

Two new Late Viséan (Mississippian) species of the genera *Nevillea* and *Mikhailovella* (Foraminiferida) from the Guadiato Area (SW Spain)

Dos especies nuevas de los géneros Nevillea y Mikhailovella (Foraminiferida) en el Viseense superior (Mississippiense) del Área del Guadiato (SO de España)

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Abstract: Two new endemic species from the Guadiato Area are described in this work, *Nevillea cordobensis* and *Mikhailovella fresnedosensis*. These species range from the Late Viséan foraminiferal zones 14 to 15 (V3a-V3b α - β - γ_{inf} o Cf5 Cf6 α - β - γ_{inf}). The first occurrence of *Mikhailovella* from Zone 14 is controversial, because its first occurrence is usually used as biomarker from Zone 15. Analysis of the rest of the foraminiferal assemblages from the same levels also suggests that the first occurrence of this genus is at the base of the Late Viséan.

Key words: Taxonomy, Foraminifera, Carboniferous, Sierra Morena, Spain.

Resumen: En este trabajo se describen dos nuevas especies de foraminíferos endémicos del Área del Guadiato, *Nevillea cordobensis* y *Mikhailovella fresnedosensis*. Estas especies tienen un rango estratigráfico que abarca las zonas 14 y 15 de foraminíferos (V3a-V3b α - β - γ_{inf} o Cf5 Cf6 α - β - γ_{inf}), ambas en el Viseense superior. La aparición de *Mikhailovella* desde la Zona 14 es un dato controvertido, ya que se considera como un taxon guía de la Zona 15. El análisis del resto de las asociaciones de foraminíferos pertenecientes a los mismos niveles sugiere que la aparición de este género desde la base del Viseense superior.

Palabras clave: Taxonomía, Foraminíferos, Carboníferos, Sierra Morena, España.

INTRODUCTION

Mississippian rocks located in the SW Iberian Peninsula contain rich foraminiferal assemblages, belonging to the suborder Fusulinina WEDEKIND, 1937. Most of the foraminifera belong to the same species that have been identified in other basins which had palaeogeographic close proximity (CÓZAR in press), however some endemic species exist in Sierra Morena. These outcrops (Fig. 1), such as the Guadiato Area (CÓZAR & RODRÍGUEZ, 1999a), have been intensively studied in the last few years from a micropalaeontological perspective. The foraminifera and algae from this region help to bridge the absence of data between the rich NW European and North

African micropalaeontological assemblages. This paper is focused on two new species assigned to the genera *Nevillea* and *Mikhailovella*. Both species have biostratigraphic significance in the Guadiato Area, and thus have implications in the biostratigraphic zonal schemes defined for Western Europe.

SYSTEMATIC PALAEOLOGY

Suborder Fusulinina WEDEKIND, 1937

Superfamily Endothyracea BRADY, 1884

Family Forchiiidae DAIN, 1953

Genus *Nevillea* CONIL & LYS in CONIL *et al.*, 1980

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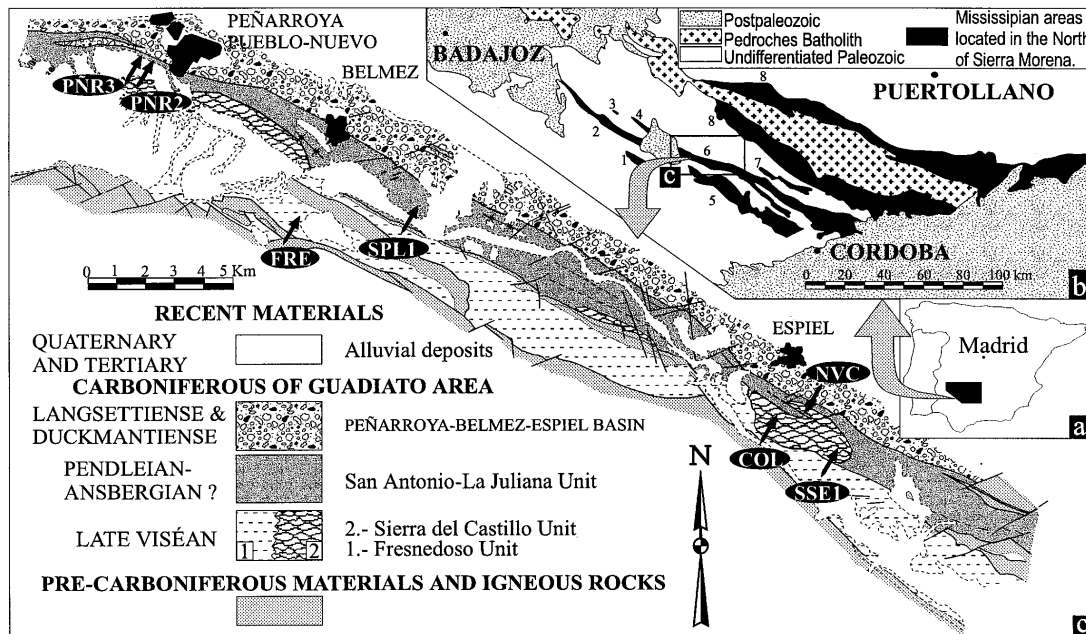


Figure 1.—Location of the studied area. a: Iberian Peninsula. b: Mississippian outcrops (late Tournaisian to Namurian) belonging to the N Sierra Morena: 1. Berlanga, 2. Machel, 3. El Casar, 4. Campillo de Llerena, 5. Benajarfe, 6. Guadiato-Guadalmellato, 7. Guadalbarbo, 8. Pedroches. c: Geologic outline of the northern sector of the Guadiato Area, stratigraphic sections mentioned in the text: PÑR2. Peñarroya 2, PÑR3. Peñarroya 3, SPL1. Sierra Palacios 1, FRE. Arroyo del Fresnedoso, COL. Collado, NVC. Navacastillo, SSE1. Sierra de la Estrella 1 (Modified from CÓZAR & RODRÍGUEZ, 1999a).

Figure 1.—Localización de la zona de estudio. a: Península Ibérica. b: Afloramientos del Missipiense (Tournaisiense superior-Namuriense) al norte de Sierra Morena, 1. Berlanga, 2. Machel, 3. El Casar, 4. Campillo de Llerena, 5. Benajarfe, 6. Guadiato-Guadalmellato, 7. Guadalbarbo, 8. Pedroches. c: Sector norte del Área del Guadiato, secciones estratigráficas citadas en el texto: PÑR2 Peñarroya 2, PÑR3 Peñarroya 3, SPL1 Sierra Palacios 1, FRE Arroyo del Fresnedoso, COL Collado, NVC Navacastillo, SSE1 Sierra de la Estrella 1 (MODIFICADA DE CÓZAR & RODRÍGUEZ 1999a).

The validity of the genus *Nevillea* is controversial, because it was also published as *Georgella* and *Nevillella*. CONIL & LYS (1977) defined *Georgella*, but the name was preoccupied by an arachnid. *Nevillea* was proposed by CONIL & LYS in CONIL *et al.* (1980), but theoretically, it was also preoccupied by a mollusc, so CONIL & LYS in CONIL (1980) proposed *Nevillella* as a replacement name. However, according to LOEBLICH & TAPPAN (1988), the name of the mollusc was an erroneous spelling of

Nevillia, and thus does not enter into homonymy, ICZN Art. 33(c), so *Nevillea* is the correct generic name.

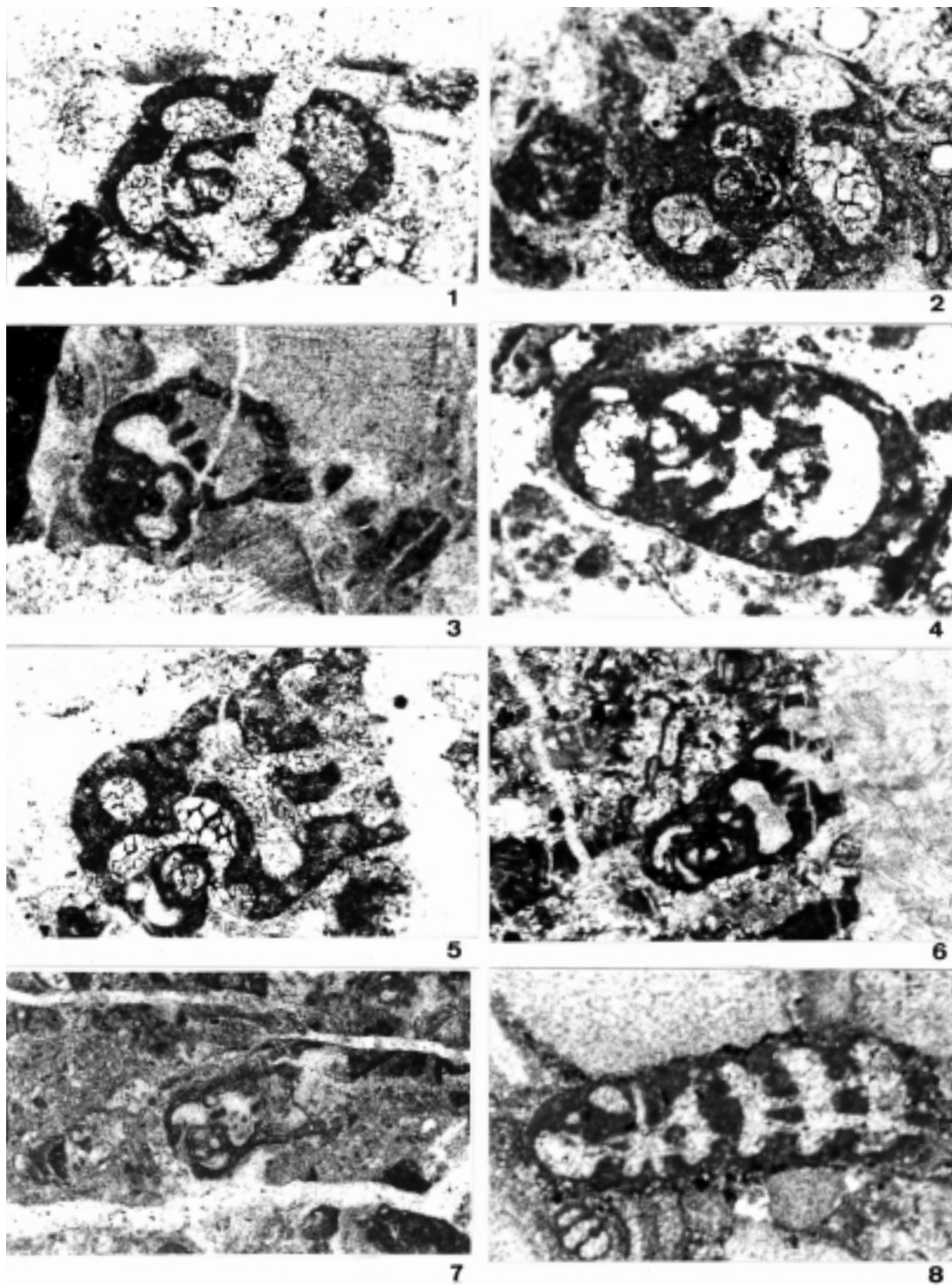
Nevillea cordobensis n. sp.
 (Pl. 1, Figs. 1-8)

1999b *Haplophragmella tetraloculi* RAUSER-CHERNOUSSOVA;
 CÓZAR & RODRÍGUEZ, Pl. 2, Fig. 18.

PLATE 1/LÁMINA 1

Figs. 1-8.- *Nevillea cordobensis* n. sp., Late Viséan. 1- PÑR2/7h(1)-1 (x65), equatorial section, Zone 15 [Paratype]. 2- PÑR2/7h(1)-2 (x65), equatorial section, Zone 15 [Paratype]. 3- PÑR2/7(4)-1 (x31.5), equatorial section, Zone 15 [Paratype]. 4- PÑR2/2(2)-1 (x65), axial section, Zone 14. 5- PÑR2/7-23 (x65), equatorial section, Zone 15 [Holotype]. 6- PÑR2/2(4)-5 (x31.5), axial section, Zone 14. 7- SPL6-2b(2)-1 (x37), equatorial section, Zone 15. 8- PÑR2/7h(2)-3 (x31.5), oblique section, Zone 15.
 Figs. 1-8.- *Nevillea cordobensis* n. sp., Visense superior. 1- PÑR2/7h(1)-1 (x65), sección ecuatorial, Zona 15 [Paratipo]. 2- PÑR2/7h(1)-2 (x65), sección ecuatorial, Zona 15 [Paratipo]. 3- PÑR2/7(4)-1 (x31.5), sección ecuatorial, Zona 15 [Paratipo]. 4- PÑR2/2(2)-1 (x65), sección axial, Zona 14. 5- PÑR2/7-23 (x65), sección ecuatorial, Zona 15 [Holotipo]. 6- PÑR2/2(4)-5 (x31.5), sección axial, Zona 14. 7- SPL6-2b(2)-1 (x37), sección ecuatorial, Zona 15. 8- PÑR2/7h(2)-3 (x31.5), sección oblicua, Zona 15.

PLATE I/LÁMINA I



Derivatio nominis: from Córdoba, a Spanish province where the outcrops are located.

Locus typicus: Peñarroya 2 Section. This stratigraphic section is measured to the west of Peñarroya-Pueblonuevo town (see the location and description of the stratigraphic section in CÓZAR & RODRÍGUEZ, 1999b).

Stratum typicum: Late Viséan, foraminiferal Zone 15, Peñarroya 2 Section, horizon PÑR2/7, 22 specimens.

Holotype: PÑR2/7-23, Pl. 1, Fig. 5 [Diameter of the spiral portion: 560 µm, length of the straight portion: 610 µm, inner diameter of the proloculum: 63 µm, wall thickness in the last chamber: 67 µm].

Paratypes: PÑR2/7-17, PÑR2/7'-4, PÑR2/7h-7, PÑR2/7h'-4, PÑR2/7h'-5, PÑR2/7(1)-1, PÑR2/7(4)-1, PÑR2/7(4)-2, PÑR2/7(4)-3, PÑR2/7h(1)-1, PÑR2/7h(1)-2, PÑR2/7h(1)-3, PÑR2/7h(2)-1, PÑR2/7h(2)-2, PÑR2/7h(2)-3, PÑR2/7h(3)-1, PÑR2/7h(3)-2, PÑR2/7h(3)-3, PÑR2/7h(4)-1, PÑR2/7h(4)-2, PÑR2/7h(4)-3.

Deposit of the types: Department of Palaeontology (Universidad Complutense de Madrid).

Diagnosis: Large test consisting of two portions: an earlier portion with few spiral volutions, and with few chernyshinellid chambers per whorl. The later portion is rectilinear, or slightly expanding with growth and numerous uniserial chambers with cribrate apertural faces.

Description of the holotype: Test bimorphic of large dimensions, greatest length 870 µm; in the early stage of the coiling is endothyroid, in the later stage the test is rectilinear. The spiral and the rectilinear parts of the tests are subdivided into chambers. The proloculum is round, with small size. The rectilinear part is nearly cylindrical, almost the same width for the whole length of the test. The spiral portion consists of 1.5 volutions. Number of chambers in the final volution of the spiral portion is 4, divided by short and thick septa, with strong chernyshinellid morphology. Septal sutures are inconspicuous. Apertures in the streptospiral part are

simple. Number of uniserial chambers is 2. Chambers in the straight part are broad and low, separated from one another by slight inflated and thick septa. Apertures in the straight part are cribrate. Wall thick composite, dark, microgranular, composed of common agglutinated particles and a darker microgranular inner layer.

Description of the test assemblage: Test in the early portion spirally coiled, endothyroid, in the later portion straight, cylindrical or expanding slightly. Proloculum large and round, rarely ovoid, 53-63 µm in inner diameter (microspheric tests) or 80-120 µm (macrospheric tests). The spiral portion is somewhat compressed along its coiling axis, consists of 1-2 whorls; diameter of the spiral portion 380-677 µm. Few chernyshinellid chambers per whorl, 3 or 4 in the last coil. Septa short and wide. Septal sutures inconspicuous. Numerous uniserial chambers, up to 6. Length of the straight portion up to 1850 µm. Simple and basal apertures between the first chambers. cribrate apertures from the last coiled chamber onward. Wall microgranular, with common agglutinated particles, 60-135 µm in the last uniserial chambers, and 43-67 µm in thickness in the last coiled chambers. A fine, dark, denser layer is observed in the inner part of the wall.

Remarks: The species described has a certain similarity to *N. dytica* (CONIL & LYS, 1977), *N. tulica* (GANELINA, 1956) and *N. tetraloculi* (RAUSER-CHERNOUSSOVA, 1948). Differs from *N. dytica* by the shape of the test, with a more compressed spiral portion and more expanded straight portion. Moreover, it differs by having a relatively smaller size, fewer whorls for a similar numbers of chambers, and less uniserial chambers. Differs from *N. tulica* by its larger test, less whorls, more compressed septa in the uniserial chambers, and more uniserial chambers. Differs from *N. tetraloculi* by a less expanded straight portion, smaller diameter of the spiral portion, fewer whorls and more uniserial chambers.

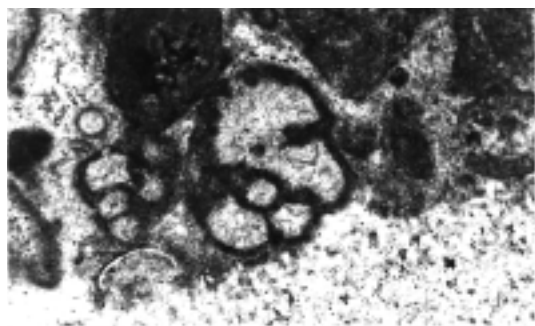
Stratigraphic and geographic distribution: The species has been found in Zone 14 (= V3a = Cf5, Late Viséan), in the stratigraphic sections of

PLATE 2/LÁMINA 2

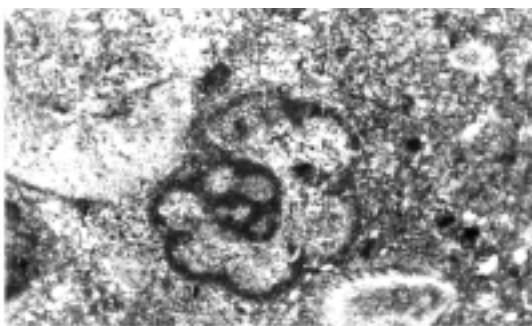
Figs. 1-8.- *Mikhailovella fresnedosensis* n. sp., Late Viséan. 1- SPL6-2b(1)-1 (x65), equatorial section, Zone 15. 2- SSE1/17b-32 (x65), equatorial section, Zone 15. 3- COL/3-14 (x65), equatorial section, Zone 15. 4- FRE1(4)-1 (x65), equatorial section, Zone 14 [Paratype]. 5- COL/4**-12 (x65), equatorial section, Zone 15. 6- FRE1(3)-1 (x65), equatorial section, Zone 15 [Paratype]. 7- FRE1(1)-1, (x65), equatorial section, Zone 14 [Holotype]. 8- NVC/4a-1 (x65), oblique section, Zone 15.

Figs. 1-8.- *Mikhailovella fresnedosensis* n. sp., Viséense superior. 1- SPL6-2b(1)-1 (x65), sección ecuatorial, Zona 15. 2- SSE1/17b-32 (x65), sección ecuatorial, Zona 15. 3- COL/3-14 (x65), sección ecuatorial, Zona 15. 4- FRE1(4)-1 (x65), sección ecuatorial, Zona 14 [Paratipo]. 5- COL/4**-12 (x65), sección ecuatorial, Zona 15. 6- FRE1(3)-1 (x65), sección ecuatorial, Zona 15 [Paratipo]. 7- FRE1(1)-1, (x65), sección ecuatorial, Zona 14 [Holotipo]. 8- NVC/4a-1 (x65), sección oblicua, Zona 15.

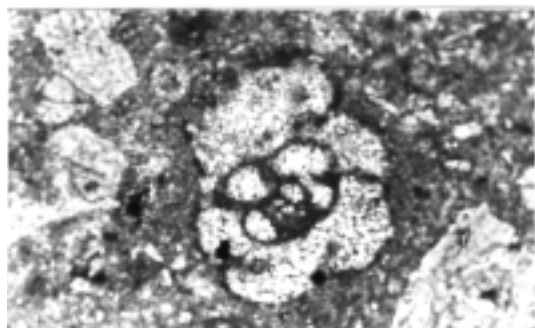
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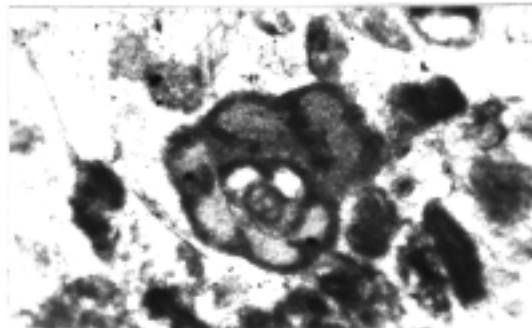
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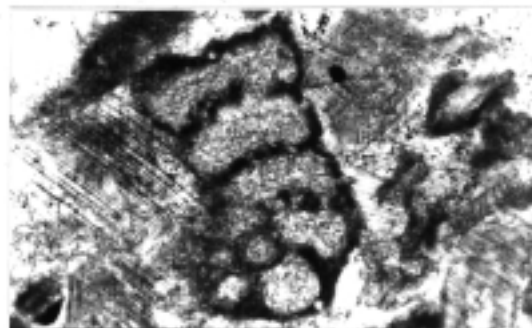
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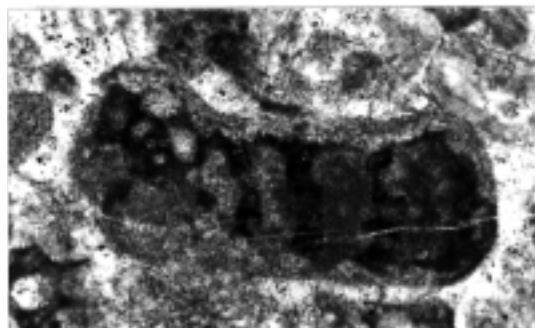
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Peñarroya 2 (17 specimens), Peñarroya 3 (1 specimen), Sierra Palacios 1 (1 specimen) and in the outcrop of Sierra Palacios 4 (1 specimen). It has been also found in Zone 15 (= V3b α - β - γ_{inf} = Cf6 α - β - γ_{inf} , Late Viséan; see CÓZAR, in press), in the stratigraphic sections of Peñarroya 2 (22 specimens), Sierra Palacios 1 (1 specimen), and in the outcrops of Sierra Palacios 2 (1 specimen) and 6 (1 specimen) (Figs. 1, 2; see the location of the stratigraphic sections in CÓZAR & RODRÍGUEZ, 1999b, 1999c).

Family Endothyridae BRADY, 1884

Genus *Mikhailovella* GANELINA, 1956

Mikhailovella fresnedosensis n. sp.
(Pl. 2, Figs. 1-8)

2000 *Mikhailovella* sp. CÓZAR, Pl. 5, Figs. 3-4.

In press *Mikhailovella* sp. CÓZAR *et al.*, Fig. 5j.

In press *Mikhailovella* sp. CÓZAR, Fig. 4i.

Derivatio nominis: from Arroyo del Fresnedoso, stratigraphic section from the Guadiato Area.

Locus typicus: Arroyo del Fresnedoso Section. This stratigraphic section is measured to the south of Belmez town (see the location and description of the stratigraphic section in CÓZAR & RODRÍGUEZ 2001).

Stratum typicum: Late Viséan, foraminiferal Zone 14, Arroyo del Fresnedoso Section, horizon FRE 1, 7 specimens.

Holotype: FRE1(1)-1, Pl. 2, Fig. 7. [Diameter of the spiral portion: 400 μ m, length of the straight portion: 660 μ m, inner diameter of the proloculum: 24 μ m, wall thickness in the last chamber: 29 μ m]

Paratypes: FRE1-23, FRE1'-4, FRE1'-5, FRE1(3)-1, FRE1(4)-1, FRE1(4)-2.

Deposit of the types: Department of Palaeontology (Universidad Complutense de Madrid).

Diagnosis: Small test consisting of two portions: an earlier portion with few spiral volutions, and a later uniserial portion. The spiral part is clearly displaced to one side relative to the uncoiled part. The spiral part is composed of few chambers per whorl, and the uncoiled part of numerous chambers with cribrate apertural faces. The uniserial part is relatively short for the number of chambers.

Description of the holotype: Test composed of an endothyroidal initial part and an uncoiled terminal part. Endothyroidal part strongly displaced to one side relative to the uncoiled part, greatest length 840

μ m. The spiral and the rectilinear parts of the tests are subdivided into chambers. The proloculum is small and round. The endothyroidal part consists of 2 whorls. Chambers are convex, with 4.5 in the last coiled whorl. Septa are slightly curved and long and septal sutures are depressed. Apertures of the spiral part are simple, but in the two last chamber are cribrate. The uniserial part is nearly cylindrical, with 4 uniserial chambers, separated by cribrate apertural faces. Uniserial chambers are very weakly convex, become slightly wider and strongly higher with the test growth. Wall microgranular, dark, uniform, relatively thin and externally recrystallized.

Description of the test assemblage: Test contains a young spiral portion (with 1.5-2.5 endothyroidal whorls), and an adult, straight, uniserial and cylindrical portion. Endothyroidal whorls in several planes located on one side of the test. Round proloculum ranges from 30 μ m to 60 μ m in inner diameter. Diameter of the spiral portion from 250 μ m to 400 μ m, total length of the test up to 880 μ m. Slightly expanded uniserial chambers, up to 4 in adult specimens. Few endothyroidal chambers in the spiral portion, up to 4 or 5 in the last whorl, rarely 6. Curved septa toward the aperture, and sutures marked. Apertures simple and basal in the young part, simple-cribrate in the two last coiled chambers, and complex-cribrate in the uniserial chambers. Thick microgranular wall, ranging from 20 μ m to 40 μ m.

Remarks: The species described has a certain similarity to *M. gracilis* (RAUSER-CHERNOUSOVA, 1948), *M. popleformis* DURKINA, 1959, *M. continua* ROZOVSKAYA, 1963, *M. mica* GANELINA, 1956 and *M. uchtovica* DURKINA, 1959. Differs from *M. gracilis* by the shape of the test, smaller spiral portion, fewer chambers per whorl, more uniserial chambers and thicker wall. Differs from both *M. popleformis* and *M. continua* by a more regular shape, longer test, more compressed uniserial part, more uniserial chambers and less marked sutures. Differs from both *M. mica* and *M. uchtovica* by a more regular shape, larger diameter of the spiral portion, shorter and narrower uniserial part, and more uniserial chambers.

As in *Nevillea cordobensis* n. sp., the correct orientation of the sections is necessary for the identification of species. The sections obtained at random may be very different in species with coiled and uncoiled portions (Pl. 1, 2), so their determinations have to be based on numerous specimens.

Stratigraphic distribution: The species has been found in Zone 14 (= V3a = Cf5, Late Viséan), in the

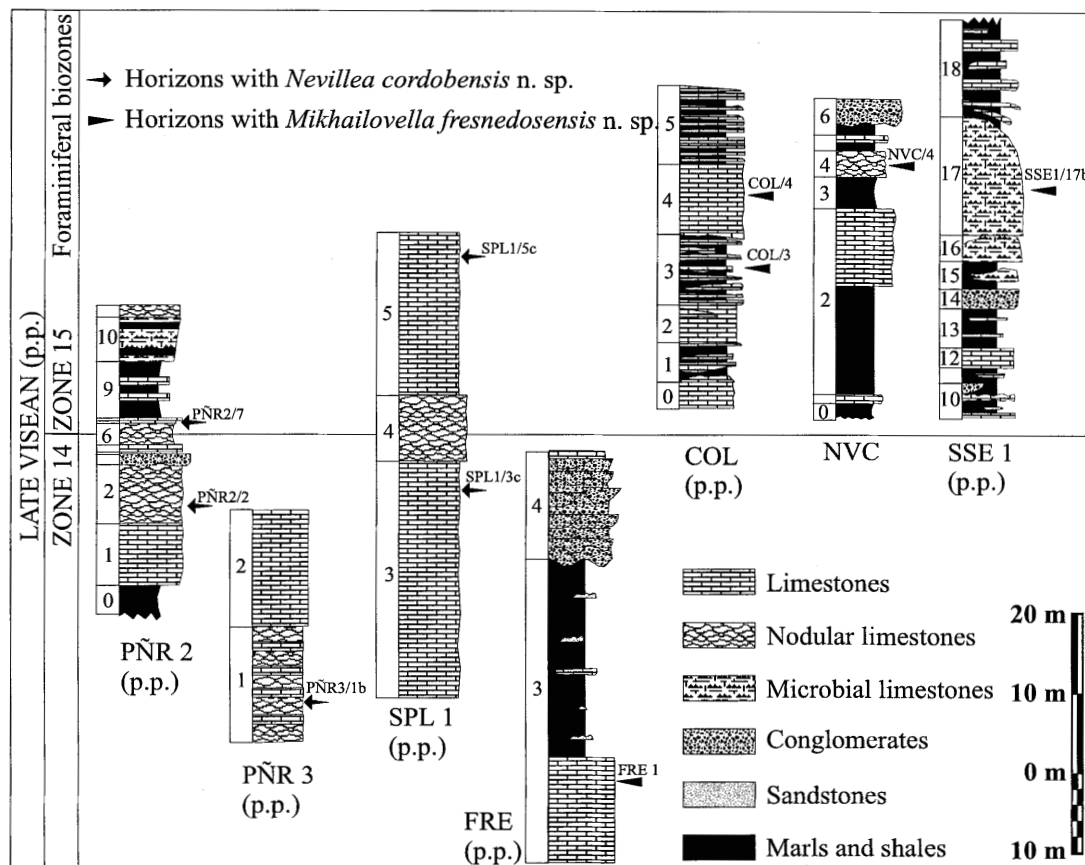


Figure 2.- Location of the horizons where *Nevillea cordobensis* n. sp. and *Mikhailovella fresnedosensis* n. sp. (arrows) have been found in the stratigraphic sections from the Guadiato Area: PÑR2. Peñarroya 2, PÑR3. Peñarroya 3, SPL1. Sierra Palacios 1, FRE. Arroyo del Fresnedoso, COL. Collado, NVC. Navacastillo, SSE1. Sierra de la Estrella 1 (PÑR2 and PÑR3 are modified from CÓZAR & RODRÍGUEZ 1999b, SPL1 from CÓZAR & RODRÍGUEZ 1999c, FRE from CÓZAR & RODRÍGUEZ 2001, COL from CÓZAR, 1996, and SSE1 from CÓZAR *et al.* in press).

Figura 2.- Localización de los niveles donde se han encontrado los ejemplares de *Nevillea cordobensis* n. sp. y *Mikhailovella fresnedosensis* n. sp. (flechas), en las secciones estratigráficas del Área del Guadiato: PÑR2 Peñarroya 2, PÑR3 Peñarroya 3, SPL1 Sierra Palacios 1, FRE Arroyo del Fresnedoso, COL Collado, NVC Navacastillo, SSE1 Sierra de la Estrella 1 (PÑR2 and PÑR3 están modificadas de Cózar & Rodríguez 1999b, SPL1 de Cózar & Rodríguez 1999c, FRE de Cózar & Rodríguez 2001, COL de Cózar, 1996, y SSE1 de Cózar *et al.* in press).

stratigraphic section of Arroyo del Fresnedoso (7 specimens) and in the outcrop of Sierra Palacios 5 (1 specimen). It has been also found in Zone 15 (= V3b α - β - γ_{inf} = Cf6 α - β - γ_{inf} , Late Viséan; see CÓZAR in press), in the stratigraphic sections of Collado (2 specimens), Navacastillo (3 specimens), Sierra de la Estrella 1 (1 specimen), and in the outcrop of Sierra Palacios 6 (3 specimens) (Figs. 1, 2; see the location of the stratigraphic sections in CÓZAR 1996; CÓZAR & RODRÍGUEZ 1999c, 2001; CÓZAR *et al.* in press).

BIOSTRATIGRAPHIC REMARKS

N. cordobensis n. sp. and *M. fresnedosensis* n. sp. are confined to the Late Viséan of the Guadiato Area. *Mikhailovella* is a typical guide taxon in Zone 15, V3b or Cf6, since according to VACHARD (1977), the genus first occurs in V3b α , and for SKOMPSKI *et al.* (1989) in V3b γ . However, MAMET (1974) placed its first occurrence in Zone 14 in Tethys realm, which concurs with its first occurrence in the Guadiato Area. FEWTRELL *et al.* (1981) placed its first

occurrence in the Arundian in England and LOEBLICH & TAPPAN (1988) regard its stratigraphic range as middle Viséan; these last ranges disagree with any other distribution published in the literature. The Guadiato Area and other Mississippian outcrops of the Sierra Morena have been poorly studied so far, so they are a very different case in regards with the classical European basins of England, France, Belgium, Ireland, etc. In the European basins, the foraminiferal stratigraphic ranges are well known due to a long period of research. On the other hand, the stratigraphic ranges attributed to the foraminifera in the Guadiato Area are more tentative at the present, pending further detailed research. To solve this problem, the rest of the assemblages in the same strata have to be analysed in more detail. The foraminiferal assemblage of the Arroyo del Fresnedoso Section (horizon 1, Fig. 2) is:

Earlandia vulgaris (RAUSER-CHERNOUSSOVA & REITLINGER), *Pseudoammodiscus parvus* (REITLINGER), *Pseudoammodiscus volgensis* (RAUSER-CHERNOUSSOVA), *Pseudoammodiscus pulchrus* (MALAKHOVA), *Koskinobigenerina prisca* (LIPINA), *Lituotubella magna* RAUSER-CHERNOUSSOVA, *Forschia mikhailovi* DAIN, *Valvulinella youngi* (BRADY), *Tetrataxis* ex gr. *conica* EHRENBERG, *Pseudotaxis eominima* (RAUSER-CHERNOUSSOVA), «*Endothyra*» ex gr. *prisca* (RAUSER-CHERNOUSSOVA & REITLINGER), *Endothyra* ex gr. *bowmani* PHILLIPS? emend. BRADY emend. CHINA, *Endothyra* ex gr. *similis* RAUSER-CHERNOUSSOVA & REITLINGER, *Endothyra* sp., *Omphalotis frequentata* (GANELINA), *Omphalotis circumplicata* (HOWCHIN), *Endothyranopsis compressa* (RAUSER-CHERNOUSSOVA & REITLINGER), *Endothyranopsis* sp., *Plectogyranopsis* ex gr. *convexa* (RAUSER-CHERNOUSSOVA), *Mediocris mediocris* (VISSARIONOVA), *Eostaffella radiata* (BRADY), *Eostaffella proikensis* RAUSER-CHERNOUSSOVA, *Eostaffella parastruvei* RAUSER-CHERNOUSSOVA, *Eostaffella* sp., *Pseudoendothyra ornata* (BRADY), *Pseudoendothyra kremenskensis* ROZOVSKAYA, *Archaeodiscus* ex gr. *koktjubensis* RAUSER-CHERNOUSSOVA, *Archaeodiscus* ex gr. *krestovnikovi* RAUSER-CHERNOUSSOVA, *Archaeodiscus* ex gr. *moelleri* RAUSER-CHERNOUSSOVA, «*Nodosarchaediscus*» *demaneti* (CONIL & LYS), «*Nodosarchaediscus*» *cornua* (CONIL & LYS) and the microproblematica *Gigasbia gigas* STRANK, *Draffania biloba* CUMMINGS, and *Diplosphaerina inaequalis* DERVILLE emend. CONIL *et al.*

The assemblage in the outcrop of Sierra Palacios 5 is:

Pseudoammodiscus parvus (REITLINGER), *Endothyra* ex gr. *similis* RAUSER-CHERNOUSSOVA & REITLINGER, *Endothyranopsis compressa* (RAUSER-CHERNOUSSOVA & REITLINGER), *Endothyranopsis* sp., *Plectogyranopsis* ex gr. *convexa* (RAUSER-CHERNOUSSOVA), *Mediocris mediocris* (VISSARIONOVA), *Eostaffella radiata* (BRADY), *Archaeodiscus* ex gr. *koktjubensis* RAUSER-CHERNOUSSOVA, *Archaeodiscus* ex gr. *krestovnikovi* RAUSER-CHERNOUSSOVA, *Archaeodiscus* ex gr. *moelleri* RAUSER-CHERNOUSSOVA, «*Nodosarchaediscus*» *demaneti* (CONIL & LYS), «*Nodosarchaediscus*» *cornua* (CONIL & LYS), «*Nodosarchaediscus*» *saleei* (CONIL & LYS) «*Nodosarchaediscus*» *conili* (BOZORGNIA) and the microproblematum *Asterosphaera pulchra* REITLINGER.

Since no guide taxa of Zone 15 appear in these assemblages, and taking into consideration the high diversity and large number of specimens, we can assume that these rocks belong to Zone 14. Therefore the first occurrence of *Mikhailovella* is extended down into Zone 14.

CONCLUSIONS

Two foraminiferal species have been described, *Nevillea cordobensis* n. sp. and *Mikhailovella fresnedosensis* n. sp., recorded in rocks of the upper Viséan foraminiferal zones 14 and 15. The first occurrence of *Mikhailovella* in Zone 14 is probably one of the oldest in Western Europe.

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