

PRIVATE LIBRARY  
OF WILLIAM L. PETERS

UNIVERSITY OF UTAH  
DIVISION OF BIOLOGICAL SCIENCES  
MISCELLANEOUS PAPERS  
NUMBER 1                      MAY, 1963

INSTITUTE OF ENVIRONMENTAL BIOLOGICAL RESEARCH

STUDIES OF BIOTA IN  
DINOSAUR NATIONAL MONUMENT  
UTAH AND COLORADO

Introduction. . . . .	Angus M. Woodbury
Log of the expedition . . . . .	Stephen D. Durrant
Ecology and limnology of Green River. . . . .	Angus M. Woodbury and Delbert W. Argyle
Non-vascular plants: algae and bryophytes . .	Seville Flowers
Mammals . . . . .	Stephen D. Durrant

UNIVERSITY OF UTAH  
DIVISION OF BIOLOGICAL SCIENCES  
MISCELLANEOUS PAPERS  
NUMBER 1                      MAY, 1963

INSTITUTE OF ENVIRONMENTAL BIOLOGICAL RESEARCH  
STUDIES OF BIOTA IN THE DINOSAUR NATIONAL MONUMENT  
UTAH AND COLORADO

Introduction . . . . .	Angus M. Woodbury . . . . .	2
Log of the expedition . . . . .	Stephen D. Durrant. . . . .	6
Ecology and limnology of Green River. . . . .	Angus M. Woodbury and Delbert W. Argyle . . . . .	9
Non-vascular plants: algae and bryophytes .	Seville Flowers . . . . .	49
Mammals . . . . .	Stephen D. Durrant. . . . .	69

This work was accomplished in part under a cooperative agreement, Contract No. 14-10-0232-685, dated June 20, 1962 between the U. S. National Park Service Regional Office No. 2, Omaha, Nebraska and the University of Utah, Salt Lake City.

ECOLOGY AND LIMNOLOGY OF GREEN RIVER

Angus M. Woodbury and Delbert W. Argyle

in consultation with George F. Edmunds Jr. and Arden R. Gaufin

CONTENTS

Introduction . . . . .	8
River environment. . . . .	8
Physiography . . . . .	8
Climate . . . . .	9
Water flow . . . . .	10
Water quality. . . . .	17
Habitat studies. . . . .	20
Aquatic habitats . . . . .	20
Description of stations. . . . .	20
Habitat characteristics. . . . .	23
Kinds of habitats. . . . .	24
Aquatic invertebrate fauna . . . . .	25
Specimens collected. . . . .	26
Ecological distribution. . . . .	28
Biological productivity. . . . .	30
Food-energy cycles . . . . .	31
Interpretations. . . . .	33
Annotated list of invertebrates. . . . .	37

ILLUSTRATIONS

Figs.	
1. Temperature, precipitation and altitude . . . . .	9
2. Seasonal fluctuation in waterflow . . . . .	12
3. Historical flows. . . . .	14
4. Stream fluctuations, 1904-1959. . . . .	16
5. Flow duration curves. . . . .	18
6. Total solids in solution. . . . .	19
7. Special adaptations of aquatic insects. . . . .	32
8. Map of Dinosaur National Monument . . . . .	34

TABLES

No.	
1. Streamflow, 1906-1959 . . . . .	11
2. Extremes in waterflow . . . . .	15
3. Water quality . . . . .	17
4. Variation in Green River grade. . . . .	24
5. Habitat classification. . . . .	25
6. Specimens collected . . . . .	26
7. Ecological distribution of specimens. . . . .	28
8. Food-energy cycle . . . . .	33



## ECOLOGICAL DISTRIBUTION OF SPECIMENS

Table 7. Showing distribution of specimens collected in different habitats.

	Still Water Ponds	RUNNING WATER					TOTAL	
		Pools	RUNS			Riffles & Rapids		Small Streams
			Sandy	Rubble Rock	Snags (Veg.)			
CRUSTACEA. .Shrimps <u>Hyallela</u> sp.						1	1	
EPHEMEROPTERA. . . Mayflies <u>Isonychia sicca campestris</u> <u>Baetis</u> sp. <u>Callibaetis</u> sp. <u>Pseudocloeon turbidum</u> <u>Lachlania powelli</u> <u>Heptagenia elegantula</u>	46			11 76 1 102	2 43	223	13 342 46 1 171	
<u>Epeorus longimanus</u> <u>Rhrithrogena undulata</u> <u>Pseudiron</u> sp. <u>Anepeorus rusticus</u> <u>Ametropus albrighti</u>				131 10 1 x x	25	x	156 10 1	
1 <u>Choroterpes albiannulata</u> <u>Leptophlebia gravastella</u> <u>Traverella albertana</u> <u>Ephemereilla inermis</u> <u>Tricorythodes minutus</u> <u>Brachycercus</u> sp.				46 x 625	4	1	51 1 649	
2 <u>Ephoron album</u>	129 4			5 346	9 1	2	145 5 346	
ODONATA. . . Dragonflies <u>Ophiogomphus severus</u> <u>Gomphus intricatus</u> <u>Argia</u> sp.	4	4 18			1	5	8 18 6	
PLECOPTERA. . . Stoneflies <u>Isogenus</u> sp. <u>Claassenia sabulosa</u>				85		7	7 85	
HEMIPTERA. . . Bugs <u>Rhagovelia distincta</u> 3 <u>Gerris remigis</u> <u>Notonecta</u> sp. Corixidae	3 4 28	x 2 6			31	2 9	31 5 6 43	

1. Migrates up small streams preceding emergence.
2. Lives in U-shaped tubes in silt between rocks of rubble.
3. Water striders hard to catch; more numerous than specimens indicate.

## ANNOTATED LIST OF INVERTEBRATES

The following list of invertebrates of the Green River system in Dinosaur National Monument includes those collected during the summer expedition of 1962 and other records found in the literature and in our museum collections.

INSECTA (class) . . . . Insects

EPHEMEROPTERA (order) . . . . Mayflies

Mayflies hatch from eggs into nymphs which molt several times before becoming adults. At the last molt, the wing pads enlarge into wings, a large front pair and a smaller hind pair folded upright over the back when at rest. Adults emerging from the water usually mate in the air, deposit eggs, and die within a few days without feeding. The vegetarian nymphs have seven pairs of respiratory gills on the abdomen, a claw on the end of each foot, and the abdomen terminates in two or three tail filaments. They possess many adaptations for life in flowing water where they spend their lives except for the few days devoted to reproduction in the adult stage.

## Siphonuridae (family)

Isonychia sicca campestris McDunnough 1931

The nymphs are filter-feeders, straining plankton from the stream current with legs and mouthparts adapted to this use. It is a common inhabitant of rocky rubble and plant snags in both rivers and is well known upstream at Flaming Gorge.

Records: COLORADO: Moffat Co., Yampa River at Deerlodge, 5600 ft. elev., 1 nymph Aug. 2; Green River at Echo Park, 6 nymphs, July 27. UTAH: Uintah Co., Green River at Rainbow Park, 4930 ft. elev., 5 nymphs and 15 adults, Aug. 5; Green River at Split Mt. Overflow Campground, 4790 ft. elev., 1 nymph, July 21.

## Baetidae (family)

Baetis spp.

Nymphs of this genus are unidentifiable to species in the present state of knowledge. Many nymphs were taken both in the river and in the cool tributary streams. There may be more than one species in the series but in the absence of adults, they cannot be recognized.

Records: COLORADO: Moffat Co., Vermilion Creek at Colorado State Highway 318, 200 nymphs, July 30; Green River at Lodore Ranger Station, 8350 ft. elev., 9 nymphs, July 30-31; Yampa River at Deerlodge Ranger Station, 5600 ft. elev., 10 nymphs, Aug. 2; Green River at Echo Park, 5085 ft. elev., 43 nymphs, July 27; Upper Pool Creek below Chew Ranch, 5345 ft. elev., 19 nymphs, 5120 ft. elev., 4 nymphs, July 25. UTAH: Uintah County, Green River at Rainbow Park, 4930 ft. elev., 38 nymphs, Aug. 5; Green River at Split Mt. Campground, 4795 ft. elev., 1 nymph, July 23; Green River at Split Mt. Overflow Campground, 4790 ft. elev., 18 nymphs, July 21-22.

Callibaetes sp.

These nymphs are also unidentifiable to species. They have been taken from Green River at Flaming Gorge but here they were found only in the small stream tributaries.

Records: COLORADO: Moffat Co., Cottonwood Creek near Lodore, 1.5 miles above Green River in a marsh, 11 nymphs, July 29; seep pool at Deerlodge, 5600 ft. elev., 35 nymphs, Aug. 2.

## Mayflies

Pseudocloeon turbidum McDunnough 1924

This species is not recorded from Green River but probably inhabits the Yampa. Only one nymph was taken in Yampa River at Echo Park, July 24, 1962.

## Oligoneuriidae (family)

Lachlania powelli Edmunds 1951

This species is known to occur in Green River from southern Wyoming downstream to the Colorado River in Glen Canyon. The slow-moving nymphs cling to rocks and sticks in the stream current where they filter food from the passing water. They were very common around rocks, rubble, gravel and plant snags in either deep or shallow water currents in both Green and Yampa rivers.

Records: COLORADO: Moffat Co., Green River at Lodore Ranger Station, 5350 ft. elev., 63 nymphs, July 30-31; Yampa River at Echo Park, 5090 ft. elev., 1 nymph and 1 exuvium, July 24; Green River at Echo Park, 5085 ft. elev., 2 nymphs and 2 exuviae, July 26-27; UTAH: Uintah Co., Green River at Rainbow Park, 4930 ft. elev., 18 nymphs and 6 adults, Aug. 5; Green River at Split Mt., 4795 ft. elev., 1 exuvium, July 23; Green River at Split Mt. Overflow Campground, 4790 ft. elev., 76 nymphs and 1 exuvia, July 21-22.

## Heptageniidae (family)

Heptagenia elegantula (Eaton) 1885

The flattened nymphs of this widespread species in the west are abundant on rocks, boulders, and snags in strong currents in Green, Yampa and Colorado rivers.

Records: COLORADO: Moffat Co., Green River at Lodore Ranger Station, 5350 ft. elev., 8 nymphs, July 31; Yampa River at Deerlodge Ranger Station, 5600 ft. elev., 6 nymphs, Aug. 2; Yampa River at Echo Park, 27 nymphs, July 24; Green River at Echo Park, 5085 ft. elev., 38 nymphs, July 26-27. UTAH: Uintah Co., Green River at Rainbow Park, 4930 ft. elev., 40 nymphs, Aug. 5; Green River at Split Mt., 4795 ft. elev., 15 nymphs, July 23; Green River at Split Mt. Overflow Campground, 4790 ft. elev., 22 nymphs, July 21-22.

Epeorus longimanus (Eaton) 1885

This species is known to be abundant in the cool tributary streams of Green River in the Uinta Mountains and has been found as far down the river as Brown's Park about 17 miles above the monument but has not yet been taken inside.

Rhithrogena undulata Banks 1924

This widespread species in the west is known in Green River as far upstream as Wyoming and was found in both Yampa and Green rivers in Echo Park. Nymphs occur uncommonly on rocks in the current.

Records: COLORADO: Moffat Co., Yampa River at Echo Park, 5090 ft. elev., 4 nymphs, July 24; Green River at Echo Park, 5085 ft. elev., 6 nymphs, July 26-27.

Pseudiron sp.

Nymphs of an unknown species on the edge of the generic range are known from Green River on both sides of the Utah-Wyoming line and only one exuvia was taken in the monument. The nymphs were found in silted sand and have mouthparts suggesting carnivorous habits.

Records: COLORADO: Moffat Co., Yampa River at Echo Park, 5090 ft. elev., 1 exuvia, July 25.



## Mayflies

Anepeorus rusticus McDunnough 1925

Inclusion of this species rests upon a single record of several adult specimens taken at "Camp Douglas" (near the dinosaur quarry) taken July 3, 1911 (O. A. Peterson, Carnegie Museum.) Nymphs are probably sand dwellers but have not been found.

## Ametropodidae (family)

Ametropus albrighti Traver 1935

This species is included on the basis of over 200 nymphs taken by George F. Edmunds, W. L. Peters, and S. L. Jensen, Aug. 27-28 from sand bars of Green River between 3 miles above and 5 miles below Jensen, Utah, just below the monument. They were taken from the smooth packed sand strips in shallow water along the edge of the river. They appear to be anchored in the sand by fleshy seta-covered pads of the forecoxae, assisted by elongate claws of the middle and hind legs, leaving the dorsal surface and the gills exposed. The comb-like claws of the short forelegs held in front of the face are used to preen the antennae, face and mouthparts. They are good swimmers adapted to adjusting position on insecure substrata. It is also known from Green River in the Flaming Gorge region.

## Leptophlebiidae (family)

Choroterpes sp., probably albiannulata McDunnough 1924

Nymphs have previously been found at several places in Green River and in its tributaries of Henry's Fork and Duchesne River. We found nymphs in the tributary, Pool Creek, and in both Yampa and Green Rivers, mainly in small rock, rubble, gravel and snag niches.

Records: COLORADO: Moffat Co., Yampa River at Deerlodge Ranger Station, 5600 ft. elev., 1 nymph, Aug. 2; Yampa River at Echo Park, 5090 ft. elev., 28 nymphs, July 24; Green River at Echo Park, 5085 ft. elev., 2 nymphs, July 26; Lower Pool Creek, 5120 ft. elev., 1 nymph, July 25.

Leptophlebia gravastella (Eaton) 1884

This species has previously been taken from Green River in both Wyoming and Utah and from Uinta River in the Uinta Basin. Numerous nymphs were taken at Split Mt. Campground, May 27, 1950 by George F. Edmunds, Jr. Several subimagos were obtained at Jensen, June 13, 1947 by F. C. Harmston. It was not found in the monument in 1962 probably because the nymphs had emerged as adults before our expedition was in the field.

Traverella albertana (McDunnough) 1931

This is a characteristic species of the Green and Colorado rivers and large tributaries wherever well-aerated water flows over rocky bottoms. The filter-feeding nymphs are usually numerous among the heavy concentrations of algae in the periphyton around protected sides of rocks. It was abundant in both Yampa and Green Rivers at every station.

Records: COLORADO: Moffat Co., Green River at Lodore Ranger Station, 5350 ft. elev., 19 nymphs, July 31; Yampa River at Deerlodge Ranger Station, 5600 ft. elev., 63 nymphs, Aug. 2; Yampa River at Echo Park, 5090 ft. elev., 58 nymphs, July 24-26; Green River at Echo Park, 5085 ft. elev., 398 nymphs, July 26-27. UTAH: Uintah Co., Green River at Rainbow Park, 4930 ft. elev., 5 nymphs, Aug. 5; Green River at Split Mt., 4795 ft. elev., 11 nymphs, July 23; Green River at Split Mt. Overflow Campground, 4790 ft. elev., 95 nymphs, July 21-22.



## Mayflies

## Ephemerellidae (family)

Ephemerella inermis Eaton 1884

This common species of Green River appears to have a single brood emerging in June and July. Only one nymph was taken on the 1962 expedition; most had probably emerged.

Records: UTAH: Uintah Co., Green River at Rainbow Park, 4930 ft. elev., 1 nymph, Aug. 5.

## Tricorythidae (family)

Tricorythodes minutus Traver 1935

This common species occurring on rocks and vegetation is a well-known inhabitant commonly found in both rivers and a small tributary but nearly 200 were taken from a seepage pool alongside the Yampa River.

Records: COLORADO: Moffat Co., Green River at Lodore Ranger Station, 5350 ft. elev., 4 nymphs, July 31; seep pool at Deerlodge Ranger Station, 5600 ft. elev., 129 nymphs, Aug. 2; Green River at Echo Park, 5085 ft. elev., 1 nymph, July 26; Lower Pool Creek, 5120 ft. elev., 2 nymphs, July 25; UTAH: Uintah Co., Green River at Rainbow Park, 4930 ft. elev., 3 nymphs, July 21; Green River at Split Mt. Overflow Campground, 4790 ft. elev., 3 nymphs, July 21.

## Caenidae (family)

Brachycercus sp., unidentifiable, but possibly prudens McD. 1931

This poorly known mayfly, represented by 4 nymphs upstream and 5 in the monument may turn out to be a new species about which little is known.

Records: COLORADO: Moffat Co., seep pool at Deerlodge Ranger Station, 5600 ft. elev., 4 nymphs, Aug. 2; UTAH: Uintah Co., Green River at Rainbow Park, 4930 ft. elev., 1 nymph, Aug. 5.

## Polymitarcidae (family)

Ephoron album (Say) 1835

Nymphs of this common species are burrowers in semi-compact sandy-clay river bottoms and cut banks. Adults that survive only one to 1½ hours generally emerge at twilight and are soon gone. Nymphs were found at all stations on both Green and Yampa rivers.

Records: COLORADO: Moffat Co., Green River at Lodore Ranger Station, 5350 ft. elev., 1 dead nymph, July 31; Yampa River at Deerlodge Ranger Station, 5600 ft. elev., 28 nymphs, Aug. 2; Yampa River at Echo Park, 5090 ft. elev., 24 nymphs, July 24; Green River at Echo Park, 5085 ft. elev., 126 nymphs, July 26-27; UTAH: Uintah Co., Green River at Rainbow Park, 4930 ft. elev., 65 nymphs, Aug. 5; Green River at Split Mt., 4795 ft. elev., 6 nymphs, July 23; Green River at Split Mt. Overflow Campground, 4790 ft. elev., 96 nymphs, July 21-22.

## ODONATA (order) . . . . Dragonflies and damselflies

Both nymphs (naiads) and adults of this order are considered to be predatory, nymphs in the water and adults in the air. Their diet includes some pests such as mosquitoes and flies. Adult dragonflies at rest hold their two pairs of wings straight out at right angles to the body; damselflies fold them back over the abdomen. Nymphs breathe by drawing water into a chamber at the end of the alimentary tract and propel themselves forward by ejecting the water forcibly like a jet stream.