

## **From light to darkness: from *Frambocythere* COLIN, 1980 to *Kovalevskiella* KLEIN, 1963 (Limnocytheridae, Timiriaseviinae)**

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In 1980, COLIN (in COLIN & DANIELOPOL 1980) created the genus *Frambocythere* for small (less than 0.600 mm) Timiriaseviinae (Ostracoda, Limnocytheridae) from the Late Maastrichtian of northern Spain, characterized by a typical “raspberry-type” ornamentation, the presence of two sulci, an inverse overlap and a strong sexual dimorphism (Fig. 1a). The authors (COLIN & DANIELOPOL 1980) introduced the *Kovalevskiella* lineage, which includes the genera *Kovalevskiella* KLEIN, 1963, *Rosacythere* COLIN, 1980 and *Frambocythere*. According to them, the main diagnostic characters of this lineage are, small-sized carapace, about 0.5 mm (or less), ornamentation in «rosettes» or micropustulose, «raspberry-type», inverse hingement with positive elements on the left valve (right valve > left valve), no, or one to two vertical sulci, marked sexual dimorphism females having a developed brood pouch. Recently (GIDÓ et al. 2007), emended this group which they called *Kovalevskiella-Abrotocythere* Group, to include the genera *Abrotocythere* ZHAO, 1987 (Oligo-Miocene of China) and *Dolekiella* GIDÓ et al., 2007 (recent stygobitic genus from southern France).

Subsequently, several other species and subspecies of the genus *Frambocythere* have been erected ranging from Late Maastrichtian to Middle Eocene (TAMBAREAU 1984; TAMBAREAU et al. 1991; Fig. 1b). The palaeobiogeographical distribution of this genus is very broad, from SW Europe to China (Hou 1978; Fig. 1c), and it has also been reported from Iran (COLIN et al., in press) and India (BHANDARI & COLIN 1999).

The origin of this genus is still not clear. The oldest species, *Frambocythere pustulosa* (GREKOFF, 1957) (Fig. 1d), has a Gondwanian distribution, known from the Albian of the central Congo Democratic Republic and Albo-Aptian of Chad (COLIN 1993; COLIN & DÉPÉCHE 1997). In the latest Bajocian (Middle Jurassic) of the Paris Basin, a related species without sulci (just a sulcal depression = *dépression sulcale* sensu CABRAL & COLIN 1998) are known as *Rosacythere* sp. 2 (OERTLI, 1957; Fig. 1e). COLIN & CARBONEL (1996) suggested that the absence of sulcus was a primitive character.

The genus *Kovalevskiella* is very similar to *Frambocythere* but has only one sulcus and has a parthenogenetic mode of reproduction (Fig. 1f). It is known from lacustrine deposits in the late Oligocene and Miocene of western Europe and the Pliocene of the Paratethys (CARBONEL et al. 1986; Fig. 1g), and is now a stygobitic genus restricted to the hypogean realm in central and southern-eastern Europe as well as Turkey (COLIN & DANIELOPOL 1980; KARANOVIC 2003).

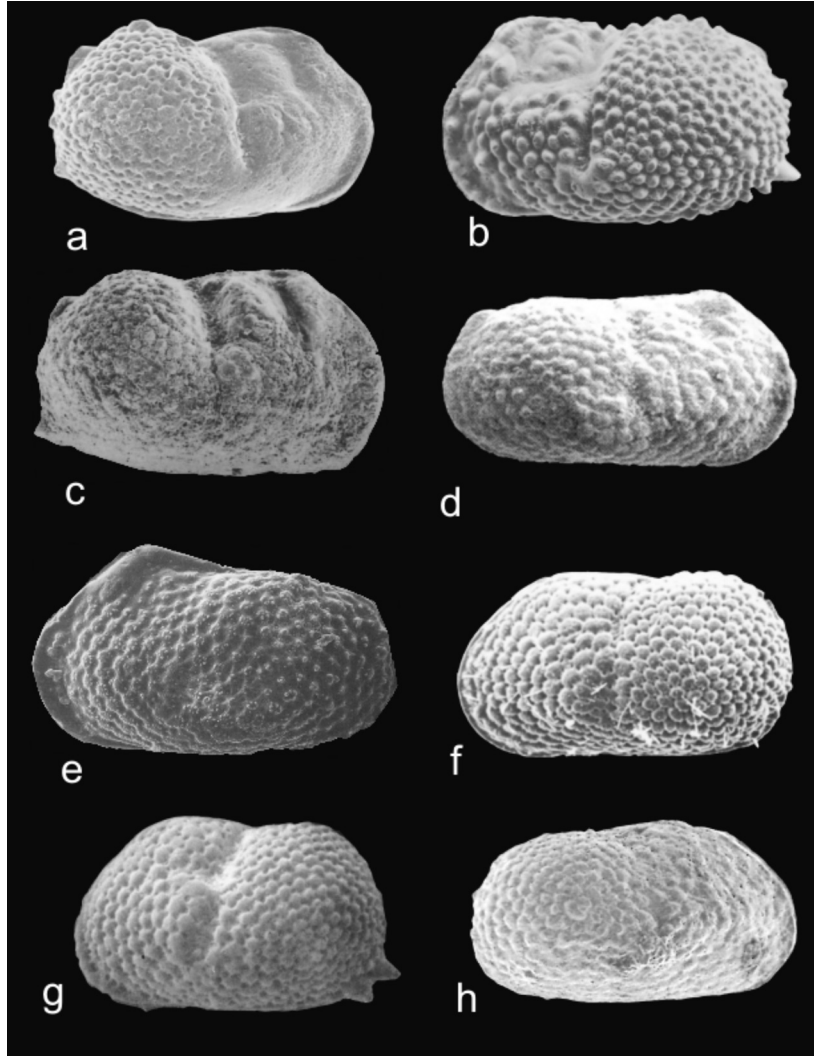


Fig. 1: a) *Frambocythere tumiensis ferreri* COLIN, 1980, Maastrichtian of NE Spain, right view (L = 0.480 mm). b) *Frambocythere tumiensis ludi* TAMBAREAU, 1984, Montian (Danian, early Palaeocene) of Belgium, left view (L = 0.580 mm). c) *Frambocythere tumiensis fanghiensis* (Hou, 1978), Late Maastrichtian of NW China. d) *Frambocythere pustulosa* (GREKOFF, 1957), Albian, Democratic Republic of Congo, right view (L = 0.450 mm). e) *Rosacythere* sp. 2 (OERTLI, 1957), Late Bajocian southern Paris Basin, France, left view (L = 0.550 mm). f) *Kovalevskiiella bulgarica* (DANIELOPOL, 1970), Recent of Bulgaria, left view (L = 0.430mm). g) *Kovalevskiiella caudata* (LUTZ, 1965), Aquitanian (early Miocene) of SW France, left view (L = 0.430 m). h) *Frambocythere valeroni* TAMBAREAU, 1991, Ilerdian (Ypresian, Early Eocene) of Montagne Noire, SW France, right view (L = 0.460 mm).

CARBONEL et al. (1986) suggested that the genus *Kovalevskiella* migrated from the epigeal to the hypogean realm before the Quaternary as the result of their morphology, their broad ecological valence and their parthenogenetic mode of reproduction. Quaternary glaciations helped keeping this genus in the hypogean realm and destroyed the putative epigeal populations.

The question is, what are the relationships between the Oligocene to Recent genus *Kovalevskiella* and the Albian to Eocene genus *Frambocythere*? They have both the same size, have the same framboidal ornamentation, the left valve is generally smaller than the right valve but typical *Frambocythere* have two distinct sulci whereas *Kovalevskiella* has only one. *Kovalevskiella* is always parthenogenetic whereas *Frambocythere* generally has a bisexual mode of reproduction (although parthenogenetic populations are known, cf. TAMBAREAU et al. 1991). A species described from the early Eocene (Thanetian) of SW France, *Frambocythere valeroni* TAMBAREAU (in TAMBAREAU et al., 1991), may be the answer. Is it a species of *Frambocythere* or of *Kovalevskiella*? It has bisexual reproduction as *Frambocythere* but has only one rather weak sulcus as *Kovalevskiella* (Fig. 1h).

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