LET THE INVASION BEGIN

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Newsflash: A recent "rash" of Crystal Darter (*Crystallaria asprella*) sightings has been observed in the upper portions of Pool 13 in the Upper Mississippi River (UMR) near Bellevue, IA. I guarantee this is going to be better news than that ever evolving and seemingly endless list of invasive species that have crept into our everyday lives and routines—like how those pesky Snakeheads do, when you were washing your car or doing something else to that effect. OK, maybe it's not so much a rash of sightings, but six separate collections by Iowa DNR fisheries personnel within a year's time is fairly significant—especially if you consider it over a 25-year chunk of time.

Prior to the fall of 2014, the last Crystal Darter collection in Pool 13 occurred in 2005. Before that, zippo, nada, nothing. No collections at all were made of this elusive little percid from a Mississippi River pool that has been sampled extensively with multiple gear types over the last 25 years. Now, all of a sudden, they're showing up. What gives? There's only a handful of historical documented captures of the fish in Iowa and these sparse records include a specimen taken near Motor Mill in the Turkey River (Clayton County) in 2002, two accounts in Pool 11 of the Mississippi River (Clayton County) in 1995 and 2001, plus one recent Pool 13 (Jackson County) record in 2014.

In the fall of 2014, a single specimen showed up in our annual night electrofishing surveys of Sauger, *Sander canadensis* and Walleye, *S. vitreus* in the Bellevue tailwaters (US Lock and Dam 12). I was pretty stoked when a coworker poked his nose into the dip net, reached in, grabbed a fish, and unclenched his hand to reveal this little treasure. We got a couple quick photos and tossed it back along the sandy channel border. Very nice, but we saw no others the rest of the fall. This year (2015), around the last week of July, our crew hit the river with the otter trawl to do our standard fixed-site trawling in the main channel below Lock and Dam 12 at Bellevue. We typically wait until later in July to run this gear, as the trawl is good at picking up early hatches of young-of-the-year Channel Catfish (*Ictalurus punctatus*), Flathead Catfish (*Pylodictis olivaris*), and Shovelnose Sturgeon (*Scaphirhynchus platorynchus*). Over the years, we've occasionally collected other not-so-everyday species such as Stonecat (*Noturus flavus*) and Shoal Chub (*Macrhybopsis hyostoma*), and even less common species such as Freckled Madtom (*Noturus nocturnus*) or Lake Sturgeon (*Acipenser fulvescens*) are possible gems in the tailwater trawls. It's not difficult to figure out where this is leading, and on our third trawl I got a smirk from one of the fellas working up the catch. I had an immediate feeling about what was in his hand, and sure enough: a Crystal Darter (Figure 1).

That was the first one the Long Term Resource Monitoring Program (LTRMP) at Bellevue had collected in their standard fisheries monitoring since its inception in 1989, and after a couple of weeks and another round of tailwater trawling, we had our second specimen. The depths the trawl will cover over a 350m standardized run are anywhere from 4 to 8m (12 to 24 ft) and it normally takes 7-9 minutes to make a complete run if we don't hit a major snag. The exact points and depths that we collected these two fish are unknown, but in general, the bottom substrate is very sandy and uneven (much like snow ski moguls) and surface water velocity is greater than 0.45m/sec.

Between those weeks of trawl efforts, our fisheries research crew in Bellevue was conducting their annual electrofishing surveys for Walleye in Pool 13. Not too far down river of the tailwaters, maybe a mile at most, the crew was shocking one of a series of closing dams (rock structures designed to deflect water back into the main channel) in a moderate-sized side channel near the Duck Creek tributary.

Figure 1. First Crystal Darter of 2015 season.

Photos by Mel Bowler. Range maps by Konrad Schmidt

Figure 2. Two Crystal Darters of four sampled or observed multiple times on the same closing dam.

Voila! Crystal Darter! When they returned to the same closing dam to shock a few days later, they netted yet another one (Figure 2). We coincidently had an electrofishing run later in the fall along the same side channel and closing dam that yielded another Crystal Darter specimen, with a couple of other scoundrels that avoided our dip netters in that run. That made five Pool 13 Crystal Darter collections in a relatively brief period, and that'd be six if you count the specimen from the previous fall.

So what's going on here? We were recently asked if the recent catches of Crystal Darters were a sign of improving river health or were these merely lucky catches. That was an excellent question, and after some thought here's my take. The presence of Crystal Darters where they are fairly abundant will be indicative of superior water quality and most likely a healthy aquatic ecosystem. However these fish are not abundant in the Mississippi River and these catches appear to be particularly localized. There are microhabitats that exist within the Mississippi River that may be conducive for this fish to survive and perhaps good enough for some limited reproduction. However, a general blanket statement equating the catches of a few of these fish to be taken as a sign of good river health, probably isn't the correct thing to say. Crystal Darters inhabit moderately fast-moving water like we find along the main channel of the Mississippi River. However, life history studies (Hatch 1997; Schmidt 1995) indicate that these fish are extremely intolerant of silty substrates. It is generally agreed upon by river biologists and ecologists that the biggest detriment to recovery of the Mississippi River is siltation and sedimentation from our tributary rivers and streams. Aquatic habitat degradation due to this sedimentation is very evident, as the vast majority of the main channel border habitats have large expanses of silty substrates. This would explain in part why the darters aren't very abundant in the Mississippi River and that's why we really shouldn't directly equate these recent catches to improving river health.

Now I must admit, just because we haven't seen Crystal Darters much in a couple of decades in our sampling, that doesn't mean that these fish haven't been here in the river. It is well known that Crystal Darters have affinities for moderate to high water velocities and they often bury themselves in deep sugary, sandy bottoms. Their cryptic coloration also allows them to nearly render themselves invisible from above in gravelly or pebbly substrates. Given all the piscivory going on in and along the main channel of the Mississippi River, lying low and occupying river niches where predators are a little less prevalent is a survival necessity when you're a potential lunch item. However, the Crystal Darter's deep, swift-water niches are not ideal for much of the sampling gear that we utilize in the LTRMP sampling regimes. An example of this is the absence of Paddlefish (*Polyodon spathula*) from our LTRMP collections in Pool 13. Now, if we drifted trammel nets in the main channel or used snagging as a sampling method in our fisheries program, we'd collect Paddlefish. It's as simple as that. Perhaps we will not have a good handle on the abundance of Crystal Darters in this neck of the river until we incorporate some other bottom sampling gear or deploy our trawl outside of the main channel.

So, lucky catch? Maybe. Well then, if Crystal Darters haven't been well established in this river pool historically, then why the sudden uptick in occurrence? Perhaps better asked, where have they come from? Let's see. Louis Pasteur dispelled the doctrine of spontaneous generation long ago, so that's not it. How about this? Let me start by citing another example of a fish species we collected last year in Pool 13 that hasn't been documented in the Iowa portion of the Mississippi River (let alone anywhere in the state) for 50-plus years. Well into our five-month sampling season in early August 2014 in the lower half of Pool 13 below the conflu-

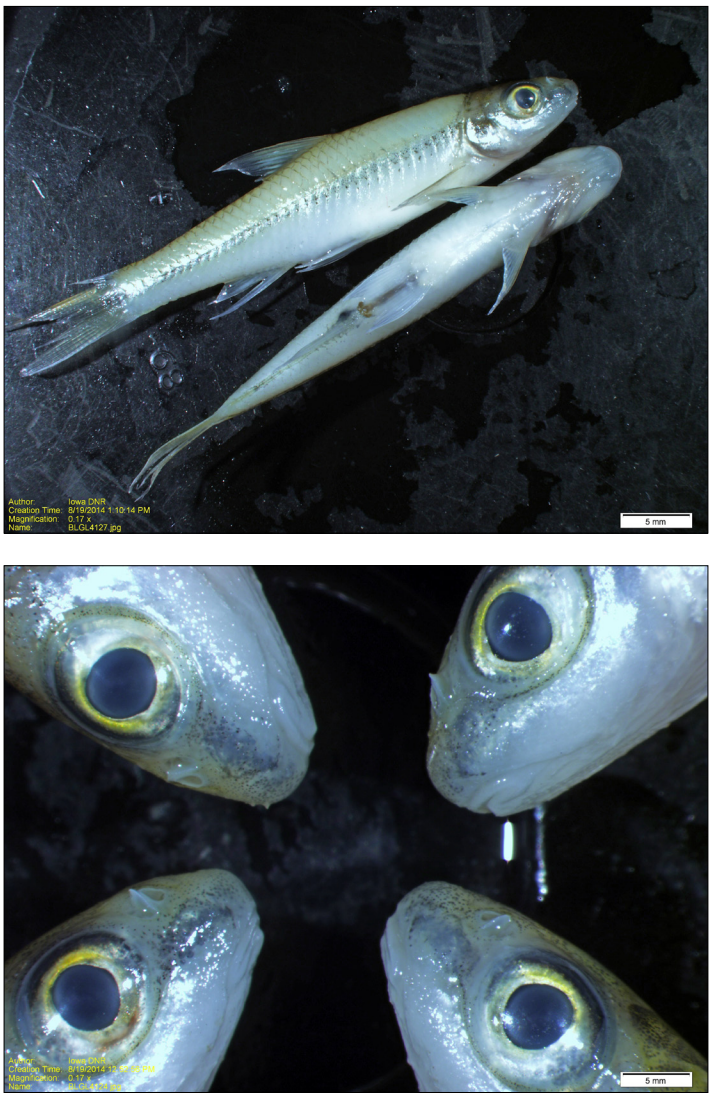

Figure 3. Pallid Shiners from Mississippi River Pool 13, on the Illinois–Iowa border.

ence of the Elk River (Clinton County, IA), we came across a small cyprinid that looked a little different. We collected three specimens of Weed Shiner (*Notropis texanus*) (endangered status in Iowa) in that electrofishing run, but this other fish was unfamiliar to me. Upon returning to the office that afternoon with the specimen, I pulled out *The Fishes of Missouri* (Pflieger 1997) and began to key out the mystery fish. The fish keyed out to Pallid Shiner (*Hybopsis amnis*) (Figure 3). Hmmm. Very odd. I must have gone wrong somewhere. I started over, but got the same result: Pallid Shiner. What the…? This species is generally thought to be extirpated in Iowa. As I usually do when unsure, I elicited the help of my old friend Bob Hrabik (Missouri Department of Conservation). I snapped a few pics under the digital scope and sent them off to Bob and to John Lyons (Wisconsin Department of Natural Resources). First John, then Bob, replied with two thumbs up, but they wanted additional pictures and Bob had copied Konrad Schmidt from Minnesota and John Olson from our Des Moines office. Not too much hubbub ensued, and the consensus was Pallid Shiner.

Cool beans! A week or so went by and we stumbled into another single collection. A few days later we were catching multiples in the tailwaters of Pool 13. What the…? John Lyons e-mailed that he's collected 29 specimens up to the north in Pool 11 of the river. By season's end, we had collected 119 Pallid Shiners at 25 different sites in Pool 13. Konrad later sent me an e-mail saying in mid-October, four confirmed Pallid Shiners were seined from upper Pool 9 in Minnesota and that those collections were the first in Pool 9 since 1969. If the recent Crystal Darter occurrences in the Mississippi River can be characterized as a rash, then the precipitous appearance of Pallid Shiners last year should be regarded as an epidemic. I'm not going to say much more about the Pallid Shiner collections, as Konrad will add more about a Pallid Shiner fishing trip we took this summer in the addendum, but the final count for this season was 25 individuals from our annual routine monitoring in Pool 13 (only 21 percent of the 2014 tally) and an additional 19 from a separate, ongoing study in Pool 12.

But again, here's the question—why are we abruptly seeing a very uncommon species show up in the river and where did they come from? The strongest historic Upper Midwest distributions of these two species in the Upper Mississippi River (UMR) watershed appear to have occurred mainly in Minnesota and Wisconsin. *Iowa Fish and Fishing* (Harlan and Speaker 1987) and *Fishes of Wisconsin* (Becker 1983) suggest the furthest southern ranges of the two species in the UMR watershed would be very close to Pool 13. Generally, smaller statured fishes inherently lack the capacity to make longer migrations in large, lentic environments due to energy constraints. I mean we're not talking Blue Catfish (*Ictalurus furcatus*) or Chinook Salmon (*Oncorhynchus tshawytscha*). These are diminutive little fish. Not to mention it certainly is a predator-heavy, fish-eat-fish world in the Mississippi River. So it surely doesn't seem that probable that these two species immigrated upstream from some secret tributary or that they are expanding their ranges in response to climate change. So what then? Here's my take. The appearances of the Crystal Darter (Figure 4) and Pallid Shiner (Figure 5) in moderate numbers in Pool 13 of the UMR may be explained by downstream dispersions due to extreme and prolonged high water levels in the 2014 spring and summer of the northern UMR watersheds, possibly from the lower St. Croix, Root, and Zumbro rivers of Minnesota; and possibly from the lower Black, Chippewa, Red Cedar, Trempealeau, and Wisconsin rivers of Wisconsin. Quite simply, these two species may have just been flushed out of those aforementioned tributaries from Minnesota

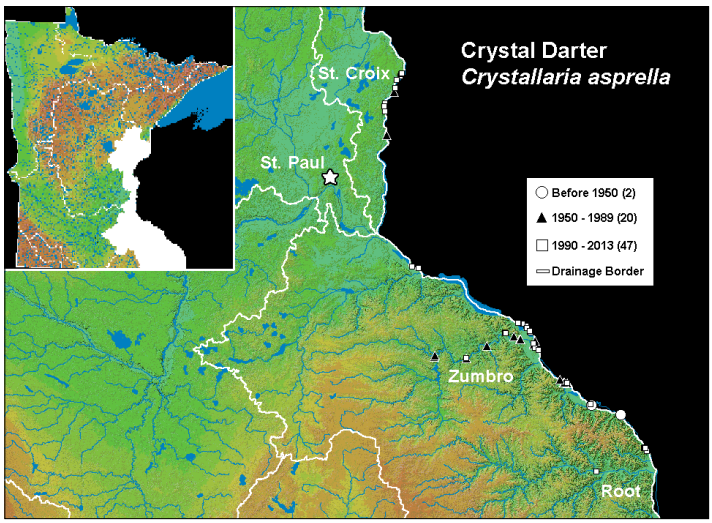

Figure 4. Crystal Darter records in Minnesota: endangered in Minnesota and Wisconsin. No status in Iowa.

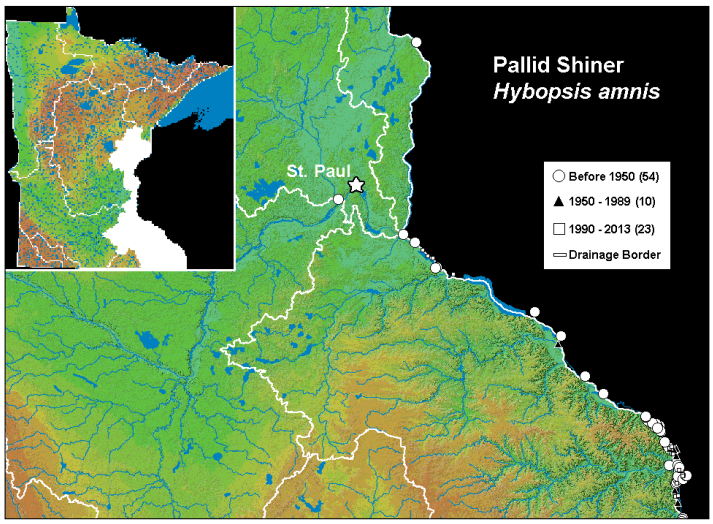

Figure 5. Pallid Shiner records in Minnesota: endangered in Minnesota and Wisconsin. No status in Iowa.

and Wisconsin and then went with the flow (so to speak) downstream. As many of us here in the Upper Midwest and UMR basin can attest, we had some extraordinary rainfall events in June and July of 2014.

Yes, it's difficult to predict how the fish biota responds to Mother Nature's rather unexpected weather tantrums and uproars. I think that sometimes fish genuinely just get displaced by such environmental anomalies, and in response, they may literally ride the waves to St. Elsewhere. After all, this logic reasonably explains the presence and spread of several Asian carp species into the UMR watershed. What should be more telling with the recent Crystal Darter and Pallid Shiner occurrences is to see if we continue to document them in the years to come, now that they seem to be here. Both Crystal Darter and Pallid Shiner are certainly welcome members to the existing diverse mix of our finned friends that we presently have in Pool 13, and I undoubtedly look forward to encountering a few more of them in the rest of the fall sampling season and in the years to come.

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PALLID SHINER ADDENDUM

Konrad Schmidt

Historical data for the Pallid Shiner in the Mississippi River are extremely limited (Figure 5). The following range map and summary are from records of a database I maintain for the authors writing the species accounts for *Fishes of Minnesota* (in preparation). There are extant specimens in museum collections as far north as the Minnesota River at Minneapolis, MN in 1926 and St. Croix River above St. Croix Falls, WI in 1928. Pallid Shiners exhibited the widest known longitudinal distribution in Mississippi River Pools 3-5a and 7-9 during surveys conducted from 1944-1949. Few records and low abundance were reported in all the upper pools. However, occurrences spiked in Pool 7 and continued in 8 and 9 with one large catch of 125 individuals in Pool 9. More recent records include Pool 3 near Hastings, MN, in 2002, Pool 4 near Red Wing, MN, in 1994, and several locations in Pool 8 near La Crosse, WI, over seven years from 1989-2014.

I first took notice of the initial surge in 2011 when John Lyons began finding Pallid Shiners in Pool 10, and later Pool 11 during fall trawling surveys of backwater lakes. Mel Bowler further piqued my curiosity with his revelation in Pool 13 (see Riffles: "Pallid Shiners on the Prowl" in *American Currents* 40:3). I thought it was worth a try to see if this trend was also occurring in the upper pools. I picked Mel's brain thoroughly, but he assured me over and over there really wasn't anything special about the sites where he found Pallids except there usually was no current, but generally this factor was never very distant, usually just off or in a sheltered area of the main channel. I still wanted to see it for

Figure 6. An example of Pallid Shiner habitat in Pool 13: upstream island shields shoreline from current.

Figure 7. An example of Pallid Shiner habitat in Pool 13: slackwater at tapering tail of island.

Figure 8. An example of Pallid Shiner habitat in Pool 13: boulder riprap on main channel border.

myself and I joined Mel and his assistant Brandon Reed for a day of boat shocking on Pool 13. As we pulled up to the first site (Figure 6), I was less than impressed saying, "Well this is pretty nondescript." Mel smiled, replying, "Told you so." True, there was no current in this tiny bay, which was sheltered by an upstream island that deflected the main channel's current. Substrates were silt and mud, and yes, Pallid Shiners were present! Mel said he was game to try seining, but advised the soft bottom would wear us out in no time. I agreed using electricity from the dry boat would suit me

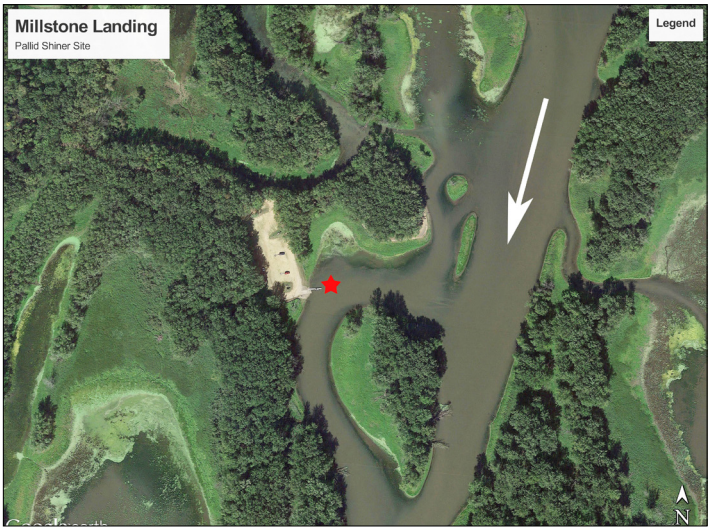

Figure 9. Reno Bottoms site in Mississippi River Pool 9 (Houston County, MN).

just fine. The second site was actually in the main channel near the tail of an island where it narrowed and was again sheltered from the current, which was literally only a stone's throw away (Figure 7). The last site was the most bizarre of all, an artificial structure of rip-rap forming the base of navigation light (Figure 8). I left with the conclusion that Pallids are not very picky.

During 2015 I conducted surveys in Pools 2-9. A few sites were visited more than once, but the grand total of individual samples tallied 89 by the end of season. Pallid Shiners were again found in Reno Bottoms of Pool 9 at Millstone Landing (Figure 9) in June and again in October, but that was it. This site is very different than what I observed at Pool 13. Millstone Landing is part of a large backwater complex and 1.6 miles from the main channel. There is current at the site only during high flows, but Minnesota Slough (indicated by the white arrow) has some current throughout summer and fall.

I am planning one final year of Mississippi River surveys in 2016, which will include additional sites in Reno Bottoms and habitats similar to locations where Mel has found them in Pool 13.