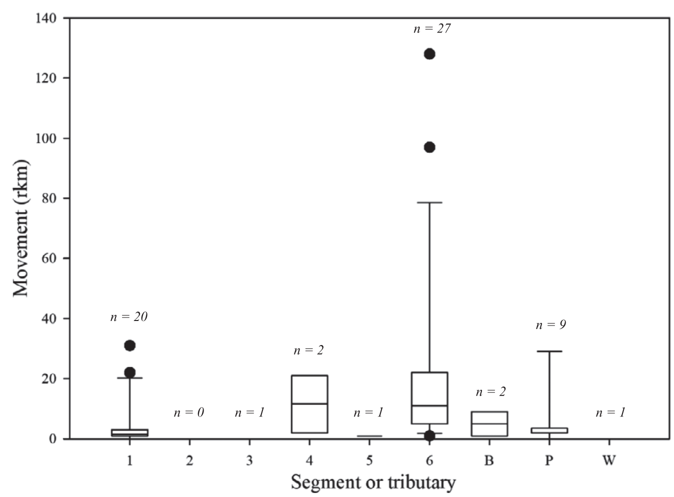

FIGURE 2. Extent of movement (rkm) for Smallmouth Bass tagged with T-bar anchor tags during 2016 in the Snake River (segments 1–5), Brownlee Reservoir (segment 6), and the three tributaries (i.e., Boise [B], Payette [P], and Weiser [W] rivers). The segment or tributary indicates where a fish was tagged and released. Sample size (n) represents the number of fish recaptured.

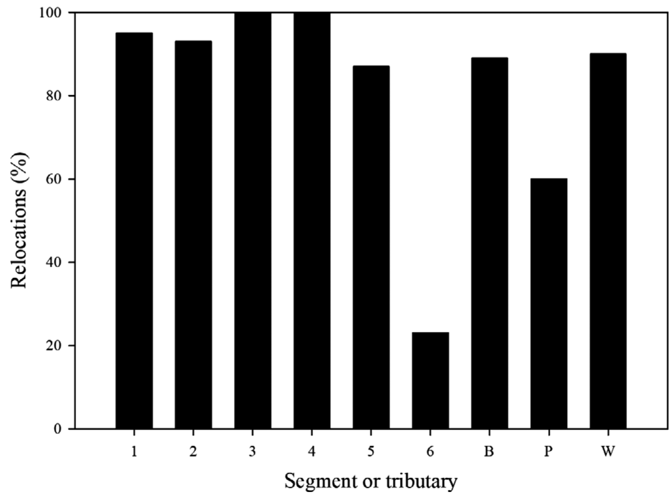

FIGURE 3. Proportion of Smallmouth Bass relocated at least one time during radiotelemetry surveys in 2017 in the Snake River (segments 1–5), Brownlee Reservoir (segment 6), and the three tributaries (i.e., Boise [B], Payette [P], and Weiser [W] rivers). The segment or tributary indicates where a fish was tagged and released.

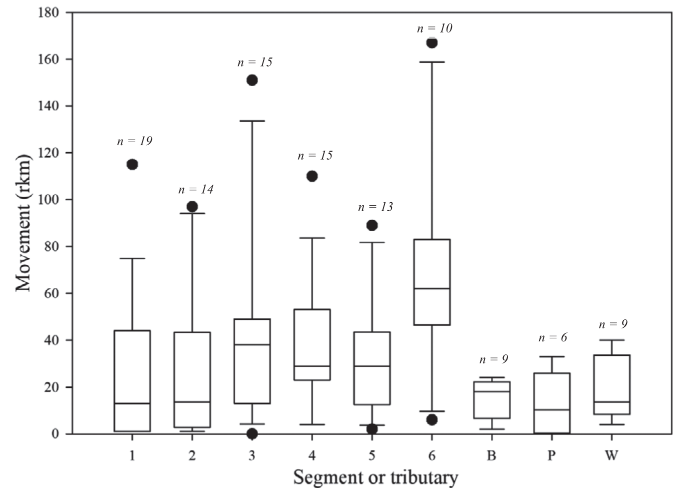

FIGURE 5. Extent of movement (rkm) for Smallmouth Bass tagged with radio tags during 2017 in the Snake River (segments 1–5), Brownlee Reservoir (segment 6), and the three tributaries (i.e., Boise [B], Payette [P], and Weiser [W] rivers). The segment or tributary indicates where a fish was tagged and released.

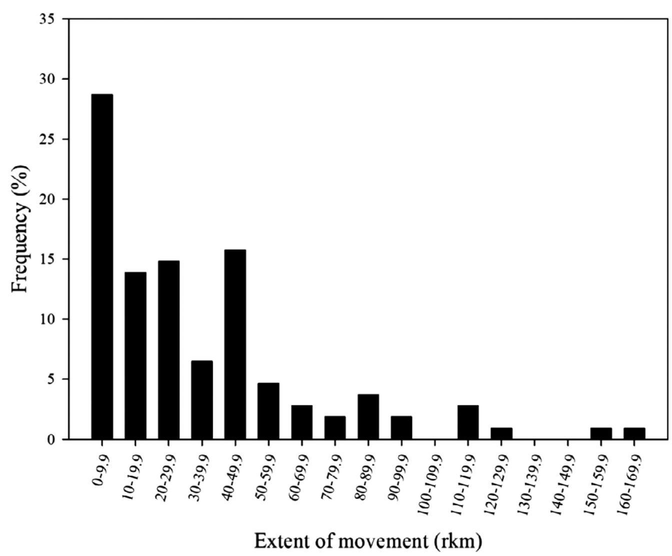

FIGURE 4. Proportional extent of movement (rkm) for all Smallmouth Bass tagged with radio tags during 2017 in the Snake River, Brownlee Reservoir, and major tributaries (i.e., Boise, Payette, and Weiser rivers).

Langhurst and Schoenike 1990; Gunderson VanArnum et al. 2004; Rubenson and Olden 2016). Previous research suggests that Smallmouth Bass may move for a variety of reasons, including major life history events (e.g., spawning; Gunderson VanArnum et al. 2004) or in response to changing habitat (e.g., thermal conditions; Munther 1970; Langhurst and Schoenike 1990). The reasons for migratory or seasonal movement of fish in the current study are likely similar to reasons previously identified for Smallmouth Bass in other areas of their distribution (Munther 1970; Langhurst and Schoenike 1990; Gunderson VanArnum et al. 2004). Gunderson VanArnum et al. (2004) reported on the seasonal movements of Smallmouth Bass in several Kentucky rivers and found evidence of discrete summer and winter locations as well as spawning aggregations. In the Snake River, Idaho, downstream of the current study area near the confluence with the Salmon River, Munther (1970) reported movement of Smallmouth Bass to deep pools (≥2.3 m) in late fall, likely in preparation for winter. Movement of several Smallmouth Bass in our study toward the reservoir in the fall suggests a similar behavior.

The extent of movement of Smallmouth Bass was variable. Approximately 30% of fish with radio transmitters moved less than 10 rkm, but the majority (~50%) of Smallmouth Bass moved 10–50 km. Although patterns in the extent of movement were similar between the two groups of tagged fish (i.e., T-bar anchor tags and radio tags), we did observe some differences. Most fish tagged with T-bar anchor tags were recaptured within 20 km of their release location. The maximum extent of radio-tagged Smallmouth Bass was generally less than 40 km, but about 60% of fish moved more than 20 km and around 40% moved over 30 km. This discrepancy is likely due to methodological differences. Specifically, radio tag data represented the maximum extent observed (i.e., furthest upstream to furthest downstream relocations), whereas the T-bar anchor tag data were simply based on angler recaptures. As such, the maximum extent was likely underestimated with the T-bar anchor tags. Despite our best efforts, error in angler reports likely introduced error into the capture location data. Nevertheless, these data suggest that most Smallmouth Bass moved less than 30 km.

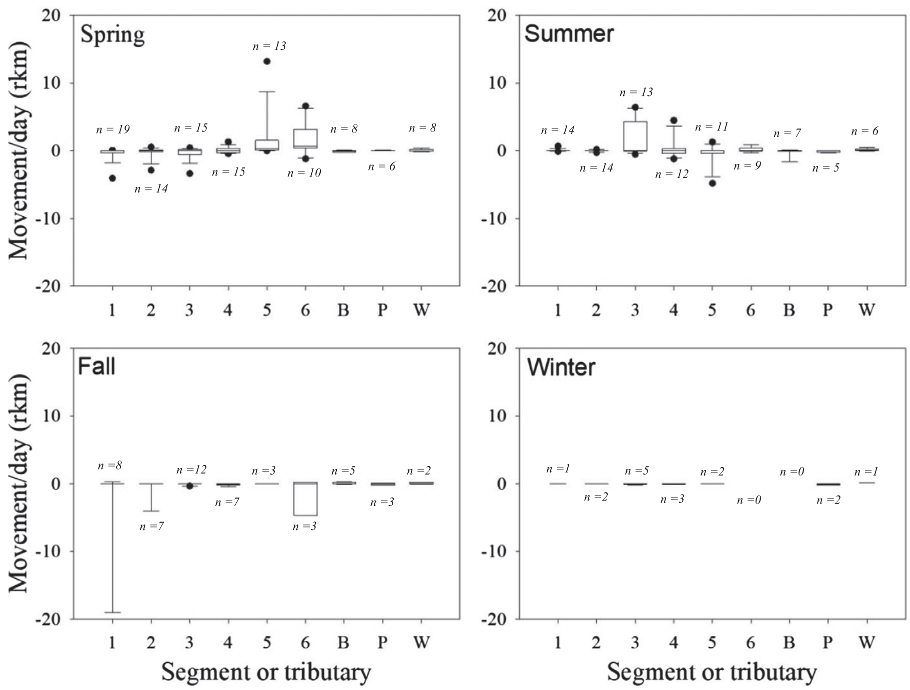

FIGURE 6. Movement of Smallmouth Bass implanted with radio tags during 2017 in the Snake River (segments 1–5), Brownlee Reservoir (segment 6), and the three tributaries (i.e., Boise [B], Payette [P], and Weiser [W] rivers). The segment or tributary indicates where a fish was tagged and released. Positive values indicate an upstream movement. Negative values indicate a downstream movement. The box plots show the median, first, second, third, and fourth quartiles. Outliers are represented by the black dots.

Long-distance movements of more than 100 rkm by Smallmouth Bass in the study demonstrated that a small component of the population (i.e., 4.0% of fish with radio transmitters and 1.5% of fish with T-bar anchor tags) exhibited extensive movement. Several studies have also reported long-distance movements by Smallmouth Bass. Langhurst and Schoenike (1990) recorded a downstream movement of 109 rkm by a Smallmouth Bass from the Embarrass River to the Wolf River in Wisconsin. Rubenson and Olden (2017) also reported 109 rkm of movement by a Smallmouth Bass in the North Fork of the John Day River, Oregon. The 167-rkm movement by a Smallmouth Bass in the current study is one of the farthest recorded for the species.

Several movement patterns were common when evaluating daily movement rates of Smallmouth Bass. Generally, fish moved more on a daily basis in the spring and summer than in the other seasons. Furthermore, fish were observed moving in both upstream and downstream directions. A pattern of greater movement in the spring and summer is likely related to thermal cues and spawning behavior (Graham and Orth 1986; Gunderson VanArnum et al. 2004; Rubenson and Olden 2016). For example, Rubenson and Olden (2016) documented upstream movement of Smallmouth Bass in the North Fork of the John Day River over a 9-week period, during which time new nests were documented at locations progressively farther upstream in response to warming temperatures. A proportion (17.5%) of fish tagged in Brownlee Reservoir was observed moving upstream from the reservoir in the spring and early summer. Of the seven fish that moved upstream from the reservoir, two were relocated at the mouth of the Weiser River and two were relocated in the Payette River. None was located in the Boise River. Additionally, 26.6% of fish (4 of 15) that were tagged in the Snake River near the reservoir (segment 5) were relocated in the Weiser River and 13.3% (2 of 15) were relocated at the mouth of the Payette River in spring. Of the six fish from segment 5 that were located in or around tributaries, four were documented as returning downstream after their spring movement, suggesting that the Weiser and Payette rivers are used by some Smallmouth Bass for spawning. In fall, daily movement rates of Smallmouth Bass were generally low and movements were often downstream. Although most daily movements were short, one fish moved downstream at a rate of 19 rkm/d. Langhurst and Schoenike (1990) also described a downstream movement of 19 rkm in 1 d by a Smallmouth Bass during fall as the fish moved from the Embarrass River to the Wolf River. By winter, movement in any direction in the Snake River had essentially ceased. In contrast to the variable movement of fish in the Snake River, movement in the tributaries was minimal.

Throughout this study, Smallmouth Bass from different segments and tributaries used various portions of the system. With many fish moving up to 5 rkm and some moving over 100 rkm, it appears that Smallmouth Bass in the study area function more as one large population as opposed to multiple subpopulations. Fish movement was greatest in the spring and summer, with fish moving both upstream and downstream as well as in and out of tributaries—a result that was consistent with anecdotal observations by anglers. During fall, fish generally moved downstream; by winter, little fish movement was observed. Based on the findings of the study, continued management of Smallmouth Bass in the study area as one population is likely warranted, despite the large geographical area. Additionally, further research into the movement and distribution of Smallmouth Bass in western streams and rivers is important as their distribution continues to expand, creating a conundrum for fisheries managers because Smallmouth Bass often prey on native fishes (e.g., salmonids; Reiman et al. 1991; Tabor et al. 1993).

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