both at the water's edge and on the summits of the most elevated hills. Those in the bays, as at Green Bay, were nearly all situated near the low water mark, and may doubtless have been drifted in by the floating ice which makes its appearance on the coast every spring; but a different explanation must be given to account for those on the elevated rocks and hills. Nearly all the protruding rocks are rounded and the marks known as "Drift marks," "Diluvial scratches," and "Glacier marks," existed in great abundance. The smooth and rounded rocks are especially observable at Bras d'Or. They are all rounded on the northern side.

Prof. Agassiz remarked that in Cambridge, on the road to Mount Auburn, there may be seen at the present time, in a recently opened gravel-pit, an instance of the two kinds of drift, one above the other. The upper one is of marine and the lower of glacial origin. The former is made up of different materials, distinctly stratified, and exhibits marks of tidal action, but contains no boulders. The lower one consists of small and large pebbles, more or less scratched, irregularly scattered through a bed of mud.

Dr. Cabot stated, that at Deer Island, in Boston Harbor, a similar drift deposit may be seen.

Mr. Girard read a paper on the genus *Cottus*.

ON THE GENUS COTTUS Auct.

There are in the genus *Cottus*, as it has hitherto been admitted, two groups of species always very easily distinguished from each other at first sight; the head of the one is smooth or nearly so; that of the other is tuberculous, or armed with spines; the former inhabits fresh water, the latter salt or brackish water at the mouths of rivers.

These two groups are generically distinct both by external characters and anatomical structure. It remains only to decide which should retain the name of *Cottus*, and to which it will be necessary to give a new name.

The most simple way to settle this question, will be to go back to the origin of the genus *Cottus* and follow its history.

Artedi established it in 1738 with the following characters: — Gill-membrane containing six distinct bony rays; head larger than the body, depressed and acute. Two dorsal fins; the anterior one composed of flexible spines. Ventral fins small, having only four soft rays. Skin scaleless.*

He places in the first rank the fresh water species having two spines on the head, of which *C. gobio* is the type, being the only one known at that time. Next the species with more spines on the head, including not only the salt water species having a smooth skin instead of scales, but two others which have since become, one the type of the genus *Aspidophorus*, the other, the type of the genus *Callionymus*. Artedi himself went thus beyond the limits of his genus by placing in it the two last species, as their body is covered with scales.

Linnæus† alters Artedi's genus by giving as the only character for it, "a spiny head broader than the body." Linnæus went further; he transposes the species and places at the head *C. cataphractus*, the type of the genus *Aspidophorus*, of later date, and which Artedi placed at the end of the genus *Cottus*. His third species belongs now to the genus *Batrachus*, and the fourth to the genus *Platycephalus*. The *C. gobio* is the last.

Fabricius‡ followed the example of Linnæus. Cuvier§ recalls that the primitive type of the genus *Cottus*, *C. gobio*, from the fresh waters of Europe, in which have been since distinguished several species which were formerly confounded. Cuvier, following Artedi, describes first the fresh water, and next the salt water species. But when the celebrated ichthyologist wrote the history of this genus, he did not find it necessary to separate generically these two groups, although he had already pointed out their principal differences. There were only two fresh water species known, and that imperfectly.

Now that their number is considerably increased, and the study of them has become somewhat more difficult, it seems proper to subdivide the genus *Cottus* of the different authors in the following manner: —

* Genera Piscium.

† Systema Naturæ, ed. xii.

‡ Fauna Grœnlandica, 1780, 8.

§ Histoire Naturelle des Poissons, vol. iv. 1829, pp. 142, 150.

I propose the name of ACANTHOCOTTUS, for the marine species, which are generally of a larger size than those found in fresh water.* They are characterized by having spines upon each of the opercular bones. The preoperculum itself has several always strongly developed. The surface of the head, and also often the circumference of the orbits, are either armed with spines, or else they are serrated or notched in different ways. The nasal bones are also in most of the species surmounted by a spine or ridge. The head itself is rather higher than broad; sometimes much deformed, with proportionally very large eyes, and a deep occipital depression. The mouth is always more deeply cleft than in the fresh water species, but the dentition, as a whole, is nearly the same. Nostrils double, distant from each other, tubular, the anterior being much larger, the posterior close to the orbit. The body is scaleless; the back is often arched, and the first dorsal fin almost as high as the second. Some species have three, others four, soft rays to the ventral fins. The lateral line runs uninterrupted from the head to the base of the caudal fin.

The American species of this genus are the following: —

ACANTHOCOTTUS GRŒNLANDICUS Grd. — *Cottus Grœnlandicus* CUV. & VAL. Hist. Nat. Poiss. IV. 1829, p. 185. — RICH. Faun. Bor. Amer. III. 1836, p. 46, and Add. p. 297, Pl. 95, fig. 2. — STORER Rep. 1839, p. 16. — DEKAY, New York Fauna, 1842, p. 54, fig. 10. — STORER, Synops. 1846, p. 53. *Cottus quadricornis* SABINE, App. to Parry's First Voy. 1821. *Cottus scorpius* FABR. Faun. Grœnl. 1780, p. 456. *Cottus variabilis* AYRES, Proc. Bost. Soc. Nat. Hist. I. 1842, p. 68, and Bost. Journ. of Nat. Hist. IV. 1843, p. 259. (Young) — Greenland; Cuvier and Valenciennes. — Davis Strait; Richardson. — Maine and Massachusetts; Storer. — Connecticut; Ayres. — Hellgate (N. Y.); DeKay.

ACANTHOCOTTUS SCORPIOIDES Grd. — *Cottus scorpioides* FABR. Faun. Grœnl. 1780, p. 157. — CUV. & VAL. Hist. Nat. Poiss. IV. 1829, p. 187. — RICHARDS. Faun. Bor. Amer.

* With the exception of *C. polaris;* but the specimens which have been observed may not have been full-grown.

III. 1836, p. 47. — STORER, Synops. 1846, p. 54. Greenland ; O. Fabricius.

ACANTHOCOTTUS POLARIS Grd. — *Cottus polaris* SABINE, App. to Parry's First Voy. 1821, p. CCXIII. & J. C. Ross, App. to Parry's Third Voy. 1826, LIII. — RICH. Faun. Bor. Amer. III. 1836. p. 43. — STORER, Synops. 1846, p. 55. — Peninsula of Boothia (Ross) ; Sabine. — Lat. 75°, Shores of North Georgia ; Richardson.

ACANTHOCOTTUS POLYACANTHOCEPHALUS Grd. — *Cottus polyacanthocephalus* PALL. Zoögr. Ross. Asiat. 1811, p. 133, Pl. 23. — CUV. & VAL. Hist. Nat. Poiss. IV. 1829, p. 176. — RICHARDS. Faun. Bor. Amer. III. 1836, p. 48. — STORER, Synops. 1846, p. 55. — Off Cape St. Elias (Billings) 60° lat. N. ; Richardson, Valenciennes.

ACANTHOCOTTUS PSITTILIGER Grd. — *Cottus psittiliger* PALL. Zoögr. Ross. Asiat. III. 1811, p. 143, Pl. 20, fig. 3 and 4.— CUV. & VAL. Hist. Nat. Poiss. IV. 1829, p. 193. — RICH. Faun. Bor. Amer. III. 1836, p. 48. — STORER, Synops. 1846, p. 54. — Unalaska and Harbor of Avatcha ; Cuvier and Valenciennes. — Coast of Kamtschatka ; Richardson.

ACANTHOCOTTUS HEXACORNIS Grd.—*Cottus hexacornis* RICHARDS. Frank. Journ. 1823, p. 726, & Faun. Bor. Amer. III. 1836, p. 44. — STORER, Synops. 1846, p. 55. — Mouth of Tree River, lat. 67° 12″ N. ; Richardson.

ACANTHOCOTTUS POROSUS Grd. — *Cottus porosus* CUV. & VAL. Hist. Nat. Poiss. VIII. 1829, p. 498. — RICH. Faun. Bor. Amer. III. 1836, p. 47. — STORER, Synops. 1846, p. 56. Baffin's Bay ; Richardson.

ACANTHOCOTTUS ÆNEUS Grd. — *Cottus æneus* MITCH. Tr. Lit. & Philos. Soc. New York, I. 1815, p. 380. — CUV. & VAL. Hist. Nat. Poiss. IV. 1829, p. 189. — STORER, Rep. 1839, p. 20. — DEKAY, New-York Fauna, 1842, p. 52, fig. 19. — STORER, Synops. 1846, p. 54. — New York ; Mitchill, DeKay. — Massachusetts ; Storer.

ACANTHOCOTTUS MITCHILLI Grd. — *Cottus Mitchilli* CUV. & VAL. Hist. Nat. Poiss. IV. 1829, p. 188. — DEKAY, New York Faun. 1842, p. 53, fig. 46. — STORER, Synops. 1846, p. 56. *Cottus scorpio* MITCH. Tr. Lit. & Philos. Soc. New York, I. 1815, p. 381. — New York ; Mitchill, DeKay.

Acanthocottus Virginianus Grd. — *Scorpius Virginianus* Willugb. Hist. pisc. App. 1685, p. 25, Pl. 10, fig. 15. *Cottus scorpius* Schœpff, Beobach. &c. viii. 1788, p. 145. *Cottus octodecemspinosus* Mitch. Tr. Lit. & Philos. Soc. New York, i. 1815, p. 380. — Cuv. & Val. Hist. Nat. Poiss. iv. 1829, p. 181. Griff. Cuv. x. 1834, Pl. 43, fig. 4 .— Rich. Faun. Bor. Amer. iii. 1836, p. 46.—*Cottus Virginianus* Storer, Rep. 1839, p. 18. — DeKay, New York Faun. 1842, p. 51, fig. 13. — Storer, Synops. 1846, p. 54. Coast of Virginia; Willugby. — New-York; Mitchill, DeKay. — Newfoundland; Richardson.

I have not been able to make the comparative study of the species of this genus as complete as I could desire, not having had sufficient materials at my disposal. I have nevertheless ascertained one fact which I think will not be without interest in the history of the species — namely, that the *C. variabilis* Ayres, is the young of the *A. Grœnlandicus*. This fact shows the importance of studying these fishes throughout their different stages of growth if we wish to arrive at a complete knowledge of the species.

The *C. variabilis*, which was at first believed to be restricted to the shores of Connecticut, has been since found at Chelsea, Massachusetts, by Mr. W. O. Ayres himself; and Mr. Horatio R. Storer brought it the last summer from the shores of Labrador, together with young *A. Virginianus*. The geographical distribution of this species follows therefore that of *A. Grœnlandicus* with which I have identified it by the study of its Zoölogical characters.

The examination of the young Acanthocotti has also apprised me of the fact that the spines of the preoperculum vary within certain limits. Thus I have noticed some individuals which had three spines on one side and two only on the other. It is already known that one of the spines may be occasionally bifurcated, but in the instance above mentioned the third spine was not the result of a division; their respective position left no doubt with regard to this point.

It would be very interesting to compare authentic specimens of the *C. scorpius*, Fabr. (*A. Grœnlandicus*) with the species of the same name of the coast of New England, Newfoundland,

and Labrador. I cannot help thinking that there are two species confounded under the name of *grœnlandicus*, the comparative study of which will alone enable us to determine. Should they prove to be distinct, the name of *variabilis* could be restored for the species of the western coast of the Atlantic.

Next to the Acanthocottus must be placed the genus TRACHIDERMIS Heckel, characterized by a rough skin, and teeth on the palatine bones; as for the rest, similar to the foregoing in its general appearance. The body is perhaps more fusiform and the armature of the head and of the opercular apparatus less developed. The head is very depressed, and the mouth deeply cleft. But one species of this genus is known, the *T. fasciatus* Heck.* from the Philippine Islands. It is a fish of a small size.

I shall preserve the name of COTTUS Artedi, for the fresh water species, having but one small spine at the angle of the preoperculum, and sometimes another still smaller, always hidden under the skin and perceptible to the touch only, at the lower margin of the suboperculum. The head itself is very depressed, more or less truncated in front, generally broader than high, but always very uniform, being scarcely detached from the body unless by its more considerable breadth. The mouth is less deeply cleft than in the Acanthocotti. Like the latter they have teeth on the intermaxillaries, on the lower maxillaries and on the front of the vomer. Sometimes at a younger age, the palatine bones are rough, indicating rudimentary teeth; these bones become smooth in the adult. Nostrils double, as in the Acanthocotti. The body is also smooth, scaleless, and tapering to the tail. The first dorsal is always less high than the second; the back is but little arched and projects little or not at all above the nape. The ventral fins have three soft rays in some species and four in some others. The lateral line is sometimes interrupted, as in the greater number of American species,† sometimes continuous throughout the total length of the body, as is the case with all the species of the old world.

The generic name of *Uranidea* has been given to a species of the genus Cottus by a mistake of its author. Nevertheless, if the

* Annalen des Wiener Museum, Vol. ii. 1837, p. 159, Pl. 9, figs. 1 and 2.

† Mr. Heckel has made of it one of the characters of his *C. gracilis*, the single American species which he saw.

principles of nomenclature had transferred the name of Cottus to the marine species, I should not have created a new one for the fresh water species. I should have adopted the genus Uranidea although unfortunately chosen, knowing how small a number of names have a true etymological signification, and how many are arbitrarily applied. There are in North America : —

Cottus cognatus Richards. Faun. Bor. Amer. III. 1836, p. 40. Great Bear Lake ; Sir John Richardson.

Cottus Richardsonii Agass. Lake Superior, 1850, p. 300. Northern shores of Lake Superior ; Prof. Agassiz.

Cottus Bairdii Grd. — *Cottus gobio* Kirtl. Bost. Journ. Nat. Hist. v. 1847, p. 342. — Body subcylindrical, short, mouth comparatively large. — Pennsylvania, tributaries of the Ohio ; Prof. Baird. — Mahoning River ; J. P. Kirtland.

Cottus meridionalis Grd. Resembles the former, but the tail tapers away more suddenly. The mouth is also a little larger. — James River ; Prof. Baird.

Cottus gracilis Heck. Ann. des Wien. Mus. II. 1837, p. 148. — *Uranidea quiescens* DeKay, New York Fauna, 1842, p. 61, Pl. v. fig. 14. — *Cottus gobio* Ayres, Bost. Journ. Nat. Hist. v. 1845, p. 121, Pl. XI. — New York ; Heckel, DeKay. — Manchester, Connecticut, W. O. Ayres.

Cottus viscosus Hald. Suppl. to a Monogr. of Limn. &c. 1840, p. 3.

Eastern Pennsylvania ; Professors Haldeman and Baird.

Cottus boleoides Grd. Remarkable for its slender body and its largely developed fins.

Windsor, Vt. ; Ed. C. Cabot, Dr. Storer.

Cottus Franklinii Agass. Lake Superior, 1850, p. 303. Eastern and Southern shores of Lake Superior ; Prof. Agassiz.

Cottus gobioides Grd. Body thick and short ; mouth very large. — Burlington, Vt. ; Rev. Z. Thompson, Dr. D. H. Storer.

Cottus Fabricii Grd. — *Cottus gobio* Fabr. Faun. Grœnl. 1780, p. 159. — Greenland ; O. Fabricius.

. . . .

There remains one species which cannot be placed in any of the preceding genera, it is the *C. asper* Rich. from Columbia

River.* Mr. Heckel† had placed it in his genus Trachidermis, where I do not believe that it can remain, notwithstanding its rough skin and its teeth on the palatine bones. Dr. Richardson has felt the necessity of withdrawing it from the genus Cottus. In the "Fauna Boreali Americana," he thought the genus Hemilepidotus might perhaps receive it, but he himself has acknowledged since, that its place was not there, and when establishing the genus Centrodermichthys,‡ for some species of the China seas, he proposed to associate with them the *C. asper*. Not having at my disposal sufficient materials to satisfy myself upon this subject I shall reconsider it in a monograph of the species of Cottus of North America, which I am now engaged in preparing.

Dr. Gould presented, in the name of Capt. Joseph P. Couthouy, a specimen of Volcanic Ammonia, brought home from the United States Exploring Expedition.

Rajinder Datt of Calcutta was chosen a Corresponding member of the Society.

November 7, 1849.

The President in the Chair.

Present, twenty-nine members.

Present, by invitation, M. H. Perley, Esq. of New Brunswick.

Prof. Agassiz said that he had been for some time engaged in the study of the Worms of the coast of Massachusetts, and he had obtained some very interesting results.

He had found that in many of the Annelids which, at an early stage of their development are furnished with a pair of eyes to each ring, these organs gradually disappear, so that at maturity

* Faun. Bor. Amer. III. 1836, p. 295, Pl. 95, fig. 1.
† Ann. d. Wien. Mus. II. 1837, p. 162.
‡ Ichthyology of the "Sulphur."