

# Mukwonago River Annual Index of Biotic Integrity (IBI) Fish Survey

## 2011 Results



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## Background

The Mukwonago River in southern Waukesha County has a rich aquatic biota, and is one of the highest quality streams remaining in southern Wisconsin. Much of its watershed remains natural or only lightly developed, water quality is good, and riparian and in-stream habitats are diverse and largely intact. The stretch of river immediately below Phantom Lake in the village of Mukwonago has the highest fish species richness of any comparably sized stretch of stream in the state and includes several state threatened and endangered fish and mussel species and numerous gamefish and panfish species. In this stretch, the river is readily accessible and easily waded and has clear water and an attractive setting, and as a result sport fishing and fish watching are popular pastimes.

The Mukwonago River watershed is threatened by increasing development and urban sprawl. Located adjacent to metropolitan Milwaukee, Waukesha County is one of the fastest growing regions in the state. Over the last 20 years, major new residential and commercial areas have been established in the Mukwonago River watershed, particularly in the vicinity of the village of Mukwonago. These new developments have the potential to degrade the Mukwonago River through altered hydrology (e.g., loss of springs, lowered base flows, more frequent and severe floods), reduced water quality (e.g., greater runoff of sediment, nutrients, and toxic substances), and loss of habitat (e.g., sedimentation, elimination of natural riparian and in-stream vegetation). The Mukwonago River below Phantom Lake is further at risk from the possibility of an accidental toxic spill at the heavily used highway and railroad bridges in the village of Mukwonago.

In 2003, the Wisconsin Department of Natural Resources (WDNR) Fish and Habitat Research Section began an ad-hoc annual effort to monitor the fish community in the Mukwonago River below Phantom Lake. Through calculation of the Index of Biotic Integrity (IBI), data on the fish community can provide insight into the overall health of the river ecosystem in this stretch. Fish catches can also reveal trends in the populations of rare and sport fish species. The overall goal of the monitoring is to better document the current status of this biologically unique piece of river and to provide an early warning of declines in environmental quality and fisheries associated with human development in the watershed.

## Methods

The study stretch of the Mukwonago River extends 220 meters from the State Highway 83 Bridge upstream to the base of the Phantom Lake Dam in the Village of Mukwonago (42.85686 N; 88.32806 W). Here, the river averages about 20 m wide and 0.5 m deep, with a small area exceeding 1 m in depth immediately below the dam. The stretch has moderate current velocities with primarily run habitat, but some riffles and pools are present. The bottom is a mix of gravel, sand, and cobble, with smaller areas of boulders and silt. Fish holding cover is good, consisting mainly of submerged and emergent aquatic vegetation, overhanging riparian vegetation, large woody debris, and boulders. Water clarity is high. Overall, the habitat conditions are excellent for fish and result in a high effectiveness for electroshocking.

A WDNR crew samples the fish community in this stretch once each year in early to mid September (Table 1). Fish are collected with a standard WDNR DC-current stream electroshocker with three anodes. A single pass is made in an upstream direction, and an effort is made to survey all areas of the channel and to collect all fish observed. Total shocking time usually ranges from 3.5 to 4 hours. No block nets are used to isolate the stretch, but a steep shallow riffle at the State Highway 83 Bridge and the Phantom Lake Dam impede fish from leaving the stretch during the sampling.

All fish collected are processed on site and returned alive to the water. All species are identified and counted. Any fish with substantial deformities, eroded fins, lesions, or tumors is noted. All individuals of two indicator species, the state-threatened longear sunfish, a sensitive pool/run-dwelling species, and the rainbow darter, a sensitive riffle/run-dwelling species, are measured for total length (data available from Lyons by request). Species are classified into origin, species group, tolerance, diet, and spawning categories (Table 2) and then the catch data are summarized and scored (Table 3, 4) to calculate the IBI.

## Results and Discussion

The Mukwonago River in the village of Mukwonago has a highly diverse and abundant fish community. Since 2003, the number of fish species collected has ranged from 32 to 44 (Table 1). To view photos of these species, see <http://wisfish.org>. Statewide, most stream stretches of similar length yield fewer than 20 fish species, and any stretch with more than 25 is exceptional. Over the course of the monitoring, six fishes designated as rare by the state have been collected, lake chubsucker and banded killifish (special concern), pugnose shiner, greater redhorse, and longear sunfish (threatened), and starhead topminnow (endangered). Statewide, any site with more than three rare species is unusual. Mukwonago River populations of two of the rare fishes, longear sunfish and starhead topminnow, are among the largest remaining in the state. A wide variety of sport fish species occur at the site, with 10-12 species collected each year. In Wisconsin, fisheries based on more than eight species are considered highly diverse. Bluegills are abundant and always dominate the electroshocking catch at the site. Most are small (< 5 inches). Rock bass and largemouth bass are usually also common. Rock bass tend to have good size structure, with several individuals in the 8-10 inch range captured every year. Channel catfish, although uncommon, are often of relatively large size for a small river such as the Mukwonago, ranging from 12 to more than 20 inches.

Since the study began, the Mukwonago River in the village of Mukwonago has maintained consistently good environmental quality. No declining trends are evident. Index of biotic integrity scores have varied relatively little, ranging from 70-85 out of a possible 100 points, and have always rated as excellent (Table 4). Fluctuations in IBI scores of 10-15 points or less are not considered to represent meaningful change in environmental quality but rather are the result of normal natural fluctuations in fish community structure, habitat conditions, and sampling effectiveness.

Although IBI scores have been stable and many species have been either consistently common (e.g., bluegill, longear sunfish, logperch) or consistently uncommon (e.g., common carp, channel catfish, yellow perch), some species have shown major annual fluctuations in abundance. For example, only one black crappie was collected in 2005, eight in 2007, 11 in 2009, and three in 2011 but 220 were taken in 2008. Three or fewer bowfin were collected in each of 2003, 2005, and 2006, but much higher numbers were captured in 2004 (101), 2007 (94), 2008 (239), and 2010 (197). For most of the species with major year-to-year variation in abundance, when numbers were high, populations were dominated by small, young (young-of-year or yearling) individuals. This suggests that much of the variation among years was caused by natural fluctuations in reproductive success.

Fish catches were above average in 2011. The number of species captured (44) was the highest recorded since the monitoring began in 2003, and the total number of fish (3326) was the third highest. The catches of 43 lake chubsuckers and 163 bluntnose minnow were the highest observed for these species. The IBI score (80) was within the range of values observed in past years. Overall, the Mukwonago River in the village of Mukwonago remains in excellent condition.

Table 1a -- Fishes captured during annual monitoring of the Mukwonago River between the State Highway 83 Bridge and the Phantom Lake Dam in the village of Mukwonago, 2003-2008.

Common Name	Scientific Name	Date of survey					
		18 Sep 2003	16 Sep 2004	7 Sep 2005	13 Sep 2006	6 Sep 2007	3 Sep 2008
<b>GARS</b>	<b>LEPISOSTEIDAE</b>						
Longnose gar	<i>Lepisosteus osseus</i>	0	0	0	0	0	0
<b>BOWFINS</b>	<b>AMIIDAE</b>						
Bowfin	<i>Amia calva</i>	1	101	3	2	94	239
<b>MINNOWS</b>	<b>CYPRINIDAE</b>						
Largescale Stoneroller	<i>Campostoma oligolepis</i>	10	0	5	0	2	1
Spotfin Shiner	<i>Cyprinella spiloptera</i>	2	0	2	0	14	0
Common Carp (exotic)	<i>Cyprinus carpio</i>	6	9	1	3	3	2
Common Shiner	<i>Luxilus cornutus</i>	3	0	26	0	1	0
Hornyhead Chub	<i>Nocomis biguttatus</i>	0	0	1	0	0	0
Golden Shiner	<i>Notemigonus crysoleucas</i>	1	3	2	1	2	1
Pugnose Shiner (threatened)	<i>Notropis anogenus</i>	3	0	0	0	0	0
Blackchin Shiner	<i>Notropis heterodon</i>	0	0	0	0	0	3
Blacknose Shiner	<i>Notropis heterolepis</i>	0	0	0	0	0	0
Rosyface Shiner	<i>Notropis rubellus</i>	0	1	0	0	1	0
Sand Shiner	<i>Notropis stramineus</i>	0	0	0	0	1	0
Bluntnose Minnow	<i>Pimephales notatus</i>	6	6	47	42	22	4
Fathead Minnow	<i>Pimephales promelas</i>	0	0	0	0	0	0
<b>SUCKERS</b>	<b>CATOSTOMIDAE</b>						
White Sucker	<i>Catostomus commersonii</i>	6	9	18	3	0	4
Lake Chubsucker (special concern)	<i>Erimyzon sucetta</i>	0	0	4	0	5	8
Golden Redhorse	<i>Moxostoma erythrurum</i>	2	3	0	2	2	19
Greater Redhorse (threatened)	<i>Moxostoma valenciennesi</i>	0	0	0	3	1	1
<b>BULLHEAD CATFISHES</b>	<b>ICTALURIDAE</b>						
Black Bullhead	<i>Ameiurus melas</i>	0	0	2	0	1	8
Yellow Bullhead	<i>Ameiurus natalis</i>	13	5	11	5	32	8
Brown Bullhead	<i>Ameiurus nebulosus</i>	0	0	0	1	1	0
Channel Catfish	<i>Ictalurus punctatus</i>	4	12	2	1	7	7
Stonecat	<i>Noturus flavus</i>	9	7	26	10	28	34
Tadpole Madtom	<i>Noturus gyrinus</i>	5	3	12	6	4	4
<b>PIKES</b>	<b>ESOCIDAE</b>						
Grass Pickerel	<i>Esox americanus vermiculatus</i>	33	4	8	15	6	5
Northern Pike	<i>Esox lucius</i>	8	32	1	4	1	19
<b>MUDMINNOWS</b>	<b>UMBRIDAE</b>						
Central Mudminnow	<i>Umbra limi</i>	1	4	11	0	1	0
<b>TOPMINNOWS</b>	<b>FUNDULIDAE</b>						
Banded Killifish (special concern)	<i>Fundulus diaphanus</i>	5	1	9	6	2	2
Starhead Topminnow (endangered)	<i>Fundulus dispar</i>	29	61	20	39	17	14
Blackstripe Topminnow	<i>Fundulus notatus</i>	48	7	55	23	19	13
<b>NEW WORLD SILVERSIDES</b>	<b>ATHERINOPSIDAE</b>						
Brook Silverside	<i>Labidesthes sicculus</i>	4	4	0	0	2	0

SUNFISHES	CENTRARCHIDAE						
Rock Bass	<i>Ambloplites rupestris</i>	52	22	113	26	37	212
Green Sunfish	<i>Lepomis cyanellus</i>	8	16	11	87	262	207
Pumpkinseed	<i>Lepomis gibbosus</i>	10	33	34	23	23	78
Warmouth	<i>Lepomis gulosus</i>	41	19	7	42	59	82
Orangespotted Sunfish	<i>Lepomis humilis</i>	2	0	1	1	4	1
Bluegill	<i>Lepomis macrochirus</i>	786	1035	382	2032	765	1936
Longear Sunfish (threatened)	<i>Lepomis megalotis</i>	291	52	102	60	157	232
Sunfish hybrid (various combinations)	<i>Lepomis sp. X Lepomis sp. (various)</i>	11	77	1	7	8	8
Largemouth Bass	<i>Micropterus salmoides</i>	110	29	47	64	22	38
Black Crappie	<i>Pomoxis nigromaculatus</i>	2	41	1	8	8	220
PERCHES	PERCIDAE						
Rainbow Darter	<i>Etheostoma caeruleum</i>	130	120	329	32	130	59
Iowa Darter	<i>Etheostoma exile</i>	0	0	0	0	0	0
Fantail Darter	<i>Etheostoma flabellare</i>	30	23	90	2	17	39
Johnny Darter	<i>Etheostoma nigrum</i>	15	28	14	20	21	14
Banded Darter	<i>Etheostoma zonale</i>	1	5	1	0	1	0
Yellow Perch	<i>Perca flavescens</i>	15	4	1	1	4	2
Logperch	<i>Percina caprodes</i>	157	95	109	92	95	134
Blackside Darter	<i>Percina maculata</i>	31	4	14	28	50	12
Total species		37	33	37	32	40	35
Total fish		1890	1875	1523	2724	1931	3679
Number of fish with deformities, eroded fins, lesions, or tumors (DELT)		0	0	0	5	0	3

Table 1b -- Fishes captured during annual monitoring of the Mukwonago River between the State Highway 83 Bridge and the Phantom Lake Dam in the village of Mukwonago, 2009-2011.

Common Name	Scientific Name	Date of survey		
		3 Sep 2009	2 Sep 2010	8 Sep 2011
<b>GARS</b>	<b>LEPISOSTEIDAE</b>			
Longnose gar	<i>Lepisosteus osseus</i>	0	1	1
<b>BOWFINS</b>	<b>AMIIDAE</b>			
Bowfin	<i>Amia calva</i>	65	197	54
<b>MINNOWS</b>	<b>CYPRINIDAE</b>			
Largescale Stoneroller	<i>Campostoma oligolepis</i>	3	1	5
Spotfin Shiner	<i>Cyprinella spiloptera</i>	7	2	0
Common Carp (exotic)	<i>Cyprinus carpio</i>	0	0	3
Common Shiner	<i>Luxilus cornutus</i>	2	1	33
Hornyhead Chub	<i>Nocomis biguttatus</i>	0	0	2
Golden Shiner	<i>Notemigonus crysoleucas</i>	2	7	4
Pugnose Shiner (threatened)	<i>Notropis anogenus</i>	0	2	7
Blackchin Shiner	<i>Notropis heterodon</i>	0	11	14
Blacknose Shiner	<i>Notropis heterolepis</i>	1	0	0
Rosyface Shiner	<i>Notropis rubellus</i>	0	0	2
Sand Shiner	<i>Notropis stramineus</i>	0	0	0
Bluntnose Minnow	<i>Pimephales notatus</i>	6	15	163
Fathead Minnow	<i>Pimephales promelas</i>	0	0	1
<b>SUCKERS</b>	<b>CATOSTOMIDAE</b>			
White Sucker	<i>Catostomus commersonii</i>	1	0	4
Lake Chubsucker (special concern)	<i>Erimyzon sucetta</i>	11	35	43
Golden Redhorse	<i>Moxostoma erythrurum</i>	5	0	0
Greater Redhorse (threatened)	<i>Moxostoma valenciennesi</i>	0	0	2
<b>BULLHEAD CATFISHES</b>	<b>ICTALURIDAE</b>			
Black Bullhead	<i>Ameiurus melas</i>	1	0	1
Yellow Bullhead	<i>Ameiurus natalis</i>	19	16	7
Brown Bullhead	<i>Ameiurus nebulosus</i>	0	0	1
Channel Catfish	<i>Ictalurus punctatus</i>	1	5	5
Stonecat	<i>Noturus flavus</i>	30	20	10
Tadpole Madtom	<i>Noturus gyrinus</i>	4	1	1
<b>PIKES</b>	<b>ESOCIDAE</b>			
Grass Pickerel	<i>Esox americanus vermiculatus</i>	11	11	4
Northern Pike	<i>Esox lucius</i>	18	2	10
<b>MUDMINNOWS</b>	<b>UMBRIDAE</b>			
Central Mudminnow	<i>Umbra limi</i>	8	1	5
<b>TOPMINNOWS</b>	<b>FUNDULIDAE</b>			
Banded Killifish (special concern)	<i>Fundulus diaphanus</i>	5	1	5
Starhead Topminnow (endangered)	<i>Fundulus dispar</i>	27	20	22
Blackstripe Topminnow	<i>Fundulus notatus</i>	20	6	31
<b>NEW WORLD SILVERSIDES</b>	<b>ATHERINOPSIDAE</b>			
Brook Silverside	<i>Labidesthes sicculus</i>	1	0	8

SUNFISHES	CENTRARCHIDAE			
Rock Bass	<i>Ambloplites rupestris</i>	380	285	189
Green Sunfish	<i>Lepomis cyanellus</i>	75	180	93
Pumpkinseed	<i>Lepomis gibbosus</i>	6	1	9
Warmouth	<i>Lepomis gulosus</i>	50	104	23
Orangespotted Sunfish	<i>Lepomis humilis</i>	20	0	0
Bluegill	<i>Lepomis macrochirus</i>	1189	1095	1606
Longear Sunfish (threatened)	<i>Lepomis megalotis</i>	707	324	424
Sunfish hybrid (various combinations)	<i>Lepomis sp. X Lepomis sp. (various)</i>	1	3	2
Largemouth Bass	<i>Micropterus salmoides</i>	72	26	58
Black Crappie	<i>Pomoxis nigromaculatus</i>	11	15	3
PERCHES	PERCIDAE			
Rainbow Darter	<i>Etheostoma caeruleum</i>	234	151	185
Iowa Darter	<i>Etheostoma exile</i>	1	0	2
Fantail Darter	<i>Etheostoma flabellare</i>	360	78	44
Johnny Darter	<i>Etheostoma nigrum</i>	65	5	14
Banded Darter	<i>Etheostoma zonale</i>	1	1	5
Yellow Perch	<i>Perca flavescens</i>	8	4	49
Logperch	<i>Percina caprodes</i>	300	114	139
Blackside Darter	<i>Percina maculata</i>	34	8	33
Total species		40	35	44
Total fish		3762	2751	3326
Number of fish with deformities, eroded fins, lesions, or tumors (DELT)		0	2	0

Table 2 – Classification of fishes for Index of Biotic Integrity (IBI) calculations.

Origin: N = native; I = introduced; H = Hybrid (not included in species counts)

SpGrp (Species group): Da = darter, Sc = sucker, Sn = sunfish, Ot = other

Toler (Tolerance): I = intolerant, T = tolerant, M = intermediate tolerance

Diet: Is = insectivore, Om = omnivore, TC = top carnivore; He = herbivore

Spawn: SL = simple lithophil, Ot = other

Common Name	Scientific Name	Origin	SpGrp	Toler	Diet	Spawn
<b>GARS</b>						
Longnose gar	<i>Lepisosteus osseus</i>	N	Ot	M	TC	Ot
<b>BOWFINS</b>						
Bowfin	<i>Amia calva</i>	N	Ot	M	TC	Ot
<b>MINNOWS</b>						
Largescale Stoneroller	<i>Campostoma oligolepis</i>	N	Ot	M	He	Ot
Spotfin Shiner	<i>Cyprinella spiloptera</i>	N	Ot	M	Is	Ot
Common carp (exotic)	<i>Cyprinus carpio</i>	I	Ot	T	Om	Ot
Common Shiner	<i>Luxilus cornutus</i>	N	Ot	M	Is	SL
Hornyhead Chub	<i>Nocomis biguttatus</i>	N	Ot	M	Is	Ot
Golden Shiner	<i>Notemigonus crysoleucas</i>	N	Ot	T	Om	Ot
Pugnose Shiner	<i>Notropis anogenus</i>	N	Ot	I	Is	Ot
Blackchin Shiner	<i>Notropis heterodon</i>	N	Ot	I	Is	Ot
Blacknose Shiner	<i>Notropis heterolepis</i>	N	Ot	I	Is	Ot
Carmine (Rosyface) Shiner	<i>Notropis percobromus (rubellus)</i>	N	Ot	I	Is	SL
Sand Shiner	<i>Notropis stramineus</i>	N	Ot	M	Is	Ot
Bluntnose Minnow	<i>Pimephales notatus</i>	N	Ot	T	Om	Ot
Fathead Minnow	<i>Pimephales promelas</i>	N	Ot	T	Om	Ot
<b>SUCKERS</b>						
White Sucker	<i>Catostomus commersonii</i>	N	Sc	T	Om	SL
Lake Chubsucker	<i>Erimyzon sucetta</i>	N	Sc	M	Is	Ot
Golden Redhorse	<i>Moxostoma erythrurum</i>	N	Sc	M	Is	SL
Greater Redhorse	<i>Moxostoma valenciennesi</i>	N	Sc	I	Is	SL
<b>BULLHEAD CATFISHES</b>						
Black Bullhead	<i>Ameiurus melas</i>	N	Ot	T	Is	Ot
Yellow Bullhead	<i>Ameiurus natalis</i>	N	Ot	T	Is	Ot
Brown Bullhead	<i>Ameiurus nebulosus</i>	N	Ot	M	Is	Ot
Channel Catfish	<i>Ictalurus punctatus</i>	N	Ot	M	TC	Ot
Stonecat	<i>Noturus flavus</i>	N	Ot	M	Is	Ot
Tadpole Madtom	<i>Noturus gyrinus</i>	N	Ot	M	Is	Ot
<b>PIKES</b>						
Grass Pickerel	<i>Esox americanus vermiculatus</i>	N	Ot	M	TC	Ot
Northern Pike	<i>Esox lucius</i>	N	Ot	M	TC	Ot
<b>MUDMINNOWS</b>						
Central Mudminnow	<i>Umbra limi</i>	N	Ot	T	Is	Ot
<b>TOPMINNOWS</b>						
Banded Killifish	<i>Fundulus diaphanus</i>	N	Ot	M	Is	Ot
Starhead Topminnow	<i>Fundulus dispar</i>	N	Ot	M	Is	Ot
Blackstripe Topminnow	<i>Fundulus notatus</i>	N	Ot	M	Is	Ot
<b>NEW WORLD SILVERSIDES</b>						
Brook Silverside	<i>Labidesthes sicculus</i>	N	Ot	M	Is	Ot



SUNFISHES	CENTRARCHIDAE					
Rock Bass	<i>Ambloplites rupestris</i>	N	Sn	I	TC	Ot
Green Sunfish	<i>Lepomis cyanellus</i>	N	Sn	T	Is	Ot
Pumpkinseed	<i>Lepomis gibbosus</i>	N	Sn	M	Is	Ot
Warmouth	<i>Lepomis gulosus</i>	N	Sn	M	TC	Ot
Orangespotted Sunfish	<i>Lepomis humilis</i>	N	Sn	M	Is	Ot
Bluegill	<i>Lepomis macrochirus</i>	N	Sn	M	Is	Ot
Longear Sunfish	<i>Lepomis megalotis</i>	N	Sn	I	Is	Ot
Sunfish hybrid	<i>Lepomis sp. X Lepomis sp. (various)</i>	H	Ot	M	Is	Ot
Largemouth Bass	<i>Micropterus salmoides</i>	N	Ot	M	TC	Ot
Black Crappie	<i>Pomoxis nigromaculatus</i>	N	Sn	M	TC	Ot
PERCHES	PERCIDAE					
Rainbow Darter	<i>Etheostoma caeruleum</i>	N	Da	I	Is	SL
Iowa Darter	<i>Etheostoma exile</i>	N	Da	I	Is	Ot
Fantail Darter	<i>Etheostoma flabellare</i>	N	Da	M	Is	Ot
Johnny Darter	<i>Etheostoma nigrum</i>	N	Da	M	Is	Ot
Banded Darter	<i>Etheostoma zonale</i>	N	Da	I	Is	SL
Yellow Perch	<i>Perca flavescens</i>	N	Ot	M	TC	Ot
Logperch	<i>Percina caprodes</i>	N	Da	M	Is	SL
Blackside Darter	<i>Percina maculata</i>	N	Da	M	Is	SL

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Table 3 – Index of Biotic Integrity (IBI) scoring criteria for the Mukwonago River between the State Highway 83 Bridge and the Phantom Lake Dam.

Metric	Criteria for scoring metrics		
	0 points (Poor)	5 points (Fair)	10 points (Good)
Number of native species	0-10	10-20	> 20
Number of darter species	0-1	2-4	> 4
Number of sucker species	0-2	3-4	> 4
Number of sunfish species	0-1	2-3	> 3
Number of intolerant species	0-2	3-5	> 5
Percent of individuals as tolerant species	51-100	20-50	0-19
Percent of individuals as omnivores	41-100	20-40	0-19
Percent of individuals as insectivores	0-29	30-60	61-100
Percent of individuals as top carnivores	0-6	7-14	15-100
Percent of individuals as simple lithophils	0-19	20-50	51-100
Number of non-tolerant individuals per 300 m	If < 50, subtract 10 from overall IBI score		
Percent of individuals with DELT	If $\geq$ 4%, subtract 10 from overall IBI score		



Table 4b – Index of biotic integrity (IBI) metric values and scores (in parentheses) for the Mukwonago River between the State Highway 83 Bridge and the Phantom Lake Dam, 2009-2011.

Metric	2009	2010	2011
Number of native species	40(10)	35(10)	44(10)
Number of darter species	6(10)	6(10)	7(10)
Number of sucker species	3(5)	1(0)	3(5)
Number of sunfish species	8(10)	7(10)	7(10)
Number of intolerant species	6(10)	6(10)	8(10)
Percent of individuals as tolerant species	3.0(10)	8.0(10)	8.4(10)
Percent of individuals as omnivores	0.2(10)	0.1(10)	5.0(10)
Percent of individuals as insectivores	83.3(10)	75.7(10)	83.4(10)
Percent of individuals as top carnivores	16.4(10)	23.6(10)	11.2(5)
Percent of individuals as simple lithophils	15.6(0)	5.6(0)	12.1(0)
Number of non-tolerant individuals per 300 m	5090(0)	3751(0)	4352(0)
Percent of individuals with DELT	0(0)	0.1(0)	0(0)
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Overall IBI score	85	80	80
IBI rating	Excellent	Excellent	Excellent