Pomoxis nigromaculatus – Black Crappie

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Fish 423

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Diagnostic Information

Class: Actinopterygii
Order: Perciformes
Family: Centrarchidae
Genus: *Pomoxis*
Species: *nigromaculatus*

Common Names: Black Crappie, Calico Bass, Crawpie, Rock Bass, Speckled Bass, Strawberry Bass

Pomoxis nigromaculatus is silver-green in color, with irregular black blotches covering the body, with more as they approach the tail. The black crappie has a compressed body with its anal and dorsal fins about equal size. To distinguish from the white crappie, which is very similar in appearance, you can look at the spot arrangement, the dorsal fin, and the dorsal spines (figure 1). The black spots on the black crappie are arranged in the random pattern, while in the white crappie, they are arranged in a vertical pattern. The base of the dorsal fin is longer in the black crappie and is set further forward, and the number of dorsal spines in black crappie is seven to eight, as opposed to the white crappie which has five to six (Wydoski & Whitney, 2003).

White and black crappie larvae are extremely

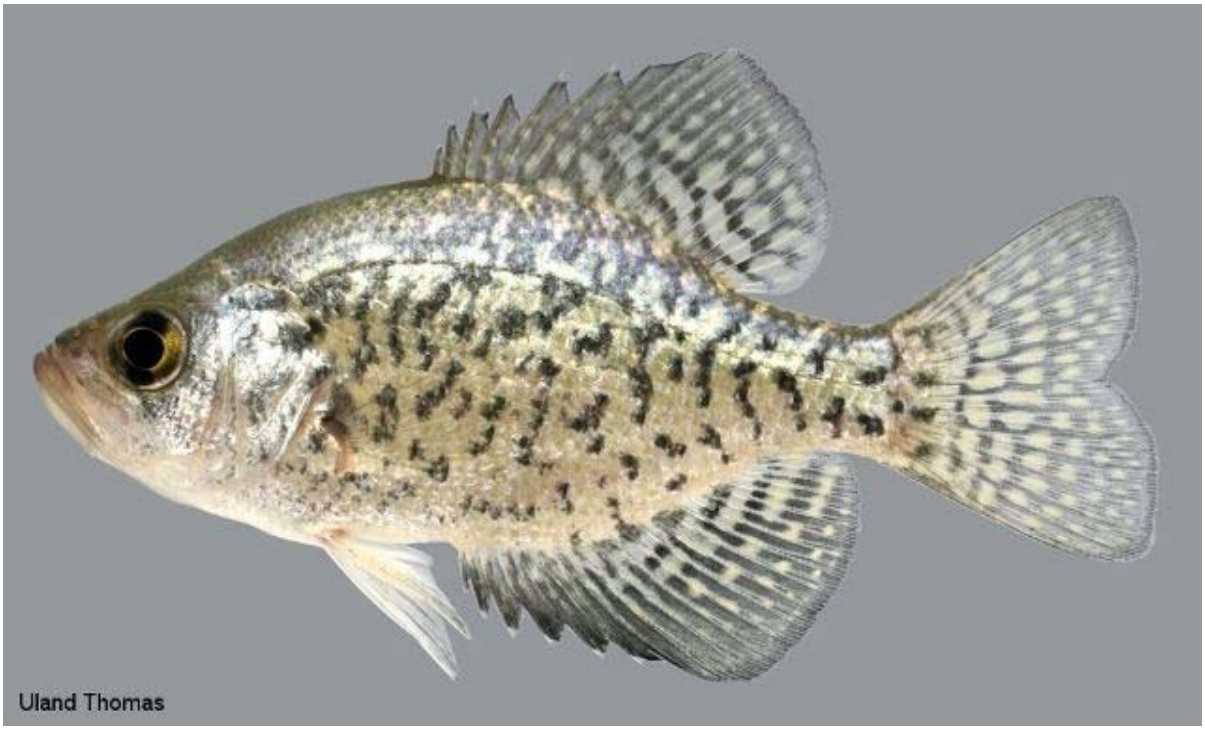
TABLE 50. Average Total Lengths (Inches) of Black Crappie at the End of Each Year of Life

	Age								
Location	*1*	*2*	*3*	*4*	*5*	*6*	*7*	*8*	*9*
Box Canyon Res., WA	2.7	4.0	5.4	6.5	7.4	8.1	8.5	8.4	–
Lake Washington	3.1	6.0	8.0	9.1	9.9	10.6	11.1	11.7	11.8
Moses Lake, WA	2.2	5.3	7.4	8.7	10.1	–	–	–	–
Potholes Reservoir, WA	1.7	3.9	6.4	8.5	10.0	11.1	11.3	11.1	–
Silver Lake, WA[1]	1.2	4.2	5.9	7.1	8.1	9.2	–	–	–
"[2]	2.3	5.1	6.6	7.7	8.4	8.9	–	–	–
Sprague Lake, WA	3.3	5.0	7.2	9.3	10.4	11.0	11.2	–	–
Washington average (17 waters)[3]	2.0	4.2	6.2	8.2	9.2	9.1	9.9	–	–
Washington average (16 waters)[4]	1.8	4.4	6.2	7.2	8.7	8.8	10.3	11.6	–
Oregon average (28 waters)	2.1	5.3	7.2	8.3	9.1	8.8	–	–	–
Osage State Fish. Lake, KS									
Without added forage[5]	2.4	5.2	7.4	9.4	10.7	11.4	–	–	–
With added forage[5]	2.0	5.1	8.0	10.2	10.9	12.2	–	–	–
Oklahoma average	3.1	6.3	8.2	9.9	11.6	13.5	15.2	–	–
Ohio average	2.2	4.7	6.3	7.8	9.2	9.9	11.5	11.9	–
Utah average	2.5	6.0	8.0	9.0	10.0	11.0	12.0	14.0	–
Montana	2.5	3.0	6.0	8.0	9.0	10.0	11.0	–	–

[1]1979.
[2]1997.
[3]Unweighted average for 17 waters in 17 reports between 1997-2000.
[4]1978-1982.
[5]Threadfin shad introduced into the lake as forage.

Table 1: Growth rates of Black Crappie (Wydoski & Whitney 2003).

Figure 1: White Crappie and the Black Crappie. The Black Crappie is below. Note the different arrangement of black spots, and the deeper body of the Black Crappie.



difficult to distinguish apart, with no distinguishing characteristics to separate them when they are less than 5mm apart (Siefert, 1969). After 5mm, there are three good characteristics to distinguish them. Between 5.00m and 6.49mm, postanal myomeres can distinguish, white crappie have 19 or less while black crappie have 21 or more. 6.00mm to 16.00mm the total myomeres differ, with white crappie having either 30 or 31, and black crappie 32 (Siefert, 1969). Greater than 16.00mm, the dorsal spines are distinguishable, and you can identify the fish with the difference in number (Siefert, 1969)

Female and male crappies grow at about the same rate, with slightly different growth rates depending on where they are (table 1). The fastest growth occurs in Washington State, at Mesa lake where they averaged 10 inches total length at the end of the fourth growing season, and 13 inches at the end of the seventh growing season.

Life-History and Basic Ecology

The black crappie spawns in spring, during May or early June when the water temperature reaches 14.4°C to 17.8°C (Moyle, 1976; Wydoski & Whitney, 2003). They will spawn smaller than average, or even have their growth stunted if they are spawning in an overcrowded area. The female will lay between 11,000 and 188,000 eggs, with larger fish producing more eggs. The eggs are about 1mm, and demersal. The male crappie will move into river backwaters or littoral lake areas to stake out their territory and build nests (Scott & Crossman, 1973) and they are usually built on or near vegetation beds on a mud, sand, or gravel substrate (Moyle, 1976). The eggs hatch in two

Stomach Contents of 5 to 10 cm Black Crappie

Food item	Percent frequency of occurrence					Percent of total volume
	Fall	Winter	Spring	Summer	Average	
Crustaceans						
Copepod and Cladocera	--	--	39.1	16.7	28.0	27.9
Mysid shrimp (*Neomysis awatschensis*)	100.0	100.0	78.3	38.9	72.0	43.5
Amphipod (*Corophium*)	100.0	40.0	60.9	27.8	50.7	16.0
Insects						
Tendipedids	--	10.0	17.4	44.4	22.7	8.4
Unidentified insects	--	--	--	5.6	1.3	2.9
Fishes						
Unidentified fishes	--	--	2.2	--	1.3	1.4
Stomachs examined	1	10	47	18	76	
Stomachs containing food	1	10	46	18	75	

Table 2: Stomach contents of 5-10cm black crappie.

Stomach Contents of 11 to 20 cm Black Crappie

Food item	Percent frequency of occurrence					Percent of total volume
	Fall	Winter	Spring	Summer	Average	
Bryozoans						
Pectinatella sp.	2.6	--	--	--	0.2	0.2
Annelids						
Unidentified leech	--	0.7	--	0.5	0.3	0.1
Crustaceans						
Copepoda and Cladocera	1.3	0.7	14.0	2.8	5.8	1.8
Mysid shrimp (*Neomysis awatschensis*)	51.9	91.0	87.1	72.1	78.0	23.7
Isopod (*Exosphaeroma oregonensis*)	--	2.1	2.2	2.5	2.1	3.4
Amphipod (*Corophium*)	44.2	47.9	75.9	69.6	65.9	9.2
Amphipod (*Gammarus*)	--	--	0.4	0.8	0.4	--
Crayfish (*Pacifastacus leniusculus*)	1.3	--	0.7	--	0.3	0.6
Insects						
Tendipedids	1.3	6.9	16.9	--	6.5	0.1
Other insects	--	1.4	3.2	3.8	2.9	0.9
Fishes						
Threadfin shad (*Dorosoma petenense*)	7.8	2.1	--	7.0	4.1	19.7
American shad (*Alosa sapidissima*)	--	--	--	1.5	0.7	1.0
Unidentified Clupeids	--	0.7	--	0.5	0.3	1.3
King salmon (*Oncorhynchus tshawytscha*)	--	--	0.4	--	0.1	1.2
Pond smelt (*Hypomesus transpacificus*)	--	--	--	0.5	0.2	1.3
White catfish (*Ictalurus catus*)	--	--	--	1.3	0.6	0.3
Striped bass (*Roccus saxatilis*)	--	0.7	0.4	10.6	4.9	15.0
Unidentified fishes	19.5	2.8	1.1	5.8	6.1	19.8
Stomachs examined	100	147	283	425	955	
Stomachs containing food	77	118	278	398	871	

Table 3: Stomach contents of 11-20cm black crappie

Stomach Contents of Black Crappie Longer Than 20 cm

Food item	Percent frequency of occurrence					Percent of total volume
	Fall	Winter	Spring	Summer	Average	
Annelids						
Unidentified leech	--	1.1	0.8	--	0.5	--
Crustaceans						
Copepoda and Cladocera	--	1.1	0.8	--	0.5	--
Mysid shrimp (*Neomysis awatschensis*)	26.0	80.0	72.8	61.4	64.8	6.7
Isopod (*Exosphaeroma oregonensis*)	2.0	--	0.8	2.1	1.2	0.2
Amphipod (*Corophium*)	50.0	46.2	69.6	73.6	63.3	4.0
Amphipod (*Gammarus*)	--	--	0.8	--	0.2	--
Crayfish (*Pacifastacus leniusculus*)	2.0	--	0.8	0.7	0.7	1.4
Insects						
Tendipedids	4.0	5.5	9.6	15.7	10.1	--
Other insects	4.0	1.1	2.4	1.4	2.0	0.2
Fishes						
Threadfin shad (*Dorosoma petenense*)	12.0	22.0	7.2	5.7	10.6	50.0
American shad (*Alosa sapidissima*)	--	--	0.8	0.7	0.5	1.2
Unidentified Clupeids	8.0	--	--	1.4	1.5	3.0
King salmon (*Oncorhynchus tshawytscha*)	--	--	2.4	--	0.7	1.0
Pond smelt (*Hypomesus transpacificus*)	2.0	--	--	--	0.2	0.7
Goldfish (*Carassius auratus*)	--	1.1	--	--	0.2	0.5
Striped bass (*Roccus saxatilis*)	14.0	--	--	27.1	11.1	21.7
Bluegill (*Lepomis macrochirus*)	2.0	--	--	--	0.2	0.1
Unidentified fishes	14.0	3.3	7.2	8.6	7.6	9.1
Stomachs examined	65	93	132	155	445	
Stomachs containing food	50	91	124	140	405	

Table 4: Stomach contents of over 20cm black crappie.

to three days, and the nest is guarded by the male until all the fry leave the site. They reach maturity when they are 2-3 years old and 7-8 inches long, faster growing crappie may also mature at a younger age (Wydoski & Whitney, 2003).

Small black crappie generally feed on small invertebrates, and then change to a fish diet as they grow larger (Scott & Crossman, 1973). For small crappie, copepods and cladocerans were the most widely fed on, composing 28% of total food volume (table 2). Forage fish occur in 1%, 60%, and 88% of the total food volume for 5-10cm crappie, 11-20cm crappie, and over 20cm crappie respectively (tables 2-4). The major fish eaten are Threadfin shad, *Dorosoma petenense*, and *Roccus saxatillis* (California, Dept. of Fish and Game, 1966). Other studies have been carried out in Wisconsin (Pearse, 1919), Illinois (Forbes & Richardson, 1920), Iowa (Bailey & Harrison, 1945), Tennessee (Dendy, 1946), Florida (Reid, 1949), Texas (Mitchell, MS, 1945), and Ontario (Keast, 1968). Between all the ranges, the sampling, analysis, quantity of fish, and older studies differ substantially, but it is clear that the diet of black crappie includes all of the same basic organisms throughout the range, although the proportions differ (Keast, 1968).

The black crappie prefers clear water, and tends to grow faster in areas of low disturbance (Moyle, 1976; Hastings & Cross, 1962). Because of their tendency to build their nests in vegetation, lots of cover is required for growth and reproduction. They frequent shallow water in the day around dense vegetation (Moyle, 1976). Black Crappie can't survive in high gradient streams, and are very common in low gradient streams (Trautman, 1957). They prefer low velocity waters, with optimum current velocities at < 10cm/sec, and cannot survive in currents > 60cm/sec (Edwards et al., 1982). Based on their preference of low velocity water, it can be assumed that black crappie prefer quiet, sluggish rivers with a high percentage of pools, backwaters, and cut-off areas (Edwards et al., 1982). Lake habitats of the black crappie are generally large, warm-water ponds, reservoirs, and small to medium-sized natural lakes (Scott & Crossman, 1973). They generally do not do well in the main body of large lakes (Hall et al., 1954), but they are abundant in the shallow areas and bays (Scott & Crossman, 1973) especially where there seems to be lots of aquatic vegetation (personal observation). There is established populations in California steep-sided reservoirs with no vegetation (Moyle, 1974), but this is not considered optimal (Edwards et al., 1982).

In 90% of all streams with black crappie along the Mississippi Valley and East Coat, the average weekly summer (July and August) temperatures were 23°C - 32°C, with the average at 26°C (Edwards et al, 1982). During spawning temperatures were from 13°C - 21°C (March – July) (Scarola, 1973), and 17.8°C-20°C are the most favorable (Schneberger, 1972).

The dissolved oxygen (D.O.) requirements can be assumed to be consistent with largemouth bass and general freshwater fish (Edwards et al., 1982). Largemouth bass avoid D.O. levels as low as 1.5 mg/l, but can tolerate 4.5 mg/l for short periods of time (Whitemore et al., 1960). In a laboratory study, there was successful spawning and survival at D.O. levels as low as 2.5 mg/l (Edwards et al., 1982).

I could not find any reports of any common pathogens, parasites, or commensals that are exclusive to the black crappie, and can be carried with (via transport) or by (inside the fish itself) it.

Current Geographical Distribution

The black crappie's native range is from eastern North Dakota and southeastern Manitoba, east to southern Quebec and Vermont, southeast to North Carolina, south to Florida, west to eastern Texas, and north to eastern South Dakota (not on the Atlantic coastal areas) (Wydoski & Whitney, 2003).

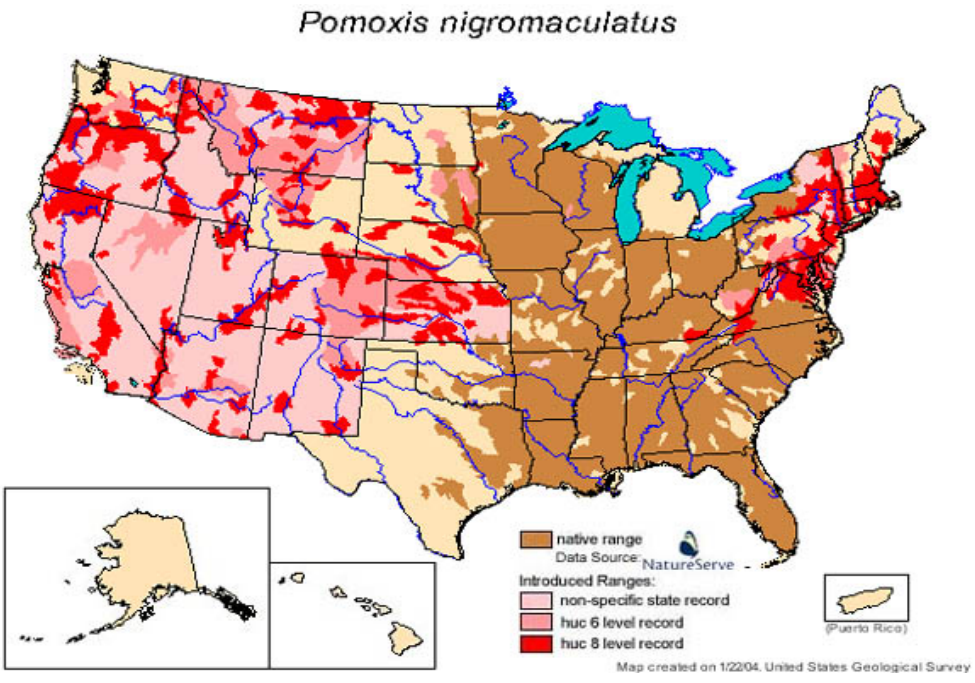


Figure 2: Native range and introduced range of the black crappie. Taken from the United States Geological Survey

They now have a presence in virtually every state in the continental United States (figure 2).

History of Invasiveness

The black crappie was introduced into California in 1908, at introduced into lakes near Spokane, Washington in the early 1890s (Wydoski & Whitney, 2003). The U.S. Fish commission also stocked various warmwater fish in the Willamette River near Salem, Oregon, which is assumed to be the source of black crappie that was established in the lower Columbia River; black crappie now occur throughout the entire Pacific Northwest, and the entire United State (Figure 2) (Wydoski & Whitney, 2003).

Washington might be the most heavily affected

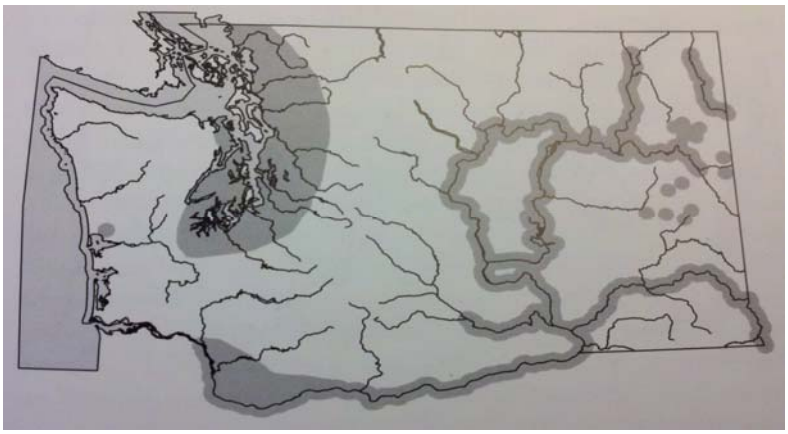


Figure 3: Washington distribution of Black Crappie. Areas where it has been introduced are shaded. Figure taken from Wydoski & Whitney, 2003)

in terms of introduced areas of black crappie (figure 3). "In Washington, black crappie are now found in the reservoirs on the Columbia and Snake Rivers. This species has been introduced into numerous lakes throughout Washington; the number of lakes (in parentheses) by county include Benton (4), Chelan (5), Cowlitz (3), Grant (15), Grays Harbor (1), Jefferson (1), King (13), Kitsap (1), Klickitat (5), Lewis (1), Lincoln (5), Okanogan (9), Pacific (2), Pend Oreille (2), Pierce (10), Skagit(6) Snohomish (11), Spokane (4), Stevens (5), Thurston (9), Walla Walla (1), Whatcom (4), Whitman (2), and Yakima
(4)" (Wydoski & Whitney, 2003). In Spraque lake, Adams and Lincoln County, Washington, black crappie composed over 50% of the total number of fish in the survey (Schmuck & Petersen, 2003), but that doesn't seem to be typical. In Lake Goodwin in Snohomish County, Washington, black crappie is rare and only few were caught during the survey (Dowmen & Mueller, 1998).

Invasion Process

The main and only well-known method of introduction for the black crappie is intentional introduction by the United States. All introductions were purposeful to promote recreation. The risk of more habitats being invaded with black crappie is low, due to the fact that almost every lake that can support black crappie has already been stocked intentionally. It has become a fixture in most lakes that it was introduced, to the point where there are now studies to look at other introduced fish's affect on crappie, for example, Li et al. (1976). There was one example of illegal stocking of black crappie, and that was in Maine (Johnson et al., 2009).

Black crappie supports a very large recreational fishery, as it is easy to catch and has very good flavor; it is reported that many fisherman from Seattle, WA will drive about 160 miles one way to fish for black crappie in Moses Lake (Wydoski & Whitney, 2003). This is probably the reason why it was so widely stocked in the late 1800s and early 1900s all along the west coast. It is my thought that there are probably no other areas that can support the black crappie, due to the Fish and Wildlife Department stocking it every area that it can survive.

In two surveys of lakes (Lake Goodwin and Sprague Lake), black crappie over the age of 2 was not found (Downen & Mueller, 1998; Schmuck & Petersen, 2003). This is despite the fact that they were in good health, food availability didn't seem to be an issue (Schmuck & Petersen, 2003). In another survey (Bennington Lake), black crappie was caught at ages up to age 5 (Phillips & Divens, 2001). There were significantly fewer fish species in Bennington Lake than either Lake Goodwin or Sprague Lake. This could suggest either the amount of food is a control factor, or the amount of predators. In Lake Goodwin and Sprague Lake, the black crappie caught were of good health, and were both higher in length (compared to age) than the nation's average (Downen & Mueller, 1998; Schmuck & Petersen, 2003). This suggests that the control on black crappie is predator related, they are being eaten before they can get up above age 2, while in Bennington Lake they are getting older before they are eaten (or recreationally harvested).

The black crappie does share food sources with many different fish that it generally inhabits with. This doesn't seem to be a problem for any of the fish though, as in Lake Goodwin, Sprague Lake, and Bennington Lake no fish seemed to be having any severe recruitment troubles (Downen & Mueller, 1998; Schmuck & Petersen, 2003; Phillips & Divins, 2001).

There does not seem to be any negative ecological impact in the water bodies that the black crappie inhabits. There is a significant economic incentive to adding black crappie into water bodies that do not already have a population, however, due to the recreational fishing that it supports.

Management Strategies and Control Methods

Due to the minimal ecological impacts, and high economic gains the control and management should be minimal. This is a species that does not need to be controlled, as it has already been introduced to most, if not all, of the water bodies it can inhabit. Black Crappie management is also simple. If possible, stocking in previously uninhabited lakes might be beneficial. The studies have already been done of habitat suitability, so any target bodies of water can be compared to Edwards et al.'s paper "Habitat suitability index models: Black crappie" (1982) to prevent any stocking of areas that is not suitable for the black crappie. It might also be beneficial to artificially stock black crappie in lakes where they don't have a self-sustaining population (due to environmental restraints, or other) to promote recreational fishing. The economic gain from recreational fishing could be enough to offset the cost of stocking, and perhaps a little extra as well.

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Other Information and Bibliographies

Washington Department of Fish and Wildlife. Surveys of Washington water bodies and all other publications regarding Washington water bodies.

http://wdfw.wa.gov/publications

Basic information about the black crappie, identification, habitat, etc.

http://www.blackcrappie.org/

Habitat suitability models for the black crappie. Useful for determining if black crappie will be able to survive in a body of water.

http://www.nwrc.usgs.gov/wdb/pub/hsi/hsi-006.pdf

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Current Research and Management Efforts

The current research on black crappie is very minimal, and I was not able to find anything. This is most likely because it has been in the Pacific Northwest for over 100 years, and is now a stable in our environment. There are always surveys being done by the Department of Fish and Wildlife (depending on the state) that provide information regarding the black crappie.

Management efforts mainly consist of stocking into lakes where the black crappie is not able to sustain its population by itself, either due to fishing pressure, or habitat incompatibility. Most, if not all, state fish and wildlife departments support the intentional stocking of black crappie for recreational fishing (Pennsylvania, Arkansas, and Kansas to name a few).