Fish Inventories of Five Parks in the Northern Great Plains Network

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INTRODUCTION

The National Park Service is in the process of initiating baseline inventories of vascular plants and vertebrates in 265 parks, grouped into 32 networks nation-wide. The Great Plains Network contains 13 'park units' in North Dakota, South Dakota, Nebraska and Wyoming. Five of these units were selected for conducting fish inventories in 2001. These were Devils Tower NM, Mount Rushmore NM, Fort Laramie NHS, Scotts Bluff NM, and Wind Cave NP. Inventories were completed in September 2001 and findings are documented here.

The objectives of the inventories were:

1. Document 90% of the fish species in each park
2. Determine if plains topminnow, a state and global species of concern, occurs at Wind Cave N.P.
3. Create voucher specimens for all species that are new or do not have voucher specimens.

GENERAL METHODS

To document 90% of the fish inhabiting inventoried streams, we walked all, or portions of each stream and visually determined the predominant mesohabitat characteristics. Where possible, we then randomly selected three areas to sample. On streams with reasonable road access, sites were selected by stopping the vehicle at random locations, walking to the stream and setting up a 100 m sampling section measured along the thalweg, being careful to include the range of mesohabitats available. Where access was limited, sampling was conducted near access sites. Sampling occurred at base flow in all streams, except the North Platt River, using either a 10.6 m bag seine (0.63 cm mesh; 1.2 m deep) or backpack electrofishing unit. Where feasible, block nets (0.63 cm mesh) were placed at the upper and lower ends of sample sections. Seining was conducted in a down stream direction and electrofishing was conducted in an upstream direction. Sample locations were documented with a GPS reading at the upper and lower boundary where feasible and a photograph was taken. Three or four 100 m sections were sampled in all streams except those in Wind Cave N.P and Mount Rushmore. Fish sampled were anesthetized with oil of cloves, identified to species, counted, and released at the site of capture or euthanized and preserved in 10% formaldehyde as voucher specimens; unidentified specimens were also retained and identified in the laboratory at a later date. Voucher specimens were labeled with species, date, location, and collectors and deposited at the respective parks or their designated repository. Deviation from this general sampling protocol will be documented in the following results for each park.

RESULTS

Devils Tower National Monument

Approximately 1.6 km of the Belle Fourche River traverses Devils Tower N.M. The entire segment of stream was walked. Discharge, regulated by Keyhole Dam, was very low at 0.1 m3/s (3.3 cfs). Water clarity was fair. Mesohabitat was predominately shallow run/pool structure with a few small riffles. Substrate was predominately silt/sand with large rocks scattered throughout pools and runs; riffles had gravel to cobble size substrate; a few areas of bedrock were present. Aquatic plants occurred in some shallow areas. No trees occurred along the stream banks. The visual survey identified two large pools. One of these was randomly chosen for sampling. The remaining two sample sites were chosen near access sites, one near the middle of the segment and one at the upper end. Because of the large rock structure, electrofishing was the preferred sampling technique. However, electrofishing was ineffective, apparently due to high dissolved solids, and seining was used for all sampling.

Nine species of fish were collected and samples of each were retained as voucher specimens. Voucher specimens were delivered to Bruce Weisman at Mt. Rushmore N.M. Of the 13 potential fish species (list provided by the Park Service; Appendix 1), 7 were documented and 2 additional species (black bullhead and channel catfish) were captured. The three most abundant species were shorthead redhorse (30%), smallmouth bass (25%), and white sucker (20%). Although sand shiners made up only 10% of the fish sampled, a large school of 50 or more was observed in shallow water over bedrock. Based on the habitat conditions in the study area, it is surprising that common carp, creek chub, fathead minnow, and longnose dace were not represented in the samples.

Belle Fourche River

Site 1: Redbed area. 100 m; block nets used
Sampled September 11, 2001
Pool/run/riffle Photo's 1,2,3
Substrate silt and large rocks in pool; gravel, large rock, and bedrock in run and riffle.
GPS: (provided by Jim Cheatham)
upper X-coord: 523362.47219 lower X-coord: 523420.39479
Y-coord: 4936484.95797 Y-coord: 4936575.13182

Site 2: Upstream boundary of monument. 100m; block nets used
Sampled September 11, 2001
Pool/run/riffle (Photo 4)
Substrate silt and numerous large rocks. Difficult to seine. Gravel and cobble in riffle
GPS: upper X-coord: 523554.60768 lower X-coord: 523584.33101
Y-coord: 4936718.80466 Y-coord: 4938812.81351

Site 3: Erosion structure area upstream from bridge. Site accessed from prairie dog viewing pull-off. Downstream boundary of site at the base of the third concrete structure touching the water looking down stream (Photo 5)
Sampled September 12, 2001
Pool/run/ short riffle (Photo 6)
Substrate silt, cobble and numerous large rocks with gravel and cobble in riffle.
Difficult to seine.
GPS: upper X-coord: 523692.71604 lower X-coord: 523795.82209
Y-coord: 4937555.95285 Y-coord: 4937580.86101

Belle Fourche River

Potential species	Site 1	Site 2	Site 3	Total	Relative abundance (%)
common carp *Cyprinus carpio*					
creek chub ***Semotilus atromaculatus***					
fathead minnow *Pimephales promelas*					
flathead chub ***Platygobio gracilis***	0	1	1	2	3
lake chub *Couesius plumbeus*					
longnose dace *Rhinichthys cataractae*					
sand shiner *Notropis stramineus*	7	0	0	7	10
shorthead redhorse ***Moxostoma macrolepidotum***	10	5	6	21	30
quillback *Carpiodes cyprinus*					
white sucker ***Catostomus commersoni***	5	4	5	14	20
stonecat *Noturus flavus*	0	2	0	2	3
green sunfish	1	3	0	4	6

Lepomis cyanellus					
smallmouth bass	**4**	**8**	**6**	**18**	**25**
Micropterus dolomieu					
Other					
black bullhead	**2**	**0**	**0**	**2**	**3**
Ameiurus melas					
channel catfish					
Ictalurus punctatus	**0**	**1**	**0**	**1**	**1**
Total	**29**	**24**	**18**	**71**	

Mount Rushmore National Memorial

Segments of the three streams identified by on site staff as having water were sampled with electrofishing in Mount Rushmore National Memorial September 25 and 26, 2001. Of the five fish species on the potential species list (Appendix 1), only brook trout and longnose dace were sampled. Voucher specimens of these two species were transferred to Bruce Weisman, museum curator.

Grizzly Bear Creek: Only 51 m of Grizzly Bear Creek is within the memorial boundary and the entire reach was electrofished. Grizzly Bear Creek is a small cold-water stream with heavy canopy and a pool-riffle channel structure. Pools were formed by large boulders and substrate was predominately gravel and sand. Water clarity was excellent (Photo's 7-9). Discharge was low but the stream is perennial and is the largest stream in the memorial. Habitat was typical of small trout streams. We collected 84 brook trout and 3 longnose dace. GPS reading at the upper boundary was N 43 52 06; W 103 26 40. We were unable to obtain a reading at the lower boundary.

Starling Basin: A very small unnamed stream flows through Starling Basin. The stream was accessed from the "Profile" parking area down a rugged, high gradient slope. At the point of access, the stream was intermittent and located in a marshy meadow without tree canopy. Substrate was silt. Because of the poor access and lack of flowing water, we sampled the only pools (3) available and found no fish. Below the meadow area, the stream flowed into a higher gradient canyon area with heavy canopy and large rock outcroppings. Substrate was predominately sand and gravel, and pools were formed by large boulders (Photo 10). Although the stream was not intermittent in this area, flow was very low. The only habitat available was small pools. Nine of these were sampled and numbers of brook trout ranged from 0 to 6 per pool for a total catch of 22. No other species were sampled. We were successful in obtaining only one GPS reading: N 43 52 26.1; W 103 27 43.6. Although we did not find the park boundary markers, we evaluated approximately 0.8 km of stream and assume this included all portions within the park.

Lafferty Gulch: A very small unnamed stream flowed through Lafferty Gulch. The entire length was walked. Heavy canopy occurred throughout. The upper area was fairly low gradient and had only a trickle of water. Substrate was predominately silt. This stream receives sewage effluent from the headquarters area. No habitat suitable to support fish was found in the upper ¾ of the stream. In the lower ¼ the gradient increased and habitat was similar to that in Starling Basin, with a trickle of water and widely space pools. We electrofished the four largest pools and found no fish (Photo 11). These pools were similar to the pools in Starling Basin that contained brook trout. Gradient near the lower park boundary became very steep flowing through large boulders and then leveling off in the boundary area. Two pools, which appeared to provide excellent habitat for brook trout, were electrofished but no fish were observed (Photo 12). We were unable to get GPS readings. The lowermost two pools sampled were just upstream of a survey marker (T2S R6E S7 AP3).

Fort Laramie National Historic Site

The North Platte and Laramie rivers run through portions of Fort Laramie NHS. The total river length, both rivers combined, is approximately 4.8 km. Sampling was conducted September 26 and 27, 2001. We collected 17 of the 21 potential fish species (Appendix 1) and four additional species (red shiner, golden shiner, smallmouth bass, and white crappie). Voucher specimens of the 21 species sampled were provided to the museum curator.

North Platte River: About 1.6 km of the North Platte River forms the eastern border of the Fort Laramie NHS. The river is large and our sampling gear was inadequate to sample other than edge habitats and confined to the west side of the river (east side is not within the historic site). Flow on September 26 and 27 was approximately 5.1 m3/s (180 cfs) and 4.8 m3/s (170 cfs), respectively, at the USGS gauging station below Whalen Diversion Dam, WY. Channel structure at these flows was primarily run and riffle. Willows or gravel bars occurred along the banks in sampling areas. Gravel and cobble were the predominant substrates. Water clarity was fair. Seining, in a downstream direction, was used for all sampling. Block nets were not used. Because of inadequate access, two sampling sections were selected near the north boundary of the park and one near the confluence of the Laramie and North Platte rivers. Sites were selected to be representative of edge habitats available.

Fourteen fish species were collected, including three (red shiner, white crappie, and smallmouth bass) that were not on the list of potential species for the site (both rivers). The most abundant species were longnose sucker (52%), red shiner (27%), and white sucker (8%).

Site 1: Located approximately 300 m below the old bridge and just below rock remains of a former crossing (Photo 13).

Sampled September 26, 2001
Deep (1.2 m) to shallow run with a few areas of rooted aquatic plants along edge; low velocity
Substrate sand, gravel and cobble
GPS: Upper: N 42 12 34.5 (no lower reading)
W 104 31 58.05

Site 2: Located approximately 200 m downstream of site 1 (Photo 14)
Sampled September 26, 2001
Substrate large gravel
Run with water depth from 0.6 to 0.9 m with higher velocities than site 1
No aquatic vegetation
Site included a small side channel which was sampled
GPS: upper: N 42 12 28.3 lower: N 42 12 26.1
W 104 31 51.3 W 104 31 49.3

Site 3: Upstream from confluence of Laramie River approximately 500 m (Photo 15)
Sampled September 27, 2001
Substrate large gravel
Fairly low velocity shallow run along a gravel bar; no plants
GPS: upper: N 42 12 15.0 lower: N 42 12 11.4
W 104 31 45.1 W 104 31 44.6

North Platte River Fort Laramie NHS

Potential species		**Site**			**Total**	**Relative abundance %**
		1	**2**	**3**		
bigmouth shiner	***Notropis dorsalis***	**1**			**1**	**0.4**
brassy minnow	***Hybognathus hankinsoni***					
common carp	***Cyprinus carpio***					
common shiner	***Luxilus cornutus***	**7**			**7**	**3**
creek chub	***Semotilus atromaculatus***	**1**			**1**	**0.4**
emerald shiner	***Notropis atherinoides***	**1**			**1**	**0.4**
fathead minnow	***Pimephales promelas***					
hornyhead chub	***Nocomis biguttatus***					
longnose dace	***Rhinichthys cataractae***					
sand shiner	***Notropis stramineus***	**10**			**10**	**4**
central stoneroller	***Campostoma anomalum***	**2**	**3**		**5**	**2**
suckermouth minnow	***Phenacobius mirabilis***	**1**			**1**	**0.4**
longnose sucker	***Catostomus catostomus***	**8**	**112**	**7**	**127**	**52**
white sucker	***Catostomus commersoni***	**8**	**11**	**1**	**20**	**8**
stonecat	***Noturus flavus***		**1**		**1**	**0.4**

brown trout	***Salmo trutta***					
rainbow trout	***Oncorhynchus mykiss***					
plains killifish	***Fundulus zebrinus***					
green sunfish	***Lepomis cyanellus***					
yellow perch	***Perca flavescens***					
johnny darter	***Etheostoma nigrum***					
Other						
red shiner	***Cyprinella lutrensis***	**65**			**65**	**27**
smallmouth bass	***Micropterus dolomieu***	**1**			**1**	**0.4**
white crappie	***Pomoxis annularis***	**1**			**1**	**0.4**
Total		**106**	**127**	**9**	**242**	

Laramie River: Approximately 3.2 km of the Laramie River traverse Fort Laramie NHS. The river has a diversity of habitat and appears in reasonably good condition. Water clarity was good and the river gives the appearance of a fairly low gradient pool/run/riffle prairie trout stream. We collected two large and one small brown trout, which suggests that the area is a transition zone between warm-water and cold-water habitats. Riparian vegetation ranged from a few large deciduous trees, to willow thickets, to grasses. Few rooted aquatic plants were observed except for cattail in the backwater areas, but mats of algae were present in low velocity areas. Substrate ranged from silt to cobble; some woody debris was present. Sampling was conducted September 27, 2001. Flow was approximately 1.5 m3/s (52 cfs) (USGS gauging station located on site). Electrofishing was the source of all samples. Discharge was too large to use block nets. An access road paralleled about 1.6 km of the river. Habitat reconnaissance was conducted by driving along the river, stopping frequently, and walking to the river. Three 100-meter sections were randomly selected along this reach. All habitat types identified were represented among these samples.

Sixteen fish species were collected, including three not on the potential species list (red shiner, smallmouth bass, and golden shiner). White suckers made up 58% of the catch, followed by longnose dace (13%), creek chub (9%) and johnny darter (6%).

Site 1: Backwater, riffle tail-out, and pool/run habitat (Photo 16)
Substrate was deep silt in the backwater and gravel/cobble elsewhere.
Water depth variable from about 1 m to a few centimeters.
Cattails and algae mats in backwater area.
Low to swift current
GPS: upper: N 42 12 2.5 lower: N 42 12 3.1
W 104 32 44.3 W 104 32 40.5

Site 2: Riffle, run, pool habitat Photo's 17 (lower end looking up stream) and 18 (upper end looking downstream)

Substrate gravel and cobble
Water depth variable from about 1.2 m to very shallow
Root wad forming small but fairly deep pool (brown trout collected here)
Low to swift velocity
GPS: upper: N 42 12 7.4 lower: N 42 12 8.2
W 104 32 58.8 W 104 32 54.2

Site 3: Located approximately 75 m above bridge.
Riffle, run, pool, undercut bank habitat Photo's 19 (looking upstream from about the ¼ point) and 20 (looking downstream to end at small islands)
Substrate gravel/cobble
Water depth variable from about 1 m to very shallow
Low to moderate velocity
GPS: upper: N 42 12 1.2 lower: N 42 12 2.5
W 104 32 14.7 W 104 32 10.8

Laramie River Fort Laramie NHS

Potential species		Site 1	Site 2	Site 3	Total	Relative abundance (%)
bigmouth shiner	***Notropis dorsalis***	**3**		**2**	**5**	**1**
brassy minnow	***Hybognathus hankinsoni***	**5**		**3**	**8**	**2**
common carp	***Cyprinus carpio***	**3**	**1**	**8**	**12**	**3**
common shiner	***Luxilus cornutus***					
creek chub	***Semotilus atromaculatus***			**41**	**41**	**9**
emerald shiner	***Notropis atherinoides***					
fathead minnow	***Pimephales promelas***	**2**			**2**	**0.5**
hornyhead chub	***Nocomis biguttatus***					
longnose dace	***Rhinichthys cataractae***	**6**	**31**	**20**	**57**	**13**
sand shiner	***Notropis stramineus***	**9**		**1**	**10**	**2**
central stoneroller	***Campostoma anomalum***					
suckermouth minnow	***Phenacobius mirabilis***	**1**			**1**	**0.2**
longnose sucker	***Catostomus catostomus***	**4**		**11**	**15**	**3**
white sucker	***Catostomus commersoni***	**123**	**12**	**121**	**256**	**58**
stonecat	***Noturus flavus***					
brown trout	***Salmo trutta***		**3**		**3**	**0.7**
rainbow trout	***Oncorhynchus mykiss***					
plains killifish	***Fundulus zebrinus***					
green sunfish	***Lepomis cyanellus***					
yellow perch	***Perca flavescens***		**1**		**1**	**0.2**
johnny darter	***Etheostoma nigrum***	**9**	**14**	**3**	**26**	**6**

Other						
red shiner	*Cyprinella lutrensis*		**1**	**1**	**2**	**0.5**
golden shiner	*Notemigonus crysoleucas*	**1**			**1**	**0.2**
smallmouth bass	*Micropterus dolomieu*			**1**	**1**	**0.2**
Total		**166**	**63**	**212**	**441**	

Scotts Bluff National Monument

Approximately 1.6 km of the North Platte River forms the northern boundary of Scotts Bluff National Monument. An irrigation canal parallels the river for about ¾ of this length. The North Platt is large in this area and was flowing about 16.8 m3/s (600 cfs) at the time of sampling, September 28 and 29, 2001. Although access was good, our sampling equipment was inadequate to sample other than shallow edge areas. Sampling was not random. We located two areas associated with inside river bends that were shallow enough for a 100 m sample, as well as a side channel. Areas sampled in the main channel were diverse in terms of both structural habitat, and depth and velocity. Sand was the predominant substrate and both areas had sand bars. Some woody debris was present. The side channel was not flowing but contained meander-associated pools that were too deep to sample. The water was turbid except in the upper reaches of the side channel. Seining, in a downstream direction, was used for all sampling. Block nets were not used.

The irrigation canal provided excellent sampling conditions. The canal was about 10 m wide and up to 1 m deep, with a solid sand substrate. The canal was somewhat sinuous and provided some diversity of habitat, including occasional instream woody structure. Canal habitat was visually surveyed either from the vehicle or by stopping at points along the access road. Three 100 m sections were randomly selected for sampling.

Twenty-one fish species were collected (17 in the North Platte River and 14 in the canal). Nine species on the potential species list (Appendix 1) were not collected but six species not on the list were sampled. Probably seven of the eight potential species not sampled are present within the monument but were not sampled due to inadequate sampling gear for a large river. Sand shiner was the predominant species (34%), followed by red shiner (19%), longnose sucker (11%), bigmouth shiner (10%) and flathead chub (8% and not on the list of potential species).

North Platte River

Site 1: Inside river bend with sand bars (Photo 21) located just up river from the irrigation canal inlet.
Sampled September 28, 2001
Sampled were taken both inside and outside the sand bar complex
Substrate sand with some woody debris
Range of velocities, and depths up to about 1.2 m.
Riffle/run habitat
GPS: upper: N 41 51 22.0 W 103 42 24.8 lower: N 41 51 21.4 W 103 42 21.1

Site 2: Inside river bend with sand bar (Photo 22 top end looking down river; Photo 23 bottom end looking up river)
Sampled September 29, 2001
Sampled both inside and outside of the sand bar
Substrate sand and some woody debris; roots of large tree laying on the sand bar extended into the water, forming a deep eddy area on the main channel side of the bar
Range of velocities, and depths to about 1.5 m.
Riffle/run habitat
GPS: upper: N 41 51 0 8.6 W 103 41 26.7 lower: N 41 51 06.0 W 103 41 24.8

Site 3: Side channel located about ¼ mile up river from irrigation diversion intake (Photo 24 looking up channel from mouth; Photo 25 example of clear water habitat at upper part of 100 m section)
Sampled September 29, 2001
Width approximately 6 m; depth 0.3 to >1.5 m, average approximately 1 m.
No flow
Backwater type habitat; tall grass along banks
GPS upper: N 41 51 21.2 W 103 42 30.4 lower: N 41 51 21.7 W 103 42 26.7

Potential species		Site 1	Site 2	Site 3	Total	Relative abundance (%)
gizzard shad	*Dorosoma cepedianum*			1	1	0.2
bigmouth shiner	*Notropis dorsalis*	6	37	4	47	10
common carp	*Cyprinus carpio*					
creek chub	*Semotilus atromaculatus*			15	15	3
fathead minnow	*Pimephales promelas*			1	1	0.2
longnose dace	*Rhinichthys cataractae*	5	6		11	2
red shiner	*Cyprinella lutrensis*		18	73	91	19
river shiner	*Notropis blennius*					
sand shiner	*Notropis stramineus*	11	116	35	162	34
central stoneroller	*Campostoma anomalum*					
longnose sucker	*Catostomus catostomus*	9	38	4	51	11
white sucker	*Catostomus commersoni*	28	9	5	42	9
shorthead redhorse	*Moxostoma macroplepidotum*		2		2	0.4
quillback	*Carpiodes cyprinus*	4	1	2	7	1
channel catfish	*Ictalurus punctatus*					
stonecat	*Noturus flavus*					
tadpole madtom	*Noturus gyrinus*					
northern pike	*Esox lucius*					
brown trout	*Salmo trutta*					
plains killifish	*Fundulus zebrinus*					
white bass	*Morone chrysops*					
bluegill	*Lepomis macrochirus*					
orangethroat darter	*Etheostoma spectabile*					
walleye	*Stizostedion vitreum*					
Other						
brassy minnow	*Hybognathus hankinsoni*			1	1	0.2
common shiner	*Luxilus cornutus*			2	2	0.4
emerald shiner	*Notropis atherinoides*			3	3	0.6
flathead chub	*Platygobio gracilis*		38		38	8
plains minnow	*Hybognathus placitus*		2		2	0.4
suckermouth minnow	*Phenacobius mirabilis*		2		2	0.4
Total		63	269	146	478	

Central Irrigation Canal North Platte River

Site 1: Channel structure similar to natural stream (Photo 26).
Root wad across from point bar
Sampled September 28, 2001
Run/pool habitat
Depth ranging from 0.3-1 m
Solid sand substrate and no in-channel obstructions
Velocity fairly low
GPS: upper: N 41 51 12.8 W103 41 51.9 lower: N 41 51 10.7 103 41 47.5

Site 2: Sand bar at upper (Photo 27 looking downstream) and lower (Photo 28 looking upstream) ends of section
Sampled September 29, 2001
Small side channel associated with both sand bars
Run/pool habitat
Depth 0.3-1 m
Solid sand substrate except near upper bar which had deep silt
Velocity moderate at upper end and low at lower end
GPS: upper: N 41 51 13.8 W 103 42 0.1 lower: N 41 51 13.7 W 103 41 55.4

Site 3: Recently dredged area approximately 50 m below irrigation canal inlet (Photo 29) and just below the swift water riffle formed by rock placed for erosion control
Sampled September 29, 2001
Shallow (0.3-0.6 m) run habitat
Soft sand substrate with dunes
GPS: upper: N 41 52 20.0 W 103 42 18.5 lower: N 41 51 18.8 W 103 42 13.9

Potential species		Site 1	Site 2	Site 3	Total	Relative abundance (%)
gizzard shad	*Dorosoma cepedianum*					
bigmouth shiner	*Notropis dorsalis*	1			1	0.3
common carp	*Cyprinus carpio*	1			1	0.3
creek chub	*Semotilus atromaculatus*	1		2	3	0.9
fathead minnow	*Pimephales promelas*		1	1	2	0.6
longnose dace	*Rhinichthys cataractae*	5	16		21	6
red shiner	*Cyprinella lutrensis*					
river shiner	*Notropis blennius*					
sand shiner	*Notropis stramineus*	22	50	6	78	24
central stoneroller	*Campostoma anomalum*	2	1		3	0.9
white sucker	*Catostomus commersoni*	23	26	4	53	16
longnose sucker	*Catostomus catostomus*	64	34	15	113	34
shorthead redhorse	*Moxostoma macroplepidotum*	1	4		5	1.5
quillback	*Carpiodes cyprinus*	5	11		16	5
channel catfish	*Ictalurus punctatus*	2	2	2	6	2
stonecat	*Noturus flavus*					
tadpole madtom	*Noturus gyrinus*					
northern pike	*Esox lucius*					
brown trout	*Salmo trutta*					
plains killifish	*Fundulus zebrinus*	1			1	0.3
white bass	*Morone chrysops*					
bluegill	*Lepomis macrochirus*					
orangethroat darter	*Etheostoma spectabile*					
walleye	*Stizostedion vitreum*					
Other						
flathead chub	*Platygobio gracilis*	1	25		26	8
Total		129	170	30	329	

Wind Cave National Park

The focus of the sampling at Wind Cave National Park was to determine if plains topminnow occur there. Pool habitat most likely to contain plains topminnows was targeted. Three streams were surveyed (upper Highland, Beaver and Cold Springs creeks), but none provided typical habitat for plains topminnow. Except for Highland

Creek, access was poor for sampling with heavy equipment. Although seining was the preferred sampling technique, all streams contained cobble substrate making electrofishing the only feasible approach. Five of the six potential species (Appendix 1) were sampled plus two species (white sucker and black bullhead) not on the list. Voucher specimens of seven fish species collected were provided to park personnel. No plains topminnows were found.

Highland Creek: We visually surveyed most of Highland Creek, which flows into the Park from the north for approximately 1.6 km before going underground. In the upper area (above the bison corrals) the stream is low gradient lacking woody riparian vegetation (Photo 30-32). Below the bison corrals gradient increases and scattered conifers occur in the riparian zone (Photo's 33-34). Channel structure is predominately pool/run and substrate ranged from gravel to boulder. The water was clear and cool, and stream habitat was typical of a small trout stream. Aquatic vegetation occurred throughout but was most dense in open-canopy areas.

Highland Creek was sampled September 13, 2001. Electrofishing, from near the point of underground flow, upstream for a few hundred meters produced no fish. In previous sampling, South Dakota Game, Fish and Parks (SDGFP) personnel also found no fish in this area. A 100 m section was sampled farther upstream where Dan Roddy said SDGFP began to find brook trout (Photo's 33-34). Although this section was down stream several hundred meters of where SDGFP collected 42 brook trout (their 100 m section started about 100 m below the corrals), only 2 brook trout were captured and we were concerned that the electrofishing equipment was not functioning properly. Also a fish kill had been documented in the upstream area earlier in the summer and there was concern that the brook trout population had been greatly reduced. However, a 100 m electrofishing section starting at the downstream side of the road crossing (Photo's 30-32) produced 43 brook trout, 8 to 20 cm total length, almost identical to densities reported by SDGFP in June 1997. No other fish species were found.

Beaver Creek: Beaver Creek flows into Wind Cave NP from the east. About 4 km from the park boundary it goes underground. Access to the stream was poor. We walked approximately ¾ of the stream length. We accessed the portions of the stream above the confluence of Cold Springs Creek from the highway bridge (Photo 35), down a steep slope. The stream was small and fairly low gradient. Substrate ranged from silt to cobble with a scatter of boulders, bed rock and some woody debris. Channel structure was primarily run/pool with a few small riffles. Riparian vegetation varied from open meadow to heavy canopy. The water was clear and discharge low. We electrofished one, 100 m section approximately 500 m upstream of the bridge (Photo's 36-37) on September 14, 2001. Three longnose dace (*Rhinichthys cataractae)* and five brook trout (*Salvelinus fontinalis)* were captured. The stream above this point to near the park boundary was walked and had similar habitat to the area downstream of the bridge and was not sampled. Since we were specifically focusing on plains topminnow habitat we sampled low velocity pools as we moved down stream to near the confluence of Cold Springs Creek. GPS readings were not taken. Fish species collected were limited to

longnose dace, brook trout and creek chub (*Semotilus atromaculatus*): Pool 1: 1 longnose dace and 1 brook trout (Photo 38); Pool 2: 3 brook trout; Pool 3: 3 brook trout (Photo 39); Pool 4: 2 longnose dace; Pool 5: 1 longnose dace and 1 creek chub.

Lower Beaver Creek and Cold Spring Creek were accessed by trail. We walked down Beaver Creek from the confluence of Cold Springs Creek to approximately 0.4 km from where it goes underground, marking representative pools (Photo's 40-42 are examples). We sampled 6 pools on September 14, 2001, starting from downstream (pool 1). Habitat in lower Beaver Creek was a mixture of slow, fairly deep pools, long shallow low gradient runs and short riffles. Substrate was silt, gravel and cobble with some boulder sized rock and woody debris. Riparian vegetation varied from grasses to shrubs with a few larger trees. Six fish species were sampled, five that were included on the potential species list and one additional species (white sucker). White sucker, however, had been collected previously by South Dakota Game, Fish, and Parks in 1997 and should have been included on the potential species list.

Potential species	**Pool**							
	1	**2**	**3**	**4**	**5**	**6**	**Total**	**%**
creek chub *Semotilus atromaculatus*	**5**		**4**	**1**	**10**	**22**	**42**	**27**
fathead minnow *Pimephales promelas*				**3**		**2**	**5**	**3**
longnose dace *Rhinichthys cataractae*	**3**	**1**	**2**	**3**	**7**	**6**	**22**	**14**
mountain sucker *Catostomus platyrhynchus*	**10**	**3**				**4**	**17**	**11**
brook trout *Salvelinus fontinalis*			**3**		**1**	**1**	**5**	**3**
plains topminnow *Fundulus sciadicus*								
Other:								
white sucker *Catostomus commersoni*	**11**	**3**	**7**	**8**	**11**	**27**	**67**	**42**
Total	**29**	**7**	**16**	**15**	**29**	**62**	**158**	

Cold Springs Creek: Cold Springs Creek flows into Wind Cave NP from the east and terminates at its confluence with Beaver Creek about 3.2 km downstream. Six representative pools in Cold Springs Creek were sampled September 14, 2001 beginning at the confluence of Cold Springs and Beaver creeks and moving upstream to near the road crossing. No sampling occurred above the road. Habitat was similar to Beaver

Creek (Photo's 43-44 are examples). Riparian vegetation ranged from forbs to shrubs and substrate from silt to boulders with some instream woody debris. Discharge was low and water was clear. Rooted aquatic vegetation and floating algae masses were present in low gradient open canopy areas. All six fish species collected in Beaver Creek were present in Cold Springs Creek, as well as a black bullhead collected in a large deep pool. No plains topminnows were found.

Potential species	**Pool**							
	1	**2**	**3**	**4**	**5**	**6**	**Total**	**%**
creek chub *Semotilus atromaculatus*	**3**		**1**		**3**	**23**	**30**	**10**
fathead minnow *Pimephales promelas*	**1**	**13**	**25**		**8**	**61**	**108**	**36**
longnose dace *Rhinichthys cataractae*	**7**			**2**	**2**	**14**	**25**	**8**
mountain sucker *Catostomus platyrhynchus*					**1**		**1**	**0.3**
brook trout *Salvelinus fontinalis*		**1**		**18**	**24**		**43**	**14**
plains topminnow *Fundulus sciadicus*								
Other								
white sucker *Catostomus commersoni*	**9**	**23**	**5**		**11**	**42**	**90**	**30**
black bullhead *Ameiurus melas*			**1**				**1**	**0.3**
Total	**20**	**37**	**32**	**20**	**49**	**140**	**298**	

DISCUSSION

We documented 40 % (Mount Rushmore; MORU), 54% (Devils Tower; DETO), 62% (Scotts Bluff; SCBL), 81% (Fort Laramie; FOLA) and 83% (Wind Cave; WICA) of the fish species on the list of expected species provided by the Park Service for the five Park Service Units sampled (Appendix 1). The list of potential species was compiled based on previous sampling and on experience of biologist familiar with the areas. We also documented 2 additional species in both DETO and WICA, 4 in FOLA, and 6 in SCBL; in MORU, where only 2 (40%) of the 5 expected species were documented, no additional species were collected. Often a species not on the list was a major contributor to relative abundance. The best documentation of expected species was from FOLA (17 of 21; 81%) and WICA (5 of 6; 83%), both of which had been sampled previously. Over all five parks, 20% of the species collected were not on the expected species list and 11 of the 39 species expected were not found (lake chub, hornyhead chub, northern pike, orangethroat darter, bluegill, white bass, river shiner, madtom, walleye, plains topminnow and rainbow trout). Deviation from the expected species list was likely due to a combination of lack of prior knowledge of the streams sampled resulting in an inadequate species list, and to inadequate sampling techniques in the North Platt and Belle Fourche rivers.

We believe our sampling was efficient in all park units except DETO, where electrofishing was inefficient, and large cobble/boulders made seining difficult, and in the North Platt River in SCBL and FOLA where flows were high and sampling was relegated to edge habitat using a 10.6 m bag seine. With more intense sampling in FOLA and sampling the North Platte River at lower flow and using boat electrofishing, several of the expected species, such as walleye, would likely be documented.

The focus of sampling at Wind Cave National Park was to determine if plains topminnow occur there. Because of this, pool habitat most likely to be inhabited by plains topminnow was targeted. After observing the habitat available in park streams, we were not surprised that the minnow was not found since none provided typical habitat. We believe sampling was sufficient to detect the minnow if it occurred in the park.

Appendix 1. Table of expected fish species in parks to be inventoried. A gray box indicates species documented in previous studies.

Fish species		DETO	FOLA	SCBL	MORU	WICA
Common name	**Scientific name**					
Creek chub	*Semotilus atromaculatus*	X		X ✓		
Fathead minnow	*Pimephales promelas*	X	X ✓	X ✓		
Flathead chub	*Platygobio gracilis*	X				
Lake chub	*Coeusius plumbeus*	X				
Longnose dace	*Rhinichthys cataractae*	X		X ✓	X	
Sand shiner	*Notropis stramineus*	X	X ✓	X		
Northern redhorse	*Moxostoma macroplepidotum*	X		X		
Quillback	*Carpiodes cyprinus*	X		X		
White sucker	*Catostomus commersoni*	X		X ✓	X	
Stonecat	*Notourus flavus*	X	X ✓	X ✓		
Smallmouth bass	*Micropterus dolomieui*	X				
Bigmouth shiner	*Notropis dorsalis*		X	X		
Brassy minnow	*Hybognathus hankinsoni*		X			
Common shiner	*Luxilus comutus*		X			
Emerald shiner	*Notropis atherinoides*		X			
Stoneroller	*Campostoma anomalum*			X ✓		
Longnose sucker	*Catostomus catostomus*			X ✓		
Plains killifish	*Fundulus zebrinus*		X	X ✓		
Johnny darter	*Etheostoma nigrum*					
Suckermouth minnow	*Phenacobius mirabilis*		X			
Horneyhead chub	*Nocomis biguttatus*		X			
Red shiner	*Cyprinella lutrensis*			X		
Northern pike	*Esox lucius*			X		
Orangethroat darter	*Etheostoma spectabile*			X		
Channel catfish	*Ictalurus punctatus*			X		
Bluegill	*Lepomis macrochirus*			X		
White bass	*Morone chrysops*			X		
Gizzard shad	*Nematalosa nasus*			X		
~~Sand shiner~~	~~*Notropis stramineus*~~			X		
River shiner	*Notropis blennius*			X		
~~Bigmouth shiner~~	~~*Notropis dorsalis*~~			X		
Madtom	*Noturus gyrinus*			X		
Walleye	*Stizostedion vietrum*			X		
Mountain sucker	*Catostomus platyrhynchus*				X	
Plains topminnow	*Fundulus sciadicus*					X
Exotic species						
Common carp	*Cyprinus carpio*	X		X ✓	X	
Green sunfish	*Lepomis cyanellus*	X	X ✓			
Yellow perch	*Perca flavescens*					
Rainbow trout	*Oncorhyncus mykiss*		X			
Brown trout	*Salmo trutta*		X	X		
Brook trout	*Salvenlinus fontinalus*				X	

PHOTOGRAPHS OF SAMPLING SITES

Devils Tower National Monument

Belle Fourche River

Photo 1. Redbed area (site 1)
2. Redbed area (site 1)
3. Redbed area (site 1)
4. Upstream boundary of monument (site 2)
5. Erosion structure area, downstream boundary of site at base of 3rd concrete structure touching water (site 3).
6. Looking upstream from downstream boundary (site 3).

Mount Rushmore National Memorial

Grizzly Bear Creek

Photo 7. Habitat type sampled (site 1).
8. Habitat type sampled (site 1).
9. Habitat type sampled (site 1).

Starling Basin

Photo 10. Example of pools sampled

Lafferty Gulch

Photo 11. Upper pool
12. Lower pool

Fort Laramie National Historic Site

North Platte River

Photo 13. Site 1
14. Site 2
15. Site 3

Laramie River

Photo 16. Site 1
17. Site 2 lower end looking upstream
18. Site 2 upper end looking downstream

19. Site 3 looking upstream from about ¼ point
20. Site 3 looking downstream to end at small island

Scotts Bluff National Monument

North Platte River

Photo 21. Site 1 inside river bend up from irrigation canal inlet
22. Site 2 top end, looking down
23. Site 2 bottom end looking up
24. Site 3 looking up side channel from mouth
25. Site 3 example of clear water habitat in upper part of side channel

Central Irrigation Canal North Platte River

Photo 26. Site 1 top end looking down
27. Site 2 top end looking down
28. Site 2 bottom end looking up
29. Site 3 top end looking down

Wind Cave National Park

Highland Creek

Photo 30. Site 1 upper end looking down from road toward bison correls
31. Site 1 lower end at riffle
32. Site 1 middle of section
33. Site 2 showing general habitat type
34. Site 2 showing general habitat type

Beaver Creek

Photo 35. Area of access to stream
36. Site 1 lower end looking up
37. Site 1 upper boundary looking down
38. Low velocity pool 1
39. Low velocity pool 3
40. Example of pools sampled
41. Example of pools sampled
42. Example of pools sampled

Cold Springs Creek

Photo 43. Example of habitat sampled
44. Example of habitat sampled

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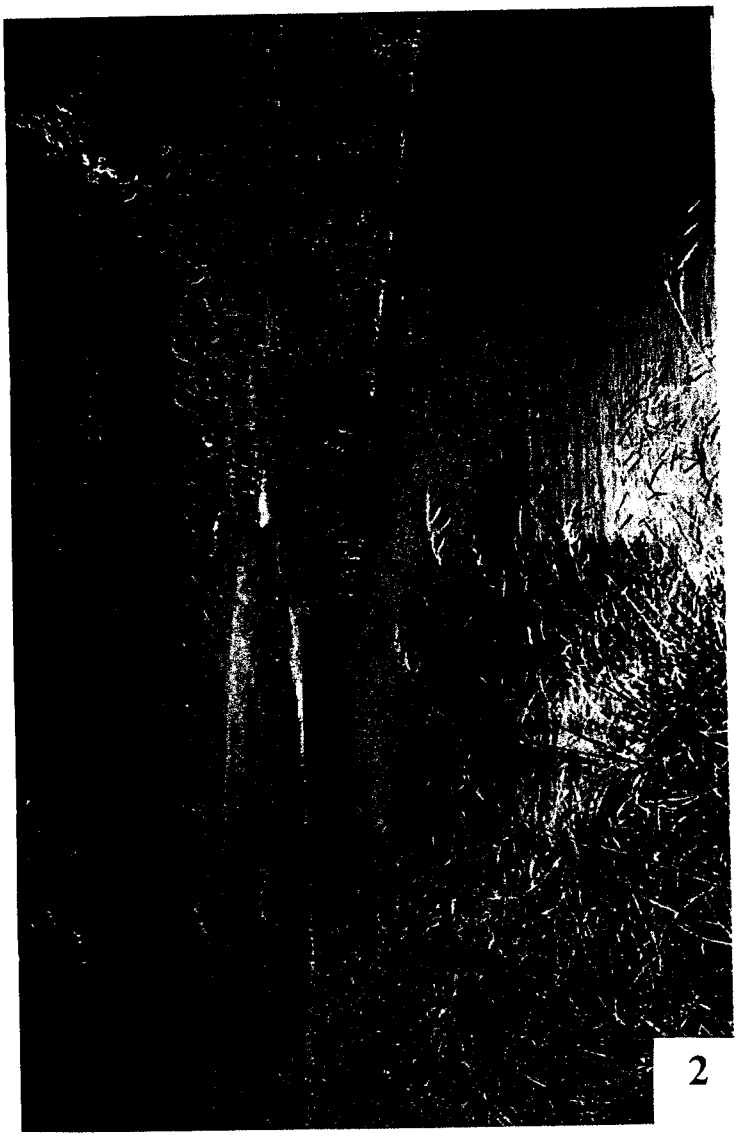

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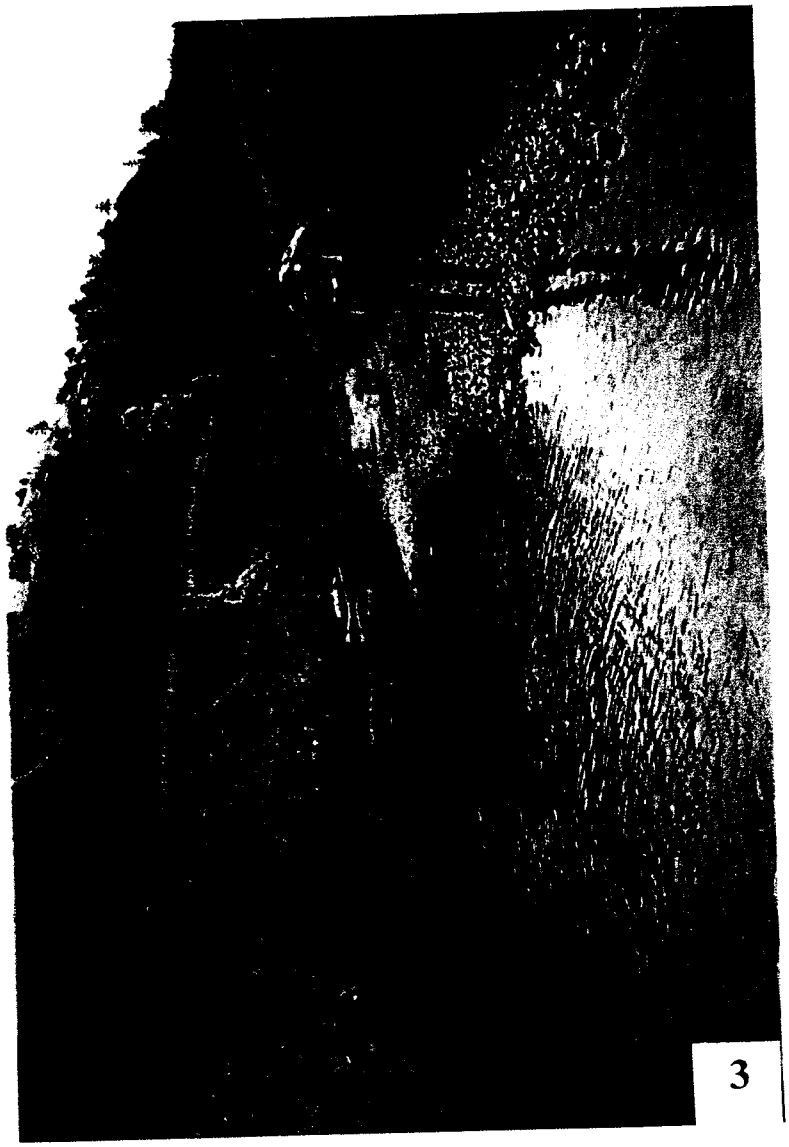

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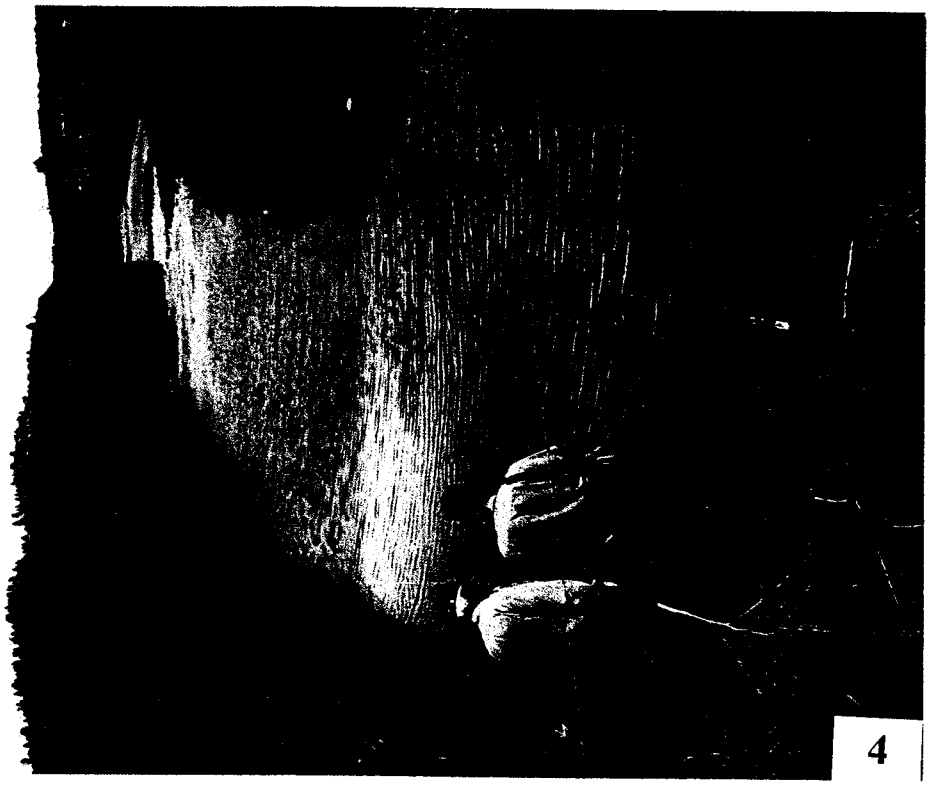

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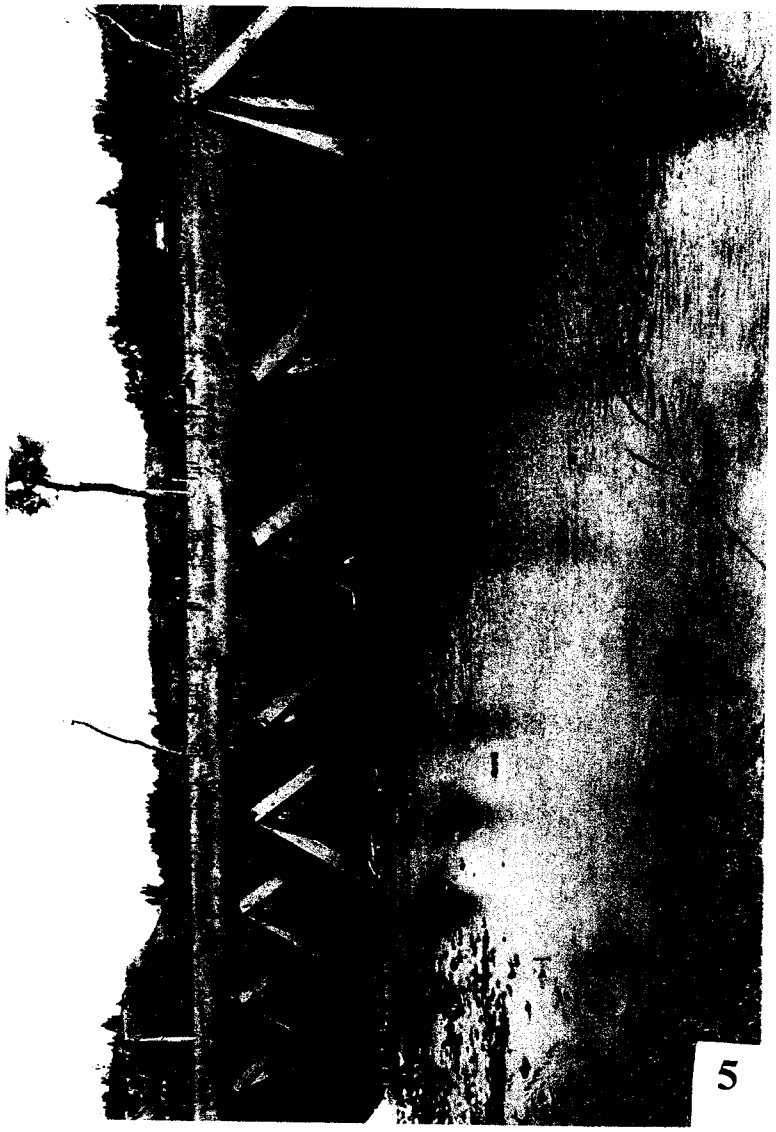

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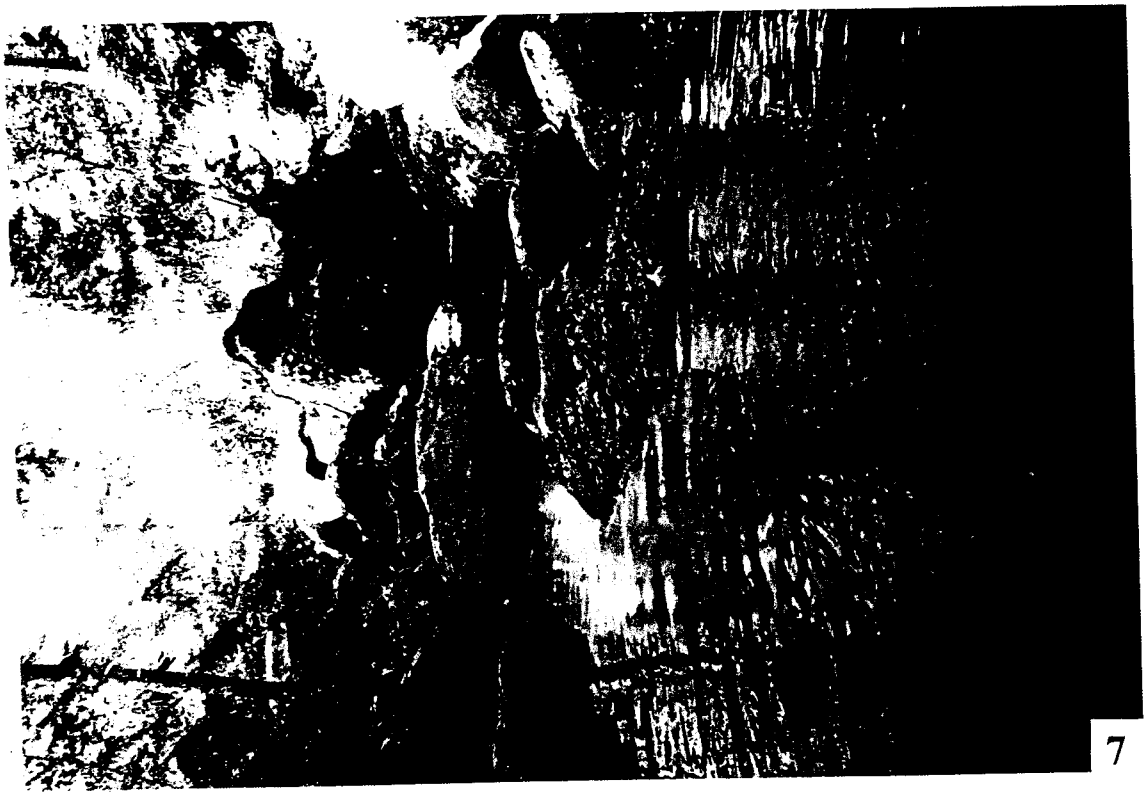

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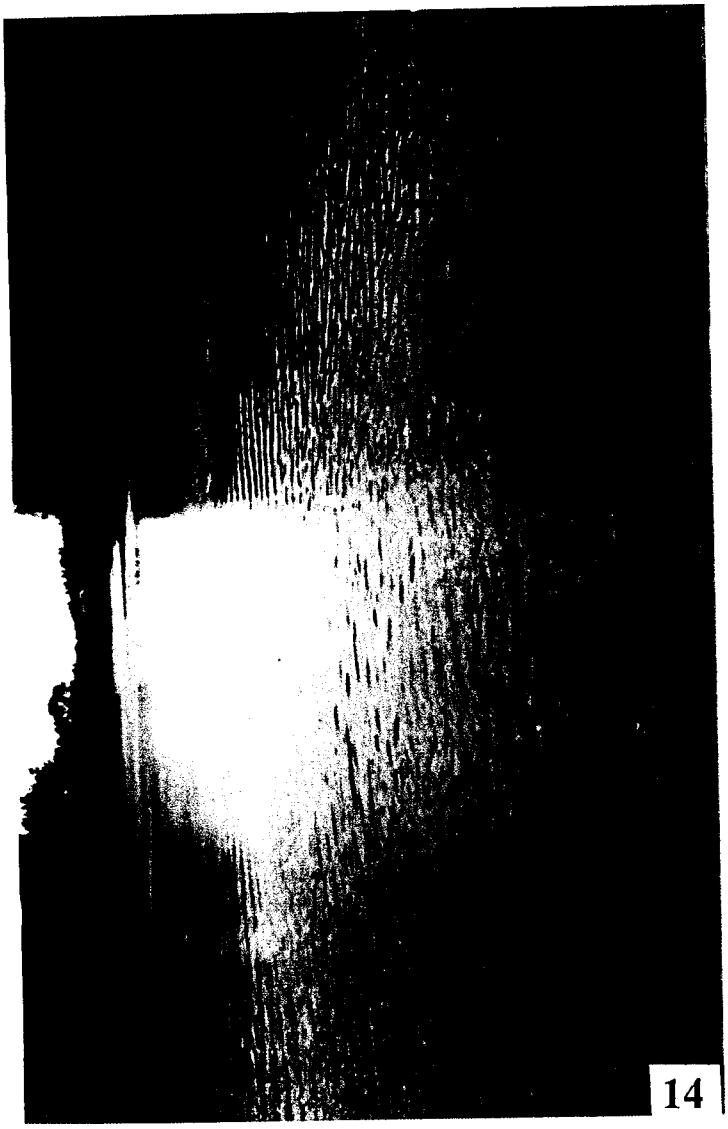

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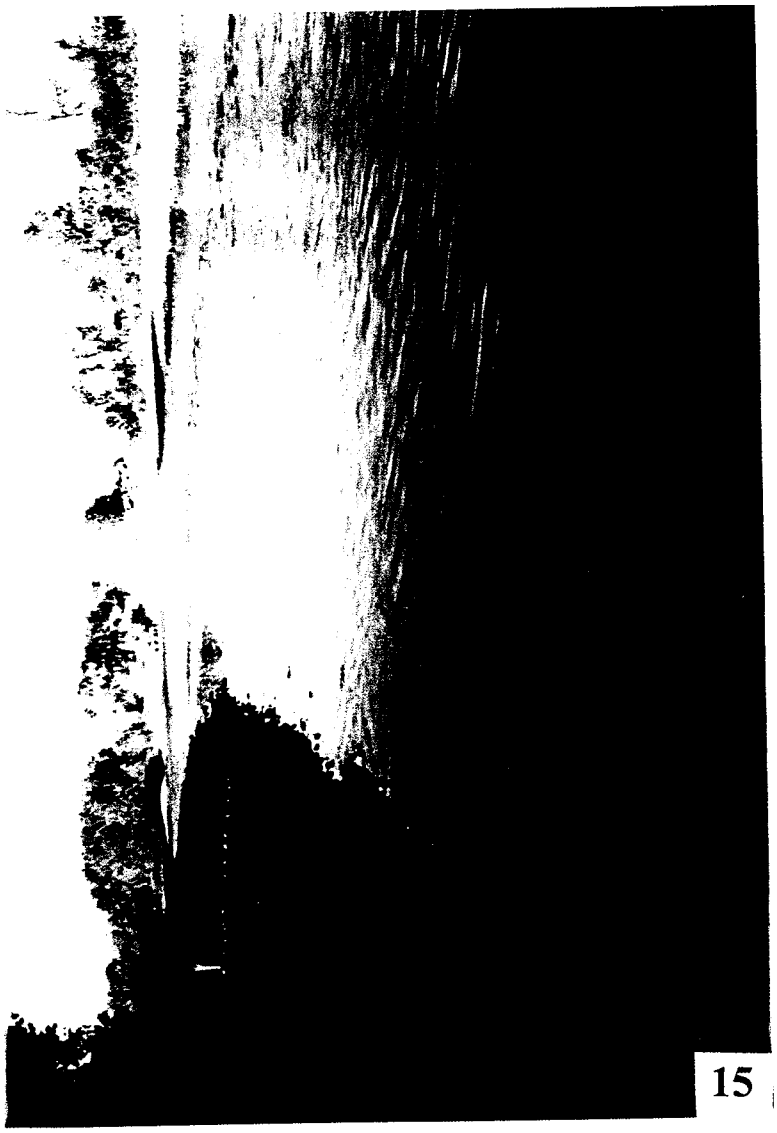

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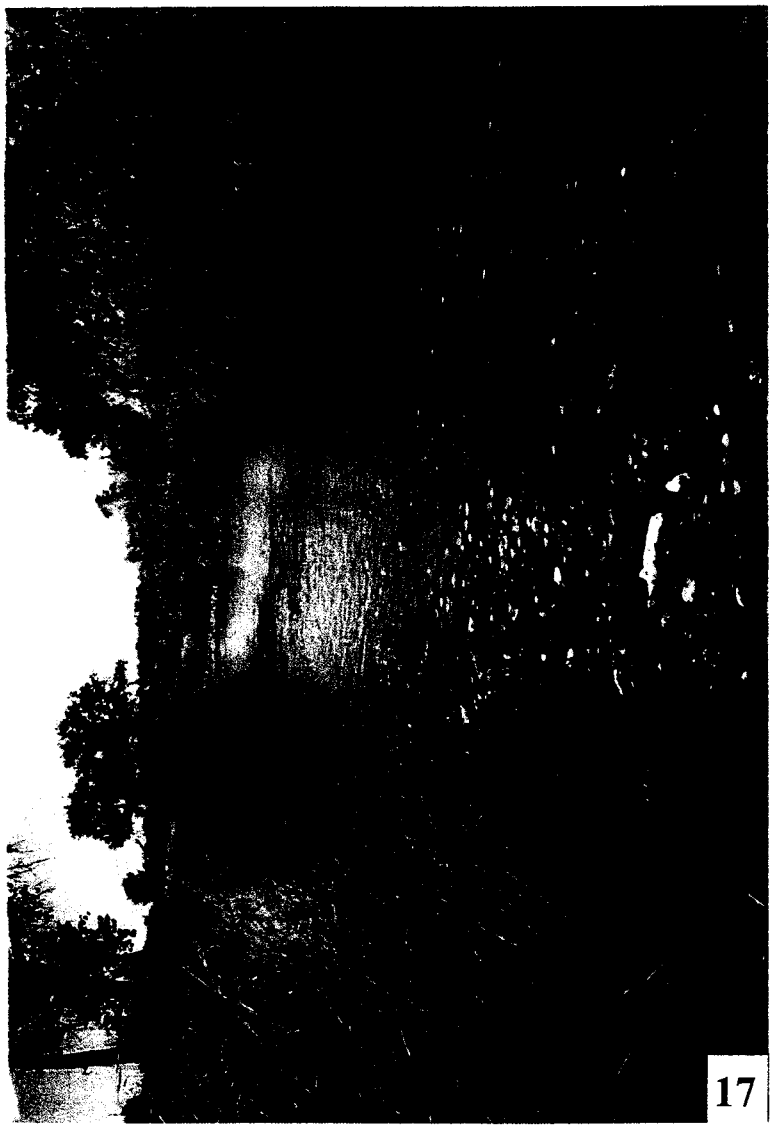

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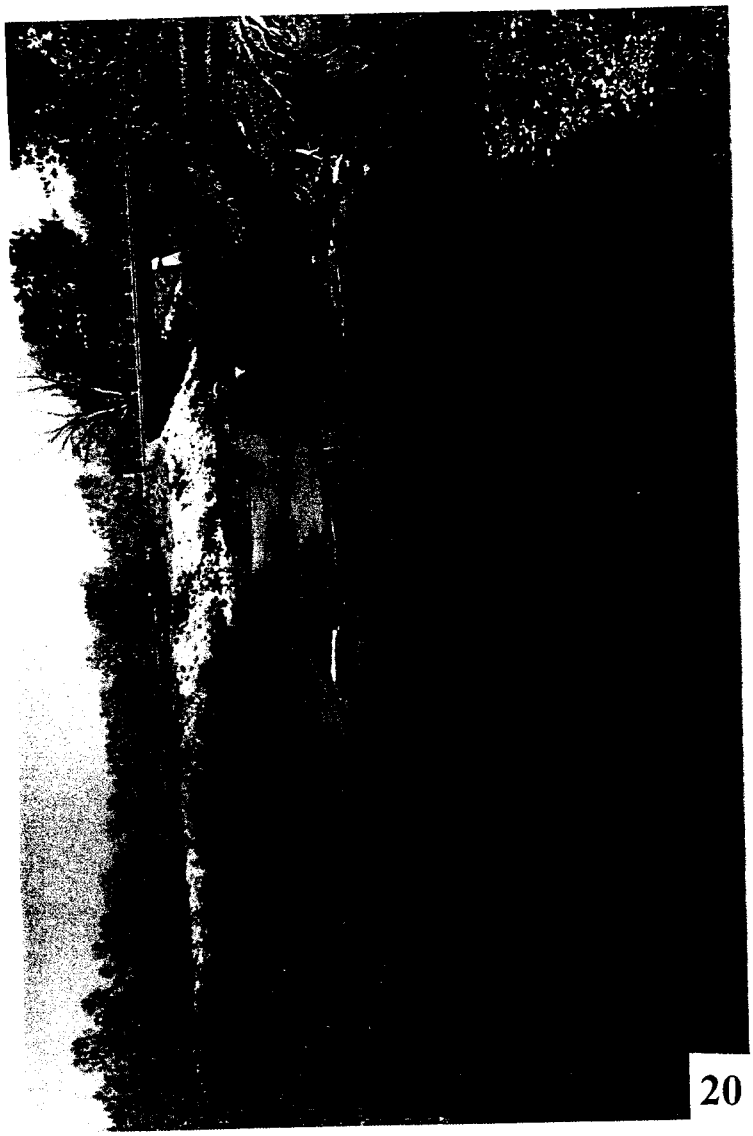

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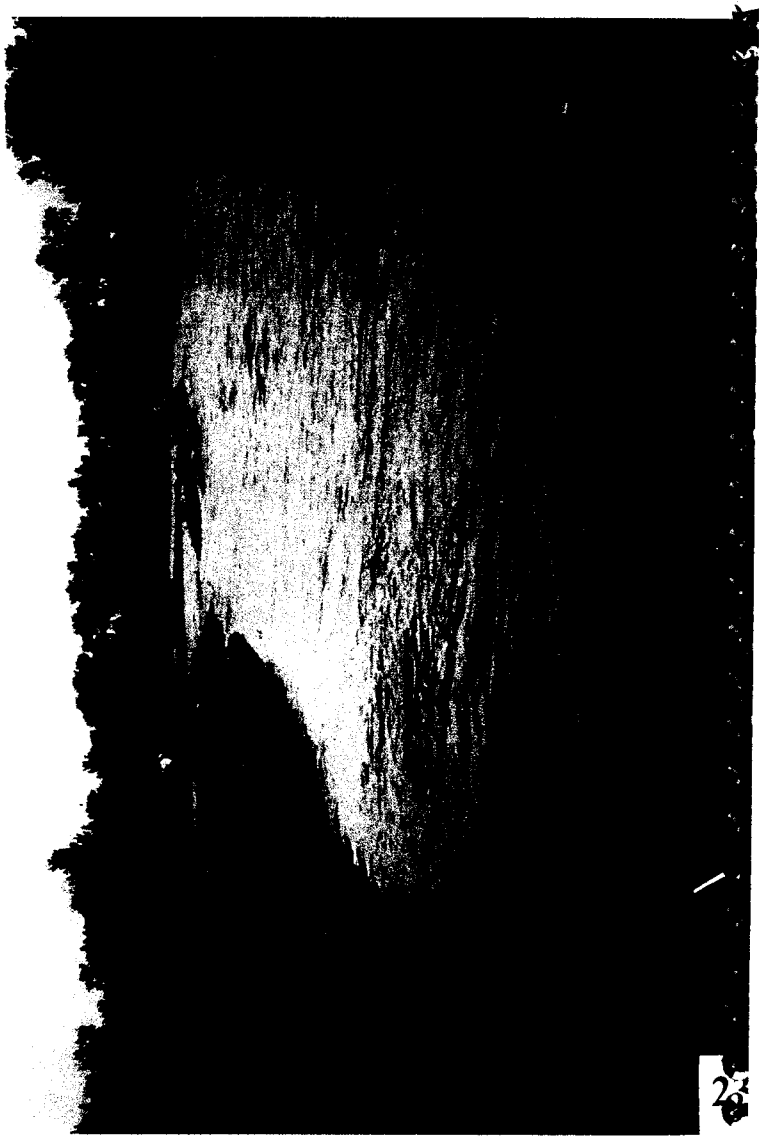

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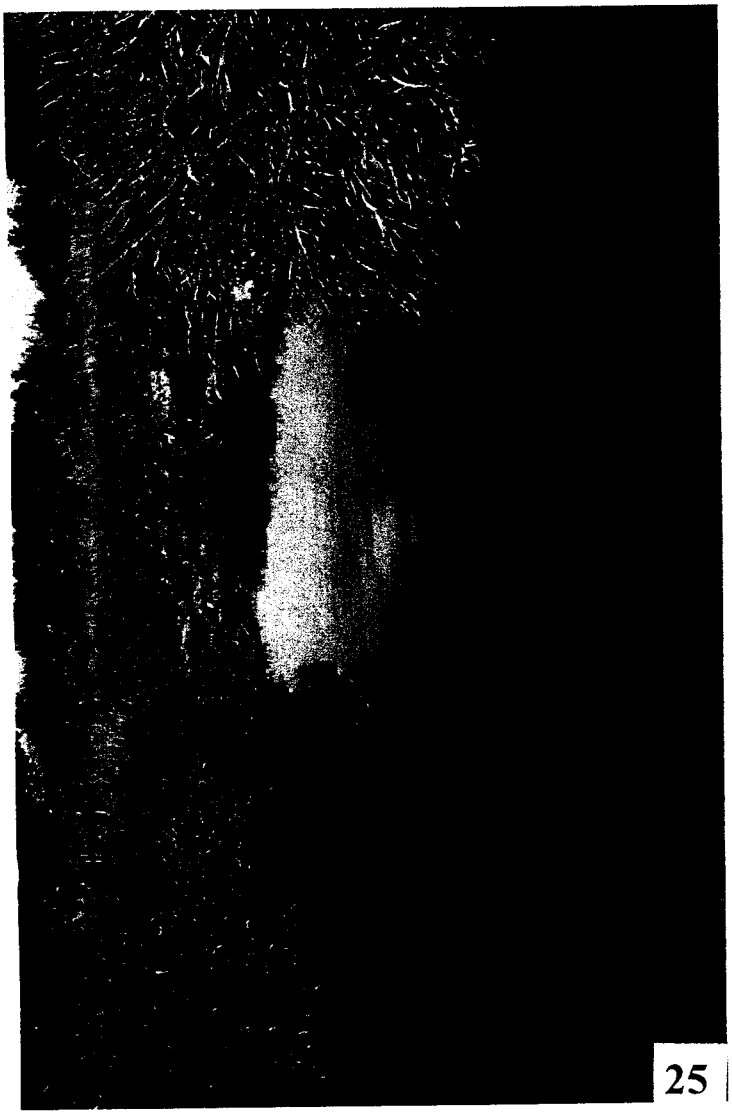

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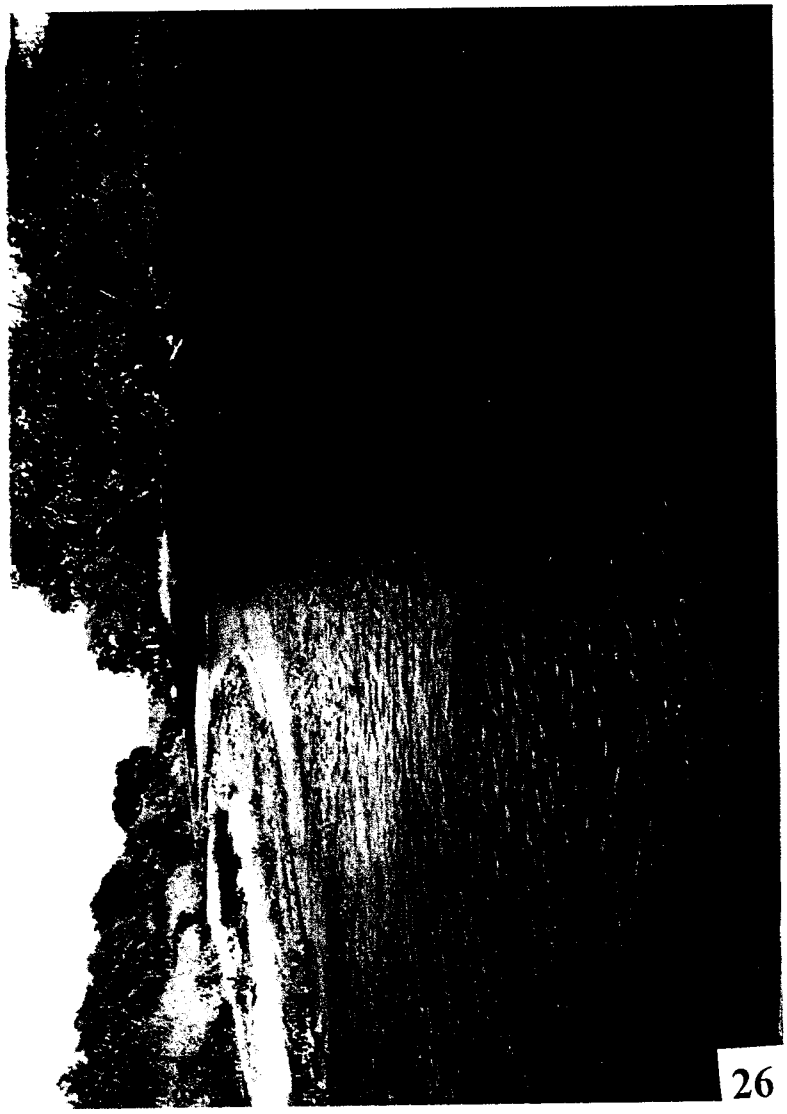

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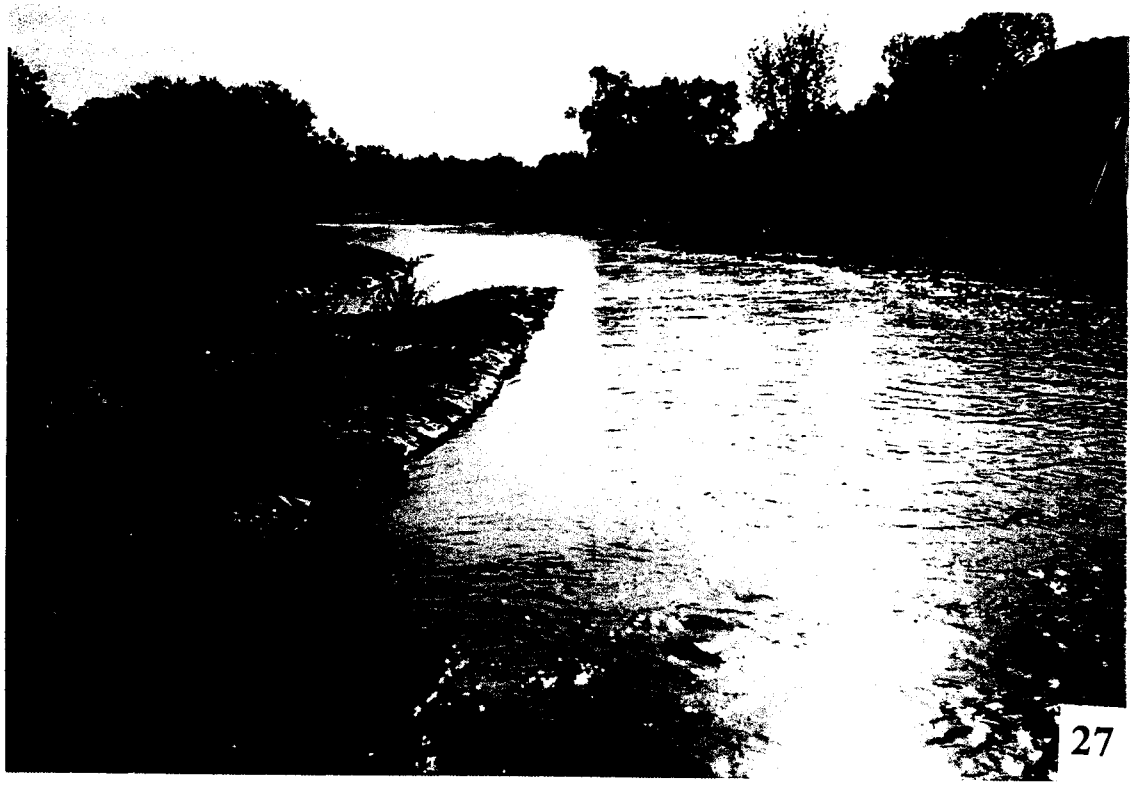

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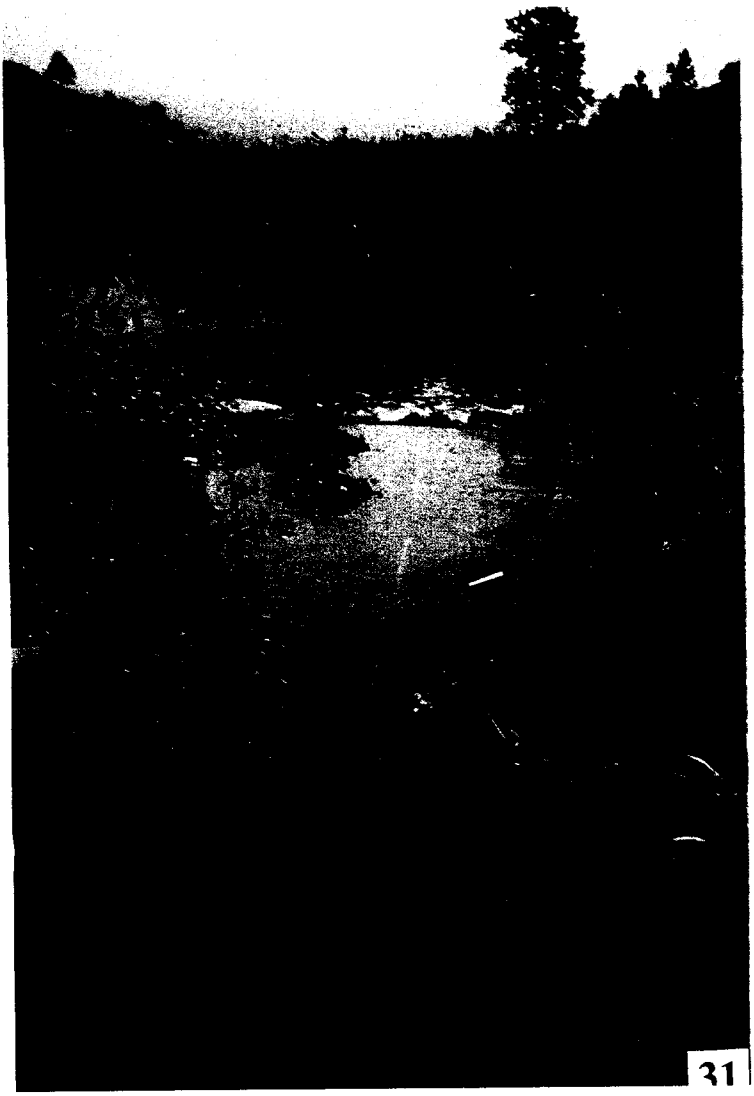

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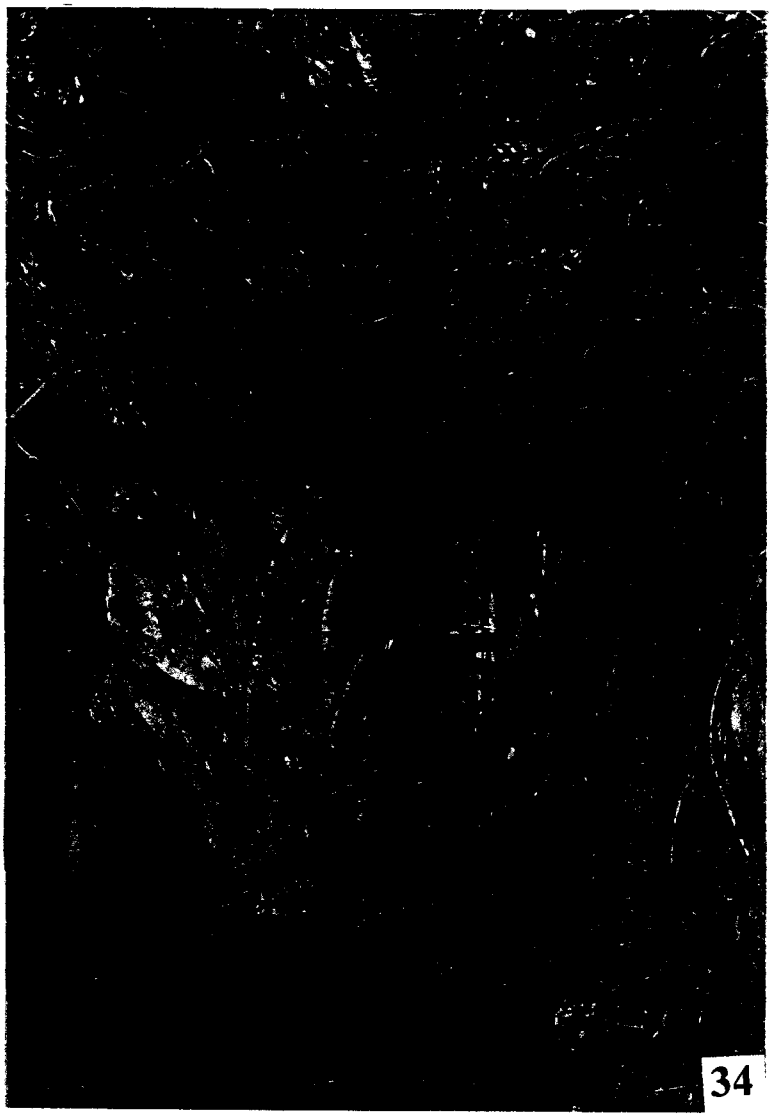

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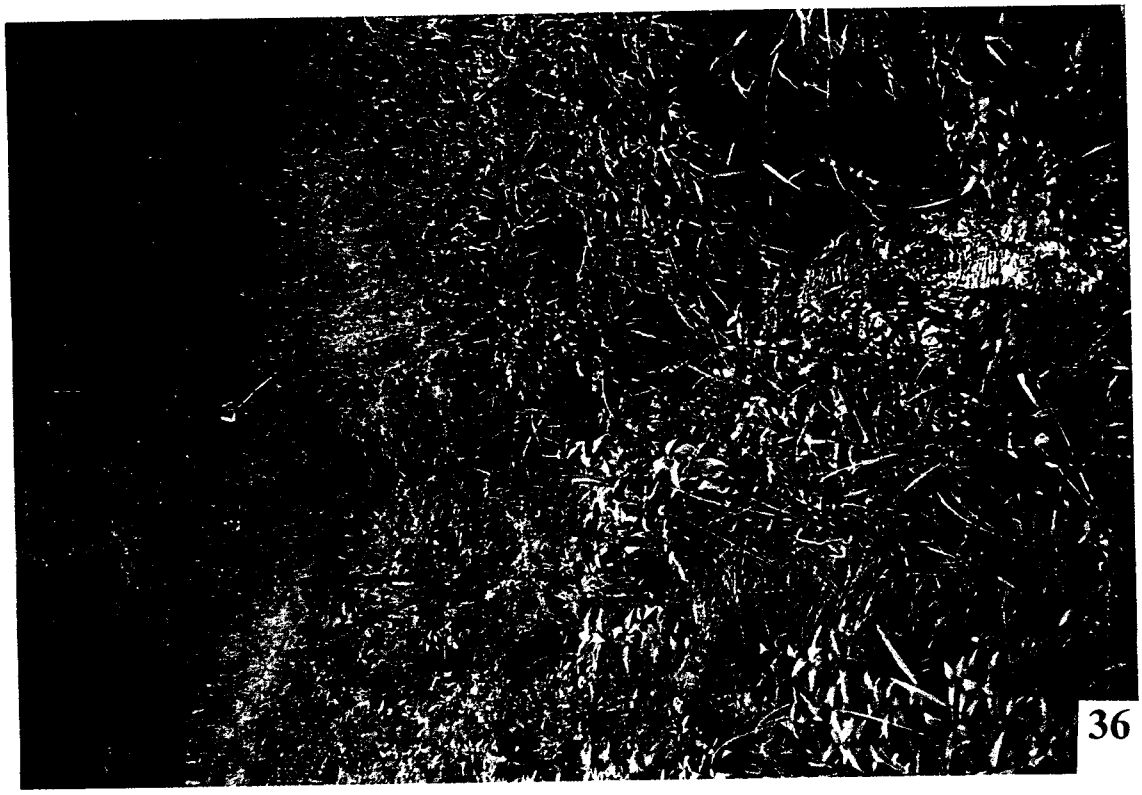

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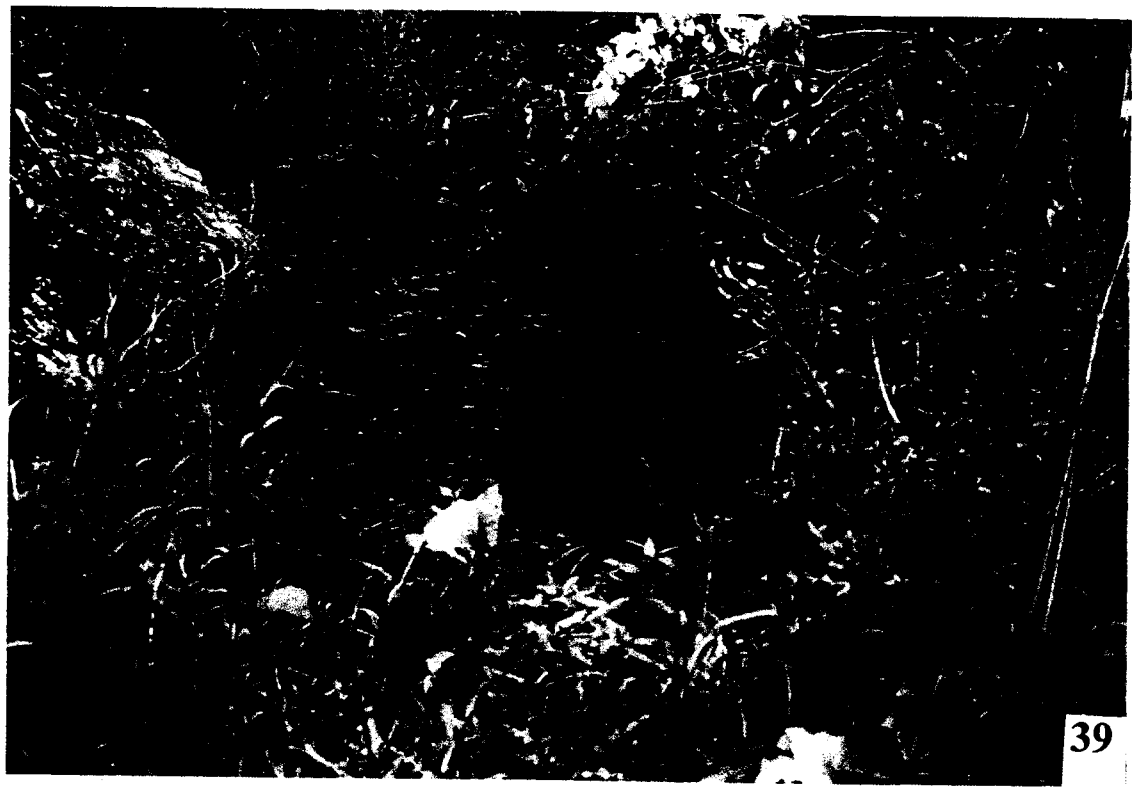

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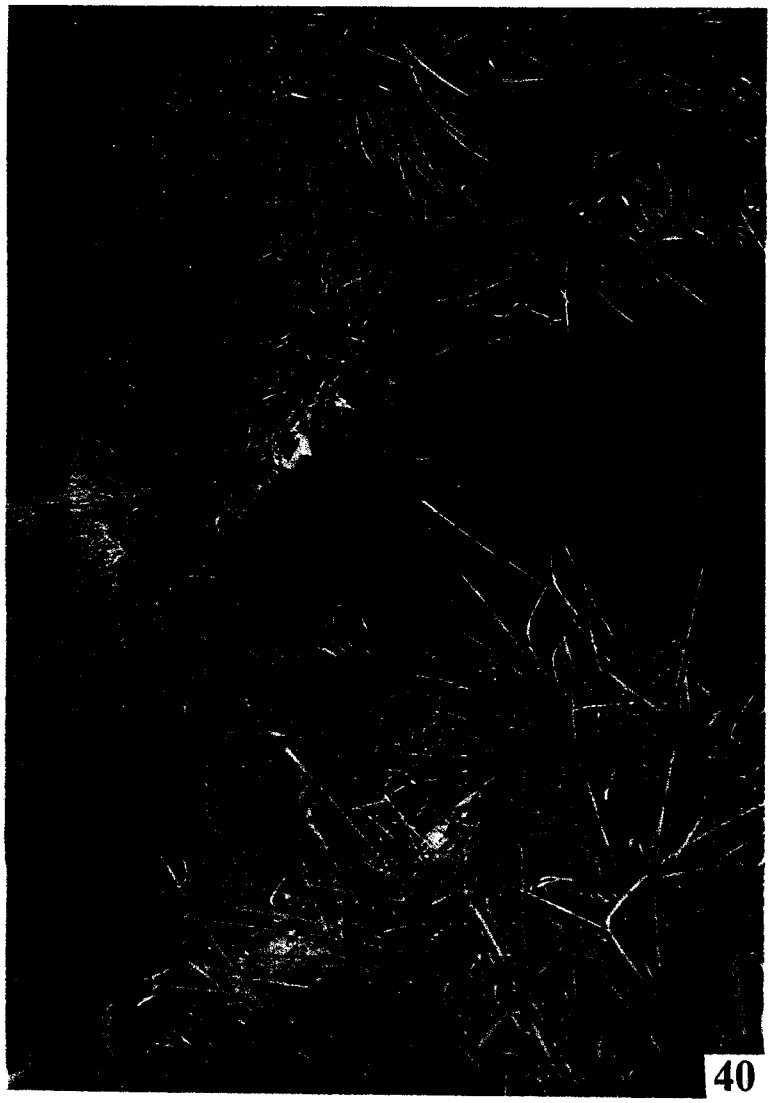

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