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VII.—Indian Cyprinidæ

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which he made on the behaviour of vegetable colours to several liquids, more especially æther, oil of turpentine, and some others, in the course of which several curious facts have been brought to light; the conclusions which M. Hünefeld has drawn, and which may interest us, are—the pigments of reddish yellow, or of *not*-yellow flowers, are probably all of an extractive nature.

For the examination of these colouring matters æther is a very useful solvent. The variety of colouring of a flower or leaf frequently arises from the deposition of one pigment over the other, or from their mixture. [On this subject better information is to be had from the newer phytotomic works.—*Mey.*] The principal change which the colours suffer in withering, etc. appears to be, that the assimilation of carbon only ceases by suppressed vegetation, while the absorption of atmospheric oxygen becomes excessive; for the easily oxidizable extractive matters, and tannin in oxidized extractive matter, become metamorphosed into gallic acid and into substances approaching more and more to humic acid, which then destroy the pigments.

M. Hünefeld* has also made a series of experiments to learn whether the formation of certain colours depends on iron contained in the plant. Quantities (one or two ounces) of the most different-coloured flowers were reduced to ashes. Some of these flowers contained evidently iron and manganese, others only iron, and traces of copper were found in the flowers of *Sambucus nigra*, which had already been noticed. The twigs and leaves of *Sambucus nigra* are said to contain no copper, but a considerable quantity of iron. Traces of manganese were found everywhere when sufficient quantities were burnt. As these metals, says M. Hünefeld, are found also in white flowers, and their quantities stand in no relation to the colours of the flowers, it seems that Meissner's theory is not correct. There is probably no vegetable which does not contain iron, and perhaps all the iron found in the human body is derived from this source.

[To be continued.]

VII.—*Indian Cyprinidæ.* By JOHN McCLELLAND, Assistant Surgeon Bengal Medical Service †.

DR. PATRICK RUSSELL published in 1803 an account of 200 species of fishes found chiefly on the coast of Coromandel;

* Beiträge zur Chemie der Pflanzenfarben.—Erdmann & Marchand's Journal für prakt. Chemie, 1839, 1 Bd. p. 81—87.

† From the 'Asiatic Researches,' vol. xix. part ii. p. 217; having been presented to the Asiatic Society of Bengal on the 5th of September 1838.

there appears to be no copy of his work in Calcutta, nor have I been able to meet with it in India; but his collection appears to have embraced few *Cyprinidæ*, and scarcely any of those afterwards found in Bengal by Dr. Buchanan*. The fishes of Ceylon, as well as those of the Bay of Bengal, have recently excited the attention of naturalists†, while those of the Sunderbuns and the vicinity of Calcutta have long been objects of interest to collectors for the museums of France and the other parts of the continent where alone ichthyology seems to have been cultivated as a philosophical branch of zoology.

2. Dr. Buchanan appears to be the only author who has devoted his attention to the freshwater fishes of Bengal, and his success seems to have left little for others to do in the way of discovering new species. His '*Gangetic Fishes*,' published in Edinburgh in 1822, contains descriptions of no fewer than eighty Cyprins, of which number he has only given figures of twenty-one. And unfortunately, Cuvier appears to have adopted such only as were figured in that work, leaving the rest as doubtful materials, which, from their extent, and the deficiency of the details connected with them, perhaps deterred him from the task of entering into, or finishing, his account of the Carps, in the hope of receiving further particulars regarding them from India.

3. It was partly with a view of supplying this deficiency that I devoted the time we spent on rivers, during our journey‡ to Assam in the winter of 1835-6, to the examination and figuring of species. The obscurity of Buchanan's specific descriptions, which with few exceptions are chiefly composed of characters of generic value, rendered the task of identifying his unfigured Cyprins most difficult and uncertain. Nevertheless it appeared to me to be a desideratum that must be accomplished sooner or later by some one, and at length, after perseverance for the better part of three years, occasionally giving it up in despair, I succeeded in identifying most of the species unfigured by Buchanan, as well as in having made two series of finished drawings of them, one set for England and one for India. After all this, and after the present paper had been ready for publication in April last, my notice was, for

* Afterwards Dr. Buchanan Hamilton. As most of his publications have appeared under the name of Buchanan, authors should follow the example of Cuvier in the '*Règne Animal*' and '*Histoire Naturelle des Poissons*' in referring to the author of the '*Gangetic Fishes*' by the name by which he is best and will be universally known, in proportion as his vast works on Indian statistics and natural history transpire.

† Mr. Bennett and my friend Dr. Cantor.

‡ I allude to the deputation of Dr. Wallich, Mr. Griffith, and myself to Upper Assam.

the first time, attracted by a remark of Buchanan, in consequence of which I thought it necessary to make inquiry for certain drawings alluded to, 'Pisc. Gang.' p. 316. I had heard of drawings at the Botanic Garden, but never saw them, and always supposed them to be merely the originals of published figures; but I confess I was quite unprepared to receive at that time a collection of drawings from Dr. Wallich, amounting to 150, beautifully executed, and including nearly all the unpublished species on which my painters had been so long employed, with the specific names in Buchanan's hand-writing marked under the figures, so as to leave no doubt or difficulty in referring them to corresponding descriptions in the 'Gangetic Fishes.' I am not prepared to state how many unfigured species this interesting collection contains, except in the particular family which is the subject of this paper. Along with these drawings I received intimation from Dr. Wallich, that two folio volumes of manuscripts and drawings on general zoological subjects, by the late Dr. Buchanan, still remain at the Garden. The descriptions alluded to may probably serve as a key to Hardwicke's 'Illustrations,' into which I perceive several figures of *Cyprinidæ* have been accurately copied, except in the colouring, from Buchanan's drawings; and as no descriptions of the plates of Hardwicke's work have been yet to my knowledge published, the source from whence the figures in question came does not transpire, and there is no allusion to it on the plates; at any rate it is unfair to General Hardwicke, as it is to Dr. Buchanan and to all who are engaged in pursuits connected with the natural history of this or any other country, to have the unpublished works of any man shut up for twenty-two years in a library that is not open to the public*.

• Buchanan's Researches regarding the fishes of India commenced on his arrival in the country in 1791, and ended with the publication of the 'Gangetic Fishes' in 1822. Anything that tended to lessen the value of a work that occupied so much of such a life is to be regretted. It is stated in a biographical notice of Buchanan in Chambers's 'Lives of Scotchmen,' that on his departure from India he was deprived by the Marquis of Hastings of all his extensive drawings and papers relating to every branch of natural history, particularly botany; "although to me," quoting his own words to the Edinburgh Philosophical Society, "as an individual, they were of no value, as I preserve no collections, and have no occasion to convert them into money, but I was merely desirous of seeing them safely deposited in the India House." In deciding that Buchanan's papers should be retained in India, it may be presumed that the object was, that they should here be rendered more useful to the country than they could be in England. It could scarcely have occurred to the Marquis of Hastings that these works would be consigned to oblivion, and the author in consequence superseded by his successors.

The following are the names of the unpublished figures of *Cyprinidæ* in this collection of drawings*.

Cyprinus	Gugani, Buch.	Cyprinus	Borila, id.
—	Gorachela, id.	—	Anjana, id.
—	Joya, id.	—	Bata, id.
—	Cachius, id.	—	Bangana, id.
—	Loubuca, id.	—	Pangusia, id.
—	Phula, id.	—	Sarana, id.
—	Bhola, id.	—	Kunta, id.
—	Gora, id.	—	Tor, id.
—	Borelio, id.	—	Sada, id.
—	Rerio, id.	—	Lati, id.
—	Dangila, id.	—	Gohama, id.
—	Balibola, id.	—	Godeyava, id.
—	Bukrangi, id.	—	Dheno, id.
—	Loya, id.	—	Jaunyali, id.
—	Phulchela, id.	—	Paungsi, id.
—	Titius, id.	—	Bimaculatus, id.
—	Terio, id.	—	Sucatio, id.
—	Sutiha, id.	—	Balitora, id.
—	Phutunio, id.	Cobitis	Gongota, id.
—	Gelius, id.	—	Balgara, id.
—	Kanipunte, id.	—	Cucura, id.
—	Casuatus, id.	—	Guntea, id.
—	Cursis, id.	—	Botea, id.
—	Cursa, id.	—	Pangia, id.
—	Chola, id.	—	Biltura, id.
—	Conchionius, id.	—	Turia, id.
—	Jogia, id.	—	Scuturiginum, id.
—	Shakra, id.	—	Savona, id.
—	Barna, id.	—	Corica, id.
—	Vagra, id.		

* But although they seem to have been withheld from Buchanan himself, the following drawings from his original collection of unpublished figures of fishes have found their way from the Botanic Garden into Hardwicke's 'Illustrations,' without any acknowledgement to point out from whence they were derived.

Tab. 81. *Hypostomus sisor*, Buch.; *Sisor Raddophorus*, id., Gan. Fish., two drawings.

Tab. 85. *Malopterus Kazali*, Buch. Two figures: name changed to '*Malopterus (Ailia) Bengalensis*,' Gray, in the pirated figures.

Tab. 86. fig. 1. *Cyprinus angra*, Buch. Pirated figure disguised under bad colouring, and named '*Cyprinus Hamiltonii*,' Gray.—Fig. 2. *Cyprinus gola*, Buch. Colouring much exaggerated. There are two figures of each species, so that this plate has been taken wholesale from Buchanan.

Tab. 87. fig. 3. *Cyprinus chedra*, Buch. A good copy of a very beautiful drawing in Buchanan's collection.

Tab. 89. fig. 1. *Syngnathus carce*, Buch. (*Kharke*, id., orig. draw.) Note—an error in spelling the generic name of this species, as written by

4. An examination of the viscera connected with the digestive organs, together with the form of the mouth, suggested the possibility of identifying something on which the natural arrangement of fishes might be founded. In those Carps whose mouths are constructed for the collection of vegetable food, I found, as might be expected, the greatest development of intestinal canal; in these the mouth is invariably either horizontal or directed downwards, as in the Cirrhins: all such

Buchanan on the original drawing, is preserved in the pirated copy. Fig. 4. *Syngnathus deokpata*, Buch.

Tab. 91. fig. 1. *Mystus chitol*, Buch. Colouring much exaggerated in the pirated copy.

Tab. 93. fig. 1. *Cyprinus mosal*, Buch. Two figures, and two of *Cyprinus morala*, id. The coloured copy of this last is so badly executed, that the characteristic marks of the species, though well depicted in the original by the obscure transverse streaks crossing the sides, are quite omitted in the copy.

Tab. 91. fig. 1. *Cyprinus tileo*, Buch.

Tab. 93. fig. 1. *Ophisurus boro*, Buch. This species is referred to Buchanan's manuscripts, but nothing is said to point out from whence the drawing was obtained; but it is so accurately traced from Buchanan's original, as to remove any doubt on that score.—Fig. 2. *Ophisurus harancha*, Buch. By mistake on the part of the plagiarists in numbering the figures, the details of the first are given to the second species.—Fig. 4. *Muræna railaborua*, Buch., disguised under the names of *Rataboura* 'Hardwickii,' Gray; thus not only depriving Buchanan of the honour of figuring but also of naming a new species. As an instance of the little reliance to be placed on those who thus appropriate the works of others, it is necessary to observe, that the outline figure representing the lower parts of *Muræna railaborua* is transferred to *Ophisurus boro*, in return for that of the last having been given on the same plate to *Ophisurus harancha*. In other plates not numbered, forming the 19th and 20th parts, are pirated as follows:—

Holocentrus ? *Kalkaya*, B. MS., two figures, name changed to '*Pterapon trivittatus*.'—*Cottus chaka*, B. MS., name changed to '*Platycephalus chaeca*,' marked 'natural size.'—*Checlodipterus Bhulibue*, B. MS., name changed to '*Checlodipterus Butis*,' and the species referred to 'Hamilton,' but nothing said of the source of the two figures.—*Cyprinus morar*, B. MS., two figures, and *Cyprinus gora*, B. MS., forming an entire folio plate; the name of the latter changed to '*Cyprinus cora*.'—*Clupanodon chapra*, B. MS.; pirated figure called '*Mosa chapra*, N. Indian Ocean:' what the latter terms mean I cannot say, as the figure is from Buchanan's unpublished drawings of Gangetic species; like the remark 'natural size' annexed to *Cottus chaka*, it is certainly calculated to impress the reader with the belief that the author had seen the specimens from which the drawings were made. Neither of the remarks in question appear on the original drawings, which are characterized in Buchanan's hand-writing.

Buchanan died in 1829. The work to which so much of his labour has been transferred was published in 1833; and although no descriptions of the plates have yet appeared, it is no excuse for having suppressed the source from whence so many of them at least were derived, especially when it was thought necessary to acknowledge the source of other figures in the same work. These circumstances induced me to visit the Botanic Garden, with

types I have included under the head of *Pænominæ* or herbivorous Carps, of which the Gudgeons and Gonorrhynchs are the most remarkable.

5. In the last-mentioned genera the mouth is situated completely under the head, and is constructed in the Gudgeons for bruising soft vegetable substances, such as are found in

the view of ascertaining if all the other plates in Hardwicke's 'Illustrations,' as well as those of fishes, were derived from the two folio volumes stated to be in the library of that institution. The following memorandum, which was made on the occasion, must be interesting to all who are in any way connected with zoological pursuits.

"Botanic Garden, 3rd September 1838.—Having obtained the requisite permission, I inspected Buchanan's zoological MSS. for the first time; they seem to contain descriptions and figures of the following animals:—

"Five species of *Simia*, one recently described by Dr. Harlan in the American Phil. Transac. as *Simia Hooleoh*.

"Five species of *Felina*, one grey above and spotted beneath, a *Felis leopardus albus*, and an *Ursus*.

"Six *Cercidæ*; a *Cervus niger*, Buch. Several species of *Mus*, two bearing Buchanan's specific names; also an *Ichneumon* and a *Hysterix opeigura*, Buch.; three species of *Capra* bearing his specific names, as well as several species of Tortoises, two species of flying Foxes, two *Lacertæ*, and two *Paradoxuri*.

"Of birds I observed about sixty species of *Falconidæ*, about 150 *Insectores*, and about 74 *Grallæ*, including many rare *Tantalidæ*, and the species of *Ciconia* recently described as *C. cristata*, which appears to have been named nearly thirty years ago by Buchanan *Ardea crinita*; all which, in addition to the fishes, are drawn in duplicate, thus amounting to about 900 drawings." Although Buchanan was professedly a botanist, his researches appear to have extended to all branches of natural history except entomology. His volumes on Gangetic Fishes, published at his own expense, under the disadvantage of being deprived of the greater part of his figures, are the only part of his zoological labours that are known, yet his inquiries in other branches of zoology were equally extensive, and equally entitled to publicity. It now appears that two quarto volumes of MSS., written with his usual erudition, have been retained in the library of the Botanic Garden since 1815; while every periodical that has since appeared deprived him of some portion of those claims to priority which his papers ought to have secured to him had they been placed in proper hands, or deposited in an institution where their existence could have been known or appreciated.

Had such an injury to the advancement of information resulted from an oversight in an ordinary public office, the circumstance would excite less surprise; but that the works of a naturalist should be so treated in a public institution expressly intended for the promotion of science, is so unaccountable to me, that I cannot presume to express an opinion on the subject. But as the case stands, perhaps the best remedy that can now be applied, in justice to Buchanan as well as to others who are still engaged in scientific pursuits, would be to give a complete edition of his labours, botanical and zoological, to the public; at the same time it is right to say, that no atonement can now make amends for the injury that has been inflicted on Buchanan as a naturalist, or for the time that has been lost in allowing others to go over unnecessarily the ground which he investigated, instead of beginning where he left off.

stagnant waters; and in the Gonorhynchs for tearing and up-rooting certain kinds of conserved plants, which form a short slimy covering to the rocks on which they grow in clear mountain streams.

6. The true Cyprins (*Cyp. proprius*, Cuv.), together with the Barbels, Cirrhins and Labes, subsist less exclusively on a vegetable regimen. Their mouths are invariably small, and either directed downward or situated low in the head; and as far as my inquiries have extended, it is on such modifications of the mouth that we find the length of the intestines and the habits of the different groups to depend.

7. In the Gudgeons the mouth is formed simply for receiving a kind of food that is obtained in abundance without any effort, and which requires no prehensile teeth or other organs for its collection or preparation before it is submitted at once to the process of digestion. The mouth is consequently small, and is opened and closed chiefly by the muscular structure of the snout; the jaws are weak, and the lips hard and cartilaginous, without sensibility or muscularity, and their intestinal canal varies from eight to eleven, and even twelve lengths of the body, including the head and caudal fin: except in the *Hypostomi*, Lacep., among fishes, Ostrich among birds, and perhaps some of the ruminants, such development of the abdominal canal is rare, a circumstance which it will be necessary afterwards to recollect when speaking of types.

8. In the Gonorhynchs the muscular power of the snout is greater than in the Gudgeons; the mouth is smaller, and situated further back in the lower surface of the head; the lips thicker, and though defended externally by a hard insensible cartilage, are formed for very powerful muscular action. In this genus the length of the intestinal canal is usually about eight lengths of the body, and exceeds that of all other Cyprins except the Gudgeons.

9. The development of the intestinal canal in *Cyprinidæ* differs with the habits of species, so as to afford something like a basis for true distinctions between the different genera, and is fortunately connected with such peculiarities of form and colour as to render it easily available as a guide to an improved method of classification.

10. The philosophical views of Mr. MacLeay regarding the circularity of groups, left it almost certain that the law which applied to other classes might be also applied to fishes; and as the essence of that law consists in the tendency of the contents of natural groups to form a circle, it became highly probable, that as strictly herbivorous Carps were known, so, on the contrary, carnivorous species might be expected also to

exist*. This is exemplified by a comparison of typical with subtypical groups, as *Quadrumana* with *Feræ* in the orders of Mammalia, and *Insessores* with *Raptores* in the orders of birds; as this is true with regard to higher groups, it should be just as applicable to the lower assemblages when they happen to be equally complete in their parts.

11. The above inference, whether its principles be just or not, has proved to be perfectly correct, notwithstanding the remark of Linnæus, that Cyprins are perhaps the least carnivorous of the whole class of fishes, "feeding chiefly on seeds, grass, and even mud;" and the observation of Cuvier, "that they are the least carnivorous of all fishes." Those who have since written on the subject have for the most part adopted the views on this point of the great authorities just named.

12. A close investigation of our Indian species has led to very different results, and enabled me to form *Cyprinidæ* into three subfamilies. First, the *Pænominae*, or herbivorous Cyprins, already adverted to, which consist of species whose habits accord with the views of Cuvier and Linnæus; and *Sarcoborinae*, or carnivorous Cyprins, consisting of several natural genera, and *Apalopterinae*, including the *Cobitinae* or Loaches, the *Pæcilianæ*, Cyprinodons, and other genera, which in the 'Règne Animal' appear to have little connexion with the family, as well as some new forms peculiar to India.

13. As the peculiarities of the first subfamily, consisting in the form of their mouth and digestive organs, have been pointed out, I shall now proceed to notice the characteristics in structure and habits of the several groups of *Sarcoborinae*. Two of the most remarkable genera of this subfamily are the *Perilamps* and *Opsarions*; the first consisting of small insectivorous fishes remarkable for the brilliancy of their colours, always disposed in streaks. The second are lengthy, handsome species, larger than the *Perilamps*, though still of small size, and very bright in their colours, which are however disposed in cross-bars;—these are exclusively carnivorous, and remarkably voracious.

14. The *Perilamps* (*Perilampus*) form the connexion between the *Systemys* and *Leuciscs*. The mouth is placed in a directly opposite position from that which it occupies in the typical forms of the *Pænominae*; the jaws are directed upward, and their apices are placed on a level with the back or crown; their intestine is short, and in no instance exceeds the length of the body; and their food consists of insects only, which they derive by springing from beneath the surface of

* I here refer particularly to what Mr. MacLeay calls affinity of translocation, or that relation which the opposite points of a circle of affinities bear to each other.

the water, thus forming a direct contrast to the Gonorrhynchs and other *Pænominae*, whose food is exclusively derived from sandy, rocky, or muddy bottoms. Eleven or twelve species of this new genus are described in this paper.

15. The *Opsarions* (*Opsarius*) differ from herbivorous Cyprins still more widely in their œconomy and habits. The body is long, the mouth widely-cleft and horizontal, and though without teeth, the symphysis of the lower jaw is armed with a sharp hook in the more characteristic, but which is blunter and less prominent the further we pass from the most typical forms; but this hook, more or less developed, is characteristic not merely of the *Opsarions*, but of the subfamily (*Sarcoborinæ*) to which they belong. It is received into a corresponding depression in the apex of the upper jaw when the mouth is closed. The back is straight; the dorsal is placed opposite to a long anal, both fins being situated near the caudal extremity, by which the power of darting or springing is rendered most perfect*. The abdominal cavity is long, and is chiefly occupied by a straight stomach of equal length, which is divided by a strangulation from a short fleshy intestine connecting the stomach directly with the vent, without any convolutions or elongation of the tube.

16. "The energies of nature," to use the words of Mr. Swainson, "are here concentrated as it were to the production of that form most adapted for one especial purpose," that of springing on their prey like the *Felinæ* or Cats, which they seem to represent. It is no uncommon thing to find an *Opsarion* so overgorged that the tail of its prey remains protruding from the mouth, to be swallowed after that portion which is capable of being received into the capacious stomach is sufficiently digested to admit of the introduction of the remainder†.

17. Two other genera of this subfamily remain to be noticed, viz. *Systomus* and *Leuciscus*. The first is made up chiefly of small species named Pungti by the Indian fishermen. If we were merely guided by their general appearance and the form of their fins, the only principle of division hi-

* The principal instrument of progressive motion in fishes is the caudal fin; other fins, as shown by Roget, are mere auxiliaries, serving to balance the body while it receives propulsion from the tail. Vide 'Bridgewater Treat.,' i. 286. This is correct in regard to fishes in general; but in the *Opsarions* and *Perilamps*, the dorsal and anal, from their position and size, contribute greatly to their velocity, being also situated on or near the tail; thus increasing the caudal surface, which, as Roget justly observes, operates as an oar does in sculling.

† I have seen *Opsarions* so often in this state, that I presume they are easier caught in it than in any other. A similar power of deglutition is recorded of sea-gulls by Blumenbach.

thereto adopted in this family, they might be brought into the several subgenera, *Cyprinus proprius*, *Cirrhinus*, &c. of the 'Règne Animal.' Buchanan, who published his 'Gangetic Fishes' contemporaneously with Cuvier's system, had not an opportunity of consulting its divisions, while those of Lacépède, Bloch, and previous writers were not reconcilable to Indian species; Buchanan therefore formed temporary groups for his own convenience, applicable to the local features of the family in this country. The Pungti, like all his other groups, were formed according to native opinions of their habits unshackled by artificial views, and being better marked than most genera, Buchanan's Pungti have more or less affinity to each other.

18. The stomach and intestine of the Systems are in none of the species I have examined more than thrice the length of the body, and the former, which is thick and fleshy, usually contains the remains of insects. The mouth is small, and when opened the intermaxillaries project so as to form a narrow tube,—hence their generic name.

It is in the Systems we first perceive a tendency to the hook or prominence on the apex of the lower jaw after quitting the herbivorous genera; and for this reason, as well as other peculiarities which appear to point them out as a typical or most perfect group, they are placed first in the list of carnivorous genera.

19. The Leuciscs, or white fishes, succeed the Perilamps. In this genus the prominence on the lower jaw is more distinct, and I have restricted the genus to such as possess this character, having at the same time the dorsal and anal small—the former placed anterior to the latter. They are all carnivorous, but not constructed for leaping above the surface like the Perilamps, nor for springing like the Opsarions; although the shortness of the intestines, size of the stomach, and prominence of the tooth on the lower jaw prove them to be scarcely less rapacious, yet I am not sure as to the accuracy of separating them from one or other of the preceding genera merely on account of the size and position of the dorsal and anal fins, particularly as the dental hook is only of importance in distinguishing them from some of the *Pænominae*.

20. After this outline of the structure of *Sarcoborinae*, a few remarks regarding their colours will be necessary, as embracing another principle on which the divisions have been formed. The whole of the subfamily *Pænominae* are remarkable for their uniformly plain colours, consisting of olive-green, bluish grey, or brown, extended along the back, and softened off on the sides, so as to leave the lower surface of the body an impure white, partaking more or less of the colours of

the back. The fins partake of the sober hues of the adjoining parts of the body, the pectorals and ventrals, as well as the branchial membranes and irides, usually displaying after death a slight blush of red, caused by the capillary effusion of blood in those parts. Of the species with which I am acquainted not one possesses a brilliant spot of any pure colour; but when we approach the limits of the next group, we begin to find in the *Gonorrhynchs* obscure dark spots on either side of the tail of some of the species, as *G. bimaculatus*.

21. But, on the other hand, as soon as we cross the verge of the herbivorous group and enter the carnivorous, we find such spots as those alluded to become brighter and more numerous, and the opercula and fins to be stained with yellow and red in deep and natural tints. To *Systomus*, the first genus of this group, the Gold-fishes*, commonly called Golden Carp, belong. The intestinal tube of the *Systoms*, though only thrice the length of the body, or half the length of the abdominal tube in those herbivorous species in which it is shortest, is nevertheless twice the length of the same organ in any of the other *Sarcoborinæ*. As we advance in this subfamily from the *Systoms* towards the *Opsarions*, we find, as has been shown, the abdominal tube diminishing in length; and in proportion as this takes place, and the habits of species become more carnivorous, we observe the brilliancy of the colours becomes more remarkable.

22. The *Perilamps*, as already stated, are followed by the *Leuciscs*. In these the diversity of colour is not great, but is compensated for by the metallic brilliancy of the nacre, or silvery pigment with which the scales and opercula are covered, and from which the genus has derived its name, *Leuciscus*, *Albus*, or white fishes, though not applicable to all the species; for there is one which is marked on each side with the bright longitudinal streak of the *Perilamps*, and, like the blending of the markings already observed between the *Pænomina* and *Sarcoborinæ*, the species in question, *Leuciscus lateralist*†, seems to unite the white fishes with the *Perilamps*.

23. The *Perilamps* in their structure naturally follow the *Systoms*, and present numerous bright longitudinal lines of various colours, but particularly blue on their sides. They are all small species, of little or no direct utility to man; nor is it possible to account for the peculiar brilliancy of their colours in any other way than as an instance of that inscrutable de-

* *Cyprinus auratus auctorum*.

† *Cyp. Daniconius*, Buch., which appears to me to be identical with *Cyp. Anjano*, id.; but if not, the latter species, on account of certain peculiarities about the mouth which seem to be wanting in the former, must be referred to the *Perilamps*.

sign, by which it would seem that, in pursuit of aquatic insects, on which they subsist, along the surface of waters, they become the better marks for Kingfishers, Skimmers, Terns, and other birds which are destined to keep the number of fishes in check, especially in deep waters beyond the reach of the Waders*.

[To be continued.]

VIII.—*Notes on Birds*. By T. C. EYTON, Esq., F.L.S.

No. IV.

Psophodes Crepitans, Vig. and Horsf.

Tongue nearly the same as in *Menura Lyra*. Trachea largest at the upper extremity, but gradually contracted towards the inferior larynx; the tube bound firmly down in the angle made by the rami of the os furcatum. The inferior larynx furnished with five pairs of muscles of voice, as among the Crows and Warblers; the sterno-tracheales weak, the other pairs of muscles connected with the trachea moderately developed. Oesophagus of moderate size, largest at the upper extremity, narrowed near the middle, and again slightly swelling above the proventriculus, which is of moderate size. Gizzard filled with the remains of insects, muscular, and of moderate size. Intestinal canal of large diameter in proportion to the size of the bird, largest a little below the duodenum; rectum short, about equal in diameter to the duodenum; cæca rudimentary; cloaca rather large.

Length of intestinal canal from stomach to cloaca $9\frac{1}{2}$ inches. Length of rectum $1\frac{1}{4}$ inch. Sternum rather elongated, and straight on the posterior margin between the fissures, which are two in number, one situated near each lateral margin, nearly closed posteriorly, deep, oval, and large. Keel shallow, nearly straight on its inferior edge, traversed by raised bony ridges as in *Menura*; the anterior edge of the keel and the manubrial process also resemble in shape those portions in the above-named genus.

Os furcatum long, without any process at the point where it joins the sternum; the rami rounded, and bending slightly inwards, so as to approach each other near the middle; coracoids, pelvis, ribs, scapula, and caudal vertebræ also as in *Menura*. The numbering of the vertebræ is

Cer. 11; Dor. 7; Sac. 11; Caud. 6; Ribs 8, 5 true, 3 false.

REMARKS.—In the structure of the soft parts and tongue *Psophodes* comes very near to *Menura*; the trachea however differs in not having the muscles of voice so strong, and in their being disposed as among the Warblers and Thrushes. *Menura* and *Psophodes* also agree in the form and length of the coracoids, scapula, and ribs, showing in these parts an affinity to Scansores, though not so strongly marked as in *Me-*

* See remarks on *P. perseus* in a subsequent part of this paper.