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## On the history of the names *Lingula*, *anatina*, and on the confusion of the forms assigned them among the Brachiopoda

Christian C. EMIG <sup>1</sup>

**Abstract:** The first descriptions of *Lingula* were made from then extant specimens by three famous French scientists: BRUGUIÈRE, CUVIER, and LAMARCK. The genus *Lingula* was created in 1791 (not 1797) by BRUGUIÈRE and in 1801 LAMARCK named the first species *L. anatina*, which was then studied by CUVIER (1802). In 1812 the first fossil lingulids were discovered in the Mesozoic and Palaeozoic strata of the U.K. and were referred to *Lingula* on the basis of similarity in the form of the shell. In the 1840's other linguliform brachiopods from the Palaeozoic were described. The similarity of the shell form of the extant *Lingula* and these fossils led DARWIN in 1859 to create the description "living fossil" in his book "On the Origin of Species". Thereafter, this Darwinian concept became traditional in that *Lingula* was considered to lack morphological evolutionary changes. Although denounced as scientifically incorrect for more than two decades, the concept still remains in many books, publications and Web sites, perhaps a witness to palaeontological conservatism.

**Key Words:** *Lingula*; brachiopod; *anatina*; DARWIN; living fossil.

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**Résumé :** *De l'origine historique des noms lingule, Lingula, anatina, et de la confusion des formes chez les Brachiopodes.*- Les premiers auteurs à publier sur les lingules – *Lingula* - furent français : BRUGUIÈRE créa le genre *Lingula* en 1791 [et non en 1797], cette date acceptée par tous les auteurs jusqu'à la fin du XIX<sup>ème</sup> siècle et confirmée dans ce travail. Elle fut remise en cause à partir du début du XX<sup>ème</sup> siècle et remplacée officiellement par 1797 par la Commission Internationale de Nomenclature zoologique en 1982, puis confirmée en 1985. La signification de lingule ou *lingula* (ou *ligula*) est communément considérée comme un diminutif (signifiant languette ou élément en forme de langue) du latin *lingua* "langue". D'autres possibilités peuvent être suggérées, comme un diminutif savant du latin *lingua* + le suffixe *-ula* [en français *-ule*] ou encore une autre traduction du latin *ligula* ou *lingula* à savoir cuillère.

LAMARCK (1801) puis CUVIER (1802) décrivent la première espèce du genre sous *Lingula anatina*. L'origine du nom d'espèce est inconnue, mais, en latin, ce nom évoque une ressemblance avec le "bec de cane" cité par CUVIER (1798). Auparavant SEBA (1758) indiquait qu'il s'agit "d'une espèce particulière de conque anatifère", *anatina* signifiant en latin du canard ou appartenant au canard. J. SOWERBY (1812) se basa sur la ressemblance de forme de la coquille pour décrire les premières lingules fossiles dans le Jurassique de Grande-Bretagne. À partir des années 1840, notamment avec la description des "*Lingula*-flags" dans le Paléozoïque inférieur du Pays de Galles, il y a amalgame, devenu classique, de la forme – linguliforme – entre les espèces actuelles de *Lingula* et les lingulides fossiles paléozoïques et mésozoïques.

L'extension géologique des *Lingula* à travers tout le Phanérozoïque a influencé DARWIN (1859) lors de la création du terme "fossile vivant". Dans son livre "Sur l'origine des espèces", il fait plusieurs fois référence aux lingules.

Depuis cette époque, les *Lingula* ont été décrites, dans la plupart des traités de paléontologie, "avec une forme pratiquement inchangée depuis leur origine au Cambrien, il y a environ 550 Millions d'années". La conséquence en est que tout brachiopode fossile linguliforme a été décrit, et l'est parfois encore de nos jours, comme appartenant au genre *Lingula* sur ce seul critère.

Pourtant, le traditionnel concept introduit par DARWIN que les *Lingula* sont des "fossiles vivants" a été rejeté depuis plus de 20 ans, et auparavant par CUVIER (1798). La persistance de cette hérésie scientifique ne peut s'expliquer que par le conservatisme de la communauté internationale des paléontologues avec des modèles difficilement remis en question..

**Mots-Clefs :** *Lingula* ; brachiopode ; *anatina* ; DARWIN ; fossile-vivant.

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## Introduction

Offered by the Web (Internet) the facility to examine old scientific work in facsimile makes it possible to review and to clarify the origin of the name *Lingula* and that of its type species *L. anatina*. The Web also makes it possible to show that (DARWIN, 1859) who originated the concept of living fossil for *Lingula*, was wrong because his conclusion was not based on systematics, and has been denounced for more than 20 years. Nevertheless, it continues to be postulated by some palaeontologists in their publications, books and Web sites.

Until the end of the XIXth century the brachiopods were classified as molluscs. DUMÉRIL (1806) proposed the creation of a 5th order of molluscs under the name Brachiopoda. However, he noted (1806, p. 154) that nine years earlier CUVIER had already suggested this subdivision. Indeed, CUVIER (1798), then LAMARCK (1801), subdivided Molluscs, inserting in the Acephal Molluscs the four brachiopod genera known at that time: *Lingula*, *Orbicula*, *Crania* and *Terebratula*. Bosc (1802) included these groups in the "Coquilles inaequivalves" and all the lamellibranchs in the "équivalves". This classification has been largely overlooked as MUIR-WOOD (1955) has pointed out. MENKE (1828) divided the class Brachiopoda into three families, one being the family Lingulaceae (now the superfamily Linguloidea MENKE, 1828 and the family Lingulidae MENKE), 1828 with *Lingula*.

At the end of the XIXth century, HATSCHKE (1888, p. 40) separated the Brachiopods from the Molluscs. He included Brachiopoda, Bryozoa (Ectoprocta) and Phoronida in his Tentaculata (= Molluscoidea) (see also MUIR-WOOD, 1955).

plus voisin des anomies que de tout autre.

### XXVI. LES LINGULES. (*Ligula*.)

Ont une coquille composée de deux valves longitudinalement oblongues, peu convexes, à nates pointus, égales entre elles, sans dents à la charnière. Le ligament se prolonge en un tube charnu, qui se fixe aux rochers ou à quelque autre corps. L'animal n'a point de squelette osseux comme celui des térébratules. Son manteau est bordé de poils fins.

#### 1. Le bec de cane. (*Ligula unguis*.)

La coquille est mince et verdâtre. Linné n'en a long-temps connu qu'une valve, dont il faisoit une patelle. (*Pat. unguis*.) Ensuite, ne connoissant point leur pédicule commun, Gmelin a fait passer ce coquillage dans le genre des anomies. (*An. unguis*.)

C'est Bruguières qui a établi le genre *lingule*, mais il n'a point connu l'animal qui l'habite.

### XXVII. LES ORBICULES. (*Orbicula*.)

L'animal paroît ressembler beaucoup à celui des

Figure 1: CUVIER (1798): p. 435.

pourquoi, qu'elle devoit passer dans le genre des jambonneaux, et la nomma *pinna unguis*. Bruguière est le premier auteur systématique qui ait su que ces deux valves sont naturellement attachées à un pédicule membraneux, comme celles des térébratules et des anatifès, et qui en ait fait en conséquence, dans les planches de l'Encyclopédie, un genre particulier, dont il ne donne point de description, parce que son voyage et sa mort l'empêchèrent de conduire jusque-là son dictionnaire d'Helminthologie. Mais le citoyen Lamarck a adopté et caractérisé ce genre, et il restera d'autant plus sûrement, que l'animal, ainsi qu'on va le voir par ma description, diffère considérablement de tous ceux des bivalves ordinaires.

Il est assez singulier que les auteurs systématiques aient été si long-temps dans l'erreur au sujet de la *Lingule*, tandis que cette coquille étoit déjà parfaitement représentée avec ses deux valves et son pédicule, dans Séba, tome III, pl. 16, no. 4; mais l'indication que cet auteur en donne en peu de mots, comme d'une espèce particulière de conque anatifère, aura sans doute donné le change aux naturalistes.

Quoi qu'il en soit, l'échantillon possédé par Séba, et composé de deux individus, étant passé depuis dans le cabinet du Stathouder, et de-là au Muséum, le citoyen Lamarck a bien voulu me permettre de disséquer l'un des deux individus.

J'en ai observé un autre, rapporté par Riche de la mer des Indes, et déposé dans le cabinet du citoyen Alexandre Brongniard: c'est d'après ces deux morceaux que j'ai fait la description suivante.

Les deux valves n'engrènent l'une avec l'autre par aucune dent; elles ne sont pas non plus attachées par un ligament

Figure 2: CUVIER (1802): p. 70.

## About the name *Lingula*

The first authors who published on *Lingula* were French, respectively BRUGUIÈRE, LAMARCK<sup>1</sup> and CUVIER<sup>1</sup> (Table 1). Before the creation of the genus *Lingula* by BRUGUIÈRE (1791), RUMPHIUS (1705) called it a gastropod which was later named *Scrutus* MONTFORT, 1810. LINNAEUS (1758, 1767) placed these animals as gastropod molluscs under the name *Patella unguis* (specimen from Ambon island in the Moluccas, Indonesia), but as stated by CUVIER (1798, 1802) (Figs. 1-3) he described only one detached valve without a pedicle. Along the coast of this island three species of *Lingula* have been reported: *L. anatina* by various authors of the XVIIIth and XIXth centuries, and recently *L. reevei* and *L. rostrum* by EMIG and CALS (1979). No specimen of *Lingula* has been found in LINNAEUS's collections. Some authors like GMELIN (1789) confirmed the name *Patella unguis*. According to CUVIER and LATREILLE (1817) "(...) SOLANDER [1786] et CHEMNITZ [1786] qui surent qu'elle avait deux valves, lui donnèrent l'un le nom de *mytilus lingua*, l'autre celui de *pinna unguis*" (see also DAVIDSON, 1888; Fig. 4).

<sup>1</sup>

LAMARCK and CUVIER are the founders of the science of palaeontology, both vertebrate and invertebrate (see GOULVEN, 2000). LAMARCK also created the word "biology" for the science of living beings.

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Ainsi, quoique nous n'ayons pas encore vu par nous-même l'animal des térébratules, il ne nous reste cependant aucun doute, d'après les réflexions précédentes, qu'il ne doive entrer dans le même ordre que ceux des *lingules* et des orbicules.

Explication des Figures.

- Fig. 1. LA Lingule entière avec sa coquille et son pédicule.
- Fig. 2. Un côté du manteau, lorsqu'on a enlevé la coquille.
  - a. Portion des glandes salivaires, vue au travers du manteau.
  - b. Portion du foie, vue de même. cccc. Diverses extrémités musculaires.
- Fig. 3. L'intérieur de la valve qui couvrait ce côté du manteau.
- Fig. 4. Le côté opposé du manteau. Les mêmes lettres signifient les mêmes choses.
- Fig. 5. L'intérieur de la valve qui couvrait ce second côté du manteau. On y voit, ainsi qu'à la fig. 3, les empreintes des muscles.
- Fig. 6. La Lingule dans la position de la fig. 4. Un des lobes du manteau soulevé.
  - aa. Les branchies. bb. Les bras roulés en spirale, avec leurs franges.
- Fig. 7. La Lingule du côté opposé, l'autre lobe du manteau relevé.
- Fig. 8. La position de la fig. 6; le manteau encore plus relevé, pour montrer ce que je crois être le cerveau, a. Les bras écartés pour montrer la bouche, b.
- Fig. 9. Le côté opposé. La bouche b fendue, pour montrer le commencement de l'oesophage.
- Fig. 10. La position des fig. 4 et 6. La partie du manteau qui couvrait les viscères, enlevée.
  - a. Glande salivaire.
  - bb. Portions de foie.
  - cc. Les cœurs.

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- dd. Les vaisseaux principaux des branchies vus au travers du manteau.
- ee. Portion d'intestin.
- f. Anus.
- Fig. 11. La même partie, où les cœurs sont mieux à découvert, et où l'un d'eux est ouvert. Les mêmes lettres ont les mêmes significations.
- Fig. 12 et 13. Tout le manteau, les glandes et les cœurs enlevés, on voit à nu tout le canal intestinal et les principaux muscles.

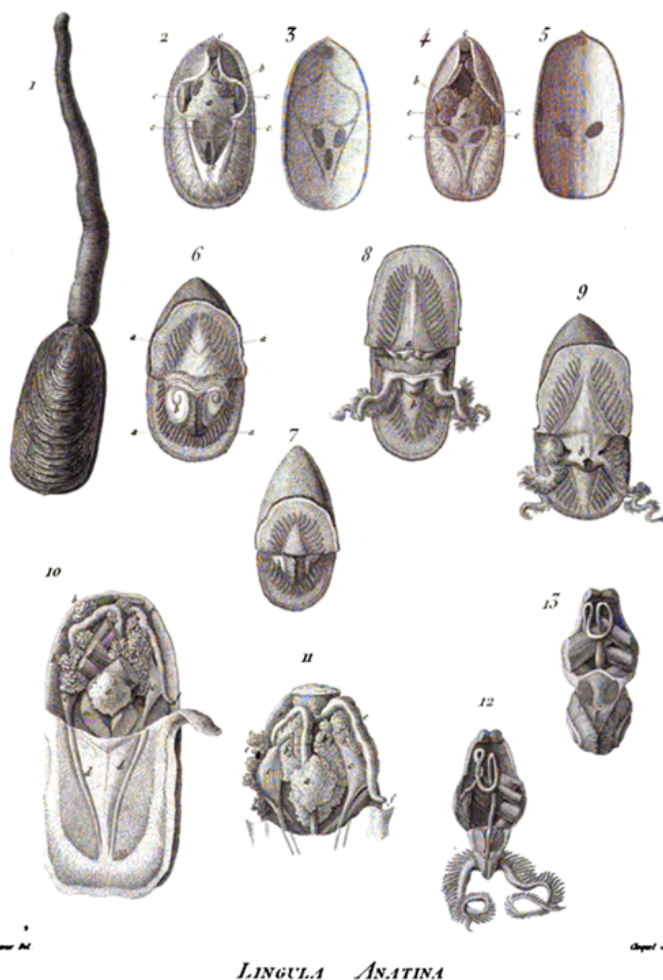


Figure 3: CUVIER (1802): p. 79 and 80, Pl. VI.

NAME and surname	Years	Nationality
SEBA Albert ou Albertus	1665 - 1736	German, lived in Amsterdam
LINNÆUS Karl - Carl von LINNÉ after his ennoblement in 1762	1707 - 1778	Swedish
LAMARCK, Jean-Baptiste Pierre Antoine de MONET, Chevalier de -	1744 - 1829	French
BRUGUIÈRE Jean Guillaume	1750 - 1798	French
SOWERBY James	1757 - 1822	British
CUVIER, Baron Georges Léopold Chrétien Frédéric Dagobert	1769 - 1832	French
SOWERBY George Brettingham	1788 - 1854	British
DARWIN Charles	1809 - 1882	British
DAVIDSON Thomas	1817 - 1885	British

Table 1: Dates et origin of the main authors who published the early works on the *Lingula*.

## Genus LINGULA.

- |  |  |
|--|--|
| 1. <i>Lingula anatina</i> , Lamarck, 1819. | 5. <i>Lingula Reevii</i> , Davidson, 1852. |
| 2. — <i>hians</i> , Swainson, 1823.        | 6. — <i>exusta</i> , Reeve, 1857.          |
| 3. — <i>tumidula</i> , Reeve, 1841.        | 7. — <i>jaspidea</i> , Adams, 1863.        |
| 4. — <i>Murphiana</i> , King, 1859.        | 8. — <i>Adamsi</i> , Dall, 1873.           |

There are, besides these, three uncertain so-termed species—*Lingula smaragdina*, Adams, 1863; *L. hirundo*, Reeve, 1859; and *L. lepidula*, Reeve, 1863. Hancock's *L. affinis* I consider to be the true *Lingula anatina*, the species Hancock figured as *L. anatina* being really the *L. Murphiana* of King.

Up to the year 1870 the species now classed with *Glottidia* had been described as

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*Lingulae*, viz.:—*Glottidia albida*, Hinds, sp., 1845; *Glottidia Palmeri*, Dall, sp., 1870; and *Glottidia Audebarti*, Broderip, sp., 1883 (emend. Deshayes), of which the *L. pyramidata* of Stimpson must be considered a synonym. A careful comparison of many specimens of *L. Audebarti*, Broderip, and *G. pyramidata*, Stimpson, has convinced me that they are one and the same species, and Broderip's name takes priority. The specific claims of *G. antillarum*, Reeve, sp., 1861, and of *G. ? semen*, Broderip, sp., 1833, are still uncertain.

## 114. LINGULA ANATINA, Bruguière, sp. (Plate XXIX. figs. 1-8.)

*Patella unguis*, Linné, Syst. Nat. ed. xii. p. 1260, 1766.

*Rostrum anatis*, Petiver, Rumphius, D'Amboinsche Rariteitkamer, t. xl. fig. 2, 1766; Seba, Moll. vol. iii. t. xvi. fig. 4.

*Mytilus lingula*, Solander, Cat. Museum, Portland, no. 1718.

*Pinna unguis seu lingula*, Chemnitz, Conch. Cab. x. p. 360, tab. clxxii. figs. 1675-1677.

? *Lepar* seu *Patella*, "Rostrum anatis," Humphrey & Da Costa, Nat. Hist. of Shells, p. 3, pl. ii. fig. 2, 1770.

*Patella unguis*, Gmelin, Linn. Syst. Nat. ed. xiii. p. 3710, 1789.

*Lingula anatina*, Bruguière, Hist. des Vers, Encycl. Méth. pl. ccl. figs. 1 a, b, c, 1789; Cuvier, Soc. Philomatique de Paris, vol. i. p. 111, pl. vii. figs. A, B, C, 1797; Cuvier, Mémoires du Muséum, vol. i. p. 69, pl. vi. figs. 1-13, 1802.

*Mytilus lingula*, Dillwyn, Cat. of Recent Shells, p. 322. no. 47, 1817.

*Lingula anatina*, Lamarck, An. sans Vert. vol. vi. p. 258, 1819; Sowerby, Genera of Shells, 1822; W. Swainson, Phil. Mag. vol. lxiii. p. 403, 1823; Sowerby, A Cat. of Shells of the late Earl of Tankerville, p. 28, 1825; Blainville, Mal. pl. lii. fig. 3, 1825-27; Sander Rang, Man. de l'Hist. Nat. des Mollusques, 1829; Deshayes, ed. An. sans Vert. vol. vii. p. 390. no. 1, 1866; Deshayes, ed. Encyclop. Méth., Vers. vol. ii. p. 364. no. 1, 1836; Anton, Verzeichniss der Conchyl. p. 24. no. 911, 1839; Küster, ed. Chemnitz, Conch.-Cab. vol. vii. p. 12, pl. i. figs. 1, 2, 3, 1843.

*Lingula Chemnitzii*, Küster, ed. Chemnitz, Conch.-Cab. vol. vii. p. 13, pl. i. figs. 4, 5, 6, 1843.

*Lingula anatina*, G. B. Sowerby, Thes. Conch., Monogr. of *Lingula*, i. p. 337, pl. lxvii. figs. 1-10, 1846.

? *Lingula anatina*, Vogt, Anatomie der *Lingula anatina*, pp. 1-16, pls. i, ii, 1845.

*Lingula anatina*, Davidson, Ann. & Mag. Nat. Hist. 2nd ser. vol. ix. p. 377, 1852; Brit. Foss. Brach., Introd. to vol. i. p. 134, 1853, and vol. v. p. 327, 1884; Article Brachiopoda, Brit. Encycl. 9th ed., 1876; Report on the Brachiopoda, Voyage of H.M.S. 'Challenger,' Zool. vol. i. p. 60, 1880; R. Owen, Anatomy of *Terebratula* and *Lingula*, Davidson's Br. Foss. Brach., Introduction to vol. i. chap. i, 1853.

? *Lingula affinis*, Hancock, Phil. Trans. vol. cxlviii. 2nd part, 1858.

*Lingula hirtula*, Gray, Coll. of Brit. Mus.

*Lingula anatina*, S. P. Woodward, A Manual of the Mollusca, p. 239, figs. 155-157, 1856; H. & A. Adams, The Recent Genera of Mollusca, p. 585, pl. cxxiii. fig. 5, 1858; Semper, On *Lingula*, Zeitschr. f. Wiss. Zool. vol. ii. p. 100, and vol. xiv. p. 424, 1864; E. Suess, Ueber die Wohnsitze der Brachiopoden, Sitzungsb. k. Akad. Wissensch. Wien, Bd. xxvii. p. 229, 1859; L. Reeve, Conch. Icon., Monogr. of *Lingula*, pl. ii. figs. 10, 11, 1859; Gratiolet, Anatomie de la *Lingula anatina*, Journ. de Conch. vol. viii. 2nd ser. pls. vi.-ix., 1860; Dall, Amer. Journ. of Conch. vol. vi. p. 155, 1870, and Proc. Acad. Nat. Sci. Philadelphia, p. 203, 1873; King, Ann. & Mag. Nat. Hist. 4th ser. vol. xii. pl. ii, 1873; A. Zittel, Handb. der Paläontologie, p. 663, fig. 486, 1880; A. Crane, The Brachiopoda and Polyzoa, Cassell's Nat. Hist. p. 263, 1881; G. Dunker, Index Moll. maris Japonici, p. 254, 1882; D. E. Lischke, Japanische Meeres-Conch. Suppl. iv. p. 163, 1884.

Figure 4: DAVIDSON (1888): part of p. 205 and 206.

*Mytilus lingula* is catalogued by LIGHTFOOT (1786) on the annotated list (which is referred to him) for the auction of the collection of Lady Margaret CAVENDISH BENTINCK, duchess of Portland, after her death in 1785. For some taxa he used the names given them by Daniel Carl SOLANDER (1733-1782), a pupil of Karl von LINNÉ and curator of the collection of the duchess. He indicated these taxa by an "S" following the name. SOLANDER's manuscripts remain unpublished and are preserved at the Natural History Museum of London. Until 1965, most of the quotations of the "Portland Catalogue" were attributed to SOLANDER (see DAVIDSON, 1888; Fig. 4). Then, KAY (1965) assigned all the names in the catalogue to LIGHTFOOT (1786), and this revision was adopted by many malacologists. Several authors, such as CUVIER & LATREILLE (1817) and DAVIDSON (1888), assigned *Mytilus lingula* to SOLANDER (Fig. 4). I was not able to consult SOLANDER's manuscripts LIGHTFOOT's list (1786), or the work of KAY (1965).

Moreover oddly enough *Mytilus lingula* was considered (see ROWELL, 1964; I.C.Z.N., 1982) as a possibility for the type species of the genus *Lingula*. But in the end *L. anatina* LAMARCK, 1801 was accepted and *Mytilus lingula* removed (I.C.Z.N., 1985), owing to a doubtful identification and the absence of acceptance (see below).

BRUGUIÈRE (1791 [1789]) created the genus *Lingula* (Fig. 5) in Volume 1 of the *Tableau encyclopédique et méthodique des trois règnes de la nature : vers, coquilles, mollusques et polypes divers*, written by BRUGUIÈRE as the sole author. Three volumes were published by Charles Joseph PANCKOUCKE (Paris and Liège) and in several editions.

Volume 1 in which *Lingula* is figured is dated 1789, but was published in 1791 (Fig. 5), as confirmed in the "Trésor de la Langue Française informatisé" (A.T.I.L.F., 2007): "1791 *lingule* (JG BRUGUIÈRE, *Tableau encyclopédique et méthodique des trois règnes de la nature*, I, 151a, Pl. 250 dans *Compte rendu de R. ARVEILLER sur les datations de QUEM. DDL t. 20, à paraître dans R. Ling. rom. t. 47*)" (see ARVEILLER 1982; QUEMADA 1982). The etymology of *lingule* (French), and *lingula* or *ligula* (Latin) is probably a diminutive meaning tongue or tongue-shaped, from the Latin *lingua* "tongue". Another possibility proposed in the "Trésor de la Langue Française informatisé" (A.T.I.L.F., 2007) is that it is a scholarly diminutive of the Latin *lingua*+suffix-*ule* (= little, small): this suffix is associated with a name from the Latin: *-ulus*, *-ula*, *-ulum*. This usage is found mainly in scientific works, particularly those of the life sciences. Another etymology: *lingula* may be derived from the Latin *ligula*, sometimes *lingula*, "spoon", with reference to the spoon-shape of the animal formed by the shell and the pedicle (Pers. Comm. R. GOURVENNEC).

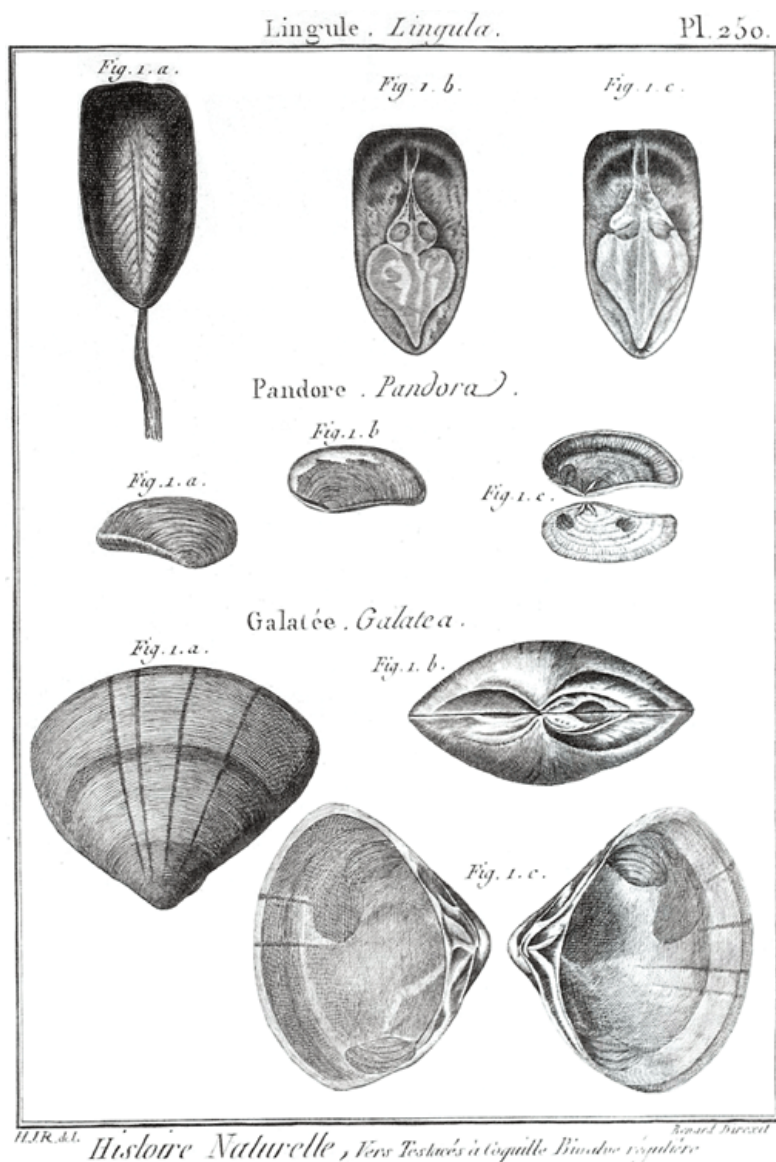


Figure 5: BRUGUIÈRE (1791): Pl. 250.

Some vernacular names for *Lingula*: "moule-à-queue" in New Caledonia; "bec de cane" along some coasts in the Indian Ocean (CUVIER, 1798); "shamisen-gai" in Japan. The name is related to its similarity to the shamisen, a Japanese lute of Chinese origin.

CUVIER (1798) (Fig. 1) assigned the genus *Lingula* to BRUGUIÈRE (1791) (Fig. 3). Throughout the XIXth century DAVIDSON (1880) and several other authors indicated the year 1789 (Fig. 4), as follows: *Lingula anatina*, BRUGUIÈRE, Hist. des vers. Encycl. Méth. Pl. CCI, fig. 1 a, b, c, 1789. Others like d'ORBIGNY (1852) list 1791. I could not find this reference 1789, but found two under BRUGUIÈRE (1791) with plates 172-314 and BRUGUIÈRE (ca. 1793) with plates 199-488.

Starting in the XXth century, various authors indicate BRUGUIÈRE, 1797 as the date of the creation of the genus *Lingula*. ROWELL (1964) in accordance with the publication dates of the *Encyclopédie Méthodique* as printed by SHERBORN and WOODWARD (1906, p. 581), obtained in 1966 from the International Commission on Zoological Nomenclature (I.C.Z.N., 1982, 1985) a change of year for *Lingula* from 1791 to 1797. Recently, the data published by EVENHUIS (2003) and EVENHUIS and PETIT (2003)

confirm ROWELL's proposal. The volumes of plates for the *Histoire Naturelle des Vers* volumes were published in the form of a *Tableau encyclopédique et méthodique*. However, their review of the publication of the *Encyclopédie méthodique* and of the *Tableau*, has several gaps in their compilation of the editions that appeared before 1797, as well as some incomplete references. For example BRUGUIÈRE's Tome 1, edited in 1792 should be quoted as: *Encyclopédie Méthodique, ou par ordre de matières: par une société de gens de lettres, de savants et d'artistes: précédée d'un vocabulaire universel, servant de table pour tout l'ouvrage, ornée des portraits de MM. DIDEROT et d'ALEMBERT, premiers éditeurs de l'Encyclopédie* [26, a], 1 *Histoire Naturelle des Vers*, tome 1, p. 1-757. PANCKOUCKE, Paris.

So the date 1797 for the first description of *Lingula* is wrong and we must return to the original date of 1791, which is the correct one. Many successive editions under various titles, as well as gaps in the bibliographic searches may explain this error. After the death of Charles-Joseph PANCKOUCKE in 1798, his daughter Thérèse-Charlotte AGASSE, wife of Henri AGASSE, the associate of PANCKOUCKE, assured the publication. Such errors in the dates of the first publication of old books are common. Another example concerns the first editions of SEBA's volume 3: its year and pagination range between 1758, the correct one, 1759 (p. [1-24], 1-108, Pl. 1-116; or 212 p., 116 plates; or 511 p., 116 Pls.) and 1761 (511 p., 116 Pls.). Several other editions have been published by scientific editors, e.g., CUVIER, SAINT-HILAIRE and LESSON under SEBA *et alii* (1828), and recently MÜSCH *et alii* (2005).

## About the name *anatina*

*Lingula* BRUGUIÈRE, 1791 as a genus was named 10 years before the description of the first species *L. anatina* LAMARCK, 1801. In Plate 16, fig. 4, SEBA (1758) figured for the first time two lingulide<sup>1</sup> specimens stored in his own collection (Fig. 6). After Albert SEBA's death in 1736, many of the specimens in his collection were auctioned off in 1752 and dispersed all over Europe. Among them the lingulids<sup>1</sup> and other specimens figured in the plates were acquired by the Muséum National d'Histoire Naturelle de Paris. These lingulide specimens were used by LAMARCK (1801) to describe the new species *Lingula anatina* (Fig. 7). Appointed in 1793 at the Muséum de Paris as a professor on insects and worms, LAMARCK was not as skilled as CUVIER in making detailed analyses, so he gave CUVIER easy access to his specimens, in particular those from the Seba collection. They were described again by CUVIER (1802) in the *Mémoire sur l'animal de la Lingule*. This memoir was reissued in 1817, the date under which this memoir is usually quoted. In 1802 (republished in 1824 and 1836), Bosc too described *Lingula anatina* in his "Histoire naturelle des coquilles" (Fig. 8).

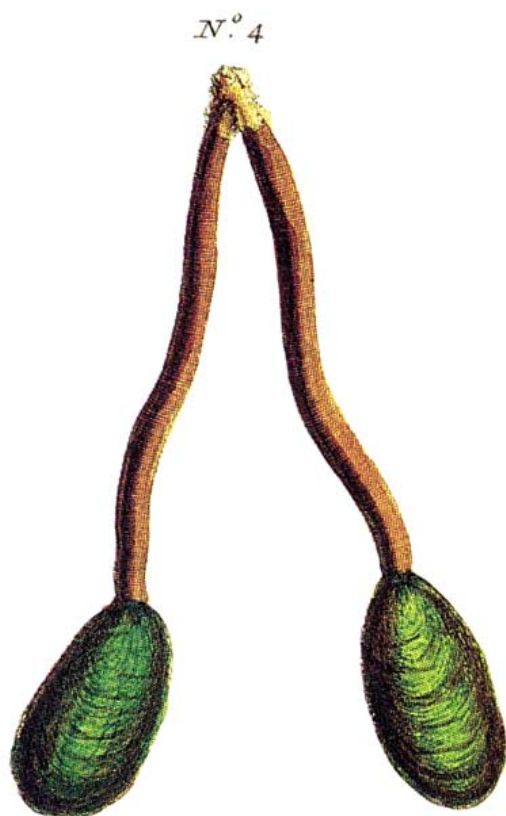


Figure 6: SEBA (1758): fig. 4 - detail of plate 15.

<sup>1</sup> In conventional terminology "lingulid" designates taxa or specimens of the Order Lingulida; preferably this word should now be restricted to indicate members of the superfamily Linguloidea. And the term, "lingulide" is used to indicate taxa and specimens of the family Lingulida.

The origin of the species name is unknown, but in Latin the adjective *anatinus*, *a*, *um*, means "duck or belonging to the duck" perhaps because a resemblance to the "bec de cane" (female duck bill) as indicated by CUVIER (1798; Fig. 1) for the *Lingula* shell? SEBA (1758) had defined it in a few words "d'une espèce particulière de conque anatifère" (quoted by CUVIER, 1802, p. 2; Fig. 2). The French word anatifère is composed of the Latin radical *anas*, *anatis* (meaning "duck") and the suffix *-fère* (from the Latin *-fer* "which carries") - see "Trésor de la Langue Française informatisé" (A.T.I.L.F., 2007). Note that Goose barnacle is Anatifère in French (see LAMARCK, 1801; and Fig. 7).

*Lingula anatina* was recognized as the type species of the genus *Lingula* only late in 1892 (see ROWELL, 1964; I.C.Z.N., 1982, 1985). Yet G.B. SOWERBY (1847) had already attributed the genus *Lingula* to BRUGUIÈRE and the type species *L. anatina* to LAMARCK. In addition, he listed the current extant species: *Lingula anatina* LAMARCK, 1801; *L. hians* SWAINS, 1823, [now *L. rostrum* (SHAW, 1798)]; *L. audebarti* BRODERIP, 1835 [now *Glottidia audebarti*]; *L. semen* BRODERIP, 1835 [now *Glottidia semen* (BRODERIP, 1835)]; *L. tumidula* REEVE, 1841; *L. ovalis* REEVE, 1841 [now *L. reevii* DAVIDSON, 1880]; *L. albida* HINDS, 1841 [now *Glottidia albida*].

DAVIDSON (1888) introducing the family Lingulidae wrote: "The recent species belonging to this family are representatives of the genus *Lingula*, BRUGUIÈRE (1789), and to the genus or subgenus *Glottidia*, DALL (1870)". And he attributed *Lingula anatina* to LAMARCK, 1819 on the list of *Lingula* species, but to BRUGUIÈRE in the species description (Fig. 4).

GOULVEN (2000) in an analysis of LAMARCK's text (1819) wrote: "En ce qui concerne les Lingules, LAMARCK ne retient que la lingule actuelle, *Lingula anatina*, qui habite l'Océan des Moluques" (p. 258). But he added: "l'animal de la térébratule est fort rapproché de celui de la lingule par ses rapports" (p. 244). CUVIER (1802) also compared *Lingula* with *Terebratula* and on p. 9 in discussing the craniid now named *Novocrania anomala* (MÜLLER, 1776) he wrote: "Il suffit de jeter les yeux sur la figure que MÜLLER a donnée de l'animal de son *Patella anomala*, pour voir qu'il ressemble à la lingule par des bras ciliés et en spirale".

HYALIER : Acéphale faisant sortir hors de sa coquille deux bras aplatis, cunéiformes, trilobés, opposés l'un à l'autre, et au moyen desquels il nage dans la mer.

\* *Hyalæa cornea*. n. *Anomia tridentata*. Forsk. Descr. An. p. 124. et ic. t. 40, fig. b. Gmel. p. 3348. Chemn. 8, p. 65, vign. a. b. c. d. e. f. g.

CLV° GENRE.

ORBICULE. *Orbicula*.

Coq. orbiculaire, aplatie, fixée et composée de deux valves, dont l'inférieure très-mince adhère au corps, qui la soutiennent. Charnière inconnue.

ORBICULIER : Acéphale sans pied et sans prolongemens tubuleux ; mais muni de deux bras alongés, frangés, qui s'étendent au gré de l'animal, et qui rentrent dans la coquille en se roulant en spirale.

\* *Orbicula norwegica*. n. *Patella anomala*. Mull. Zool. Dan. 1, p. 14, t. 5. Prodr. 2870.

CLVI° GENRE.

LINGULE. *Lingula*.

Coq. longitudinale, aplatie, composée de deux valves presque égales, tronquées antérieurement. Charnière sans dent. Bases ou crochets des valves pointus, et réunis à un tube tendineux qui sert de ligament à la coquille et se fixe aux corps marins.

LINGULIER : Acéphale muni de deux bras fort longs, ciliés dans toute leur longueur, extensibles au gré de

l'animal, et qui rentrent dans la coquille en se roulant en spirale. Les deux lobes du manteau bordés de filets.

\* *Lingula anatina*. n. *Patella unguis*. Lin. Seba Mus. 3, t. 16, n° 4. *Pinna unguis*. Chemn. Conch. 10, t. 172, f. 1675, 1676. Naturf. 22, t. 3, fig. A. E. Encycl. pl. 250, f. 1, a. b. c. Cuvier, Bullet. des Sc. n° 52. Vulg. le bec de cane.

[C] Plus de deux valves inégales, non articulées en charnière.

CLVII° GENRE.

ANATIFE. *Anatifa*.

Coq. cunéiforme, composée de plusieurs valves (cinq ou davantage) inégales, réunies à l'extrémité d'un tube tendineux, fixé par sa base. Ouverture sans opercule.

ANATIFIER : Acéphale ayant la partie supérieure de son corps munie d'environ vingt-cinq tentacules longs, inégaux, comprimés, crustacés, ciliés, et qui se contractent en se roulant en spirale. Entre ces tentacules est un tube court, et dans la partie inférieure et antérieure du corps se trouve une autre ouverture.

\* *Anatifa laevis*. Brug. n° 2. Plancus, t. 5, fig. xi. Gualt. Test. t. 106, fig. D. Argenv. t. 26, fig. E. Da costa Brit. Conch. t. 17, f. 3. Chemn. 8, t. 100, f. 853-855. *Lepas anatifera*. Lin. Vulg. la conque anatifère.

## About the usage of the term linguliform and its consequences

I could not find the origin of the adjective linguliform. However, the earliest definition is in KING (1859, p. 260): *linguliform*, tongue shaped. This descriptive term is employed in a specific scientific sense in several groups of invertebrates (crustaceans, brachiopods), and in botany and medicine. As concerns brachiopods it appeared in the 1880's.

Linguliform means having the form of a tongue, tongue-shaped. It is derived from the Latin *linguliformis*. CUVIER *et alii* (1834) used it for *Mytilus* describing "the linguliform of the appendage of the foot". More interesting is that this adjective was not used in the description of *Lingula* in the same book (p. 131) in which *Lingula anatina* is attributed to CUVIER.

At the beginning of his memoir of 1802 CUVIER was the first to discuss the shape of the shell but these sentences have not been heeded: "Il n'est pas de genres de testacés qui prouve mieux que ne fait celui des Lingules, la nécessité de connoître [= connaître] l'animal, et ne pas se borner à la coquille, pour ranger convenablement ces mollusques dans une méthode naturelle. En effet les coquilles des Lingules, quoique de forme assez particulière, ne pouvoient [= pouvaient] faire soupçonner les grandes différences qui séparent leur animal des autres genres de sa classe ; et tant qu'on n'a connu qu'elles, on les a ballottées arbitrairement de genre en genre."

Figure 7: LAMARCK (1801): p. 140 and 141.

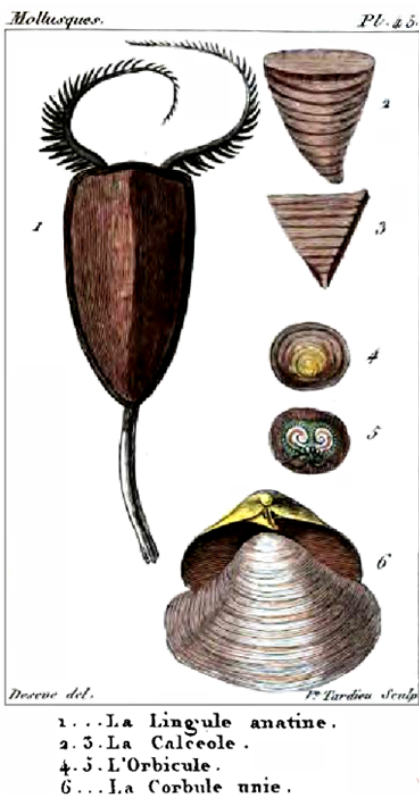


Figure 8: Bosc (1802): p. 172 and Pl. 45.



From the Jurassic of Great-Britain came the first descriptions of fossil lingulides, *i.e.*, *Lingula mytilloides*, *L. ovalis*, *L. tenuis*. They were made by J. SOWERBY (1812; Fig. 9) based on LINNAEUS's (1758) and CUVIER's (1802) studies and on similarity in the shape of the shell with those of the living species of *Lingula*. *Lingula mytilloides* at least is assignable to *Lingularia* BIERNAT & EMIG, 1993. BRODERIP (1835) was probably the first who affirmed the similarity between fossil and recent forms (Fig. 10). However the two *Lingula* species he described were later referred to *Glottidia*.



**Figure 9:** J. SOWERBY (1812): Pl. 19 - f. 1 & 2: *Lingula mytilloides*; f. 3: *L. tenuis*; f. 4 *L. ovalis*.

[ 141 ]

XVII. Descriptions of some new Species of Cuvier's Family of Brachiopoda. By W. J. BRODERIP, Esq., Vice-Pres. of the Geological and Zoological Societies, F.R.S., L.S., &c.

Communicated November 26, 1833.

and in the Ludlow rock below the old red sandstone; and *Lingula* in the inferior oolite of Yorkshire, in the old red sandstone formation, and in other old fossiliferous beds. That the organization of the recent animals is the same with that of those species which lived and died thousands of years ago, there can be no doubt; and we may thus form some conclusion as to the nature of those most ancient seas wherein the fossils existed. acuteness and accuracy which mark his researches.

**Figure 10:** BRODERIP (1835): p. 141.

In the 1840's the similarity of the linguliform shell in extant and fossils forms was emphasized during the studies of the "*Lingula* flags" in the lower Palaeozoic of North Wales, particularly of those from the Cambrian (see MURCHISON, 1847). In 1845, LYELL wrote about the occurrence of *Lingula* in the "Potsdam sandstone" (New York): "(...) it is highly interesting that one of its commonest organic remains should belong to a living genus (*Lingula*), and that its form should come very near to species now existing." (p. 132).

Many works and books published between 1845 and 1865 discuss or describe this genus. Consequently the number of species of Palaeozoic *Lingula* grew rapidly. In various French and English publications during the second half of the XIXth century the geological range of *Lingula*: "Palaeozoic to Present" is found. (BOULE, 1910, p. 29): "Dans les couches les plus inférieure des terrains primaires, on trouve des lingules, tout à fait semblables aux lingules des mers actuelles (fig. 27 et 28); c'est là un premier exemple de longévité extraordinaire de certains types d'animaux". Consequently, based solely on the shape of the shell any fossil linguliform brachiopod was assigned this genus! However, EMIG (1982, 2002), BIERNAT and EMIG (1993) have demonstrated that this shape has no taxonomic value. The linguliform shape also occurs in several other inarticulated brachiopod families, *i.e.*, the Pseudolingulidae, Obolidae, and Eoobolidae, of which many species were originally referred to the genus *Lingula*.

The broad geological range and the similarity in the shape of the lingulide shell throughout the Phanerozoic led DARWIN (1859) to create the term *living fossil* for his book "On the Origin of Species" (Table 2), in which several sentences refer to *Lingula*.

DARWIN (1859)	Original text	Texte en français
p. 107 Chapter 4	And it is in fresh water that we find seven genera of Ganoid fishes, remnants of a once preponderant order and in fresh water we find some of the most anomalous forms now known in the world, as the <i>Ornithorhynchus</i> and <i>Lepidosiren</i> , which, like fossils, connect to a certain extent orders now widely separated in the natural scale. These anomalous forms may almost be called living fossils; they have endured to the present day, from having inhabited a confined area, and from having thus been exposed to less severe competition.	Or, c'est dans l'eau douce que nous trouvons sept genres de poissons ganoïdes, restes d'un ordre autrefois prépondérant ; c'est également dans l'eau douce que nous trouvons quelques-unes des formes les plus anormales que l'on connaisse dans le monde, l' <i>Ornithorhynque</i> et le <i>Lépidosirène</i> , par exemple, qui, comme certains animaux fossiles, constituent jusqu'à un certain point une transition entre des ordres aujourd'hui profondément séparés dans l'échelle de la nature. On pourrait appeler ces formes anormales de véritables fossiles vivants ; si elles se sont conservées jusqu'à notre époque, c'est qu'elles ont habité une région isolée, et qu'elles ont été exposées à une concurrence moins variée et, par conséquent, moins vive.
p. 307 Chapter 9	Some of the most ancient animals, as the <i>Nautilus</i> , <i>Lingula</i> , etc., do not differ much from living species, and it can not on my theory be supposed, that these old species were the progenitors of all the species of the orders to which they belong, for they do not present characters in any degree intermediate between them.	Quelques-uns des animaux les plus anciens, tels que le Nautile, la Lingule, etc., ne diffèrent pas beaucoup des espèces vivantes ; et, d'après ma théorie, on ne saurait supposer que ces anciennes espèces aient été les ancêtres de toutes les espèces des mêmes groupes qui ont apparu dans la suite, car elles ne présentent à aucun degré des caractères intermédiaires.
p. 313 Chapter 10	Species of different genera and classes have not changed at the same rate, or in the same degree. In the oldest tertiary beds a few living shells may still be found in the midst of a multitude of extinct forms. The Silurian <i>Lingula</i> differs but little from the living species of this genus; whereas most of the other Silurian Molluscs and all the Crustaceans have changed greatly.	Les espèces appartenant à différents genres et à différentes classes n'ont pas changé au même degré ni avec la même rapidité. Dans les couches tertiaires les plus anciennes on peut trouver quelques espèces actuellement vivantes, au milieu d'une foule de formes éteintes. La lingule silurienne diffère très peu des espèces vivantes de ce genre, tandis que la plupart des autres mollusques siluriens et tous les crustacés ont beaucoup changé.
p. 316 Chapter 10	Species of the genus <i>Lingula</i> , for instance, must have continuously existed by an unbroken succession of generations, from the lowest Silurian stratum to the present day.	Les espèces du genre lingule, par exemple, qui ont successivement apparu à toutes les époques, doivent avoir été reliées les unes aux autres par une série non interrompue de générations, depuis les couches les plus anciennes du système silurien jusqu'à nos jours.
p. 331 Chapter 10	The Silurian <i>Lingula</i> differs but little from the living species of this genus; whereas most of the other Silurian Molluscs and all the Crustaceans have changed greatly.	La lingule silurienne diffère très peu des espèces vivantes de ce genre, tandis que la plupart des autres mollusques siluriens et tous les crustacés ont beaucoup changé.

**Table 2:** References to *Lingula* and living fossils in DARWIN's book (1859): in original version, and translated into French by <http://abu.cnam.fr/cgi-bin/go?espece1> (Copyright © 1999 Association de Bibliophiles Universels <http://abu.cnam.fr/>)

Since DARWIN's times *Lingula* is considered as in an almost unchanged form since first appearing in the Cambrian period around 550 MA ago. Once found in more widespread environments, today's *Lingula* are confined to brackish intertidal habitats where they live in burrows. Such a statement concerning persistence is known to be wrong (see EMIG, 1997). The taxa of the superfamily Linguloidea show morphological evolutionary changes despite the panchronic characteristics of this group among the Recent Brachiopods. Consequently, DARWIN's statement created by that *Lingula* is a "living fossil" must be rejected (see EMIG, 2003).

Today this anachronism, condemned for more than two decades and blatantly erroneous for those who work on evolution, can still be read on Web sites and in publications. Some recent examples among others:

WILLIAMS *et alii* (1996) created a new subphylum of Brachiopoda named "Linguliformea" which includes all the former Inarticulata Brachiopoda, except the former Craniida which become the subphylum Craniiformea. Linguliformea appears to be inappropriate as the name for a group of which the majority of taxa do not have a linguliform shell.

MILSOM and RIGBY (2003) write: "*Lingula*. Linguliform brachiopod. Ordovician-Recent. A small (about 2 cm from the beak to the anterior edge), smooth, phosphatic brachiopod known as a "living fossil" as its morphology has not changed significantly since the Ordovician. Fully infaunal, it lives in burrows with its anterior edge close to the sediment-water interface. The pedicle anchors the brachiopod to the mud whilst the valves rotate and grind through the sediment. Modern *Lingula* mainly exploit marginal habitats, but fossil *Lingula* are known from shelf and basin environments." NB: Lingulide species may reach 7-8 cm, are unable to live in a muddy substrate, but live in true marine conditions and habitats (EMIG, 1986, 1997)

J. MOORE (2006): "Living fossils: this is a potentially confusing description of animals that have changed remarkably little over long periods of time. Examples include brachiopod *Lingula*, found in Cambrian fossils and persisting today." So the confusion is maintained.

As a result of this blind consensus even today fossil linguliform brachiopods are assigned the genus *Lingula* based only on their linguliform appearance. Nevertheless, this scientific anachronism has been impugned for over two decades by EMIG (1982, 1997, 2002), BIERNAT and EMIG (1993). These authors have demonstrated as pointed out two centuries ago by CUVIER (1802) that the shape of the lingulide shell is not a taxonomically valid character. The concept introduced by DARWIN that *Lingula* is a "living fossil" must be rejected (see EMIG, 2003).

The persistence of this scientific heresy may be related to the conservatism of the palaeontological community. A partial explanation is contained in the answer of an American specialist in Mesozoic brachiopods, who in 2003 wrote me in an email: "(...) [people who study faunal lists and databases instead of anatomy and taxonomy, and thus perpetuate older nomenclature. As the ecology and distribution of lingulides does not seem to have changed dramatically since their origin, the name "\*Lingula\*" has a tremendous amount of inertia.](#)"

An anonymous referee, an Anglophone palaeontologist (according to the editor of the *Journal of Experimental Marine Biology and Ecology*) in 1982 wrote this short sentence as comment on my submittal to that journal: "[All what is written in this manuscript is opposite of what can be read on \*Lingula\* in any treatise of palaeontology. To be rejected](#)". My work was published in *Marine Biology* (EMIG, 1983).

Evidence of an approach to the acceptance of the possibility that linguliform brachiopods

are not all assignable to a single unique genus is found in the successive editions of the *Treatise of Invertebrate Paleontology*. In the first (R.C. MOORE, 1965) the stratigraphic distribution of *Lingula* was: "["? Ord., Sil.-- Rec., Cosmopolitan.](#)" The 2nd edition (HOLMER and POPOV, 2000) states: "["?Cretaceous, Tertiary-Holocene;? Cosmopolitan \(exact stratigraphic and geographic distribution of fossil forms is very uncertain\)](#)". The study of these distributions has advanced considerably (SCHMID *et alii*, 2001; EMIG, 2003; EMIG and BITNER, 2005; BITNER and DULAI, 2008) but no update regarding them was made in the revision of HOLMER and POPOV's contribution in the *Treatise on Invertebrate Paleontology: Volume 6* (2007) part H, Brachiopoda.

Finally, in the future may authors stop using the so-easy copy and paste, and instead read recent papers on the matter.

## Acknowledgments

Many of the works quoted here are available on the Web, *e.g.*, <http://darwin-online.org.uk/> - <http://www.lamarck.cnrs.fr/> - <http://www.buffon.cnrs.fr/> - <http://www.literature.org/> - <http://books.google.com/> - Universal Bibliophiles Association: <http://abu.cnam.fr/> (more at [http://paleopolis.rediris.es/BrachNet/ANNONCE\\_S/JOURNAL/e-library.html](http://paleopolis.rediris.es/BrachNet/ANNONCE_S/JOURNAL/e-library.html)). I would like thank Martin LIEBETRUTH of Niedersächsische Staats- und Universitätsbibliothek Göttingen (<http://www.sub.uni-goettingen.de/> - <http://www.animalbase.uni-goettingen.de/zooweb/servlet/AnimalBase/search>) and of the Zentrum Göttinger Digitalisierung (GDZ: <http://gdz.sub.uni-goettingen.de/>) for permission to reproduce some of facsimiles made available on these sites. I am most grateful to Remy GOURVENNEC and to two anonymous referees for comments on the earlier version, and to Nestor SANDER for improvements in the English of this version.

## Bibliographic references

- A.T.I.L.F. - Analyse et Traitement Informatique de la Langue Française (2007).- Le Trésor de la Langue Française informatisé.- C.N.R.S., <http://atilf.atilf.fr/>
- ARVEILLER R. (1982).- Compte rendu sur les datations de Bernard QUEMADA, Datations et documents lexicographiques.- *Revue de Linguistique romane*, Paris, vol. 46, p. 453-461. [*Lingula* p. 460]
- BIERNAT G. & EMIG C.C. (1993).- Anatomical distinctions of the Mesozoic lingulide brachiopods.- *Acta Palaeontologica Polonica*, Warszawa, vol. 38, n° 1, p. 1-20.
- BITNER M.A. & DULAI A. (2008).- Eocene micromorphic brachiopods from north-western Hungary.- *Geologica Carpathica*, Bratislava, vol. 59, n° 1, p. 31-43.
- BOSC L.A.G. (1802 = an X).- Histoire naturelle des coquilles, contenant leur description, les

- mœurs des animaux qui les habitent et leurs usages.- Déterville, Paris, vol. 2. 330 p.
- BOSC L.A.G. (1836). Histoire naturelle des coquilles contenant leur description, les mœurs des animaux qui les habitent et leurs usages [*Lingula*: p. 169-172 ; Pls. 45].- Librairie encyclopédique de Roret, Paris, 3e éd., vol. 1, 539 p.
- BOULE M. (1910).- *Conférences de géologie*.- Masson, Paris, 160 p. [p. 29]
- BRODERIP W.J. (1835).- Descriptions of some new species of CUVIER'S family of Brachiopoda.- *Transactions of the zoological Society of London*, vol. 1, p. 141-144.
- BRUGUIERE J.G. (1791 [1789]).- Tableau Encyclopédique et Méthodique des trois Règnes de la Nature : vers, coquilles, mollusques et polypes divers.- Panckoucke, Paris, T. 1, Pls. 172-344. [*Lingula*: Pl. 250, fig. 1a-c]
- BRUGUIERE J.G. (ca 1793).- Histoire naturelle des vers.- Panckoucke, Paris, Tableau [2.] Planches 199/488.
- BRUGUIERE J.G. (1797).- Tableau Encyclopédique et Méthodique des trois Règnes de la Nature : vers, coquilles, mollusques et polypes divers.- Panckoucke, Paris. T. 2, Pls. 190-286. [*Lingula*: Pl. 250, fig. 1a-c]
- CHEMNITZ von J.H. (1786).- Neues systematisches Conchylien-Cabinet. Geordnet und beschrieben von Friedrich Heinrich Wilhelm MARTINI und unter dessen Aufsicht nach der Natur gezeichnet und mit lebendigen Farben erleuchtet.- Raspe, Nürnberg, vol. 9, n° 2, 194 p., Pls. 1-20.
- CUVIER G. (1798).- Tableau élémentaire de l'histoire naturelle des animaux.- Baudouin, Paris, 710 p., Pls. I-XIV. [*Lingula*: p. 435]
- CUVIER G. (An XI = 1802).- Mémoire sur l'animal de la Lingule (*Lingula anatina* LAM.).- *Annales du Muséum National d'Histoire Naturelle*, Paris, vol. 1, p. 69-80, Pl. VI.
- CUVIER G. (1817).- Mémoire sur l'animal de la Lingule (*Lingula anatina* LAM.). In: Mémoires pour servir à l'histoire et à l'anatomie des Mollusques.- Déterville, Paris, 489 p. [12 p.]
- CUVIER G. & LATREILLE P.A. (1817).- Le règne animal distribué d'après son organisation pour servir de base à l'histoire naturelle des animaux et d'introduction à l'anatomie comparée.- Déterville, Paris, t. 2, 406 p.
- CUVIER G., GRIFFITH E., SMITH C.H., PIDGEON E., GRAY J.E., LATREILLE P.A. & GRAY G.R. (1834).- The animal kingdom arranged in conformity with its organization.- Whittaker, London, Vol. 12.
- DARWIN C.R. (1859).- On the origin of species by means of natural selection, or the preservation of favoured races in the struggle for life.- Murray, London, 1st edition, 1st issue, 502 p.
- DAVIDSON T. (1880).- Report on the Brachiopoda dredged by the HMS Challenger during the years 1873-1876.- *Report of the Scientific Research of the Voyage of the HMS Challenger*, London, vol. 1, n° 1, p. 1-67, Pls. 1-4.
- DAVIDSON T. (1888).- A monograph of the Recent Brachiopoda. Part III.- *Transactions of the Linnean Society of London*, (2) vol. 4 (Zool.), p. 205-230.
- DUMÉRIL A.M.C. (1806).- Zoologie analytique, ou méthode naturelle de classification des animaux, rendue plus facile à l'aide de tableaux synoptiques.- Allais, Paris, 344 p. [Brachiopoda p. 171]
- EMIG C.C. (1982).- Taxonomie du genre *Lingula* (Brachiopodes, Inarticulés).- *Bulletin Muséum National d'Histoire Naturelle de Paris*, (4) vol. 4 (Sect. A) (3/4), p. 337-367.
- EMIG C.C. (1983).- Comportement expérimental de *Lingula anatina* (Brachiopode, Inarticulé) dans divers substrats meubles (Baie de Mitsu, Japon).- *Marine Biology*, Berlin, vol. 75, n° 2/3, p. 207-213.
- EMIG C.C. (1986).- Conditions de fossilisation du genre *Lingula* (Brachiopoda) et implications paléoécologiques.- *Palaeogeography, Palaeoclimatology, Palaeoecology*, Amsterdam, vol. 53, p. 245-253.
- EMIG C.C. (1997).- Ecology of inarticulated brachiopods - Biogeography of inarticulated brachiopods. In: KAESLER R.L. (ed.), *Treatise on Invertebrate Paleontology. Part H, Revised, Brachiopoda*.- Geological Society of America and University of Kansas, Boulder, Colorado, and Lawrence, Kansas, vol. 1, p. 473-502.
- EMIG C.C. (2002).- Tools for linguloid taxonomy: the genus *Obolus* (Brachiopoda) as an example.- *Carnets de Géologie/Notebooks on Geology*, Article 2002/01 (CG2002\_A01\_CCE), 9 p., 3 figs., 2 tabl.
- EMIG C.C. (2003).- Proof that *Lingula* (Brachiopoda) is not a living-fossil, and emended diagnoses of the Family Lingulidae.- *Carnets de Géologie/Notebooks on Geology*, Letter 2003/01 (CG2003\_L01\_CCE), 8 p., 7 figs., 1 tabl.
- EMIG C.C. & BITNER M.A. (2005).- The brachiopod *Lingula* in the Middle Miocene of the Central Paratethys.- *Acta Palaeontologica Polonica*, Warszawa, vol. 50, n° 1, p. 181-184.
- EMIG C.C. & CALS P. (1979).- Lingules d'Amboine, *Lingula reevei* DAVIDSON et *Lingula rostrum* (SHAW), données écologiques et taxonomiques concernant les problèmes de spéciation et de répartition.- *Cahiers de l'Indo-Pacifique*, Paris, vol. 2, p. 153-164.
- EVENHUIS N.L. (2003).- Dating and publication of the *Encyclopédie Méthodique* (1782-1832), with special reference to the parts of the *Histoire Naturelle* and details on the *Histoire Naturelle des Insectes*.- *Zootaxa*, Paris, vol. 166, p. 1-48.
- EVENHUIS N.L. & PETIT R.E. (2003).- Corrections and additions to the dating of the "Histoire Naturelle des Vers" and the Tableau Encyclopédique (Vers, coquilles, mollusques et polypiers) portions of the *Encyclopédie Méthodique*.- *Zootaxa*, Paris, vol. 207, p. 1-4.

- GMELIN J.F. (1789).- *Systema Naturae, editio decima tertia aucta*.- Reformata I. Ps. VI. Vermes. Lipsiae. p. 3021-4120.
- GOULVEN L. (2000).- Paléontologie(s) et évolution au début du XIXe siècle CUVIER et LAMARCK.- *Asclepio*, Madrid, vol. 52, p. 133-212.
- HATSCHKE B. (1888).- Lehrbuch der Zoologie, eine morphologische Übersicht des Thierreiches zur Einführung in das Studium dieser Wissenschaft.- Fischer, Jena, 432 p.
- HOLMER L.E. & POPOV L.E. (2000).- Class Lingulata. In: KAESLER R.L. (ed.), Treatise on Invertebrate Paleontology. Part H. Revised Brachiopoda.- Geological Society of America, Boulder, and University of Kansas, Lawrence, Vol. 2, p. 30-146.
- HOLMER L.E. & POPOV L.E. (2007).- Linguiformea. In: KAESLER R.L. (ed.), Treatise on Invertebrate Paleontology. Part H. Revised Brachiopoda.- Geological Society of America, Boulder, and University of Kansas, Lawrence, Vol. 6, p. 2532-2559.
- I.C.Z.N. - International Commission on Zoological Nomenclature (1982).- *Lingula anatina* LAMARCK, 1801 (Brachiopoda), proposed conservation. Z.N. (S.) 1598.- *Bulletin of Zoological Nomenclature*, London, vol. 139, p. 302-304.
- I.C.Z.N. - International Commission on Zoological Nomenclature (1985).- Opinion 1355. *Lingula anatina* LAMARCK, 1801 is the type species of *Lingula* BRUGUIÈRE, [19797] (Brachiopoda).- *Bulletin of Zoological Nomenclature*, London, vol. 42, p. 332-334.
- KAY E.A. (1965).- The Reverend John LIGHTFOOT, Daniel SOLANDER, and the Portland Catalogue.- *The Nautilus*, Sanibel, vol. 79, n° 1, p. 10-19.
- KING J. (1859).- The Microscopist's Companion; a popular manual of practical microscopy: To which is added a glossary of the principal terms used in microscopic science.- Rickey, Mallory & Co., 308 p.
- LAMARCK J.B. [P.A. de MONET de] (1801).- Système des animaux sans vertèbres, ou tableau général des classes, des ordres et des genres de ces animaux, présentant leurs caractères essentiels et leur distribution, d'après la considération de leurs rapports naturels et de leur organisation, et suivant l'arrangement établi dans les galeries [*sic!*] du Muséum d'Hist. Naturelle, parmi leurs dépouilles conservées; précédé du discours d'ouverture du Cours de Zoologie, donné dans le Muséum National d'Histoire Naturelle l'an 8 de la République.- Déterville, Paris, 432 p., Pls. 1-6. [*Lingula* p. 140-141]
- LAMARCK J.B. [P.A. de MONET de] (1819).- Histoire naturelle des Animaux sans vertèbres.- Déterville, Paris, vol. 6, n° 1, 586 p. [Brachiopoda p. 240-258].
- LIGHTFOOT J. (1786).- A catalogue of the Portland Museum, lately the property of the Duchess of Portland, deceased; which will be sold at auction, by Mr. SKINNER and Co. on Monday the 24th of April, 1786.- Skinner, London, 194 p.
- LINNÆUS C. (1758).- *Systema naturea per regna tria naturæ, secundum classes, ordines, genera, species, cum characteribus, differentiis, synonymis, locis*.- Salvius, Stockholm, vol. 1, Editio decima, reformata, 824 p. [*Lingula*: p. 783]
- LINNÉ C. von (1767).- *Systema naturæ per regna tria naturæ secundum classes, ordines, genera, species, cum characteribus, differentiis, synonymis, locis*.- Salvius, Stockholm, vol. 1., n° 2, Editio duodecima reformata, p. 533-1327. [*Lingula*: p. 1260]
- LYELL C. (1845).- Travels in North America in the years 1841-2; with geological observations on the united states, Canada, and Nova Scotia.- Wiley and Putnam, New-York, Vol. 1, 232 p.
- MENKE C.T. (1828).- *Synopsis methodica molluscorum generum omnium et specierum earum, quae in museo Menkeano adservantur; cum synonymia critica et novarum specierum diagnosibus*.- Uslar G., Pyramonti, Uslar, 91 p.
- MILSON C. & RIGBY S. (2003).- Fossils at a glance.- Blackwell Science, Oxford, 155 p. [*Lingula*: p. 40]
- MOORE J. (2006).- An introduction to the Invertebrates.- Cambridge University Press, Cambridge, 2nd ed., 338 p. [*Lingula*: p. 15]
- MOORE R.C. (ed.) (1965).- Treatise on Invertebrate Paleontology. Part H. Brachiopoda.- Geological Society of America, Boulder, and University of Kansas, Lawrence, 927 p.
- MUIR-WOOD H.L. (1955).- A history of the classification of the phylum Brachiopoda.- British Museum (Natural History), London, 124 p.
- MURCHISON R.I. (1847).- A brief review of the classification of the sedimentary rocks of Cornwall.- *Edinburgh new Philosophical Journal*, vol. 43, p. 33-40.
- MÜSCH I., WILLMANN R. & RUST J. (2005).- SEBA A.: Das Naturalienkabinett. Vollständige Ausgabe der kolorierten Tafeln 1734 - 1765.- Taschen, Allemagne, 587 p.
- d'ORBIGNY A. (1852).- Cours élémentaire de paléontologie et de géologie stratigraphiques.- Masson, Paris, 382 p.
- QUEMADA B. (1982).- Datations et documents lexicographiques: Collection Matériaux pour l'histoire du Vocabulaire français.- Klincksieck, Paris, vol. 20, 254 p.
- ROWELL A.J. (1964).- *Lingula* BRUGUIÈRE (1797) (Brachiopoda, Inarticulata): proposed designation of a type-species under the plenary powers. Z. N. (S.) 1598.- *Bulletin of Zoological Nomenclature*, London, vol. 21, p. 222-224.
- RUMPHIUS G.E. (1705).- D'Amboinsche rariteitkamer: behelsende een kort verhaal der gedenkwaardigste geschiedenissen zo in vrede als oorlog voorgevallen sedert dat de Nederlandsche Oost Indische.- Halma, Amsterdam, 340 p.
- SCHMID P.H., HARZHAUSER M. & KROH A. (2001).-

- Hypoxic events on a Middle Miocene carbonate platform of the Central Paratethys (Austria, Badenian, 14 Ma).- *Annalen des Naturhistorischen Museums in Wien*, (A), vol. 102, p. 1-50.
- SEBA A. (1758).- *Locupletissimi rerum naturalium thesauri accurata descriptio et iconibus artificiose expressio per universam physices historiam*.- Janssonius van Waesberge, Amsterdam, vol. 3, 511 p., 116 Pls. [*Lingula*: Pl. 16, fig. 4].
- SEBA A., CUVIER G., DESMAREST A.G., GEOFFROY SAINT-HILAIRE J.G. & GUÉRIN-MÉNEVILLE F.E. (1828).- Planches de SEBA, *Locupletissimi Rerum naturalium Thesauri accurata Descriptio*. Accompagnées d'un texte explicatif mis au courant de la Science.- Levrault, Paris, vol. 3.
- SHEBORN C.D. & WOODWARD B.B. (1906).- On the dates of publication of the natural history portions of the "Encyclopédie Méthodique".- *Annals and Magazine of Natural History*, London, (ser. 7), vol. 17, p. 577-582.
- SOLANDER D.C., manuscrits non publiés, in LIGHT-FOOT (1786): *Mytilus lingua*, p. 77, no. 1718.
- SOWERBY G.B. (1847).- *Thesaurus conchyliorum* or Monographs of genera of shells.- Sowerby, London, vol. 1, 438 p., 91 Pls. [*Lingula*: p. 337-339, Pl. 57]
- SOWERBY J. (1812).- The mineral conchology of Great Britain, printed by B. Meredith, London, vol. 1, 244 p. [*Lingula*: p. 55-56, Pl. 19, figs. 1-4]
- WILLIAMS A., CARLSON S.J., BRUNTON C.H.C., HOLMER L.E. & POPOV L. (1996).- A supra-ordinal classification of the Brachiopoda.- *Philosophical Transactions of the Royal Society of London*, B, vol. 351, p. 1171-1193.