STATE WILDLIFE GRANT F12AF00530

PROJECT TITLE

Distribution and Population Characteristics of the Calcasieu Painted Crayfish

PRINCIPLE INVESTIGATORS

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PROJECT PERIOD

May 2012 through May 2016

PROJECT NEED

The Calcasieu painted crayfish, *Orconectes blacki*, is a Louisiana endemic currently ranked as G2/S2 in Louisiana's Wildlife Action Plan (WAP) and known only from the Calcasieu River drainage in southwestern Louisiana. Historically, pure specimens have only been collected in the West Fork from seven localities, while the East Fork has only yielded what are considered hybrids (Walls 1972) from six localities. In 2002 a researcher from the Illinois Biological Survey failed to find this species at several historic locations even though his attempts were made during the peak breeding season (Walls 2003). During 2003, Walls conducted a survey and was only able to locate this species at four of the seven localities in the West Fork of the Calcasieu and four of the six in the East Fork. The habitat at several historic localities has been degraded (Walls 2003) and the lack of detection at some of these sites suggests that the fate of this species may be tenuous. The U. S. Fish and Wildlife Service has recently been petitioned to assess this species for listing under the Endangered Species Act (ESA), however, no current data exists on its status to facilitate an informed decision.

The Calcasieu creek crayfish, *Procambarus pentastylus*, is another species endemic to this drainage that also occupies similar habitat. It was described too recently to have been included in the WAP and likewise it does not have a state rank yet. Little data exists on its current distribution and status as well.

OBJECTIVES

1) Visit historical localities as well as potential new sites within the historic range to assess habitat suitability of historic sites, and to fill in gaps with respect to the species' distribution.
2) Conduct a mark/recapture study at selected locations to obtain an estimate of the population size, survival, mortality, and potentially growth rate.

EXPECTED RESULTS AND BENEFITS

An assessment of current habitat and population characteristics will provide critical data needed for the ESA status assessment. Knowledge of where this species is still extant will provide opportunities for conservation through easements while knowledge of degraded habitat locations will provide habitat restoration opportunities. This proposal will address, in part, all three crustacean species strategies listed in Appendix O. of the WAP:

1) Develop strategies to abate further degradation of streams known to contain populations of crayfish species of concern.
2) Continue to monitor known populations through periodic surveys to maintain current database records.
3) Develop a protocol to monitor abundance, distribution, and habitat quality using baseline data.

Any data collected on Calcasieu creek crayfish will be beneficial to the WAP revision that is currently underway, as this species is intended for inclusion in the revised WAP as a species of conservation concern.

APPROACH

We plan to visit 6-8 of the most promising sites we are able to locate within the historical range of this species (likely divided equally between the East and West Forks of the Calcasieu River drainage). We will be selecting sites that most resemble the preferred habitat of the genus *Orconectes* (small, cool, well oxygenated streams containing sandy substrate with fallen branches or rubble [Walls 2009]).

At each site we will use dip nets, seines, commercial grade traps, mask-and-snorkel or other methods to capture crayfish. All crayfish will be sexed and measured for total length, carapace length, and carapace width. Each crayfish will then be marked using a visible implant elastomer (VIE), which is a fluorescent dye that is injected into the tail muscle. This method has proved to be sufficient for marking crayfish in other studies, because compared to other tags, they do not lose the marks when they molt (Isley and Stockett 2001). Individual crayfish may receive specific combinations of markings to allow for estimates of instantaneous survival, mortality and growth rates (Eaton and Link 2011). Also, this technique will allow for the prediction of age for a given measured length. Since it is so difficult to age crayfish, this will be an indispensible asset when considering conservation strategies for Calcasieu painted crayfish.
Each selected site will be visited four times at 1-2 week intervals, and this marking technique will be repeated. The ratio of marked to unmarked individuals will be used to calculate the local population size. A suitable mark-recapture model (or models) will be chosen based on the suitability of the data.

Although the Calcasieu painted crayfish will be the focal species for this study similar data will be collected on Calcasieu creek crayfish if sufficient numbers are encountered.

LOCATION OF WORK

This project will be restricted to Southwest Louisiana, specifically Beauregard, Calcasieu, Rapides, Allen, Vernon, and Jefferson Davis parishes.

ESTIMATED COST: $28,000

BUDGET

	Federal	State	Total
Salaries[1]	$16,250	$8,750	$25,000
Supplies[2]	$1,950	$1,050	$3,000
Total Cost	$18,200	$9,800	$28,000

[1] includes 328 man-hours for field work and 30 hours for the final report and/or lab work.
[2] includes nets, marking kits, etc. as well as $1000 for fuel.

RESULTS AND DISCUSSION

All historical streams were sampled during 2012 and 2013 using dip nets primarily, and to a lesser extent, hand captures and kick seines. No Calcasieu painted crayfish were captured at five historical locations using these techniques. Nine non-historical locations within the Calcasieu painted crayfish historic drainages were sampled and one or both of the target species were detected at some but not all of these sites. Three creeks outside of, but near to, the known range of the Calcasieu painted crayfish were sampled (see table 1.), and two of these yielded Calcasieu creek crayfish only. Lack of rainfall during the summer and fall of 2013 caused Bear Head Creek to dry except for a few small hypoxic pools (dissolved oxygen contents ranged from 1.02-1.34mg/L) which almost certainly contributed to our lack of captures at these sites. Using these "active" techniques, a total of four species[3] were captured (table 1.) with the two target species being the most abundant captures in our samples.

A total of 96 crayfish comprised of both species and originating from three sites were marked with VIE tags. Although the same small pools were resampled, no marked individuals were ever recaptured precluding any mark-recapture population estimation. Continued use of VIE tags was determined to be unproductive and was discontinued. Kaller et al. had similar results marking crayfish

Both netting techniques typically yielded immature specimens which can complicate identification and provides little info on breeding phenology. Hand captures were typically larger individuals; however, it tended to be opportunistic and much less efficient than netting. For a brief period in November 2012 and during April and May of 2013, use of commercial pyramid crayfish traps and minnow traps was explored in an effort to

catch larger individuals and the smaller mesh size of the minnow traps was determined to be more desirable for this project. Dip nets and hand captures were still utilized until the end of 2013.

After a particularly wet winter, we resumed trapping only in April 2014, with the goal of detecting the target species at the remaining historical locations as well as new locations. Unfortunately, with the onset of trapping, precipitation ceased and three of the creeks were once more gradually reduced to small hypoxic pools. The trapping ceased after 25 days due to the low water and dissolved oxygen levels.

Trapping was again resumed in April of 2015 and was terminated in July as funding was depleted.

A total of seven[3] species were captured using traps (table 1.), and captured individuals tended to be primarily adults. Calcasieu creek crayfish were the most abundant followed by Red swamp crayfish and White river crayfish, while Calcasieu painted crayfish were the fourth most abundant species in our samples. 2014 trapping efforts under low flow conditions may have influenced the high number of Red swamp crayfish and White river crayfish captures.

Out of thirteen historical locations, there were three which we were not able to sample with nets or traps (table 1.) and these were positioned within the Calcasieu painted crayfish hybrid/intergrade zone. At least two other locations within both of these streams were sampled; however, and both of the target species were found to be present. There were two additional historical locations where we sampled using only one method and were unsuccessful in detecting one or both targets. The first was the Calcasieu River at the weir in Oakdale. This site was sampled only once using nets and only Calcasieu creek crayfish were captured. Although it is possible that the weir may have affected the local Calcasieu painted crayfish population at this site, it was found to be present in 2003 (Walls 2003), and was detected in this study immediately downstream from a weir on Barnes Creek. It is likely that further sampling effort at this location will detect it, especially since specimens were collected in 2013 only one mile Euclidean distance upstream and also downstream near the Kinder historical location by an LDWF biologist while conducting fish sampling. The second was John's Gully at Highway 109 near Fields, LA. Though the site was sampled 42 trap-nights and 48 crayfish were captured, the sampling period was during low flow conditions which likely contributed to the lack of detection if in fact the Calcasieu painted crayfish is still extant there. The habitat still appears suitable and this site should be sampled again during better environmental conditions.

Active capture techniques yielded more captures than traps; however, traps produced larger individuals, more species, and also detected Calcasieu painted crayfish at five sites where active techniques did not. Effort was not standardized between active and passive techniques, favorable environmental conditions, or among sampling locations so extreme caution is advised when making comparisons of capture techniques or inferences about local crayfish abundance from these data. Furthermore, once the focus of the project

shifted towards documenting Calcasieu painted crayfish occurrences, when confirmed at a site, trapping was often discontinued and resumed at a different location.

A total of 464 Calcasieu creek crayfish and 130 Calcasieu painted crayfish (including hybrid/intergrades) were captured during this project (table 1.). The Calcasieu painted crayfish and/or its hybrid/intergrade was detected at all but two historical locations (Figure 1.) that were sampled plus six previously unknown locations. Although it was not possible to determine population estimates through mark recapture techniques, it would appear from our data that this taxon is still extant throughout its range. At this point it is unclear which factors most influence likelihood of detection. We suspect stream flow is highly important; however, seasonality, habitat structure, and sampling methodology likely all play a role. Until these dynamics are better understood, it would be premature to assume that Calcasieu painted crayfish were absent at the sites where they were not detected in this study. It is interesting to note that even after at least two consecutive years in which Bear Head Creek completely dried except for a few hypoxic pools, both of the target species were detected at these locations when adequate rainfall is present.

[3] Potential *Procambarus zonangulus* captures were pooled with *P. acutus* due to the difficulty in separating females and juveniles. *Orconectes blacki* and *O. blacki* x *hathawayi* hybrid/intergrades are lumped here as well.

LITERATURE CITED

Eaton, Mitchell J. and William A. Link. 2011. Estimating age from recapture data: integrating incremental growth measures with ancillary data to infer age-at-length. *Ecological Applications* 21(7):2487-2497.

Isely, J. Jeffery and Patricia E. Stockett. 2001. Tag retention, growth, and survival of Red Swamp Crayfish marked with a visible implant tag. *North American Journal of Fisheries Management* 21:422-424.

Walls, Jerry G. 1972. Three new crawfishes related to *Orconectes difficilis* (Faxon) (Decapoda: Astacidae). *Proc. Biol. Soc. Washington*, 84(53): 189-194.

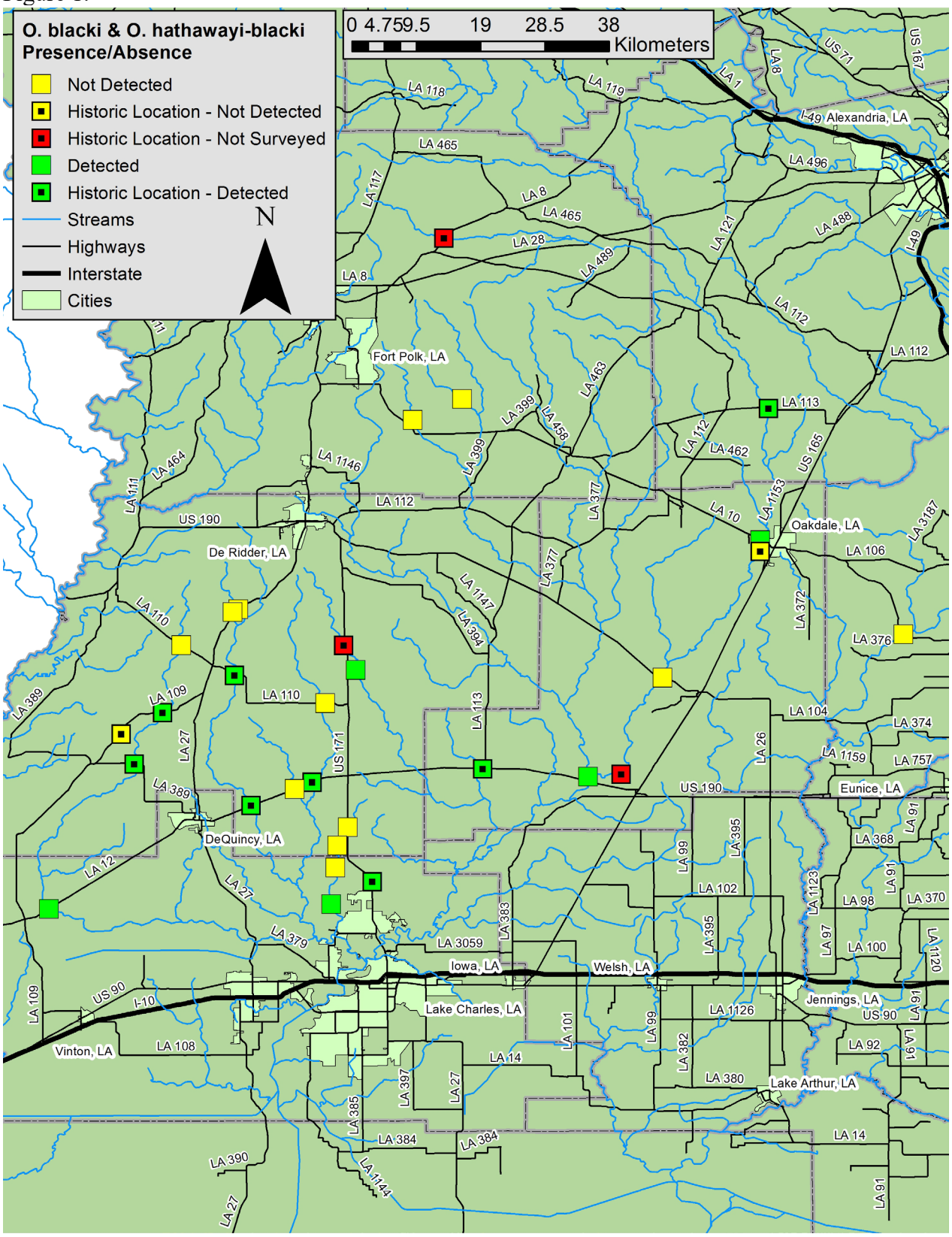
Walls, Jerry G. 2003. Survey of Localities for Fourteen Threatened Crawfish Species in Louisiana.

Walls, Jerry G. 2009. Crawfishes of Louisiana. LSU Press.

Table 1.

CRAWFISH SURVEY RESULTS	(*/)Historic Site Not sampled					**594**						**192**									
(*)historic site (#)Outside Historic Range				**# of Species**		79		51		464		94		38		1		47		12	
(*+) O. blacki or hathawayi Detected at historic site			**786**	**5**	**8**	***O. blacki***		***O. hathawayi/blacki***		***P. pentastylus***		***P. clarki***		***P. kensleyi***		***C. diogenes***		***P. acutus***		***O. lancifer***	
(*-)O. blacki or hathawayi Not Detected at historic site			**Total**	443	343	45	34	45	6	335	129	15	79	0	38	0	1	0	47	3	9
Creek	**Location**	**Near**	**Crawfish**	No Trap	Trap	No Trap	Trap	No Trap	Trap	No Trap	Trap	No Trap	Trap	No Trap	Trap	No Trap	Trap	No Trap	Trap	No Trap	Trap
Barnes Cr.	Longville Park Rd.	Longville	**127**	85	42	0	0	29	2	55	37	1	3	0	0	0	0	0	0	0	0
	HWY 171 (*/)	Longville	**.**	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
	Memmorial Ch. Rd.	Longville	**45**	.	45	.	0	.	4	.	41	.	0	.	0	.	0	.	0	.	0
Bear Head Cr.	HWY 12	Starks	**2**	2	.	2	.	0	.	0	.	0	.	0	.	0	.	0	.	0	.
	HWY 389 (*+)	Fields	**39**	0	39	0	1	0	0	0	5	0	18	0	4	0	0	0	10	0	1
	HWY 109 (*+)	Juanita	**14**	0	14	0	1	0	0	0	5	0	3	0	4	0	1	0	0	0	0
Bear Head Mrsh.	HWY 110	Singer	**44**	.	44	.	0	.	0	.	5	.	34	.	5	.	0	.	0	.	0
Beckwith Cr.	HWY 110 (*+)	Singer/longville	**11**	0	11	0	1	0	0	0	2	0	4	0	4	0	0	0	0	0	0
	HWY 12 (*+)	Dequincy	**99**	88	11	21	0	0	0	66	10	0	1	0	0	0	0	0	0	1	0
Calcasieu R.	HWY 113 (*+)	Glenmora	**46**	46	.	0	.	10	.	36	.	0	.	0	.	0	.	0	.	0	.
	Oakdale Weir (*-)	Oakdale	**14**	14	.	0	.	0	.	14	.	0	.	0	.	0	.	0	.	0	.
	HWY 10	Oakdale	**7**	7	.	0	.	4	.	1	.	0	.	0	.	0	.	0	.	2	.
	HWY 26	Oberlin	**0**	0	.	0	.	0	.	0	.	0	.	0	.	0	.	0	.	0	.
	HWY 8 (*/)	Slagle	**.**	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
	Old Pump rd (*/)	Kinder	**.**	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
	HWY 190	Kinder	**1**	1	.	0	.	1	.	0	.	0	.	0	.	0	.	0	.	0	.
Clear Cr.	HWY 190 (*+)	Reeves	**21**	21	.	0	.	1	.	18	.	2	.	0	.	0	.	0	.	0	.
Cowpen Cr.	HWY 27	Singer	**0**	.	0	.	0	.	0	.	0	.	0	.	0	.	0	.	0	.	0
Drakes Cr.	Forest Service (#)	Fort Polk	**44**	44	.	0	.	0	.	44	.	0	.	0	.	0	.	0	.	0	.
Hickory Branch Cr.	Hwy 12 (*+)	Ragley	**102**	65	37	22	13	0	0	43	18	0	1	0	5	0	0	0	0	0	0
	Hwy 110	Longville	**21**	0	21	0	0	0	0	0	4	0	7	0	6	0	0	0	4	0	0
Little Indian Bayou	Hwy 171 (*+)	Gillia	**3**	0	3	0	2	0	0	0	1	0	0	0	0	0	0	0	0	0	0
Indian Bayou	Coffey Road	Moss Bluff	**25**	0	25	0	16	0	0	0	1	0	0	0	0	0	0	0	0	0	8
	Hickory Branch Rd.	Gilis	**2**	2	.	0	.	0	.	0	.	2	.	0	.	0	.	0	.	0	.
	Campedgewood Rd	Gilis	**13**	10	3	0	0	0	0	0	0	10	3	0	0	0	0	0	0	0	0
John's Gully	Hwy 109 (*-)	Fields	**48**	.	48	.	0	.	0	.	0	.	5	.	10	.	0	.	33	.	0
Persimmon Mrsh.	Hwy 27	Singer	**0**	.	0	.	0	.	0	.	0	.	0	.	0	.	0	.	0	.	0
Whiskey Chitto	Lookout Rd. (#)	Kisatchie N.F.	**58**	58	.	0	.	0	.	58	.	0	.	0	.	0	.	0	.	0	.
Bayou Nezpique	HWY 110 (#)	Vidirine	**0**	0	.	0	.	0	.	0	.	0	.	0	.	0	.	0	.	0	.

Figure 1.


O. blacki & O. hathawayi-blacki
Presence/Absence
Not Detected
Historic Location - Not Detected
Historic Location - Not Surveyed
Detected
Historic Location - Detected
Streams
Highways
Interstate
Cities
N
0 4.759.5 19 28.5 38
Kilometers
Fort Polk, LA
De Ridder, LA
DeQuincy, LA
Oakdale, LA
Eunice, LA
Iowa, LA
Welsh, LA
Lake Charles, LA
Jennings, LA
Lake Arthur, LA
Vinton, LA
Alexandria, LA
US 190
US 90
I-10
I-49
US 71
US 167
LA 1
LA 8
LA 118
LA 119
LA 465
LA 496
LA 117
LA 28
LA 121
LA 488
LA 489
LA 112
LA 463
LA 113
LA 399
LA 458
LA 462
US 165
LA 1146
LA 464
LA 111
LA 377
LA 1153
LA 10
LA 3187
LA 106
LA 1147
LA 394
LA 372
LA 376
LA 110
LA 109
LA 389
LA 27
US 171
LA 104
LA 374
LA 26
LA 1159
LA 757
LA 368
LA 91
LA 99
LA 395
LA 102
LA 1123
LA 98
LA 370
LA 97
LA 100
LA 1120
LA 12
LA 379
LA 3059
LA 383
LA 101
LA 1126
LA 382
LA 92
LA 380
LA 14
LA 108
LA 397
LA 385
LA 384
LA 390
LA 1144