Lower Colorado River Multi-Species Conservation Program

Balancing Resource Use and Conservation

COLORADO RIVER FISHES DATABASE MANAGEMENT SEPTEMBER 1, 2004 to SEPTEMBER 30, 2005

U.S. DEPARTMENT OF THE INTERIOR
BUREAU OF RECLAMATION

September 2007

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National Park Service
Bureau of Land Management
Bureau of Indian Affairs
Western Area Power Administration

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Ducks Unlimited
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Lower Colorado River
Multi-Species Conservation Program

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Lower Colorado River
Multi-Species Conservation Program Office
Bureau of Reclamation
Lower Colorado Region
Boulder City, Nevada
http://www.lcrmscp.gov

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COLORADO RIVER FISHES DATABASE MANAGEMENT, SEPTEMBER 1, 2004 to SEPTEMBER 30, 2005

Final Annual Report
to
U.S. Bureau of Reclamation
Lower Colorado Region
Boulder City, NV 89006-1470
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SUMMARY

One of the primary purposes of the Colorado River native fishes database is to support periodic estimation of population abundance of razorback sucker in Lake Mohave in behalf of the species conservation in the lower basin. The March 2004 population estimate for wild adult razorback sucker in the lake was 421 fish, based upon mark-recapture data from 2004 and 2005, which confirms a two- orders-of-magnitude-decline from both historical and more recent population estimates. The March 2004 repatriate razorback sucker population estimate was 1,497 fish, which represents about 1.6% of nearly 91,600 fish stocked prior to March 1, 2004.

BACKGROUND AND DATABASE MANAGEMENT

Arizona State University (ASU) has served for nearly 20 years as a central repository of field data gathered by the lower Colorado River Lake Mohave Native Fish Work Group (NFWG) which formed in 1990 with representation from Arizona Game and Fish Department (AZGFD), ASU, Biological Resources Division of U.S. Geological Survey (BRD-GS), Nevada Department of Wildlife (NDOW), U.S. Bureau of Reclamation (BR), U.S. Fish and Wildlife Service (FWS) and U.S. National Park Service (NPS). The primary mission of the NFWG is to capture and rear native lower Colorado River fishes for repatriation, in particular razorback sucker, *Xyrauchen texanus*. Larvae are collected annually during the winter-spring spawning season from the shallows along Lake Mohave's shorelines, and these initially were reared in several off-site facilities including Willow Beach National Fish Hatchery (NFH) AZ, Boulder City NV Golf Course Ponds, and Boulder City NV Wetland Ponds; the last two sites are no longer in service for native fish. Some fish are (or were) stocked directly into the lake from these sites, while others are retained at Willow Beach NFH or transferred for grow-out at various locations, including predator-free lakeside backwaters such as Yuma and Davis Coves in AZ, and Dandy and Chemehuevi Coves in NV, Lake Mohave. Once they attain a size thought to be relatively safe from predation (initially 25 cm, now increased to 50 cm), the juvenile fish are tagged with PIT tags, measured and stocked into the lake.

In addition to capturing young, the NFWG continues to oversee Lake Mohave monitoring programs that periodically assess population status of wild adult and repatriated razorback suckers, and other components of the fish community. W.L. Minckley and ASU initiated these programs in 1968. Members of the NFWG annually revisit the same localities at the same times of year and deploy the same kind of collection devices, capturing untagged and previously PIT-tagged native fishes as well as many non-native species. Field expeditions typically occur in May, March (also referred to as the Razorback Round-up) and November, generally targeting post-spawning, spawning and pre-spawning periods, respectively, and employing several fishing methods, primarily with trammel netting and electrofishing. It is during these expeditions that repatriates are captured and/or recaptured, generally as mature adults as they co-mingle with the few remaining wild adults on spawning grounds, but also as juveniles at scattered locations.

Field data sheets are regularly received at ASU and data are manually entered into electronic Excel spreadsheets (Microsoft ® Excel 2000, © 1985-1999 Microsoft Corporation) while electronic data files are generally received already in Excel. Data generally include collection or stocking date, collection locality, stocking or rearing site with associated state and river mileage (upstream from Davis Dam, for Lake Mohave), Global Positioning System (GPS) coordinates in either Universal Transverse Mercator (UTM) coordinates or in latitude/longitude degrees/minutes, agency, gear, PIT tag number, total length (TL in mm or cm), weight (g or lb), sex, status and field comments. Sex categories are defined as "juvenile" (a young fish that has not attained sexual maturity and does not exhibit external secondary characters that allow reliable sex determination), male, female, and "unknown" (an adult fish whose sex cannot reliably be determined). Status refers to fish capture, recapture or stocking history, and field comments are generally related to fish health but also may indicate mortality or involvement in an in-situ or hatchery research study.

All manually-entered PIT tagging data are proofed using text to speech software (Zoom Text® 8.1, © 2003-2004 Ai Squared) before they are imported into the NFWG's

database maintained in Access (Microsoft ® Access 2000, ©1992-1999 Microsoft Corporation); electronic data files are generally sorted for duplicates, but not proofed. All razorback sucker data from reservoirs Mead, Mohave, Havasu and below Parker Dam are maintained in this single database, using a species/reservoir identification key to differentiate between reservoirs, and a record identification number to identify each individual record regardless of reservoir. Data queries are initiated based on information requirements and generically written to accommodate any reservoir.

ASU typically handled several dozen requests for specific searches each year from biologists working for a suite of state and federal entities until we made access to the database via the internet in FY 2005. This allowed NFWG members easier and faster retrieval of fish capture histories, capable of searching for one PIT tag/search online. However we also did this because the database in its entirety was no longer made available to NFWG members in any software format due to its complexity and size. Currently our website is hosted by Arizona State University.

This report provides a summary and analysis of information on razorback sucker and an assessment of wild adult and repatriated population status as of March 2004.
For clarification, “short-term capture(s)” are captures within the same sampling period as capture.

RESULTS

The comprehensive Lake Mohave survey on 14-18 March 2005 captured a total of 145 razorback suckers of which 16 (11%) were untagged and 129 (89%) were PIT-tagged (Table 1). Among all fish, 51 (35%) were female, 5 (3%) were male, 78 (54%) were juvenile, and 11 (8%) were of indeterminate sex; high number of juveniles and fish with indeterminate sex (*N* = 89, 61% of total number of fish captured) may have been due fish handlers’ inexperience in sexing razorback sucker and not due to lack of sexual characteristics in fish. There were six short-term captures among 129 contacts with 123 PIT-tagged fish, and these were omitted from further analysis. Of the remaining 123

PIT-tagged fish, 68% (*N* = 84) were repatriates while 28% (*N* = 34) were wild adults; five fish were not represented in the database and therefore categorized as “unknown” (Table 2). The sex ratio of PIT-tagged wild adult females to males (14:19) was skewed slightly toward males (0.74); sex of one wild adult was indeterminate.

Of the repatriates collected, there was an approximately 1:2 ratio of females to males (20:49). Off-site rearing facilities contributed 87% of the total number of repatriated fish sampled during the survey, with both off-site and lakeside backwaters supplying fish with average TL at stocking larger than 30 cm with the exception of one fish reared at Dexter National Fish Hatchery & Technology Center (Table 3). Release year ranged from 1992 to 2005; fish released from 1993 and 1995 were not represented (Table 4). Slightly more than half (55%, *N* = 46) of repatriates sampled were released in 2004 and 2005, and their average TL at release was 356 and 369 mm TL, respectively. Appendix A provides a summary of the rearing and release locations of repatriated razorback sucker collected with PIT tags 14-18 March 2005 in Lake Mohave.

Wild Adult Population Size

Wild adult razorback sucker population abundance of 421 fish as of March 2004 was estimated from 2004 and 2005 sample data and using the adjusted Peterson Method formula (i.e., the single census Chapman modification, Ricker 1975). The 95% confidence interval ranged from 261 to 716 fish. This estimate is significantly less than the most recently published estimate of 2,698 in 2001 (Marsh et al. 2003), which was derived from all of March data in 2001 and 2002; however, it confirms the dramatic population decline over the past decade when the estimate was near 44,000, which was still at that time substantially lower than historical estimates (see Minckley et al. 2003).

Juvenile Repatriate Stocking and Repatriate Population Size

From September 1, 2004 through September 1, 2005, a total of 11,100 razorback suckers juveniles were stocked into Lake Mohave, of which 11,064 were PIT-tagged; 36

fish with either missing or duplicate PIT tags were not included in any further analysis (Appendix B). The majority of fish were reared in off-site facilities (9,048) including (Willow Beach National Fish Hatchery, 7,036; Dexter National Fish Hatchery & Technology Center, 2,007; and Phoenix Zoo, 5). Of the fish reared in lakeside backwaters (2,016), Yuma Cove (Arizona Bay) AZ was the most productive backwater overall, contributing 560 fish.

Repatriation population size was estimated using March-only captures (1 March to 31 March) from 2004 and 2005 without short-term capture data and applying it to a modified Peterson method formula (i.e., Chapman modification; Seber 1973). The March 2004 repatriate razorback sucker population estimate was 1,497 fish, which represents about 1.6% of nearly 91,600 fish stocked prior to March 1, 2004.

CONCLUSIONS

Since 1992, the program to replicate the dwindling Lake Mohave population of wild adult razorback suckers with juveniles has been successful in repatriating a population of about 1,500 fish as of March 2004. However, that number is far from the target of 50,000 repatriates, and the wild population now has dwindled from probable recent-historical levels in the hundreds of thousands to fewer than 500. Repatriate capture/ recapture data demonstrate unequivocally that fish released at larger size have a higher survival probability than smaller fish. Young razorback suckers should be reared to an individual minimum total length of 50 cm prior to release, and larger sizes should be attained if practical, even if that means fewer fish are being released.

We are perplexed by the apparent low overall survivorship of repatriated razorback suckers in Lake Mohave. It was predicted that a substantial increase in survivorship would accompany an increase in size at stocking, but this has not yet been reflected in the available capture data. This may change with the recent (2007) increase to 50 cm. .

ACKNOWLEDGEMENTS

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Table 1. Field data summary for razorback sucker collected 14-18 March 2005 in Lake Mohave, AZ-NV.

	N fish (% Total; % Sum)		Sum (% Sum total)
Sampling agency	Without PIT tags	With PIT tags	
ASU	-	12 (9;100)	12 (8)
BR	2 (13;6)	30 (23;94)	32 (22)
FWS	12 (75;16)	61 (47;84)	73 (50)
NDOW and NPS	2 (13; 7)	26 (20;93)	28 (19)
Total (% Sum total)	16 (11)	129 (89)	145
Fish gender			
Female	12 (75;23)	39 (30;77)	51 (35)
Male	-	5 (4;100)	5 (3)
Juvenile	4 (25;5)	74 (57;95)	78 (54)
Unknown	-	11 (9;100)	11 (8)
Total (% Sum total)	16 (11)	129[a] (89)	145

[a]Includes six fish that were short-term captures.

Table 2. Summary of razorback sucker collected with PIT tags 14-18 March 2005 in Lake Mohave, AZ-NV. Classification into one of the three categories (wild, repatriate and unknown) was based upon information in the NFWG razorback sucker database; fish listed as unknown were recorded as "recaptures" in the field data, but had no information in the database to identify them as either wild adult or repatriate.

Fish gender	*N* fish (% Total; % Sum)			Sum (% Sum total)
	Wild adult	Repatriate	Unknown	
Female	14 (41;39)	20 (24;55)	2 (40;5)	36 (29)
Male	19 (56;27)	49 (58;69)	3 (60;4)	71 (58)
Juvenile	-	5 (6;100)	-	5 (4)
Unknown sex	1 (3;9)	10 (12;91)	-	11 (9)
Total (% Sum total)	34 (28)	84 (68)	5 (4)	123[a]

[a]Six fish were short-term captures and omitted from further analysis.

Table 3. Rearing locations and average TLs in mm at release of repatriated razorback sucker collected with PIT tags 14-18 March 2005 in Lake Mohave, AZ-NV.

Rearing location	*N* fish (% Total; % Grand total)	Release TL (mm)			
		Avg	SD	Min	Max
Lakeside backwater					
Arizona Juvenile	2 (18;2)	363	18	350	375
Dandy Cove	1 (9;1)	300	-	-	-
North Chemehuevi Cove	3 (27;4)	358	50	320	415
Yuma Cove	5 (45;6)	318	45	250	370
Total (% Grand total)	11 (13)	335	44	-	-
Off-site facility					
Boulder City Golf Course Ponds	4 (5;5)	302	27	276	325
Boulder City Wetlands Park	16 (22;19)	369	55	280	470
Bubbling Ponds	3 (4;4)	315	43	265	340
Dexter NFH & TC	1 (1;1)	295	-	-	-
Willow Beach NFH	49 (67;58)	359	30	250	400
Total (% Grand total)	73 (87)	355	41	-	-
Grand total	84	353	41	-	-

Table 4. Time at large of repatriated razorback sucker collected with PIT tags 14-18 March 2005 in Lake Mohave, AZ-NV. Time at large is differentiated into days at large (DAL), months at large (MAL) and years at large (YAL).

Release year	*N* fish	DAL	MAL	YAL
2005	26	64	2	0.2
2004	20	280	9	0.8
2003	9	625	21	1.7
2002	3	993	33	2.8
2001	2	1,184	39	3.3
2000	5	1,637	55	4.5
1999	5	1,977	66	4.5
1998	4	2,434	81	6.8
1997	3	2,695	90	7.5
1996	5	3,041	101	8.4
1994	1	3,763	125	10.5
1992	1	4,471	149	12.4
Total	84	-	-	-

Appendix A. Rearing and release locations of repatriated razorback sucker collected with PIT tags 14-18 March 2005 in Lake Mohave, AZ-NV.

Location		*N* fish
Rearing	Release	
Lakeside backwater		
Arizona Juvenile	Arizona Juvenile	2
Dandy Cove	Dandy Cove	1
North Chemehuevi Cove	Chemehuevi Cove	3
Yuma Cove	Arizona Bay	1
	Yuma Cove	4
	Total	11
Off-site facility		
Boulder City Golf Course Ponds	Cottonwood Cove	2
	Placer Cove	2
Boulder City Wetlands Park	Cottonwood Cove	3
	Cottonwood Cove Landing, Resort and Marina	1
	Placer Cove	11
	Six Mile Coves	1
Bubbling Ponds FH	Princess Cove	3
Dexter NFH & TC	Princess Cove	1
Willow Beach NFH	30 RM	2
	Cat Claw Cove, Antelope Cove, Bonnie Brae Cove, and Wrong Cove (north of)	6
	Cat Claw Cove, Wrong Cove and Wrong Cove (north of)	8
	Elizabeth J. Cove	1
	Great West Cove, Wrong Cove and Antelope Cove	9
	Oro, Elizabeth and Fortune Coves	12
	Tequila Cove	1
	Wrong Cove	10
	Total	73
	Grand total of lakeside backwaters and off-site facilities	84

Appendix B. Rearing and release locations of repatriated juvenile razorback suckers reared in lake-side backwaters repatriated in Lake Mohave, AZ-NV, September 1, 2004 to September 30, 2005.

Location		*N* fish	TL in mm			
Rearing	Release					
Lakeside backwater			Avg	SD	Min	Max
Arizona Juvenile	Arizona Juvenile	238	367	23	290	430
Dandy Cove	Dandy Cove	532	322	24	255	405
Nevada Egg	Nevada Egg	65	381	26	335	445
Nevada Larvae	Nevada Larvae	21	345	13	330	380
Nine Mile Coves	Nine Mile Coves	27	345	20	300	405
North Chemehuevi Cove	Chemehuevi Cove	436	342	24	245	425
South Sidewinder Cove	Sidewinder Cove	41	348	21	310	400
Willow Cove	Arizona Juvenile	17	379	20	345	415
	Willow Cove	79	408	40	320	480
Yuma Cove	Yuma Cove	560	340	42	210	565
	Total	2,016	344	37	-	-
Off-site facility						
Dexter NFH	Princess Cove	2,007	317	23	215	405
Phoenix Zoo	Princess Cove	5	537	38	490	581
Willow Beach NFH	48.5 RM	1	385	-	-	-
	Antelope Cove	501	371	17	315	455
	Cat Claw Cove, Antelope Cove, Bonnie Brae Cove, and Wrong Cove (north of)	1,710	358	23	245	465
	Cat Claw Cove, Wrong Cove and Wrong Cove (north of)	797	371	19	275	450
	Great West Cove, Wrong Cove and Antelope Cove	1,425	377	20	310	470
	Red Tail Cove	500	376	17	315	435
	Road Runner Cove	404	360	9	335	400
	Sheeptrail Cove	597	374	17	345	445
	Wrong Cove	601	370	19	330	460
	Yuma Cove	500	375	18	320	455
	Total	9,048	355	31	-	-
	Grand total of lakeside backwaters and off-site facilities	11,064	32	32	-	-