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Some Observations on *Helix cooperi*

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		ALBERT LEA, MINNESOTA, Well.	CEDAR RAPIDS, IOWA, Cedar River.
1.	When collected.....	July 5, 1890.	July 5, 1890.
2.	When analyzed.....	July 10, 1890.	Average of several Analyses
3.	Kind of weather week previous to collecting..	Fair.	at different seasons of the year.
4.	Number of trains watering per 24 hours.....	7	
5.	Number of gallons used per 24 hours.....	12,000	
6.	Location of tank.....	600 ft. S. Depot.	
This water contains in solution.....		Grains per	Gallon.
7.	Total solid matter.....	28.10	12.49
8.	Carbonate of Lime, CaCO ₃	14.28	6.56
9.	Sulphate of Lime, CaSO ₄24	.29
10.	Carbonate of Magnesia, MgCO ₃	7.41	2.48
11.	Sulphate of Magnesia, MgSO ₄40	1.07
12.	Oxides of Iron and Aluminum, Fe ₂ O ₃ and Al ₂ O ₃08	.28
13.	Silicia, SiO ₂	1.60	.28
14.	Total Incrusting Solids.....	24.01	10.96
15.	Alkali Chlorides, NaCl and KCl.....	.80	.64
16.	Alkali Sulphates, Na ₂ SO ₄ and K ₂ SO ₄	2.34	.28
17.	Total Non-Incrusting Solids.....	3.14	.95
18.	Hardness—Equivalence in CaCO ₃	32.49	12.56
19.	Total Magnesia and Lime Salts.....	22.33	10.46
7.	Total Solids on Evaporation.....	28.10	12.49
20.	Total Solids on Analysis.....	27.15	11.92
21.	Alkalies by difference.....	4.09	1.53
22.	Alkalies by addition.....	3.14	.96
23.	Pounds of Incrusting Solids per 1,000 gallons..	3.43	1.56
24.	Comparison with Cedar River as unity.....	2.32	1.00
25.	Comparative rating.....	Bad.	Good.

A—Incrusting Solids.

B—Non-Incrusting Solids.

C—Additional Information.

Good..... 6 to 12 }

Medium...11 to 18 }

Bad... ..18 to 28 }

Very bad 28 to ∞ }

Comparative rating based on
total gains of Incrusting Solids.SOME OBSERVATIONS ON *HELIX COOPERI*.

BY F. M. WITTER, MUSCATINE.

In "Land and Fresh Water Shells," Part I, by W. G. Binney and T. Bland, 1869, the mollusk to which I invite your attention is called *Helix cooperi*. In "Manual of American Land Shells," by W. G. Binney, 1885, this little mollusk is honored with the following synonymy: *Helix strigosa*, Gould; *Anguispira strigosa*, Tryon; *Helix cooperi*, W. G. Binney; *Anguispira cooperi*, Tryon; *Helix haydeni*, Gobb; *Patula strigosa*, W. G. Binney; *Anguispira bruneri*, Ancy. In this work Mr. Binney uses the second name proposed by himself, viz: *Patula strigosa*. Inasmuch as the regions inhabited by this creature are quite diverse in regard to climate and food, it would seem most likely a considerable variation in size, form and color would necessarily follow. It appears to be at home throughout the Rocky Mountain region in the United States.

On July 12th, 1892, I was just starting up the Rabbit Ear mountains, from the southwest corner of North Park. After crossing Colorado creek, a branch of Big Grizzley, dead *Helix cooperi* were noticed in the road. A little search soon revealed the living mollusk. Here is plenty of sage brush about two feet high, with here and there clumps of a woody plant about the same height as the sage brush, with a dark green leaf. Bunches of two or three kinds of herbaceous

plants were common. The snails were in these bunches of herbaceous plants. A few I found crawling, but the greater portion were quiet, resting on the coarse sand or gravel, or on the stems or leaves of the plants in the shade. I could not determine the nature of their food. They did not seem to be under the sage brush. This, I thought, was due to the absence of herbaceous plants around and under the sage brush. There were four in our party, and we collected a quart in about twenty minutes.

On July 20th I was deer hunting in Danforth Hills, on a branch of Spring creek, about twelve miles north of Meeker on the White river, Rio Blanco county, Colorado.

During a rain, I happened to observe snails crawling about the damp weeds among the sage and other short brush. These were *Helix cooperi*. The weeds and brush were so wet I collected but few. Colorado creek in North Park, and the Danforth Hills are on opposite sides of the great divide, about 100 miles apart. There is but little difference to be noted in the shells from these two localities, separated as they are by lofty, snow clad mountains.

On my return through North Park I collected a considerable number of *Helix cooperi* at the same locality on Colorado creek. These I wrapped in paper and brought with me alive. They formed an epiphragm over the aperture, and some of them may still be alive. A few were broken and I was surprised to find some of these almost filled with young snails, containing from $1\frac{1}{2}$ to $2\frac{1}{2}$ whorls. In looking up the literature of *Patula strigosa*—*Helix cooperi*, I find I am not the first to observe that it is viviparous.

These snails inhabit treeless, almost barren regions.

The altitude on Colorado creek is probably near 9,000 feet, and perhaps a thousand feet less in the Danforth Hills. I have the pleasure of presenting specimens of these mollusks for inspection by the members of this Academy.

ON THE ABSENCE OF FERNS BETWEEN FORT COLLINS AND MEEKER COLORADO.

BY F. M. WITTER, MUSCATINE.

Partly because of their grace and beauty, and partly because of the small number of species in any given locality and of their singular mode of growth and development, this group of plants has, to me, for many years been of more than common interest. Muscatine county is honored with about twenty-two species of ferns. As a rule these plants seek damp and shaded spots, and it would seem as if some of them will not thrive unless certain conditions of soil, water and exposure are secured. Hence, a rough, rocky region, with springs and more or less swampy ground would, most likely, be rich in individuals and in species of this interesting family.

It was my good fortune to make a wagon journey from Fort Collins to Meeker, Colorado, from July 6 to August 5, 1892. Our route lay from Fort Collins northwest through a continuation or southerly extension of the Black Hills to a point on the Union Pacific railroad, twenty miles from Laramie City on Laramie Plains, thence west across Laramie Plains and the Medicine Bow mountains to North