

CHAPTER XI.

LINEAR SERIES—*continued.*

MISCELLANEOUS EXAMPLES.

IN this chapter are given some miscellaneous examples. Most of them illustrate the Meristic Variation of parts standing in bilateral symmetry on either side of a median line.

Here also are included certain cases of Variation concerning the series of apertures in the shell of *Haliotis*, though probably they are of a wholly different nature.

SCALES.

Among animals possessing an exoskeleton composed of scales, the number of the scales or of the rows of scales found in particular regions is usually more or less definite. So constant are these numbers in their range of Variation that in both Reptiles and Fishes either actual numbers or certain ranges of numbers are made use of for purposes of classification.

Considerable Variation in these numbers is nevertheless well known, and many instances are given in works dealing with Reptiles or Fishes. The following cases are given as illustrations of some of the larger changes which may occur.

403*. ***Clupea pilchardus*** (the common Pilchard). Among the Pilchards brought to the curing factories at Mevagissey, Cornwall, specimens have from time to time been found by Mr Mathias Dunn, the director, having the scales of one side very many more in number than those of the other side. Two specimens¹ shewing this abnormality were given to me by Mr Dunn in 1889. Owing to the fact that the fresh Pilchards are shovelled wholesale into the brine-vats, it is not until the fish are picked over for packing after the salting process that any individual peculiarities are

¹ These specimens are now in the Museum of the Royal College of Surgeons. An account of them was published in *P. Z. S.*, 1890, p. 586. Figures of the same variation were given by DAY, F., *P. Z. S.*, 1887, p. 129, Pl. xv.

noticed. This was the case with the present specimens, which were given to me as they came salted from the presses. Nevertheless when received they were in fairly good condition.

The first specimen measured 8 in. to the base of the caudal fin. The head and opercula were normal on both sides. *The number of scales along the lateral line or the left side is 32 and the number on the right side is 56 or 57.* On the left side the scales have the size usually seen in Pilchards of this length, and on the right side for a distance of about an inch behind the operculum the scales are not much smaller than those of a normal Pilchard, but behind this point each scale is of about half the normal size.

The second specimen has a very similar length. It differs from the first in having the reduplication on the left side instead of on the right. Furthermore the scales are normal in size as far as the level of the anterior end of the dorsal fin, behind which place they are of about half the normal size. The transition in this specimen is quite abrupt. The scales had been somewhat rubbed, and the counting could not be very accurately made, but the total number along the left lateral line was approximately 48.

As these abnormal individuals were taken with the shoal there can be little doubt that they were swimming with it.

In *P. Z. S.*, 1887, p. 129, Pl. xv. DAY described a specimen, also obtained from Mr Dunn, exhibiting characters similar to those above described. The number of scales along the lateral line is given as 32 on the right side and 51 on the left. In the figure no transition from normal to abnormal scales is shewn, but there is a general appearance of uniformity.

Mr Day regarded this specimen as a hybrid between the Herring (*C. harengus*) and the Pilchard, and before adopting the view that the case is one of Variation this suggestion must be discussed. This view was chiefly based on the presence of the small scales on one side, but it is added that the ridges on the operculum, which are characteristic of the Pilchard as compared with the Herring, were better marked on the right side than on the left, though they are stated to have been very distinct on the left side also. In the specimen described, the gill-rakers were 61 in the "lower branch of the outer branchial arch" (viz. the bar consisting of the first hypobranchial and ceratobranchial), and it is mentioned that this number is intermediate between that found in a Pilchard (71) and in a Herring (48); but whether this intermediate number was found on the side shewing the "Herring" characters, or on the other, or on both, is not stated. These gill-rakers are also said to have been intermediate in length between those of a Pilchard and those of a Herring. From these points of structure Mr Day concludes that the specimen was a hybrid between the Herring and the Pilchard.

As against the theory that these specimens are hybrids it may be remarked that no direct evidence is adduced which points to hybrid parentage. The suggestion is derived from (1) the condition of the

scales, (2) the number of the gill-rakers, (3) the alleged difference in the opercula of the two sides. In view of the first point, viz. that the number of the scales on one side is intermediate between that of the Pilchard and that of the Herring, it seemed desirable to know whether the resemblance extended to the minute structure of the scales or was restricted to their number only. On comparing microscopically the scales of the Pilchard and the Herring, I find that those of the Herring bear concentric lines which are almost always smooth and without serrations, while those of the Pilchard are marked with lines which are waved into very characteristic crenelated serrations. On comparing the scales which are repeated, it was found that they also shew these characteristic serrations and that in pattern they differ in nowise from the scales of the Pilchard. This evidence appears to tell very strongly against the theory that the small scales are derived from a Herring parent.

The evidence from the gill-rakers seems to be also unreliable. In a normal Pilchard Mr Day found 71 on the hypo- and cerato-branchials of the first gill-bar, and in a specimen examined by me 72 were present and in normal Herrings 48. But in my two specimens shewing the repeated scales there were present, on the normal sides 79 and 67 respectively, and on the abnormal sides 78 in the one fish and 67 in the other. In size and shape the gill-rakers were like those of the Pilchard, being smooth, and unlike those of the Herring, which bear well-marked teeth.

As it is stated that the serrations characteristic of the operculum of the Pilchard were very distinct on the abnormal side, it is impossible to lay much stress on the circumstance that they were less distinct than those of the other side.

In addition to the considerations given above, there are several *à priori* objections to the hypothesis of the hybrid origin of these forms; as, for example, that unilateral division of parental characters is certainly not a common phenomenon in hybrids, if it occurs at all, and so on. But since the evidence advanced for the theory of hybrid parentage is already open to criticism, it is perhaps unnecessary to discuss these further difficulties.

On the whole, therefore, it seems simpler to look on these abnormalities as instances of the phenomenon of Meristic Variation¹.

In Ophidia the number of scales occurring in different parts of the body is constant in some genera and species, and variable in others. Variation in the number of rows of scales on the body may be specially referred to as an instance of a change in number occurring at right angles to that just described. The number of such rows in *Tropidonotus*, for example, is generally 19, but Mr 404. BOULENGER informs me that the Swiss ***Tropidonotus viperinus*** has either 21 or else 23 rows.

405. ***Tropidonotus natrix*** is remarkably constant in the possession of 19 rows of body scales. A specimen taken in Switzerland

¹ Compare with an interesting series of cases in ***Gasterosteus*** (Stickleback). BOULENGER, G. A., *Ann. and Mag. N. H.*, 1893, S. 6, xi. p. 228, see also *Zool.*, 1864, p. 9145; SAUVAGE, *Nouv. Arch. du Mus.*, 1874; DAY, *Journ. Linn. Soc.*, xiii. 1878, p. 110; &c.

is described by STUDER, *Mitth. natur. Ges. Bern*, 1869, p. 24, as having 20 rows. This specimen was unusually dark in colour. [The presence of an even number of rows is in itself remarkable, but it is not stated whether this total was reached by duplicity in the median dorsal row or by inequality on the two sides.]

406. A specimen of Snake from Morocco closely resembled *Macroprotodon mauritanicus* Guichenot (= *Lycognathus cucullatus* Dum. Bibr.), but differed from it in having 23 rows of body-scales instead of 19, being 4 rows in excess of the normal number. PETERS, W., *Sitzb. Ges. naturf. Fr. Berlin*, 1882, p. 27.

For particulars as to the range of variation in these numbers in different species, see numerous examples given by BOULENGER, G. A., *Fauna of Brit. India : Reptilia and Batrachia*, 1890.

KIDNEYS; RENAL ARTERIES; URETERS.

Meristic Variation in these organs is well known and the principal forms found are described in most text-books of anatomy. Some information as to these is given below. The examples are all from the human subject.

407. *Kidneys.* Male having three kidneys. The left kidney was normal in shape, position and consistency but was abnormally large. The right kidney was placed opposite to it and weighed only half as much as the left. From it a ureter with a small lumen arose and passed in a normal course so far as the division of the aorta. At this point its course lay along the surface of the third kidney. This third kidney lay over the whole right iliac artery, a portion of the right crural artery for the space of 9 lines, the right crural vein and the psoas major muscle. It was larger than the upper right kidney and had the form of an oval with its ends cut off. The anterior and posterior surfaces were convex. The anterior surface was grooved for the passage of the ureter mentioned above, which received the ureter of the second kidney and passed normally into the bladder. The man was a sailor and died of enteritis at the age of 39. THIELMANN, C. H., *Müller's Arch. f. Anat. u. Phys.*, 1835, p. 511.
408. *Renal Arteries.* The number of the renal arteries in Man is liable to great variation. In specimens in which the kidneys are normal in position the arteries may be (a) diminished or (b) increased in number. The latter is much more common.

Multiple renal arteries may be threefold. (a) Most commonly the additional branches spring from the aorta, (b) they may come from other sources; or (c) there may be a co-existence of additional vessels from both sources.

Of the first class, there have been described cases of

one, two, or three	}	right aortic renals associated with	{	one, two, three or four	}	left aortic renals.
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In the commonest form, next to the normal condition of one on each side, there are two on the right side and one on the left. In the second commonest condition there are two on the left and one on the right; but among the forms with larger numbers, the greatest number is more frequently seen on the left than on the right side. In all these cases one vessel arises in the position of the normal renal; a second commonly springs from the aorta much lower down, generally on the level of, or below the inferior mesenteric; the third when present, is at a very short distance above the normal renal, very close to the supra-renal and on the level of the superior mesenteric. Cases of five on the right are described by OTTO and MECKEL, and other multiple forms are recorded by the older anatomists. MACALISTER, A., *Proc. Roy. Irish Ac.*, 1883, p. 624.

409. Three renal arteries on each side, symmetrically placed (Fig. 73). In this case the posterior ends of the kidneys were united

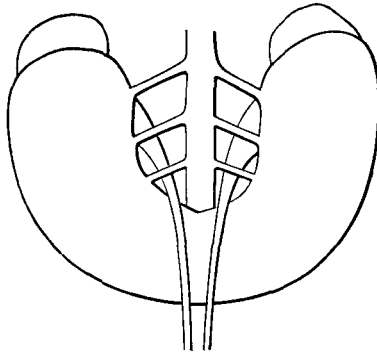


FIG. 73. Case of three renal arteries on each side combined with "horse-shoe kidney" (Man). (From *Guy's Hosp. Rep.*).

across the middle line in the condition known as "horse-shoe kidney" [see evidence as to Bilateral Series]. *Guy's Hosp. Rep.*, 1883, p. 48, fig.

410. *Ureters*. Male. *Four* ureters emerging from the hilum of each kidney. After proceeding about four inches they became united, forming a pelvis from which sprang the proper ureter. The hilum of the kidney was found to be occupied by a quantity of

fat and connective tissue, imbedded in which the ureters could be traced to the infundibula, communicating with the calices and pyramids: thus there was no pelvis within the hilum, but the calices united to form infundibula of which these ureters seemed to be the continuation, and they became united in a pelvis some distance removed from the kidney. There were other signs of abnormal urino-genital development and the author believes that it is almost certain that the abnormality described was congenital and not a sequel of disease. RICHMOND, W. S., *Jour. Anat. Phys.*, XIX. p. 120.

411. *Two* ureters from one kidney are frequent. For an example, see *Guy's Hosp. Rep.*, 1883, p. 48.

TENTACLES AND EYES OF MOLLUSCA.

412. **Submarginula**: specimen having a supernumerary eye on each eye-stalk (Fig. 74, II.). Author remarks that supernumerary eyes are common in forms having eyes borne on tentacles, but are rare in forms in which the tentacle is reduced as it is in *Submarginula*. FISCHER, P., *Jour. de Conch.*, S. 2, I. p. 330, Pl. XI. fig. 4.
413. **Patella vulgata**: tentacle and eye repeated on left side (Fig. 74, I.). Right side normal. Supernumerary eye and tentacle of normal size. *Ibid.*, S. 3, IV. p. 89, Pl. VIII. fig. 8.

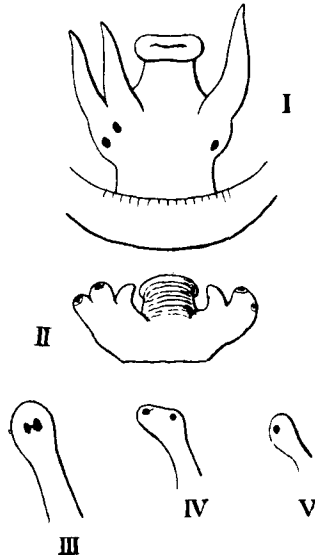


FIG. 74. Repetitions of eyes and tentacles in Molluscs. (After Fischer and Moquin-Tandon.)

I. *Patella vulgata*, No. 413. II. *Submarginula*, No. 412. III. *Helix kermovani*, No. 416. IV. *Clausilia bidens*, abnormal, No. 417; V. normal of the same.

414. **Triopa clavigera** (a Nudibranch): adult of the usual size, having the lamellar rhinophore of the right side formed of three branches, of which the two anterior were lamellar, borne on a common peduncle, and the posterior was simple, of regular shape and probably representing the normal rhinophore of the right side. The rhinophore of the left side was normal. *Ibid.*, S. 3, XXVIII. p. 131.
415. **Physa acuta**: right tentacle bifid, left normal. MOQUIN-TANDON, *Hist. nat. des Moll. terr. et fluv. de France*, I. p. 322, Pl. XXXII. fig. 15.
416. **Helix kermorvani**: a second eye present, close to, but separate from the normal eye (Fig. 74, III.) on the left tentacle. *Ibid.*, Pl. XI. fig. 10.
417. **Clausilia bidens**: supernumerary eye on the right tentacle as shewn in Fig. 74, IV. *Ibid.*, Pl. XXIII. fig. 24.
418. **Littorina**: supernumerary eye on one tentacle. PELSENEER, *Ann. Soc. belge de microscopie*, XVI., 1891.

In examining large numbers of *Pecten* of several species, Mr BRINDLEY occasionally found one of the eyes imperfectly divided into two, the division being at right angles to the mantle-edge.

EYES OF INSECTS.¹

The following are examples of supernumerary eyes in Insects. They are mentioned as examples of the development of tissues of the same nature as those of the normal eye in abnormal situations. All the cases known to me occur in Coleoptera.

419. **Toxotus (= Pachyta) 4 - maculatus**: a normal female. On the vertex of the margin of the right eye and abutting against it is a small third eye. This third eye is round-oblong in shape. It is separated from the large eye only by the outermost margin of the eye, and though it is more convex than the latter there is nevertheless a considerable depression between the upper surfaces of the two eyes. This supernumerary eye is of a brighter colour than the normal eye, being brownish-yellow, while the latter is of a pitchy black. It is faceted in the same way as the normal eye is. LETZNER, K., *Jahresb. d. Schles. Gesell. für vaterl. Cultur.*, 1881, p. 355.
420. **Calathus fuscus**: having a third eye. On the left side of the vertex was placed a supernumerary eye. This structure was smaller and less projecting than the normal eye and was separated from it by the usual groove. It did not appear to be a part of the normal eye which had separated from it, for the normal eyes of the left and right sides were exactly alike. The integument of the head was slightly wrinkled around the supernumerary eye. DE LA BRULERIE, P., *Ann. de la Soc. Ent. de France*, S. 5, v., 1875, p. 426, note.
421. **Vesperus luridus** ♀: head abnormal and bearing a third

¹ For cases of eyes compounded in the middle line (Bees), see evidence as to Bilateral Series.

faceted eye. The consistency of the chitinous covering of the head, its sculpture and hairs, colour, &c. are all normal and of the usual structure. The left side of the head however is rather less developed than the right, and the left eye seems to be smaller and somewhat less convex, but there is no special deformity or alteration in the facetting.

At the left side of the head arises an irregular chitinous *loop* of unequal thickness and having a diameter of about 2.5 mm. This loop is attached to the substance of the head before and behind and these two attachments are distant from each other about 1 mm. The height of this loop from the surface of the head is about 1 mm. in the highest part. Upon the upper surface of the loop is a small, irregularly rounded *eye*. The diameter of this eye is about 2.5 mm. and its convexity is considerable. It is faceted, but its facetting is not quite regular and is finer and slighter than that of the normal eyes. VON KIESENWETTER, *Berl. Ent. Ztschr.*, 1873, XVII. p. 435, *Plate*.

[A case is recorded by REITTER (*Wiener Ent. Ztg.*, IV., 1885, p. 276) of a *Rhyttirhinus deformis*, having a "complete and fully formed faceted eye placed on the left side of the thorax." Upon the request of Dr Sharp, this specimen was most kindly forwarded by Dr Reitter for our examination, when it was found that upon the application of a drop of water, the supposed abnormal eye came off. The eye appeared to be that of a fly, and had no doubt become accidentally attached to the beetle either in the collecting-box or before its capture.]

WINGS OF INSECTS.

Supernumerary parts having the structure of wings have been occasionally recorded in Lepidoptera, but their occurrence is exceedingly rare. In a subsequent chapter detailed evidence will be given respecting supernumerary legs and other of the jointed appendages of Insects and it will be shewn that in very many and perhaps all of these cases the supernumerary parts constitute a Secondary Symmetry within themselves (see p. 90). Extra wings however are of a different nature altogether, and there is so far as I am aware no indication that any of their parts are disposed as a Secondary Symmetry. In other words, an extra wing if on the left side is a left wing, and if on the right side a right wing.

In some cases the extra wing is a close copy of a normal structure, in others it seems to be more or less deformed. No genuine case of an extra wing present on both sides of the body is known to me.

From the fact that no specimen of supernumerary wing has ever been properly dissected, it is not possible to make any confident statement as to the attachments or morphology of such parts. (See also No. 78.)

The cases of *S. carpini*, No. 422, and of *Bombyx quercus*, No. 429, nevertheless suggest that Variation in number of wings is of the same nature as that seen in teeth, digits, or other parts standing in a Meristic Series. In the specimen of *S. carpini* it is especially noticeable that on the side having three wings, both the wings formed as secondaries were smaller than the secondary of the normal side; but in other cases, *G. rhamni* (No. 427) for instance, this was not the case, and the wing standing next to the extra wing was normal. Both these conditions are frequently found in cases of the occurrence of supernumerary parts in series: for two members of a varying series may clearly correspond jointly with a single member of the normal series, or on the contrary a new member may stand adjacent to members in all respects normal as in *G. rhamni* (No. 427.)

*422. **Saturnia carpini** ♀, having a supernumerary hind wing. The specimen is rather a small female. The right wings and the left anterior wing are normal, but in the place of the left posterior wing, there are two rather small but otherwise nearly normal posterior wings. Of these the anterior is rather the larger and to some extent overlaps the posterior. The costal border of the posterior wing is folded over a little so that its width cannot be exactly measured.

	Greatest length.	Greatest width.
Right hind-wing normal	22·5 mm.	19 mm.
First left hind-wing	20·5 „	14 „
Second left hind-wing	15·5 „	11 „ about.

From the fact that the bases of these two wings are greatly overgrown with hair, it is difficult to distinguish their exact points of origin from the body, but so far as may be seen, the second arises immediately behind and on a level with the first. The neuration of each of the two small wings is identical with that of a normal hind-wing. The scaling is perfect on both surfaces of both wings, but is perhaps a little more sparse on the anterior of the two abnormal ones. In colour the anterior abnormal wing is rather light, but the posterior one is identical with that of the other side. The markings on each of the wings are normal, but are on a reduced scale in proportion to the size of the wings. This is especially remarkable in the case of the ocelli, which are both of a size greatly less than that of the ocellus of the normal hind wing of the right side.

The two wings were in every respect true left hind-wings and were in no way complementary to each other. [Specimen in collection of and kindly lent by Dr MASON.]

423. **Bombyx rubi** ♀: 5th wing on left side. The additional wing was placed behind the left posterior wing. It was of normal structure as regards scaling and coloration. Its length was that of the hind-wing but in breadth it did not exceed 6 mm. The

insertion of this wing into the body was immediately above that of the normal hind-wing. The extra wing bore 4 nervures, of which 3 reached to the margin but one was shorter. The proper hind-wing of the same side was rather narrower than that of the other side and was not so thickly covered with scales, but its neuration was complete and normal. SPEYER, A., *Stettiner Ent. Ztg.*, 1888, XLIX. p. 206.

424. **Samia cecropia** ♂, having a fifth aborted wing. Bred in captivity: ordinary size, expanding about $5\frac{1}{2}$ inches: a smoky variety in which red portion of transverse bands on wings is much narrowed. Right primary and both secondaries normal in shape and marking. Left primary in length from base to apex exactly the same as the right, but in width from inner angle across to the costa is $\frac{3}{8}$ of an inch less; the markings are the same, but condensed into the narrower space. Neuration normal in all wings. Left primary also somewhat narrower at base, where it joins the body. The inner margin is in exact line with its fellow; hence the costal line of the left primary is somewhat posterior to that of the right primary. The supernumerary wing emerges from the side of the collar and runs parallel to the normal left primary. It consists mainly of the costal and subcostal nervures, a small part of the median nervure and a strip of wing about $\frac{1}{4}$ inch wide which was much curled in drying. The supernumerary wing is in no way connected with the normal one.

[The author regards this supernumerary wing as a repetition of the anterior part of the left primary wing.] STRECKER, H., *Proc. Ac. Sci. Philad.*, 1885, p. 26.

425. **Limnitis populi**, having four normal wings and a fifth wing behind the left posterior one. This supernumerary wing was 20 mm. long and 9 mm. wide. It slightly overlapped the left secondary and was attached to it for a length of 12 mm., but its outer end was free. It is described as exactly resembling the part of the secondary which bears the three anterior nervures, and it is stated that both surfaces were normal as regards scales and colouration. RÖBER, J., *Correspondenzbl. d. ent. Ver. "Isis" z. Dresden*, 1884, i. p. 31.
426. **Vanessa urticae**, having an additional hind-wing on the right side. This structure is inserted into the thorax dorsal to and between the two normal wings. It is shorter and of about $\frac{1}{3}$ the width of the normal hind-wing. In colouring it is a close copy of the anterior third of the hind-wing. WESTWOOD, *Trans. Ent. Soc.*, 1879, pp. 220 and 221, *Plate*. [Now in Brit. Mus.]
427. **Gonepteryx rhamni** with additional imperfectly developed hind-wing on the right side. In this case the normal right hind-wing is only about two-thirds of its normal size. It overlies the additional hind-wing. The latter is coloured like the normal wing and bears an orange spot. From the neuration of the two wings Westwood considered that the supplemental wing contained missing parts of the normal wing.

Only two legs existed on the side of the abnormal wing, but for fear of injury the specimen was not sufficiently examined to shew whether

the missing leg had been broken off or whether the extra wing was in its place. WESTWOOD, *ibid.*, p. 220.

A specimen of *G. rhamni* having five wings was caught at Brandon, Norfolk, in Aug. 1873 by Mr J. Woodgate, and exhibited to the Ent. Soc. by Prof. Meldola, *Proc. Ent. Soc.*, 1877, p. xxvi. A similar specimen of this species was bought at Stevens's auction-rooms and exhibited to Linn. Soc. by Prof. C. Stewart, in April, 1891. This specimen is now in Mus. Coll. Surg. Whether it is the same as that taken by Mr Woodgate, or that described by Westwood, or not, I cannot say, but possibly the references are all to one individual.

428. ***Lycæna icarus*** ♂. A coloured figure is given of a specimen of this form with 5 wings from Taurus, Asia Minor. [No further description is given. The figure is not very clear. It shews however that all the wings are normal except the right anterior. This wing is represented by two wings, which together are about a third wider than the normal wing. The costal portion of the foremost of these wings appears to be nearly normal in neuration, and the posterior part of the hindmost seems to be also normal. The two taken together shew several supernumerary nervures as compared with the normal wing, but the details are not shewn with sufficient clearness to justify a more precise statement.] HONRATH, E. G., *Berl. Ent. Ztschr.*, xxxii. 1888, p. 498, *Taf.* VII. fig. 9.
429. ***Bombyx quercus*** ♀: specimen having 5 wings figured in colour by HONRATH, with statement that the left anterior wing shews a double structure. [No further description given. The figure shews the left anterior wing represented by two wings. Of these the *posterior* appears to represent a nearly complete anterior wing on a reduced scale. It bears the white ocellar mark of the anterior wing. The pale-yellow submarginal band is curved inwards over the ocellus upon the costal border as in a normal wing and thus shews that the foremost wing is not merely the separated costal part of this wing. The foremost wing is anomalous. Its central half is rather darker in colour than that of the normal wing and its peripheral half is pale in colour, deepening towards the margin. It bears no ocellus. The neurations cannot be made out from the figure with precision but the two wings together contain many more nervures than the normal anterior wing. The legs are not described.] HONRATH, E. G., *ibid.*, fig. 10.
430. ***Zygæna minos***, having a fifth wing on the left side, inserted above and between the normal wings. The neuration of this wing is peculiar. The colouring of the supernumerary wing was that of the anterior wing. [Dr Rogenhofer kindly informs me that the legs were normal.] ROGENHOFER, A., *Sitz.-Ber. d. zool.-bot. Ges. Wien*, 1883, xxxii. p. 34, fig.
- In the same place the following instances of five-winged *Lepidoptera* are given:
431. ***Orthosia laevis*** with an additional posterior wing on the left side, in the Museum of Pesth. TREITSCHKE, Bd. vi. Abth. II. p. 407.
432. ***Fygæra anastomosis*** with a wing-like appendage to the left anterior wing in the collection of OCHSENHEIMER in Pesth.
433. ***Nania typica*** with an additional posterior wing in the collection of NEUSTADT at Breslau.

434. **Crateronyx dumi** with five wings in the collection of WISKOTT in Breslau.
 435. **Penthina salicella**: left fore-wing about $\frac{1}{4}$ wider than the normal right fore-wing. The apical border was markedly emarginated, giving it a bilobed appearance. The nervures were as in the normal wing, except that the cells between the branches of the subcostal nervure were enlarged. ROGENHOFER, *ibid.* [I am indebted to Dr Rogenhofer for a sketch of this specimen.]

[**Palloptera ustulata** (Diptera): specimen having a large upright scale on the thorax. This abnormal structure is like a third wing in appearance, and is fixed on the thorax, passing from the head, backwards between the wings. Its upper border is circular, and in all respects it resembles the upper wing-scale of one of the Calypterous *Muscidae*. GERCKE, G., *Wiener Ent. Ztg.*, 1886, v. p. 168.]

HORNS OF SHEEP, GOATS AND DEER.

436. **Sheep.** Repetition of the horns in sheep is well known. The best account is that of H. VON NATHUSIUS¹ of which the following is chiefly an abstract.

Commonly there is a pair of extra horns placed *externally* to the usual pair, but there may be three pairs in all, and even higher numbers are recorded, though Nathusius had seen no such case. The numbers on the two sides may be different, two on one side and one on the other, and three on one side and two on the other being sometimes met with.

It is noticeable that in all cases the horns stand in a *transverse* series, and not in a longitudinal series as they do in the Four-horned Antelope (*Tetraceros quadricornis*). The bases of the horn-cores are generally in contact, standing one outside the other at the same transverse level on the skull. Nathusius observed that in development the outgrowth for the horns of one side is at first single, but afterwards divides into two or more points, but he surmises that the division may appear earlier in other cases.

The external horns are generally smaller than the internal ones, but this is not universal. In some cases of two pairs of horns a small fifth horn is placed between the external and internal horns of one side.

In another form of double horn the *horn-core* of one side or other may be a double structure, both cores being enclosed in a single horn, which on being separated has a double-barrelled appearance.

Several examples of permanently four-horned breeds occur in various localities, being described as common in Cyprus and notably in Iceland and other northern islands. YUATT (p. 169) stated that there were two breeds of sheep in Iceland, the one small and the other large, and that the greater part of both breeds

¹ H. VON NATHUSIUS, *Vortr. üb. Viehzucht u. Rassenkenntniss*, Th. II., *Die Schafzucht*, 1880, p. 177, fig. 47.

had more than two horns, some having eight. I am informed however by Mr E. H. Acton, who has spent some time in the country, that many-horned sheep are by no means common in Iceland at the present day. In Kishtwar (district of S.E. Kashmir) a breed of 4-horned sheep is carefully preserved, in which the horns are as a rule very symmetrical, somewhat resembling No. 438¹.

Nathusius states that a four-horned ram does not always beget four-horned offspring even when the ewe has the same character, and the variation between father and son in respect of horns is frequently considerable.

The best figures of many-horned sheep are those given by BUFFON, *Hist. nat.*, Vol. xi. Pis. 31 and 32 (3-horned and 4-horned); YOUBERT, *The Sheep*, pp. 141 and 171, copied from BUFFON. Numerous other figures are referred to by Nathusius, but few of them are satisfactory.

437. **Goat.** A family of goats on an isolated farm near Bozen had 4 horns, which had been inherited for many generations. In most cases the two ordinary horns were typical in shape and direction; and in addition to these there were two lateral ones, which were laterally curved, being sickle-shaped and bent into a semicircle. GREGLER, V., *Korrespondenzbl. d. zool. min. Ver. Regensburg*, 1869, XXIII. p. 35.
- *438. **Rupicapra tragus** (Chamois): skull bearing two well-formed and symmetrical extra horns. The cores of these horns were a little outside and posterior to the normal pair. ALSTON, E. R., *P. Z. S.*, 1879, p. 802.
439. **Capreolus caprea** (Roebuck): specimens having a supernumerary beam are probably not very rare, and a number of such antlers were shewn among the hunting-trophies exhibited by H. H. the Duke of Saxe-Coburg-Gotha, and H. S. H. the Prince of Waldeck-Pyrmont at the German Exhibition held in London in 1891. The normal antler of the roebuck has a single beam rising vertically, then bifurcating, the posterior branch again dividing. In the abnormal specimens from the single burr of one side arose a supernumerary beam in addition to the normal one. In one specimen, in which the supernumerary beam was nearly as long as the normal one, the latter bifurcated as usual but was rather more slender than that of the other side (Fig. 75 I.). In another case (Fig. 75 II.), from the left burr, which was much enlarged, arose (1) an innermost beam, in thickness and texture resembling that of the normal right horn, though it was much shorter and bore no tine; (2) an external beam at once dividing into two almost equivalent branches having about the same length as the innermost beam. In such a case I know no criterion by which one of the three beams can be certified to be the normal to the exclusion of the others. As in the sheep and goats, the several horns resulting from subdivision seem to be generally in or nearly in the same transverse plane.

¹ GODWIN-AUSTEN, H. H., *P. Z. S.*, 1879, p. 802.

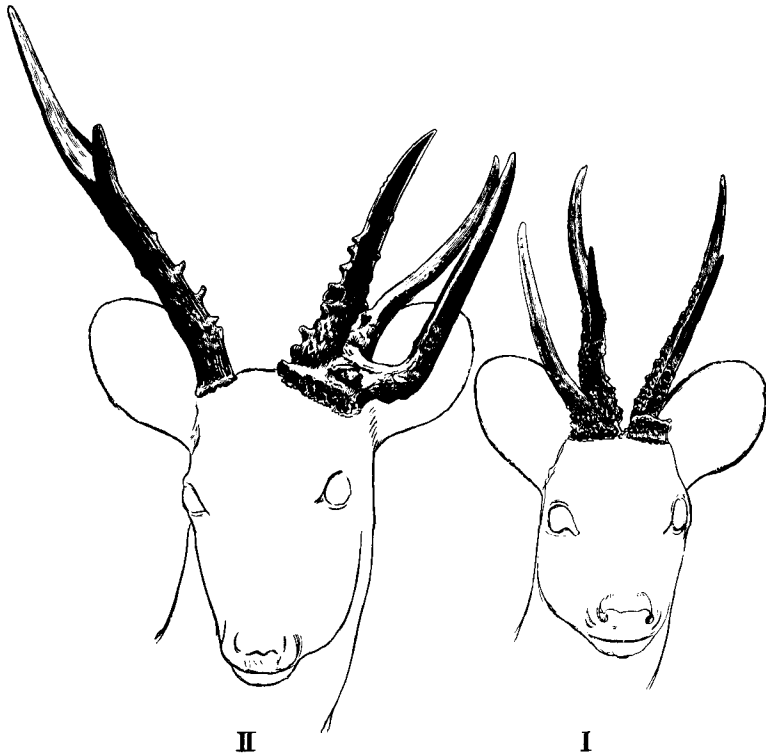


FIG. 75. Abnormal horns of Roe buck (*Capreolus caprea*), No. 438. (When seen by me the horns were fixed upon heads modelled in plaster.)

PERFORATIONS OF SHELL OF *Haliotis*.

440. ***Haliotis gigantea*** (Japan) having two rows of perforations in the shell. In addition to the ordinary row of perforations, of which 12 were present in this specimen, there was a series of 8 additional perforations which began within an inch of the apex. Of the normal series the last four remained open, but all the perforations in the abnormal row were closed with nacre. Specimen in Brit. Mus. SMITH, E. A., *Ann. and Mag. of N. H.*, 1888 (1), p. 419.
441. ***Haliotis***: two specimens, of different species, in which the perforations were entirely absent, their place being taken by a continued convex, spiral rib, like the second rib of *Padollus*. "Probably in this individual the mantle was without any slit, and hence the malformation, the water being admitted to the gills by the slight notch in front of the ribs, as in some *Emarginula*, or *Scuta*." GRAY, J. E., *Proc. Zool. Soc.*, 1856, p. 149.
442. ***H. albicans***: several specimens in which the perforations were united to form a continuous slit. The appearances were so uniform that Gray was disposed to think that these specimens might represent a new genus, but on comparison with types they seemed to belong to the species named. In some fossil genera (*Scissurella*) the perforations are replaced by a more or less continuous slit over the mantle. The specimens in question were greatly eroded and had a diseased appearance, *ibid.* Plate.