

Supplementary Material

Table S1

⁸⁷Sr/⁸⁶Sr values, stratigraphy of the samples and conodont assemblages using for age determination

Sample, no.	Well, no.	Stratigraphy	Conodont assemblages	⁸⁷ Sr/ ⁸⁶ Sr ±2σ
1	7	Eletsian–Lebedyanian, <i>rhomboidea</i> Zone – <i>marginifera</i> Zones	<i>Palmatolepis minuta subtilis</i> , <i>Palmatolepis minuta minuta</i> , <i>Pa. glabra glabra</i> , <i>Pa. lobicornis</i> (Fig. S1: 1–7)	0.708162±0.000010
2	2	upper Zadonian, <i>crepida</i> Zone (upper part)	<i>Palmatolepis minuta subtilis</i> , <i>Pa. glabra glabra</i> , <i>Pa. minuta minuta</i> , <i>Pa. superlobata superlobata</i> , <i>Pa. marginifera</i> , <i>Polygnathus nodocostata nodocostata</i> (Fig. S1: 8–10)	0.708158±0.000010
3	7	Zadonian, <i>crepida</i> Zone (lower part)	<i>Palmatolepis</i> sp. (Fig. S1: 11)	0.708113±0.000008
4	2	Volgogradian, <i>triangularis</i> Zone	<i>Palmatolepis tenuipunctata</i> , <i>Pa. minuta</i> , <i>Pa. regularis</i> , <i>Pa. superlobata superlobata</i> (Fig. S1: 12–16)	~0.7081
5	2	lower Volgogradian, <i>triangularis</i> Zone	<i>Palmatolepis triangularis</i> , <i>Pa. superlobata superlobata</i> , <i>Pa. minuta</i> (Fig. S2: 1–3)	0.708174±0.000020
6	8	Evlanovian–Livenian, <i>juntianensis</i> Zone – <i>linguiformis</i> Zone	<i>Polygnathus aspelundi</i> , <i>Po. cf. costulatus</i> , <i>Po. komi</i> , <i>Po. cf. krestovnikovi</i> , <i>Po. lodinensis</i> , <i>Po. pennatus</i> , <i>Po. politus</i> , <i>Po. webbi</i> (Fig. S5: 1–10)	0.708103±0.000010
7	1	Voronezhian–Evlanovian, <i>elegantula-semichatovae</i> Zone – <i>juntianensis</i> Zone	<i>Ancyrodella nodosa</i> , <i>An. ioides</i> , <i>Pa. sp.</i> (Fig. S2: 4–5)	0.708106±0.000007
8	4	lower Rechitsian, <i>elegantula-semichatovae</i> Zone	<i>Palmatolepis hassi</i> , <i>Pa. gigas gigas</i> , <i>Pa. aff. gyratus</i> , <i>Pa. jamieae</i> , <i>Pa. nasuta</i> , <i>Pa. plana</i> , <i>Polygnathus</i> sp. (Fig. S3: 1–8)	0.708124±0.000017
9	2	lower Rechitsian, <i>elegantula-semichatovae</i> Zone	<i>Polygnathus</i> sp., <i>Po. ljaschenkoae</i> , <i>Palmatolepis aff. kireevae</i> (Fig. S2: 6–7)	0.708104±0.000010
10	4	upper Semilukian, <i>An. ancyrornathoideus</i> – <i>Pa. orbicularis</i> Zone – <i>Pa. mucronata-amplificata</i> Zone	<i>Palmatolepis proversa</i> , <i>Pa. cf. punctate</i> , <i>Pa. aff. subrecta</i> , <i>Ancyrodella nodosa</i> (Fig. S2: 8–11)	0.708238±0.000018

11	6	lower Semilukian, <i>Po. efimovae</i> – <i>Pa. punctate</i> Zone (lower part)	<i>Polygnathus</i> aff. <i>grandidentatus</i> , <i>Po. lingulatus</i> (Fig. S2: 12–13)	0.707937±0.000008
12	5	upper Sargaevian, <i>An. alata</i> – <i>M. bogoslovskiy</i> Zone	<i>Ancyrodella pristina</i> , <i>An. rotundiloba alata</i> , <i>Mesotaxis asymmetricus</i> , <i>Klapperina ovalis</i> (Fig. S2: 14–15)	0.708162±0.000030
13	3	upper Sargaevian, <i>An. rotundiloba</i> – <i>africana</i> Zone – <i>An. alata</i> – <i>M. bogoslovskiy</i> Zone	<i>Mesotaxis asymmetricus</i> , <i>M. falsiovalis</i> , <i>Ancyrodella rotundiloba alata</i> (Fig. S4: 1–6)	0.707960±0.000011
14	6	middle Sargaevian; <i>An. rotundiloba</i> – <i>africana</i> Zone	<i>Icriodus nodosus</i> , <i>Ic. symmetricus</i> , <i>Ic. expansus</i> , <i>Mesotaxis falsiovalis</i> (Fig. S4: 7–11)	0.707948±0.000008
15	5	Timanian, <i>Po. pennatus</i> – <i>Po. ljaschenkoi</i> Zone	<i>Icriodus alternatus</i> , <i>Ic. nodosus</i> , <i>Polygnathus alatus</i> , <i>Po. ljaschenkoi</i> , <i>Po. dubius</i> , <i>Po. webbi</i> , <i>Ancyrodella pristina</i> , <i>A. binodosa</i> (Fig. S4: 12–15)	0.707896±0.000015
16	5	upper Givetian, Mullinian	<i>Ancyrodella prima</i> (Fig. S4: 16)	0.707918±0.000008
17	9	Eifelian, Mosolovian	<i>Polygnathus linguiformis alveolus</i> , <i>Pseudobipennatus</i> cf. <i>ziegleri</i> (Fig. S5: 12)	0.707780±0.000012
18	9	Eifelian	<i>Polygnathus</i> aff. <i>pseudofoliatus</i> (Fig. S5: 11)	0.707798±0.000012
19	4	Eifelian, Biyian	ramiform elements	0.708568±0.000020
20		lower Kungurian (control sample)	<i>Neostreptognathodus lectulus</i> (Fig. S3: 9)	0.707394±0.000010

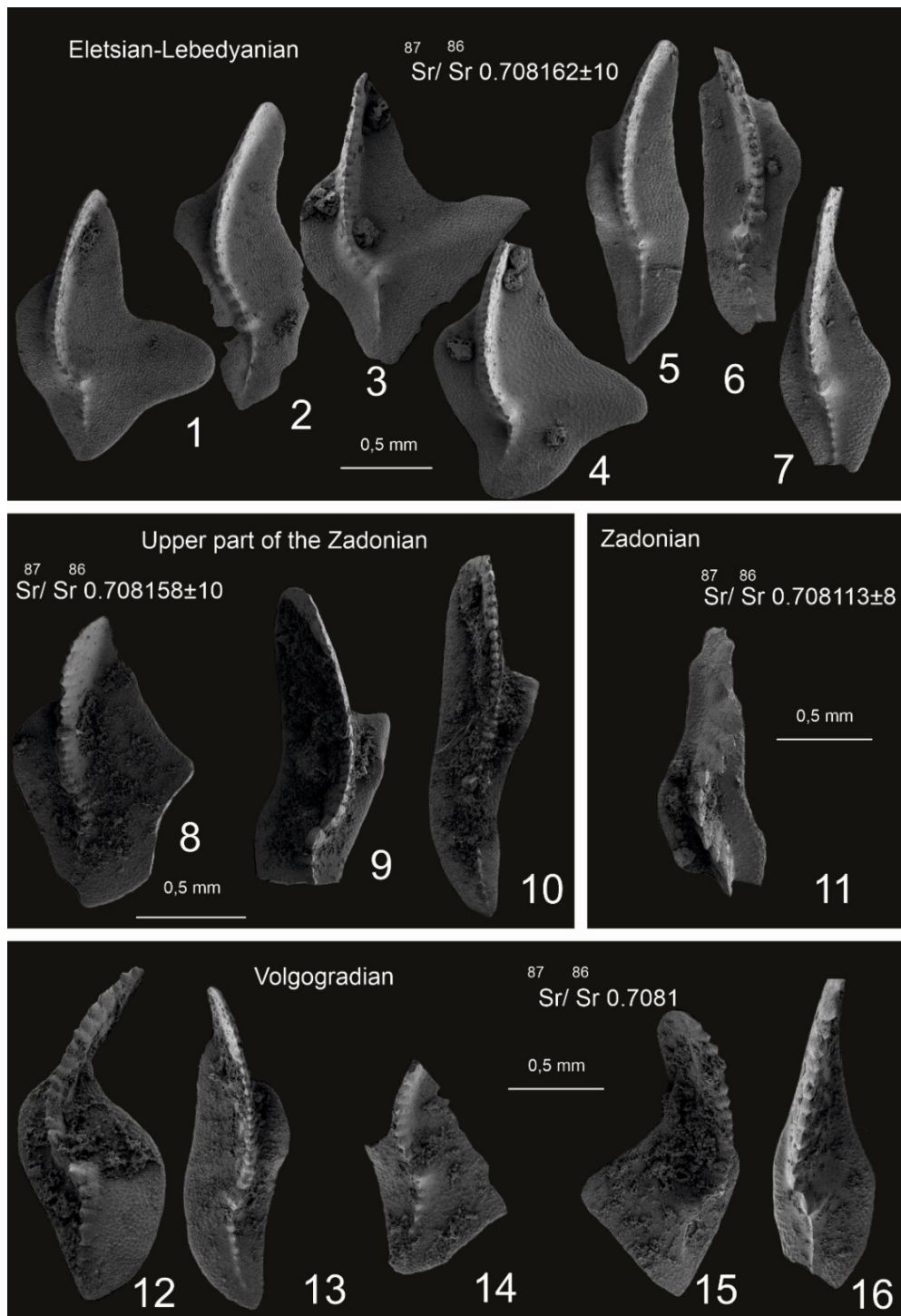


Figure S1. Famennian conodonts: 1, 3–4. *Palmatolepis lobicornis* Schülke, well no. 7, Elelsian–Lebedyanian, *rhomboidea* Zone – *marginifera* Zone; 2, 5–6. *Palmatolepis glabra glabra* Ulrich et Bassler, well no. 7, Elelsian–Lebedyanian, *rhomboidea* Zone – *marginifera* Zone; 7. *Palmatolepis minuta minuta* Branson et Mehl, well no. 7, Elelsian–Lebedyanian, *rhomboidea* Zone – *marginifera* Zone; 8. *Palmatolepis* sp., well no. 2, upper Zadonian, *crepida* Zone; 9–10. *Palmatolepis glabra glabra* Ulrich et Bassler, well no. 2, upper Zadonian, *crepida* Zone; 11. *Palmatolepis* sp., well no. 7, Zadonian, *crepida* Zone; 12. *Palmatolepis* aff. *regularis* Cooper, well no. 2, Volgogradian, *triangularis* Zone; 13. *Palmatolepis tenuipunctata* Sannemann, well no. 2, Volgogradian, *triangularis* Zone; 14. *Palmatolepis* cf. *superlobata superlobata* Branson et Mehl, well no. 2, Volgogradian, *triangularis* Zone; 15. *Palmatolepis superlobata superlobata* Branson et Mehl, well no. 2, Volgogradian, *triangularis* Zone; 16. *Palmatolepis minuta* Branson et Mehl, well no. 2, Volgogradian, *triangularis* Zone.

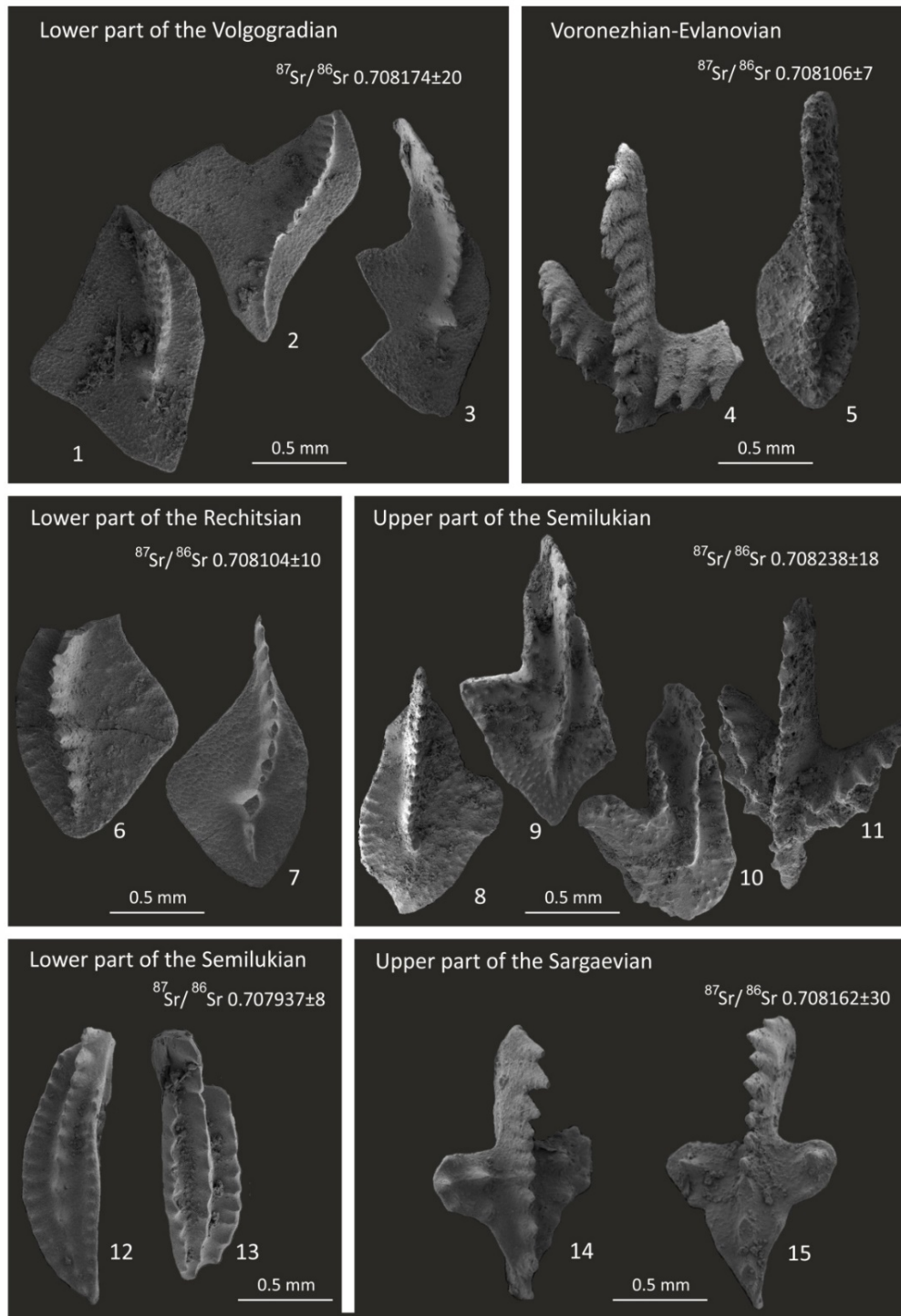


Figure S2. Famennian and Frasnian conodonts. 1, 3. *Palmatolepis* cf. *superlobata superlobata* Branson et Mehl, well no. 2, lower Volgogradian, *triangularis* Zone; 2. *Palmatolepis triangularis* Sannemann, well no. 2, lower Volgogradian, *triangularis* Zone; 4. *Ancyrodella ioides* Ziegler Morphotype 1, well no. 1, Voronezhian–Evlanovian, *elegantula–semichatovae* Zone – *juntianensis* Zone; 5 – *Palmatolepis* sp., well no. 1, Voronezhian–Evlanovian, *elegantula–semichatovae* Zone – *juntianensis* Zone; 6. *Palmatolepis* aff. *ljaschenkoae* Ovnatanova, well no. 2, lower Rechitsian, *elegantula–semichatovae* Zone; 7. *Palmatolepis* aff. *kireevae* Ovnatanova, well no. 2, lower Rechitsian, *elegantula–semichatovae* Zone; 8. *Palmatolepis* cf. *punctata* (Hinde), well no. 4, Upper Semilukian, *An. ancyrognathoides–Pa. orbicularis* Zone – *Pa. mucronata–amplificata* Zone; 9–10. *Palmatolepis proversa* Ziegler, well no. 4, upper Semilukian, *An. ancyrognathoides–Pa. orbicularis* Zone – *Pa. mucronata–amplificata* Zone; 11. *Ancyrodella nodosa* Ulrich et Bassler, well no. 4, upper Semilukian, *An. ancyrognathoides–Pa. orbicularis* Zone – *Pa. mucronata–amplificata* Zone; 12. *Polygnathus lingulatus* Ovnatanova, well no. 6, lower Semilukian, *Po. Efimovae–Pa. punctate* Zone. 13. *Polygnathus* aff. *grandidentatus* Aristov, well no. 6, lower Semilukian, *Po. efimovae–Pa. punctate* Zone; 14–15. *Ancyrodella pristina* Khalymbadzhia et Chernysheva, well no. 5, upper Sargaevian, *An. alata–M. bogoslovskiyi* Zone.

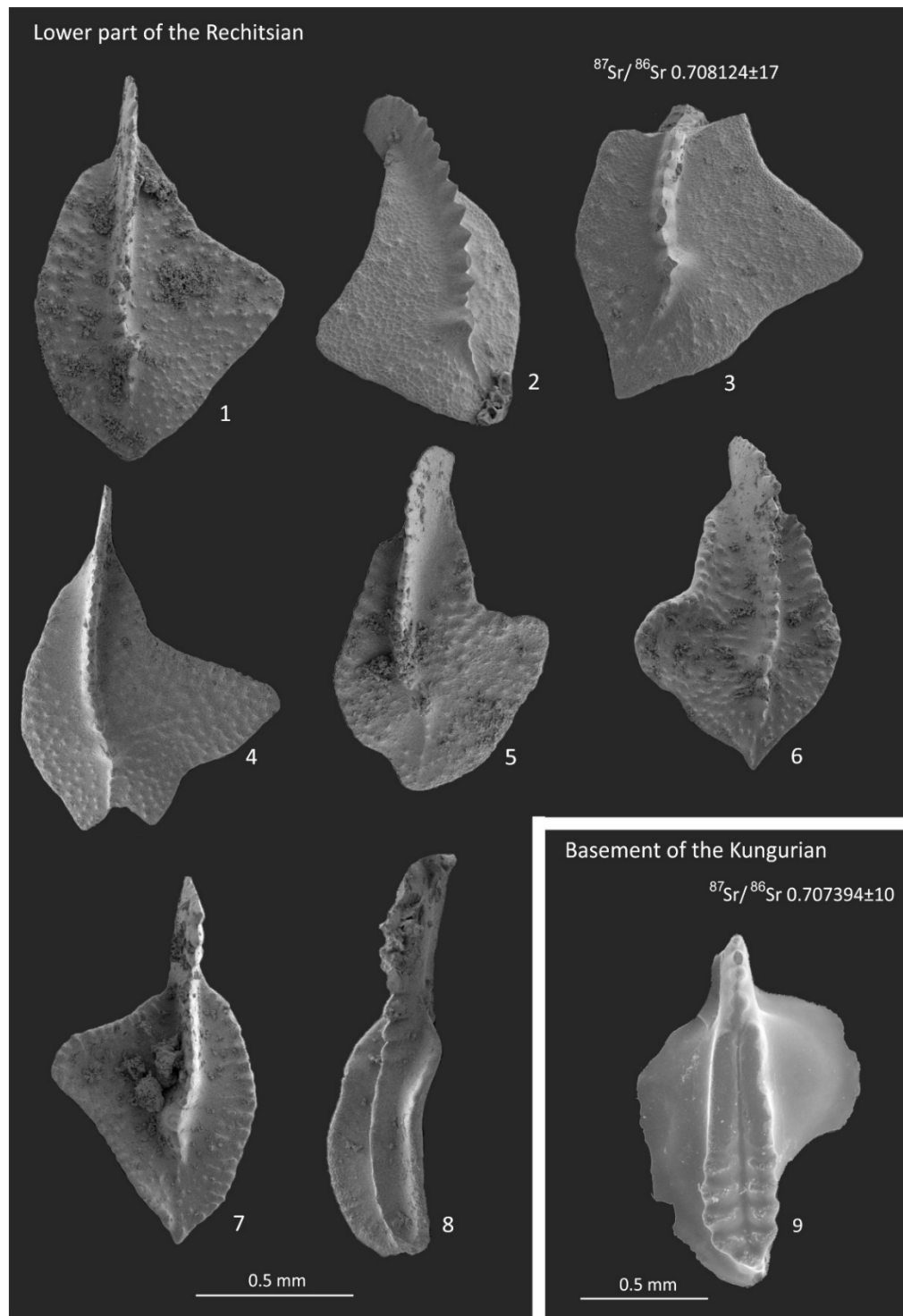


Figure S3. Frasnian conodonts. 1, 3. *Palmatolepis hassi* Muller et Muller, well no. 4, lower Rechitsian, *elegantula*–*semichatovae* Zone; 2. *Palmatolepis jamieae* Ziegler et Sandberg, well no. 4, lower Rechitsian, *elegantula*–*semichatovae* Zone; 4. *Palmatolepis nasuta* Muller, well no. 4, lower Rechitsian, *elegantula*–*semichatovae* Zone; 5–6. *Palmatolepis plana* Ziegler et Sandberg, well no. 4, lower Rechitsian, *elegantula*–*semichatovae* Zone; 7. *Palmatolepis* aff. *gyratus* Kuzmin et Melnikova, well no. 4, lower Rechitsian, *elegantula*–*semichatovae* Zone; 8. *Polygnathus* sp., well no. 4, lower Rechitsian, *elegantula*–*semichatovae* Zone; 9. *Neostreptognathodus lectulus* Chernykh, Mechetlino section, layer 12, lower Kungurian.

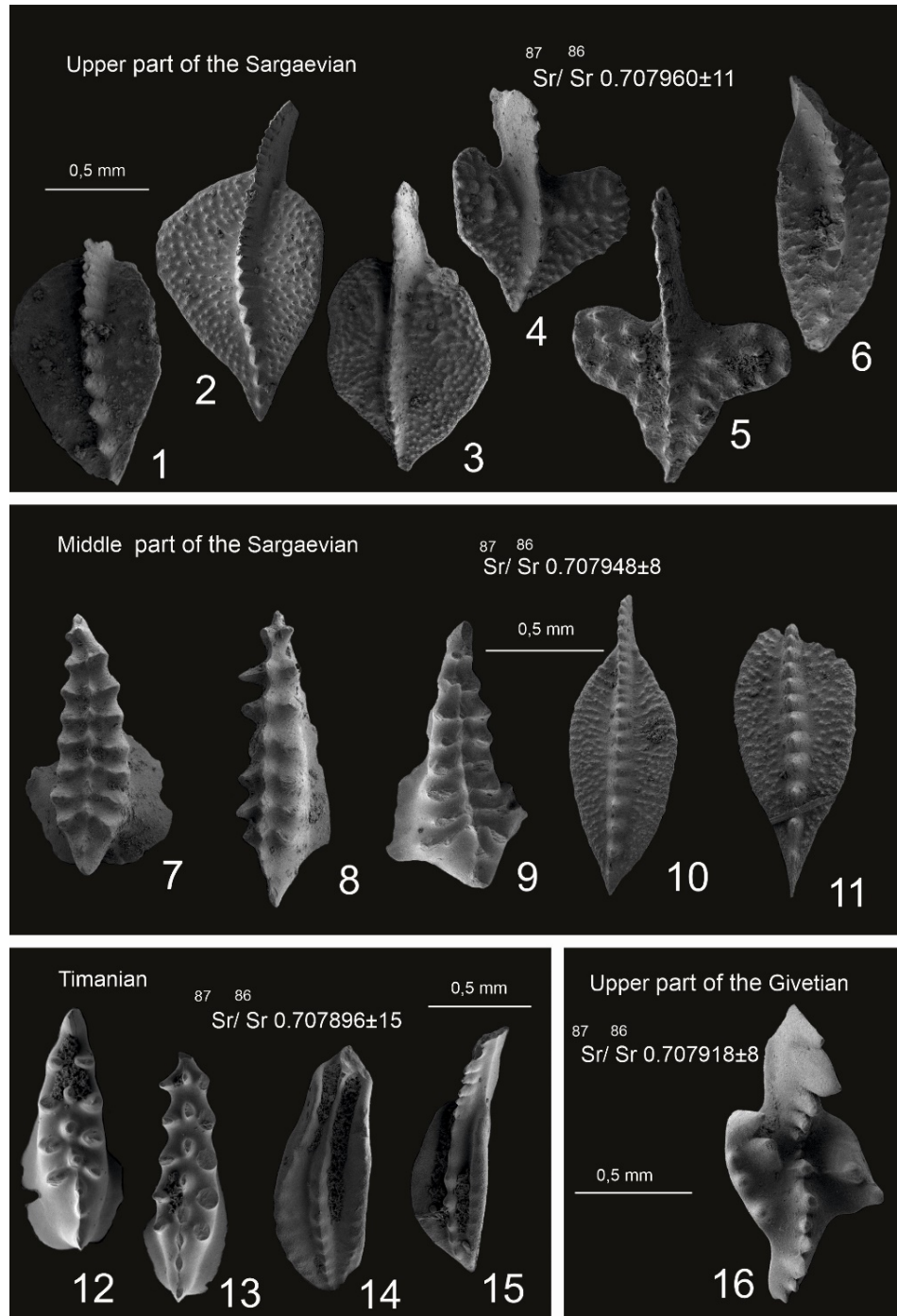


Figure S4. Frasnian and Famennian conodonts. 1. *Mesotaxis falsiovalis* Sandberg, Ziegler, Klapper, well no. 3, upper Sargaevian, *An. rotundiloba–africana* Zone – *An. alata–M. bogoslovskiy* Zone; 2–3. *Mesotaxis asymmetricus* (Bischoff et Ziegler), well no. 3, upper Sargaevian, *An. rotundiloba–africana* Zone – *An. alata–M. bogoslovskiy* Zone; 4–5. *Ancyrodella rotundiloba alata* Glenister et Klapper, well no. 3, upper Sargaevian, *An. rotundiloba–africana* Zone – *An. alata–M. bogoslovskiy* Zone; 6. *Mesotaxis falsiovalis* Sandberg, Ziegler et Klapper, well no. 3, upper Sargaevian, *An. rotundiloba–africana* Zone – *An. alata–M. bogoslovskiy* Zone; 7. *Icriodus nodosus* (Hiddle), well no. 6, middle Sargaevian; *An. rotundiloba–africana* Zone; 8. *Icriodus symmetricus* Branson et Mehl, well no. 6, middle Sargaevian; *An. rotundiloba–africana* Zone; 9. *Icriodus expansus* Branson et Mehl, well no. 6, middle Sargaevian; *An. rotundiloba–africana* Zone; 10–11. *Mesotaxis falsiovalis* Sandberg, Ziegler et Klapper, well no. 6, middle Sargaevian; *An. rotundiloba–africana* Zone; 12–13. *Icriodus alternatus* Branson et Mehl, well no. 5, Timanian, *Po. pennatus–Po. ljaschenkoi* Zone; 14. *Polygnathus alatus* Huddle, well no. 5, Timanian, *Po. pennatus–Po. ljaschenkoi* Zone; 15. *Polygnathus ljaschenkoi* Kuzmin, well no. 5, Timanian, *Po. pennatus–Po. ljaschenkoi* Zone; 16. *Ancyrodella prima* Khalymbadzhia et Chernysheva, well no. 5, Upper Givetian, Mullinian.

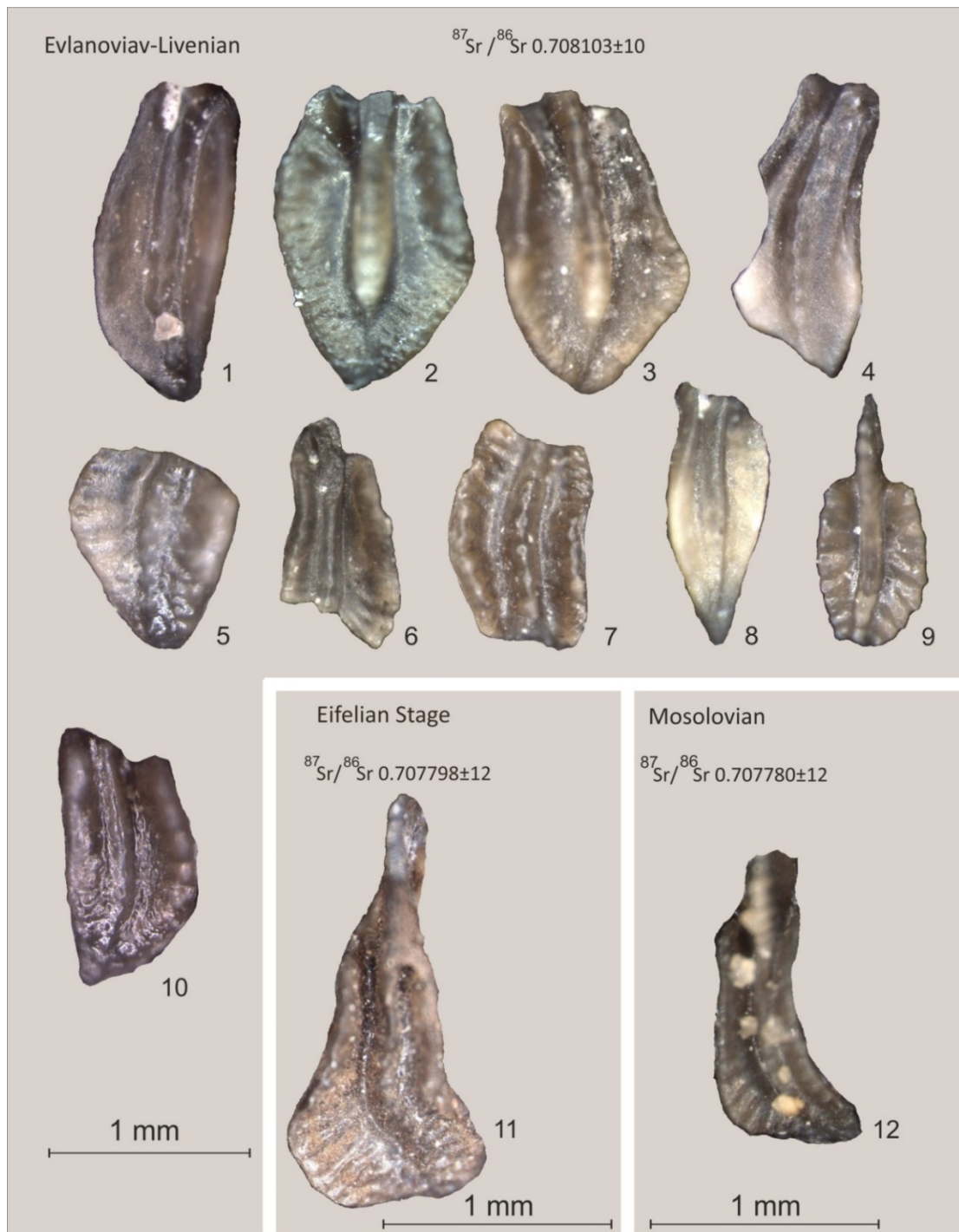


Figure S5. Eifelian and Frasnian conodonts: 1. *Polygnathus politus* Ovnatanova, well no. 8, Evlanovian–Livenian, *juntianensis* Zone – *linguiformis* Zone; 2–3. *Polygnathus komi* Kuzmin et Ovnatanova, well no. 8, Evlanovian–Livenian, *juntianensis* Zone – *linguiformis* Zone; 4. *Polygnathus* cf. *lodinensis* Pölsler, well no. 8, Evlanovian–Livenian, *juntianensis* Zone – *linguiformis* Zone; 5. *Polygnathus* cf. *costulatus* Aristov, well no. 8, Evlanovian–Livenian, *juntianensis* Zone – *linguiformis* Zone; 6. *Polygnathus* cf. *krestovnikovi* Ovnatanova, well no. 8, Evlanovian–Livenian, *juntianensis* Zone – *linguiformis* Zone; 7. *Polygnathus* cf. *aequalis* Klapper et Lane, well no. 8, Evlanovian–Livenian, *juntianensis* Zone – *linguiformis* Zone; 8. *Polygnathus politus* Ovnatanova, well no. 8, Evlanovian–Livenian, *juntianensis* Zone – *linguiformis* Zone; 9. *Polygnathus* aff. *pennatus* Hinde, well no. 8, Evlanovian–Livenian; 10. *Polygnathus* cf. *webbi* Stauffer, well no. 8, Evlanovian–Livenian, *juntianensis* Zone – *linguiformis* Zone; 11. *Polygnathus* aff. *pseudofoliatus* Wittekindt, well no. 9, Eifelian; 12. *Polygnathus* cf. *linguiformis alveolus* Weddige, well no. 9, Mosolovian.