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## NOTES ON DINICHTHYS TERRELLI NEWBERRY, WITH A RESTORATION.

CONTRIBUTION FROM THE GEOLOGICAL LABORATORY OF OBERLIN COLLEGE.  
E. B. BRANSON.

In volume seven of the Ohio Geological Survey, page 626, Professor A. A. Wright gives measurements of the bones of an almost complete specimen of *Dinichthys terrelli* Newberry. This is probably the most complete specimen of *Dinichthys* ever collected. The only bones missing are right mandible, right antero-supero-gnathal, left postero-supero-gnathal, left postero-dorso-lateral, and the median ventrals. The skull is crushed in such a way that the right suborbital lies at the right in the same plane as the roof of the skull. The left sub-orbital and left margin of the skull lie against the bottom of the roof. The dorso-median is broken and the shaft turned to the left.

Many of the bones are not perfectly preserved. The lower part of the right clavicular is missing, neither antero-dorso-lateral is perfect, the left clavicular has several parts broken away, the left suborbital is imperfect posteriorly and the right suborbital is imperfect anteriorly, and other bones have small portions missing.

The accompanying restoration is made from this specimen and the excellence of the specimen leaves few points in doubt. Nearly all of the points were checked up with other specimens.

The ventrals are those figured by Professor A. A. Wright in volume seven of the Ohio Geological Survey.\* The specimen furnishes no positive indication of the relation of the ventrals to the other bones, but the left antero-ventral is crushed against the right antero-dorso-lateral. The position of the ventrals shown in figure 1 represents nothing more than the writer's opinion of their proper location.

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\* Ohio Geological Survey, Vol. VII, Plate XLIV, figs. 1, 2, 3, 4, and 9.

In figure 1 all bones of the side of the skull are foreshortened since in a direct lateral view they lie at an angle of about thirty-five degrees with the median line of the skull. The suborbital, mandible, dorso-laterals, and clavicular are foreshortened dorso-ventrally. They lie at an angle of about forty-five degrees with the median longitudinal vertical plane of the body. This angle was obtained from an undistorted dorso-median of the same species. The relations of the other bones to the dorso-median make it certain that it is approximately correct. In figure 2 the bones are represented as lying in one plane almost exactly as they lie in the specimen and all bones are drawn in proportion.

The sutures in the skull are not distinct. The median occipital and external occipital are the only bones of which it is possible to make out the outline distinctly.

The suborbital as shown in figure 2 lies just as it does in the specimen. The anterior end is restored from the anterior end of the left suborbital. The notched anterior end has not been figured or described previously that I am aware. In the interior of the notch the bone is fifteen millimeters thick and apparently articulated with some other bone. The anterior slime canal seems to be continuous with the anterior slime canal of the top of the skull. The bone is usually broken where the slime canal crosses it and the anterior end lost. Behind the orbit the suborbital articulates with the postorbital for a short distance and then does not touch the margin of the skull again till about the middle of the marginal. At the place where it articulates the slime canal of the marginal reaches the edge of the skull. Behind the postorbital a bone lies between the suborbital and the roof of the skull. It overlaps the upper edge of the suborbital and is crushed against the skull in such a way that its relations can not be determined. It is probably part of the left suborbital displaced when the skull was crushed. The posterior end of the suborbital lies against the inner part of the anterior projection of the clavicular and thus completes the boxing in of the posterior part of the skull as well as making the clavicular more rigid. The top of the bone is thin and sinuous in outline. The dotted lines in figure 2 indicate the parts of the bone that are missing.

DINICHTHYS TERRELLI NEWBERRY.

Figures 1 and 2. One-fifth natural size.

- |                        |                             |
|------------------------|-----------------------------|
| 1. Median occipital,   | 10. Clavicular.             |
| 2. External occipital. | 11. Dorso-median.           |
| 3. Central.            | 12. Antero-dorso-lateral.   |
| 4. Marginal.           | 13. Postero-dorso-lateral.  |
| 5. Pineal.             | 14. Mandible.               |
| 6. Postorbital         | 15. Postero-supero-gnathal. |
| 7. Preorbital.         | 16. Antero-supero-gnathal.  |
| 8. Rostral.            | 17. Anterior ventral.       |
| 9. Suborbital.         | 18. Posterior ventral.      |

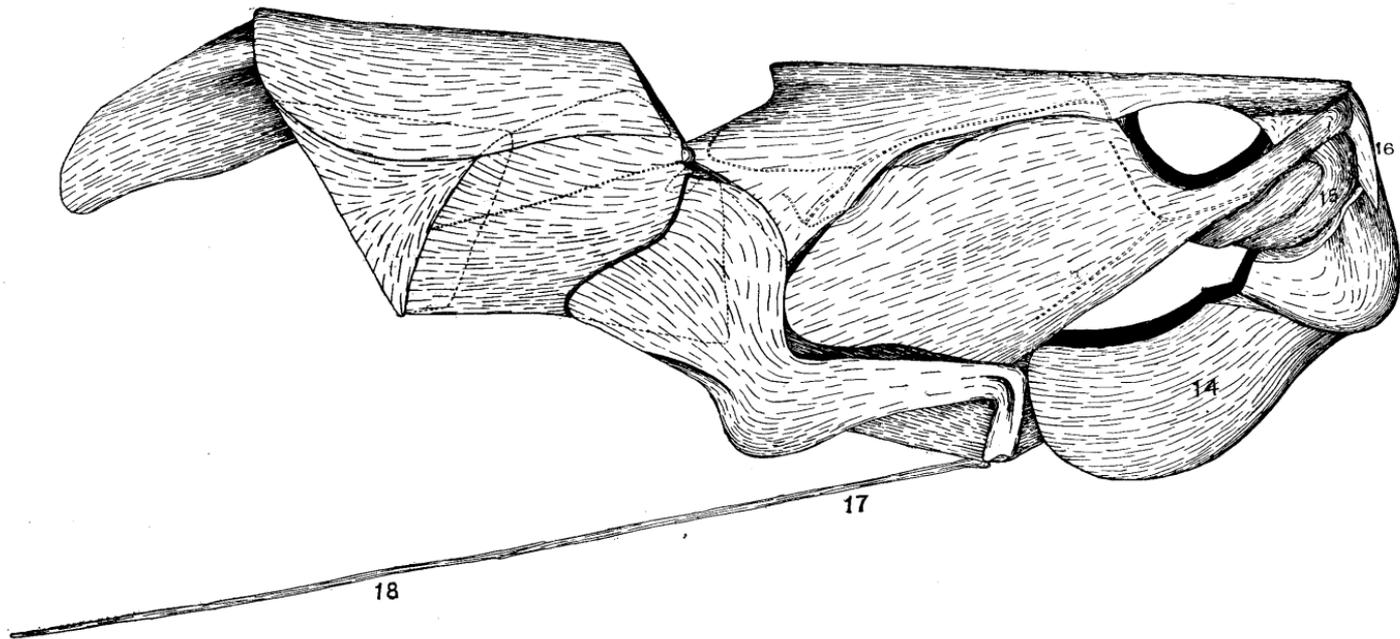


FIGURE I.

The relations of the dorsal to the dorso-laterals is shown in both restorations. In the specimen the postero-dorso-lateral and antero-dorso-lateral are firmly united in their original relation. Some fragments are missing from the upper margin and are restored in outline in the drawings. The right margin of the dorso-median is missing in the specimen but its position and shape are almost perfectly indicated on the dorso-laterals. Outside of the dotted line in figure 2 the antero-dorso-lateral is restored. As the left postero-dorso-lateral is crushed down on the right dorso-laterals their relation to one another is obscured. The writer is not satisfied with the outline of the antero-dorso-lateral as it is shown in the drawing, but the bones are undoubtedly in their natural association and the antero-dorso-lateral is the only bone to fill the space in front of the posterior bone. The overlapping part of the antero-dorso-lateral is very thin.

The relation of the antero-dorso-lateral to the skull is determined beyond controversy by the specimen under discussion and by two other specimens in the Museum of Oberlin College. The relation is determined by placing the dorso-median and dorso-laterals in association and placing the median line of the dorso-median in the median line of the skull and the articulating part of the antero-dorso-lateral in its socket. The anterior edge outside of the articulation overlaps the depressed edge of the posterior part of the skull for about two centimeters. A specimen of *Dinichthys intermedius* shows the same relation, and in a specimen of *Dinichthys* recently collected from the Huron shale in which both antero-dorso-laterals are preserved in their natural relation to the skull the same relation is shown.

The position of the clavicular and its relations to other bones is definitely shown and is represented in both restorations. The main articulation is with the depression in the antero-dorso-lateral. Its anterior edge overlaps for more than two centimeters the depressed posterior edge of the skull though it does not articulate with the skull. The posterior end of the suborbital rests against a large part of the anterior edge of the clavicular between its two anterior projections. The outer of the anterior projections which just reaches the lower edge of the suborbital probably supported a lateral appendage. It diverges from the inner projection at an angle of about forty degrees but soon curves inward and runs nearly parallel with the inner part. The distal end of this projection is a separate bone. It is sometimes ankylosed with the rest of the bone but is detached in many cases. It should be classed as a distinct skeletal element. If it is homologous with any bone of other vertebrates the writer is in doubt about the homology. The inner anterior projection of the clavicular extends further forward than the outer, and the anterior end supports the mandible. In the restorations the inner part is dis-

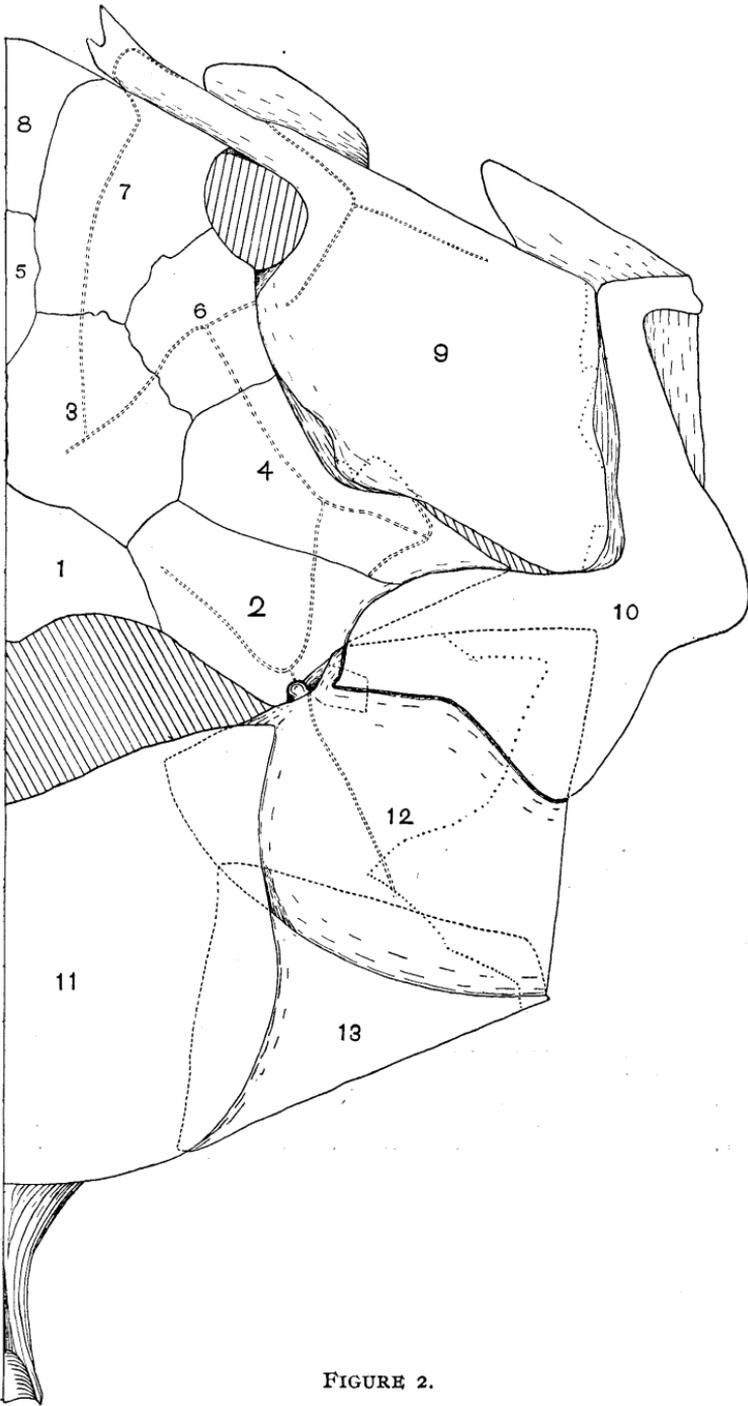


FIGURE 2.

tinguished from the outer by heavier shading. The part that projects forward beneath the suborbital is missing in all specimens at the writer's disposal and is restored in the drawings after Newberry<sup>1</sup> and Hussakof.<sup>2</sup> A part of the upper end is restored in their specimen but is present in this one. In the specimen under consideration there is no indication of a thickened edge of the mandibular support.

The arrangement of the supero-gnathals as near as can be ascertained is the same as in *Dinichthys curtus* as figured by Hussakof.<sup>3</sup> Their exact relation to the suborbital is not clear, though it is essentially that shown in figure 1. The anterior end of the suborbital is complete on the left side but the postero-superio-gnathal is missing. The anterior end of the suborbital is missing from the right side. The notch in the anterior end of the suborbital apparently fitted against some part of the antero-superio-gnathal, but it is impossible to determine this fit with the specimens at the writer's disposal.

Placing the mandible in its natural relation to the supero-gnathals it is found that the posterior end rests just beneath the postero-infero-corner of the suborbital and against the inner anterior projection of the clavicular. The conclusion that the mandible rested against this projection is necessary. There is no other bone which could furnish support for it. Hussakof indicates this attachment in a general way in figure 1 of the paper above cited.

The slime canal on the marginal does not extend to the angle of the marginal but branches to right and left as shown in figure 2. In other respects the canals do not differ materially from the way they are represented by Hussakof in figure 24C of the paper just cited. The shape of the skull differs considerably from Hussakof's restoration but agrees with Newberry's figures in Plate IV, Monograph XVI, of the United States Geological Survey.

The dimensions of the bones following Hussakof's method of measuring, are as follows:

1. Monograph XVI, U. S. Geol. Surv., Plate XLVIII, figs. 1 and 2.
2. Mem. Am. Mus. Nat. Hist., Vol. IX, Pt. III, p. 133, fig. 19.
3. Mem. Am. Mus. Nat. Hist., Vol. IX, Pt. III, p. 112, fig. 5.

| NAME OF PLATE.             | LENGTH              | WIDTH                     | REMARKS.   |
|----------------------------|---------------------|---------------------------|--|
| Skull.....                 | 37 cm.              | 29 cm.<br>65 cm.          | Width between anterior extremities of orbits.<br>Greatest width.   |
| Dorso-median.....          | 45 cm.<br>31.5 cm.  | .....<br>.....<br>44 cm   | Length without shaft.  |
| Antero-dorso-lateral.....  | 24 cm               | 24 cm.                    | About.   |
| Postero-dorso-lateral..... | 11 cm.              | .....<br>26 cm.           | Not including overlap.<br>About.   |
| Clavicular.....            | 30 cm.<br>20 cm.    | .....<br>.....            | Dorso-ventrally.<br>Part from which lateral appendage is suspended, measuring from the place where the two branches diverge. |
|                            | 33 cm.              | .....<br>18 cm.           | Part to which the mandible is attached.<br>Greatest width where it overlaps antero-dorso-lateral.                            |
| Suborbital.....            | 35 cm.              | .....                     | From anterior to posterior end along lower margin.   |
|                            | 42 cm.              | .....                     | From anterior end to opposite posterior end of upper margin, along lower margin.   |
|                            | 28 cm.              | .....<br>17 cm.           | Greatest length behind orbit.<br>Greatest width behind orbit.  |
| Antero-supero-gnathal..... | 11.7 cm.<br>8.2 cm. | .....<br>.....<br>9.5 cm. | Length of supporting shaft.<br>Width of cutting part, including prong.   |
| Postero-supero-gnathal.... | 14 cm.              | 10.2 cm.<br>8.8 cm.       | Measured on outside and including shaft.<br>Measured on inside and including shaft.  |
| Mandible.....              | 39.7 cm.            | 12 cm.                    |  |
| Anterior ventrals.....     | 41 cm.              | 12 cm.<br>18 cm.          | At the anterior end.   |
| Posterior ventrals.....    | 42 cm.              | 18 cm.                    |  |