against a salient from the more northerly land area. There is some evidence in favor of the latter view.

In Miocene time it is definitely known that a cold inshore current found its way southward to Florida and westward to Pensacola. This current may be due to the Miocene submergence of the Hatteras area, which sufficiently lowered the sea bottom off Hatteras to permit the Gulf Stream to continue its course unobstructedly northward, at the same time permitting a cold inshore current to move southward. The Miocene southward current, aided by winds and tides, transported quantities of terrigenous material and deposited it on the eastern border of the Floridian Pleateau.

Since Miocene time there have constantly been return currents of warm water (however, not so warm as the Gulf Stream), and they have, aided by the winds and tides, transported terrigenous material which was deposited on the eastward side of the existing land areas, sweeping a portion of it to the southern end of the plateau. These currents were active during Pliocene and Pleistocene times, and are still active to-day.

The shape of the upper surface of the Floridian Plateau, the land area of its eastern side, the arrangement of the geologic formations of successive ages, the directions of the stream courses, and the contour of the present coast line, owe their peculiarities and characteristics to the concomitant operation of the forces producing deformations and to oceanic currents.

T. WAYLAND VAUGHAN

GLACIAL LAKES OF THE CATSKILL VALLEY

THE Hudson lobe of the waning Wisconsin ice sheet blockaded the southeastern embouchure of the Catskill Valley, and sent a blunt "thumb" into this depression, pressing against the northeast front of the Catskills. The highest impounded waters were continuous with Schoharie Valley lakes recognized by Fairchild, by way of the summit col at Franklinton, Schoharie County. Then eastward escapes were apparently found between the ice-margin and the Catskill front, carving three or four sets of roughly parallel channels for eight miles between Hervey Street and Cairo Round Top.[1] The series of falling lakes thus determined have as their lower limit the notch behind the Round Top, at about 600 feet, and to this level may be given the name "Lake Durham." The channelings have caused interesting stream diversions, especially of former Shingle Kill headwaters through this notch into the Kiskatom.

The next escape was east of the Round Top, at Cairo Junction, and southward by a minor body ("Lake Kiskatom") into the gorge of the Kaaterskill at Great Falls, and to Lake Albany near Asbury. This lake, at 350 feet, is marked also by a cobble delta of the Catskill north of Cairo, discovered by W. M. Davis. It may be called "Lake Cairo." The hypo-Cairo channels are east of Vedder Hill, near Leeds, between the steep shale slope and a flanking moraine. A mile south of the hill the waters entered Lake Albany and built a shale-pebble delta now largely submerged under Albany clays. Shortly afterward Lake Albany entered the valley and established a grade-plane of which there are extensive remnants at Leeds depot, the mouth of Potuck Creek and at Sandy Plains north of South Cairo. It is significant that these remnants are of much coarser material than the present lower flood-plains of the Catskill, indicating strong drainage from the north, which apparently came around the east face of the Helderbergs via Clarksville, Lawson Lake, etc., and through the Cabin River and Potuck valleys. Heavy scourings at Result and Urlton, noted by Fairchild, are probably due to these waters, which may have included even Mohawk drainage.

The delta of the Catskill in Lake Albany, associated with this grade-plane, is found in Jefferson and West Catskill, now bisected by the creek. It extends four miles south and has crowded the Hudson to the east, but has merely blockaded, without filling, the valley of the Hans Vosen Kill on its north. In the

[1] See Durham, Coxsackie, Kaaterskill and Catskill topographic sheets.

later down terracing, the Catskill encountered a rock-ridge near its mouth and developed behind it an interesting meander-curve at about the hundred-foot contour in West Catskill, left as an elevated oxbow.

The entire problem deserves more extended field work.

George H. Chadwick

Canton, N. Y.,
June 3, 1910

On the Stickleback of Lake Superior

In 1850 Louis Agassiz[1] described a stickleback from Lake Superior which he called *Gasterosteus pygmæus.* The species was founded on three specimens, one less than eleven sixteenths, the other two less than one quarter of an inch long. The description given of these covers somewhat over a page. Most of it, however, would apply equally well to any form of the genus *Eucalia,* and there are only the following characters which seem of value as a basis for differentiation: the small size (Agassiz seems to have considered his largest specimen as representing the approximate maximum for the species); the relation of length to depth (eleven sixteenths of an inch, or less, to one eighth or one seventh of an inch); the dorsal fin formula (VI.–7 [?]); and the anal fin formula (I.–6). The supposed species is not discussed by Jordan in the paper in which he first fully describes the genus *Eucalia,* although the name is mentioned.[2] Eigenmann, in his review of the North American Gasterosteidæ,[3] includes it as a variety of *Eucalia inconstans;* and in this form it is taken over into Jordan and Evermann's "Fishes of North and Middle America."[4] This last work has taken over bodily Eigenmann's notes on the form, which notes are, however, inaccurate in ascribing to *pygmæa* a deeper body than to *inconstans.* I can discover no such character in Agassiz's original description. Supposing his largest specimen to have been only ten sixteenths of an inch long, and its depth to have been one seventh of an inch (the most favorable figures to make for great relative depth of body), the ratio will still be about four and one third. This would appear to give a rather more slender body than in typical *inconstans,* but in reality it lies well within the range of variation of *inconstans* as collected from almost any locality.

In the course of making a collection of Wisconsin fishes the State Geological and Natural History Survey had occasion last summer to send a collecting party under the leadership of Mr. H. H. T. Jackson to the Superior shore. Mr. Jackson was instructed to keep a special lookout for sticklebacks in those waters. As a result I have before me various lots of sticklebacks collected from the following places within the Lake Superior Basin: Mamie Lake (Vilas County); Montreal River and Lake La Vine at Hurley (Iron County); Siskiwit River, Siskiwit Bay, and Lost Creek Slough at Cornucopia, Flag River at Washburn, and Pike's Creek at Bayfield (all in Bayfield County).

Agassiz's specimens were taken at Michipicotin, on the northeastern shore of Lake Superior, undoubtedly either in the lake itself or very near it. There is no reason to suppose that any form existing there would not be found in other tributaries of the lake. Such close restriction would be unique among fishes of waters not landlocked. And more especially must this force itself upon us when we consider that *Eucalia inconstans* ranges from Saskatchewan to Ohio, and *Pygosteus pungitius* from France to Alaska, with only a slightly modified form in Greenland.

We feel justified therefore in believing that if *Eucalia inconstans pygmæa* exists, specimens of it would occur among our collections. A careful examination of all our specimens from Lake Superior discloses nothing that is not typical *inconstans.* But an examination of the few characters given for *pygmæa* shows that these in themselves have no value. Let us examine them separately.

First, Size:—This is easily disposed of. Any one who has had considerable experience in field work among our common fishes knows

[1] "Lake Superior," p. 314; Plate IV., Fig. 1.
[2] *Proc. Ac. Nat. Sci., Phila.,* 1877, p. 65.
[3] *Proc. Ac. Nat. Sci., Phila.,* 1886, p. 233.
[4] Bulletin 47, U. S. Nat. Museum, Vol. I., p. 744.