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Osteology of genus *Salamandrina*: preliminary observation from a paleontological perspective.

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INTRODUCTION

Considered monotypic for a long time, the genus *Salamandrina* has been recently split into two species: *S. perspicillata* (Savi, 1821) and *S. terdigitata* (Lacépède, 1788) (Mattocchia *et al.*, 2005; Nascetti *et al.*, 2005). Their distinction was based on molecular evidence only and so far no morphological diagnostic characters have been identified.

The osteology of genus *Samalandrina* has never been studied in detail. The pioneering anatomical work by Wiedersheim (1875) described the general morphology of most of the bones of *S. perspicillata* but did not take into consideration many anatomical features that are now recognized to bear taxonomic information. Sanchiz (1988) remarked the presence of an additional articulation in the vertebrae of *Salamandrina* and discussed its biomechanical role. Haller-Probst & Schleich (1994), in their comparative analysis of the European caudates, presented the major features of selected skeletal elements allowing a generic identification. However, recent analysis of all the available putative fossil *Salamandrina* remains by Pitruzzella (2008) revealed that in most of the cases the features commonly described as typical of this genus are not preserved in the fossil record.

In order to describe new characters for a better diagnosis of the genus and to evaluate the possibility of identifying fossil remains of *Salamandrina* at specific rank, the skeletal morphology of the two currently recognized species has been compared. Due to the paleontological perspective, the study focused on the most

informative bones usually found in paleontological sites: otic capsules and trunk vertebrae.

MATERIAL AND METHODS

The morphology of five specimens of *S. perspicillata* (Museo Nacional de Ciencias Naturales in Madrid - MNCN 16274, 16276; Dipartimento di Scienze della Terra dell'Università di Firenze - DSTF 228, 300, 326) and two of *S. terdigitata* (DSTF 332, 333) has been described and compared. The general characters have been assessed mostly with an optical microscope, whereas minor details have been checked with a scanning electron microscope.

RESULTS

The *Salamandrina* otic capsules are quite different from those of the other European caudates in being drop-shaped in dorsal view, in having three dorsal well-developed elongated ridges delimiting a marked median depression, a funnel-shaped roundish oval fenestra, and a variably developed small tubercle on the posterior tip of the inner ridge. No significant differences among the two species of *Salamandrina* have been detected.

The vertebrae of *Salamandrina* are well characterized by a zygosphene-zygantrum intervertebral articulation (but it is nearly absent in DSTF 300) and by a posteriorly bifurcated neural spine. In addition to these characters, the vertebrae of *Salamandrina* differ from those of the other European caudates for minor characters like the presence of 'lips' on the dorsal edge of the neural spine, the development of the posterior laminae of the parapophyses (they reach the cotyle), the major development of the ventral lamina, and for the approximately vertical anterior edge of the neural arch between the prezygapophyses and the centrum (when seen in lateral view). The vertebral morphology of the vertebrae of *S. perspicillata* and *S. terdigitata* is extremely homogeneous but, at least according to the limited comparative material available for this study, the development of the neural spine shows some variation. The posterior bifurcation is well defined in *S. perspicillata* but not in *S. terdigitata*; in the latter the two branches of the bifurcation are linked by an irregular transversal 'bar'. Moreover, the 'lips' of the neural spine reach (and in some cases overhang) the posterior edge of the postzygapophyses in *S. perspicillata* but not in *S. terdigitata*.

CONCLUSION

Our osteological analysis did not recognize any significant difference among the two species. The minor differences concerning the bifurcation of the neural

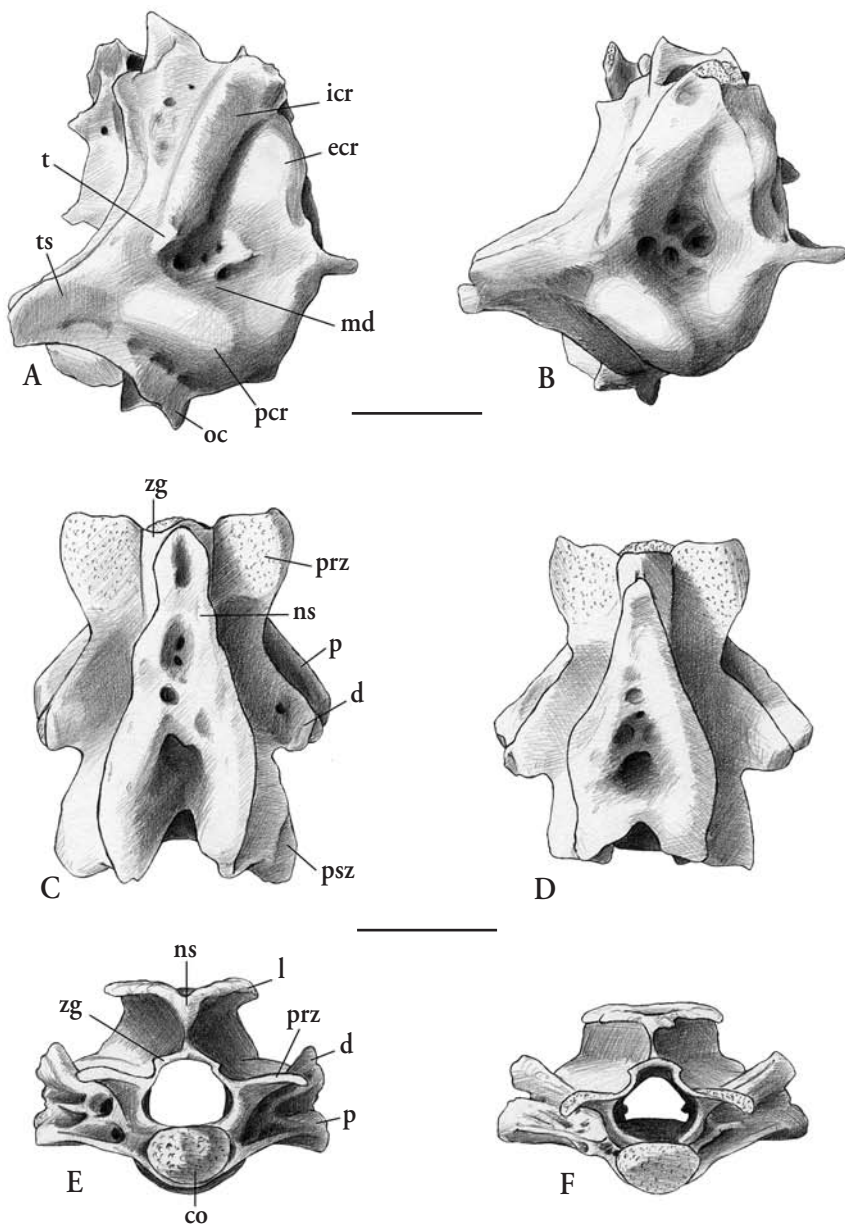


Figure 1. A: *Salamandrina perspicillata* DSTF 326; C,E: *S. perspicillata* MNCN 16276. B,D,F: *S. terdigitata* DSTF 332. Right otic capsule in dorsal view (A,B). Trunk vertebra in dorsal view (C,D) and anterior view (E,F). Scale 1 mm. Abbreviations: co: condyle; d: diapophysis; ecr: external convex ridge; icr: inner convex ridge; l: 'lip'; md: median depression; ns: neural spine; oc: occipital condyle; p: parapofisi; pcr: posterior convex ridge; prz: prezygapophysis; psz: postzygapophysis; t: tubercle; ts: tectum synoticum; zg: zygosphenone.

spine and the development of the ‘lips’ of the neural spine could be actually due to intraspecific variability. A wider sample of vertebrae should be analysed to exclude that such differences are related to the limited sample of specimens available for this study. The morphological uniformity of the selected skeletal elements considered in this study does not allow referring at species level the fossil remains whose morphology is congruent with the one described above. However, the morphological characters exclusive of *Salamandrina* detected during this study can be useful for the identification at genus rank of highly fragmented fossil remains.

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