Institut royal des Sciences naturelles de Belgique

BULLETIN

Tome XXXVIII, n° 50

Bruxelles, novembre 1962.

Koninklijk Belgisch Instituut voor Natuurwetenschappen

MEDEDELINGEN

Deel XXXVIII, nr 50

Brussel, november 1962.

A DIPNOAN FROM THE ASSISE DE MAZY OF HINGEON,

by Errol Ivor White (Londres).

(With 2 plates.)

Through the courtesy of Dr. A. Capart, Director of the Institut royal des Sciences naturelles de Belgique, and of Dr. Edgar Casier, I have had the opportunity of examining a most interesting dipnoan head from Hingeon, some 12 km N. E. of Namur. The details of the locality are given as, « Pl. Andenne n. 1, Loc. Hingeon (tranchée Intercommunale des eaux, 920 m S. S. E. du village). Ass. Roches rouges Mazy (F 1), and the number of the specimen is I. G. 8701.1 A & B.

The matrix is a hard grey limestone. These beds have been described by Professor E. Asselberghs (1), who recorded both *Bothriolepis* and *Osteolepis* from them, and scales of the latter are present on the block on which the specimen lies.

On development, the specimen (Text-fig. 1; Pl. 1) shewed the greater part of the head-shield of a dipterine and the anterior part of the underside, the whole measuring, as preserved, 7.0 cm. It is broken across plate E (2) and although the two parts would fit on to one another, the anterior part of the specimen is separated from the hinder by a small gap and lies at an angle to it.

As restored (Text-fig. 2) the median length from the front margin of the snout to the posterior edge of plate ' B ' is 5.7 cm. The right margin of the snout is folded under so that this region is slightly asummetrical (Pl. II, fig. 6). Plates on both sides are missing from the middle region,

(1) E. Asselberghs, 1936, pp. 265-6, 309.

(2) The nomenclature of the cranial roofing plates used here is that proposed by Forster-Cooper (1937, pp. 228-229).

but fortunately the two sides supplement one another almost completely, only part of the margin between plates C and J being unknown. However, since the plates missing from one side are made up from mirror-

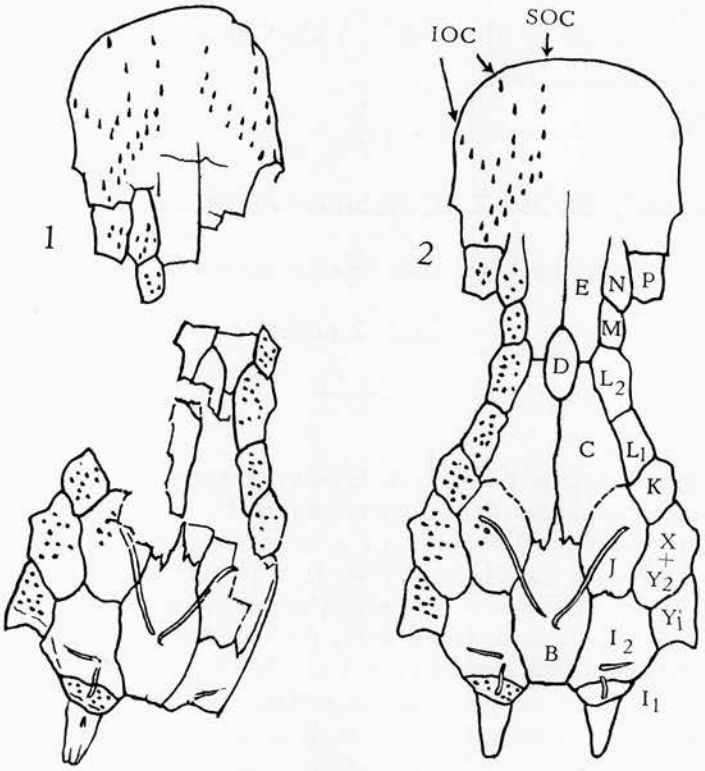


Fig. 1. — *Rhinodipterus secans* (GROSS).
Imperfect skull-roof. Assize de Mazy, near Hingeon.
I. R. Sc. N. B., I. G. 8701.1 A (× 1 ½).

Fig. 2. — *Rhinodipterus secans* (GROSS).
Restoration of specimen in Fig. 1. The pattern of the component plates is probably more symmetrical than in the living fish, as plates missing on one side are restored by mirror-reflections from the other. Sensory pores omitted in right side. IOC : infraorbital sensory canal; SOC : supraorbital sensory canal.

reflections of those preserved on the other, the restoration is doubtless unnaturally symmetrical.

It is evident that we are dealing with a specimen of *Rhinodipterus secans* (GROSS).

This species was described by GROSS (3) from the Cellulosa-marl of Kokenhusen, Latvia, first as a species of *Dipterus*, then as the type of a new genus, *Rhinodipterus;* and recently a second species, *R. ulrichi*, has been described by ØRVIG (4) from the Oberer Plattenkalk of the Bergisch Gladbach area, East of Cologne.

The Belgian fossil is rather larger than those represented in the Latvian material and in addition to shewing the main roofing plates in a single specimen, it shews those carrying the sensory canals. The sensory pores are, however, much finer (although not so fine as normally in *Dipterus valenciennesi*), in keeping with the state of the plates which shew little or no signs of resorption and all, as well as the snout, are covered in dentine. On the other hand the Latvian fossils do show considerable resorption, and the large size of the sensory pores is due to this factor, which is also apparent in the specimens belonging to the new German species.

The hindmost median plate A is missing. The next plate B resembles that in the Latvian specimen from Stockholm reasonably well but it has a marked anterior projection. It shews well the anterior pit-lines, which are slightly asymmetrical for they do not quite meet and the right line is slightly hooked behind, instead of crossing over.

The paired plates C are largely missing and their outline is determined by the form of the neighbouring plates. They were long, almost triangular and separated in front by the small oval plate D, about the middle of which they had a narrow transverse contact with plates E. In GROSS's restoration 'D' is much larger and is in full contact with the lateral series of plates for some distance on both sides. In this matter the Belgian fossil resembles many specimens of *D. valenciennesi* (5).

The long narrow plates E are at first clearly separated from one another, but the median suture just peters out and the apparent transverse contact-margins with the snout region are only p o s t - m o r t e m cracks.

The snout is very much the same as in GROSS's material, and like all the plates, covered in dentine.

Returning to the back of the head, plate H is missing on both sides, but a large plate I is complete on the left side and partly preserved on the right. It bears a long transverse middle pit-line and a shorter posterior pit-line nearly meeting it at right angles at the inner end. The posterior end of 'I' appears to have been separate — it is missing on the right side — and besides the end of the pit-line shews the pores of the occipital cross-commissure, the only place where it is preserved, since A

(3) W. GROSS, 1933, p. 44, text-fig. 25, pl. V, figs. 5, 13; 1956, p. 20, text-figs. 12-13, pls. V-VIII, fig. 1.

(4) T. ØRVIG, 1961, p. 11, text-figs. 8, 9 D, pl. II, pl. III, figs. 2-4.

(5) T. S. WESTOLL, 1949, p. 131, text-figs. 2 B, E, 3 A, B *(D. platycephalus)*.

and both of H are missing. Below and behind I projects what WATSON & GILL (6) call ' a tabular horn for the attachment of the shoulder-girdle ', and LEHMAN (7) the ' processus postérieur du pariétal '.

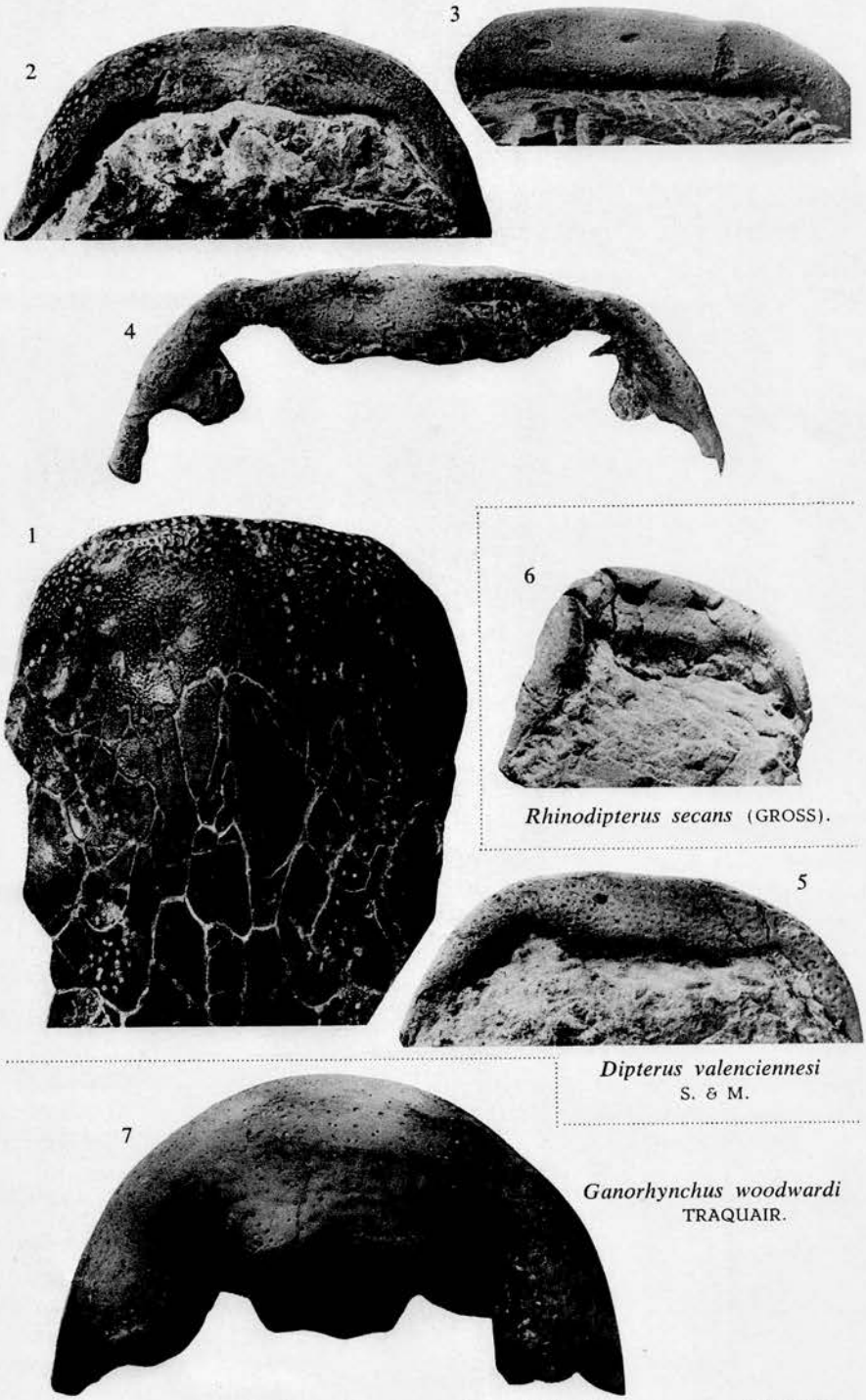
In front of I is an equally large and elongated plate ' J ', imperfect on both sides, which carries the forward continuation of the anterior pit-line from B which passes near the anterior border into the supraorbital canal. Then this canal, as shewn by the pores, runs forward through the series of small bones, K, L_1, L_2 and M, varying in shape and complete only on the right side, to N which is long and narrow and not completely separated from the snout, the anterior suture being, like those of plate E, a post-mortem crack. From N the canal turns sharply outwards to a squarish plate P (' Q ' of WESTOLL), and then curves inwards on the snout towards its fellow of the other side, finally running forwards and slightly outwards to near the front of the snout where it then plunges to end in a oval aperture on the underside (Pl. II, fig. 6) in much the same position as « a large dorsal pore between rostrals 20 and 21 », opens from the rostral commissural canal on each side between the anterior openings of the rostral cavity in *Latimeria* (8). These terminal apertures of the supraorbital canals are large in this specimen, but in the much resorped head figured by GROSS (9) they are so relatively enormous that the pair were identified as the anterior nasal openings. In *R. ulrichi* they were described by ØRVIG (10) as ' probably openings for glands of some sort ', and at the same time he illustrated them in a species of *Dipterus*. They are to be found in all appropriately preserved specimens of *D. valenciennesi* (Pl. II, figs. 2-5) and though very much smaller than in *Rhinodipterus*, it is curious that they have not been described before. In *Dipterus* there are also numerous enlarged pores to be found above and below the tip of the snout. These enlarged pores, which are readily distinguishable from the openings of the dentine tubuli, are clearly sensory in function, as GROSS (11) has suggested in regard to those he found on the underside of the snout and the front of the lower jaw of *Rhinodipterus*. They are most likely part of a highly developed system permeating the snout regions and connected with the terminal parts of the sensory canals, the whole doubtless forming a means for discovering food in muddy waters. ØRVIG (12) also drew attention to the occurrence of ' openings which in size occupy an intermediary position between those of the (« mucous ») canal system... and the pores of the lateral line... ' and claimed that they

(6) D. M. S. WATSON & E. L. GILL, 1923, p. 168, text-fig. 1.
(7) J. P. LEHMAN, 1959, pp. 12, 40, etc.
(8) J. L. B. SMITH, 1939, p. 51, pl. XII; J. MILLOT, 1954, pl. XXI; J. MILLOT & J. ANTHONY, 1956, p. 382, text-fig. 1.
(9) W. GROSS, 1956, p. 23, text-fig. 14 C, pl. V, fig. 5.
(10) T. ØRVIG, 1961, p. 15, text-figs. 8 B, C; 9 C-E; pl. 3, fig. 3.
(11) W. GROSS, 1956, p. 24, text-fig. 14 B.
(12) T. ØRVIG, 1961, p. 15, text-fig. 8.

Rhinodipterus secans (GROSS).

E. I. WHITE. — A dipnoan from the Assise de Mazy of Hingeon.

Phototypie A. Dohmen. Bruxelles



1.-5. — *Dipterus valenciennesi* S. & M. 6. — *Rhinodipterus secans* (GROSS).
7. — *Ganorhynchus woodwardi* TRAQUAIR.

E. I. WHITE. — A dipnoan from the Assise de Mazy of Hingeon.

Phototypie A. Dohmen, Bruxelles

occur in addition to the snout and the anterior end of the lower jaw, on the top of the head (bones I, J and C) and on the gular bones, areas where reasons for their presence do not seem so obvious, and where, at least on top of the head, they have not been detected in *Dipterus* (Pl. II, fig. 1) or in the present specimen.

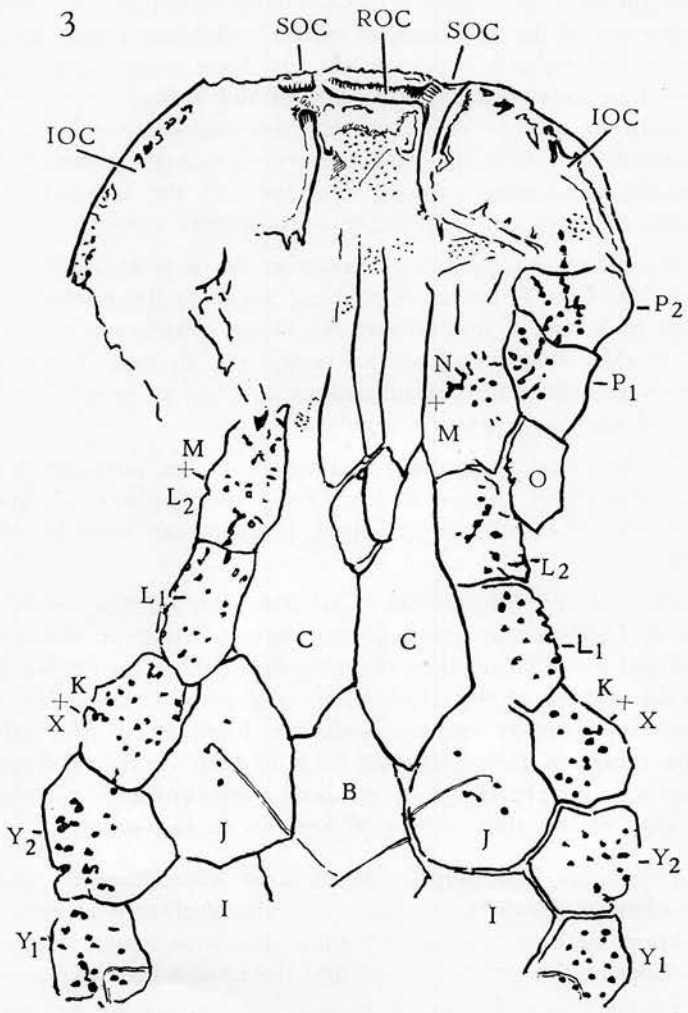


Fig. 3. — *Dipterus valenciennesi* SEDGWICK & MURCHISON.
Imperfect skull-roof with anterior end naturally weathered to shew the front parts of the sensory canals (IOC, SOC) and the rostral commissure (ROC). Middle Old Red Sandstone, loc. unknown, Caithness. Brit. Mus. (Nat. Hist.). P. 6087 (× 3).

It is interesting to note that the terminal openings of the sensory canals are absent from the unique snout of *Ganorhynchus woodwardi* (Pl. II, fig. 7). In this massive, heavily ' enamelled ' specimen, the provenance of which is unknown, the pores are relatively small and widely scattered, but the nasal notches are very deep, suggesting that its habits were entirely different from those of *Rhinodipterus* and *Dipterus;* possibly it was a surface feeder.

The canals of the rostral region are very clearly shewn in a naturally weathered specimen of *Dipterus valenciennesi* (Text-fig. 3). This clearly shews the ends of the supraorbital canals which are joined by a rostral commissure just behind the front of the bone, very much as GOODRICH (13) had indicated in *Dipterus* and the living « *Ceratodus* »; so it is certainly not a ' new primary tubule anastomosis ' as WESTOLL (14) has suggested; but there are no signs of an anterior commissure, or of an ethmoidal commissure linking the ends of the infraorbital canals, which seem to peter out in a series of indefinite cavities.

The only other elements to be noted in the new specimen of *Rhinodipterus* (Text-figs. 1, 2) are the lateral bones at the back of the head, at the side of I_2 and J, and behind K. These, which are preserved only on the left side, correspond to the series Y_1, Y_2 and X, the last two being fused according to current notions and are so labelled. They bear the pores of the main sensory canals.

From X the canal presumably descended to the postorbital bones to form the infraorbital canals, at the same time sending a branch to K to link up with the supraorbital canal, but this can only be proved by dissection.

The pores of the infraorbital canal are seen on the snout on both sides. As in *Dipterus* the pores of the sensory canals in this region are elongated and much larger than those further behind but unlike *Dipterus,* in which the pattern of the tubuli forms a gentle concave curve forwards from the front contact margin with the foremost of the infraorbital series, the tubuli in *Rhinodipterus* form a deep backward loop on the upper surface, apparently with a small (but unseen) complementary forward loop at the sides where it runs on to the snout.

Remarks. — The peculiar features of *Rhinodipterus secans* have been described in detail by GROSS (15). The skull-roof is very like that of a specimen of *Dipterus valenciennesi,* but it is longer and narrower and the pores of the sensory canal are larger and less numerous.

On the other hand, that of *R. ulrichi* is much shorter and broader.

(13) E. S. GOODRICH, 1930, figs. 311 A, 722.
(14) T. S. WESTOLL, 1949, p. 128.
(15) W. GROSS, 1956, pp. 21-32.

The Cellulosa-marls of Stage b_1 at Kokenhusen, from which the original Latvian specimens came, are reckoned by GROSS (16) as the equivalent of the Snetogor Stage of North-West Russia, at the base of the Upper Devonian (17). This new specimen from Belgium came from the Assise de Mazy which ASSELBERGHS (18) places at the top of the Givetian, but not all Belgian geologists follow him in so doing, some preferring a lower Frasnian age. Although, of course, there is no special reason why a dipnoan should not range from one to the other, the known evidence does perhaps tip the scales slightly against a Givetian age.

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(16) W. GROSS, 1942, p. 329.

(17) T. S. WESTOLL, 1951, p. 12, Table III.

(18) E. ASSELBERGHS, 1936, pp. 243, 305-6.

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EXPLANATION OF PLATES.

PLATE I.

Rhinodipterus secans (GROSS).
Roches rouges de Mazy, 920 m S. S. E. of Hingeon, 12 km N. E. of Namur.

Fig. 1. — Imperfect skull-roof. (I. R. Sc. N. B., P. 1451, I. G. 8701.1. × 2.)

PLATE II.

Dipterus valenciennesi SEDGWICK & MURCHISON.
Middle Old Red Sandstone, North Scotland.

Fig. 1. — Rostral region of skull-roof of small specimen. Orkney. Brit. Mus. [Nat. Hist.], P. 44711. × 3.)

Fig. 2. — Undersurface of snout. Thurso, Caithness. (Brit. Mus. Nat. Hist.) No. 33178. × 2.)

Fig. 3. — Undersurface of snout. Thurso, Caithness. (Brit. Mus. [Nat. Hist.], No. 33153. ×2.)

Fig. 4. — Undersurface of snout. Toldale Quarry, Caithness. (Brit. Mus. [Nat. Hist.], P. 6507. × 2.)

Fig. 5. — Undersurface of snout. Same specimen as in Fig. 1.

Rhinodipterus secans (GROSS).
Roches rouges de Mazy, 920 m S. S. E. of Hingeon.

Fig. 6. — Undersurface of snout of specimen figured in Pl. I (× 2).

Ganorhynchus woodwardi TRAQUAIR.
Formation and locality unknown.

Fig. 7. — Undersurface of snout of only known specimen. (Brit. Mus. [Nat. Hist.], No. 44627. × 1.)

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