Supplementary material

The supplementary material includes new foraminifera, calcareous algae, nannofossil and palynology determinations from the Mesozoic – Tertiary sequences of the Central Pontides. The foraminifera were determined by Ercüment Sirel (ES), Sevinç Altıner, Demir Altıner, Mike Simmons and Mike Bidgood (GSS International); the nannofossils by Paul Bown (University College London) and Steve Starkie (Datum Stratigraphic Associates); the palynomorphs by Jim Riding (British Geological Survey); and the calcareous algae by Mike Simmons.

Nannofossil Zones used are NC Zones for the Lower Cretaceous (see summary in Bown, 1998, Calcareous Nannofossil Biostratigraphy); UC Zones for the Upper Cretaceous (see summary in Bown, 1998, Calcareous Nannofossil Biostratigraphy) or the CC zonation of Sissingh (1997) and NP Zones for the Paleogene (Martini, 1971, and summary in Perch-Nielsen, 1985, Plankton Stratigraphy).

Palynological age interpretations are based on published ranges as mentioned in Heilmann-Clausen (1987) and Costa & Davey (1992).

COSTA, L. I. & DAVEY, R. J. 1992. Dinoflagellate cysts of the Cretaceous System. *In*: Powell, A. J. (ed.). *A Stratigraphic Index of Dinoflagellate Cysts.* British Micropalaeontological Society Series. Chapman and Hall, London, 99-153.

HEILMANN-CLAUSEN, C. 1987. Lower Cretaceous dinoflagellate biostratigraphy in the Danish Central Trough. *Danmarks Geologiske Undersogelse Serie A*, Nr. **17**, 89 p.

The locations of the samples are given in geographic or in UTM coordinates on European 1979 datum.

Inpiri Formation (Barremian – Aptian)

ZO21
Location: Road north of Uzungüney village 41.378°N; 31.679°E
Foraminifera
The presence of *Palorbitolina lenticularis* indicates a Late Barremian – Early Aptian age

ZO1 – Z010 (4100)
Location: Close to Zonguldak town centre 41.452°N; 31.759°E (36 T 03 96 387 N – 45 89 905 E)
Calcareous algae & foraminifera
The presence of *Salpingoprella muehlbergii, Charentia cuvillieri, Cylindroporella lyrata, ?Torinosuella peneropliformis* and *Charaxis* sp. indicates a Barremian, possibly Early Aptian age for this outcrop with deposition in multiple cycles of very shallow water marine deposition, with exposure and occasional freshwater limestones.

AM7 - 3553
Location: Quarry at Amasra road junction 41.44.577°N; 034 39.228°E (36 T 04 52 583 N – 46 21 216 E)
Foraminifera and Calcareous algae
The presence of *Lithocodium* and *Neotrocholina aptienesis* indicates an Early Aptian age.

AM17
Location: Cliffs west of Amasra, directly overlying Carboniferous succession
Calcareous algae

The presence of *Salpingoporella muelhbergii, Salpingoporella hasi* and *Cylindroporella lyrata* indicates a Barremian – Early Aptian age and deposition in very shallow marine conditions.

Tasmaca Formation (Albian)

AM5 - 4067
Location: Road cutting at Amasra junction. Large angular unconformity 41.739°N; 32.428°E (36 T 04 52 477 N – 46 21 058 E), see Fig. 5b
Nannofossils
The occurrence of *Watznaueria britannica*, *Braarudosphaera africana* with *Tranolithus orionatus* which suggests an uppermost Early Albian - Early Cenomanian age, CC9b - CC8b Nannosubzones of Sissingh (1977).

AM9 - 4067
Location: Road cutting at Amasra junction. Large angular unconformity 41.739°N; 32.428 (36 T 04 52 477 N – 46 21 058 E) see Fig. 5b
Nannofossils
Occurrence of *Hayesites irregularis, H. albiensis* and *Calculites anfractus,* which suggests a Late Albian age, CC9b (Lowermost) Nannosubzone of Sissingh (1977).
Younger than suggested by Hippolyte et al. (2010).

ZO13 - 4103
Location: Road north of Uzungüney 41.373°N; 31.686°E (36 T 03 90 157 N – 45 81 260 E)
Nannofossils
The occurrence of *Braarudosphaera stenorhetha* with *Eiffellithus monechiae* suggests a Late Albian age, CC8b Nannosubzone of Sissingh (1977).
Younger than suggested by Hippolyte et al. (2010).

ZO14- 4103
Location: Road north of Uzungüney 41.373°N; 31.686°E (36 T 03 90 157 N – 45 81 260 E)
Nannofossils
A sparse assemblage including *Tranolithus orionatus* which suggests an age no older than uppermost Early Albian, No older than CC8b Nannosubzone of Sissingh (1977).

ZO15 - 4103
Location: Road north of Uzungüney 41.373°N; 31.686°E (36 T 03 90 157 N – 45 81 260 E)
Nannofossils
A sparse assemblage including *Watznaueria britannica* with *Axopodorhabdus albianus* which suggests an Middle Albian - Early Cenomanian age, CC9b (Lower) - CC8b Nannosubzones of Sissingh (1977).
Younger than suggested by Hippolyte et al. (2010).

Foraminifera
A sparse, poorly-preserved microfauna was recorded.

- *Hedbergella ?planispira* (2)
- *Hedbergella* spp. (2)
- *Gyroidinoides gracillimus* (2)
- *Osangularia schloenbachi* (1)
- ?*Lenticulina heiermanni* (1)
- ?*Dentalina* spp. (1)
- *Inoceramus* fragments (2)

Although the specimen is not a good one, *O. schloenbachi* is an Albian-restricted form in NW Europe.

Çağlayan Formation (Barremian – Aptian)

PONT38 – 7064
Location: Boyabat-Sinop road, 36 T 06 54 216 N – 46 05 196 E

Nannofossils
Overall abundance – Common
Preservation – Moderate/Good
Diagnostic taxa: *Eprolithus floralis, Rhagodiscus gallagheri, Flabellites oblongus, Rhagodiscus achlyostaurion.*
Dominant taxa: *Rhagodiscus asper, Watznaueria barnesiae, Helenea chiastia.*
Other taxa: *Nannoconus, Assipetra terebrodentarius.*
Age: upper lower to upper Aptian, Zone NC7 (=CC7b), based on the presence of *Eprolithus floralis* and absence of *Prediscosphaera.*

Palynology
Abundant bisaccate pollen grains. Other miospores recovered include *Cicatricosisporites* sp., and *Cyathidites* spp. The presence of *Cicatricosisporites* is characteristic of the Early Cretaceous. Marine palynomorphs are relatively rare; these are dominated by the dinoflagellate cyst *Odontochitina operculata*. Foraminiferal test linings were also recovered. Other dinoflagellate cysts recorded are chorate cysts (indeterminate), *Coronifera oceanica*, peridinioid forms (indeterminate), and *Spiniferites ramosus*. This association is not diverse, and the most stratigraphically useful occurrence is that of *Coronifera oceanica*. The range base of *Coronifera oceanica* is in the late Hauterivian (*gottschei* zone). Hence age is Early Cretaceous, no older than late Hauterivian. Nannofossils provide a more precise age.

PONT39 – 7065
Location: Boyabat-Sinop road, 36 T 06 54 208 N – 46 07 043 E
Nannofossils
Overall abundance – Common
Preservation – Moderate/Good
Diagnostic taxa: *Flabellites oblongus, Assipetra terebrodentarius, Chiastozygus litterarius, Retecapsa angustiforata* (Lower Cretaceous form)
Dominant taxa: *Rhagodiscus asper, Watznaueria barnesiae, Helenea chiastia*
Other taxa: *Nannoconus, Assipetra terebrodentarius, Rhagodiscus gallagheri, Flabellites oblongus, Rhagodiscus achlyostaurion, Zeugrhabdotus diplogrammus, Zeugrhabdotus xenotus, Zeugrhabdotus howei, Chiastozygus litterarius, Diloma primitiva, Micrantholithus* fragments.
Comments: Well preserved, diverse assemblage.
Age: uppermost Barremian, uppermost Zone NC5 (=CC6) based on the presence of *Flabellites oblongus, Chiastozygus litterarius* and *Rhagodiscus gallagheri* and the absence of *Hayesites irregularis*. The presence of *Retecapsa angustiforata* (Lower Cretaceous form) and absence of *Eprolithus* confirms that it cannot be younger than Zone NC6 (lower Aptian).

This age for the Caglayan is substantially older than suggested by Hippolyte et al. (2016) for the same region.

Palynology
Abundant bisaccate pollen grains. *Classopollis* is also present in minor proportions. Pteridophyte spores were observed, largely smooth forms referable to *Cyathidites*. Rare representatives of *Appendicisporites* and *Impardecispora* were observed; these are consistent with an Early Cretaceous age. Dinoflagellate cysts are also present in significant proportions, indicating an open marine depositional setting. These are dominated by *Odontochitina operculata*. Also present are *Cerbia tabulata*, chorate cysts (indeterminate), *Cribroperidinium edwardsii*, *Cyclonephelium* spp., *Florentinia mantellii, Florentinia* spp., *Gardodinium trabeculosum*, gonyaulacoid forms (indeterminate), *Heslertonia heslertonensis*, ?*Meiourogonyaulax stoveri,*

Occisucysta tentoria, Oligosphaeridium complex, Oligosphaeridium spp., peridinioid forms (indeterminate), *Spiniferites ramosus*, and ?*Subtilisphaera* spp.

The dinoflagellate cyst association is clearly Early Cretaceous in age. Taxa such as *Cribroperidinium edwardsii, Occisucysta tentoria, Oligosphaeridium complex* and *Spiniferites ramosus* are characteristic, but not stratigraphically significant in terms of a detailed stage/substage resolution. The occurrence of *Odontochitina operculata* means that this sample is no older than *Barremian* (r*arocinctum* zone). The key markers in this sample are *Cerbia tabulata* (mid Barremian [*rude-fissicostatum* zone] to late Aptian [*nutfieldiensis/jacobi* zones]), *Gardodinium trabeculosum* (early Hauterivian [*inversus* zone] to late Aptian [*nutfieldiensis/jacobi* zones]), and *Heslertonia heslertonensis* (latest Ryazanian-early Aptian [*forbesi* zone]). In conclusion therefore, the overlapping ranges of *Cerbia tabulata, Heslertonia heslertonensis*, and *Odontochitina operculata* are indicative of a Barremian-early Aptian [*forbesi* zone] age. This is in keeping with the uppermost Barremian age determination from nannofossils.

Kapanboğazı Formation (Coniacian - Santonianampanian – Maastrichtian)

Kaşharman section 553-559 (Figs. 10 and 11)

603A to E
Biomicrite
Stratigraphic location: 10-metre thick section between the Çağlayan and Gürsökü formations (Fig. 11)
Dicarinella.concavata, D.primitiva, Marginotruncana coronate, M.pseudolinneiana, Globotruncanita elevata Hedbergella sp*., Globigerinelloides* sp., *Heterohelix* sp.
M.marginata *G. arca* *G.linneiana* *G. orientalis* *S.multispinata*
Age: Santonian

Gürsökü Formation (Campanian – Maastrichtian)

PONT56 – 7074
Location: Ayancık – Gökçeağaç road, 36 T 06 38 839 N – 46 27 014 E

Nannofossils
Overall abundance – Common/Abundant
Preservation – Moderate/Good
Diagnostic taxa: *Broinsonia parca constricta, Broinsonia parca parca, Ceratilithoides aculeus, Eiffellithus eximius, Nannoconus*.
Dominant taxa: *Watznaueria barnesiae, Prediscosphaera* spp., *Micula staurophora*
Other taxa: *Zeugrhabdotus bricrescenticus, Eiffellithus turrieiffelii, Calculties obscurus, Lucianorhabdus cayeuxii, Tranolithus orionatus, Assipetra terebrodentarius.*
Comments: Diverse assemblage
Age: upper lower to lower upper Campanian, Zone UC15 (subzones b-d tethyan) (=CC20-22) based on the presence of *Broinsonia parca constricta, Broinsonia parca parca, Ceratilithoides aculeus, Nannoconus* and *Eiffellithus eximius*.

Akveren Formation (Maastrichtian-Paleocene)

Ballıkaya section 553-559 (Figs. 10 and 11)

This section comprises Gürsökü and Akveren formations

553
Sandstone
Siderolites calcitropoides
Age: Maastrichtian

559A
Algal and Bryozoan limestone
Stratigraphic location: Base of the Akveren Formation, one metre above the basal conglomerate
Smoutina? cf. *subsphaerica* (Sirel), *Planorbulina cretae* (Mosson),
Age: Thanetian (ES).

559B
Algal and bryozoan limestone
Stratigraphic location: One meter above the basal conglomerate of the Akveren Formation
Smoutina? cf. *subsphaerica* (Sirel), *Planorbulina cretae* (Mosson), *Miscellanea* sp., orthophragminid tiplerin eksenelimsi kesitleri
Age: Thanetian (ES).

559C
Algal and bryozoan limestone
Stratigraphic location: Eleven meters above the basal conglomerate of the Akveren Formation
Smoutina? cf. *subsphaerica* (Sirel), *Planorbulina cretae* (Mosson), orthophragminid tiplerin eksenelimsi kesitleri
Age: Thanetian (ES).

PONT53 – 7073
Location: south of Ayancık, 36 T 06 33 886 N – 46 35 626 E
Nannofossils
Overall abundance – Rare
Preservation – Moderate
Diagnostic taxa: *Prinsius dimorphosus, Cruciplacolithus intermedius, Ericsonia subpertusa, Cruciplacolithus tenuis*.
Dominant taxa: *Coccolithus pelagicus*
Other taxa: *Prinsius martini, Prinsius africana, Cruciplacolithus primus, Markalius inversus, Zeugrhabdotus sigmoides*, calcisphere fragments.
Comments: Indurated sample with rare nannofossils only.
Age: Danian, Zone NP2, based on the presence of typical Danian taxa (*Prinsius dimorphosus, Cruciplacolithus intermedius, Cruciplacolithus primus)* and absence of *Chiasmolithus danicus*/*C. edwardsii.*

PONT69 – 7081
Location: West of Hanönü, Sirke village, 36 T 06 14 356 N – 46 08 788 E
Nannofosils
Overall abundance – Common
Preservation – Moderate
Diagnostic taxa: *Discoaster multiradiatus, Fasciculithus tympaniformis, Fasciculithus involutus*.
Dominant taxa: *Toweius pertusus, Sphenolithus moriformis*.
Other taxa: *Chiasmolithus bidens, Ellipsolithus macellus, Fasciculithus lilianiae, Neochiastozygus distentus.*
Comments: rare Cretaceous reworking
Age: upper Paleocene, Zone NP9, based on co-occurrence of *Discoaster multiradiatus* and *Fasciculithus involutus*, and presence of diverse and abundant *Fasciculithus* (i.e. pre-PETM, when this genus declines).

Hippolyte et al. (2016) suggest the Atbasi Formation is of this age.

Maastrichtian, Paleocene and Eocene shallow marine carbonates on the metamorphic rocks

Dereköy section (Figs. 10 and 13)

647A
Limestone
Siderolites sp., *Sirtina* sp.
Age: Maastrihtiyen (ES).

647B
Limestone
Siderolites calcitrapoides, *Hellenocyclina beotica* Reichel, *Orbitoides* sp
Age: Maastrihtiyen (ES).

647C
Limestone
One axial section of a Globotruncanid
Age: Late Senonian (ES).

Kızılcadere-Tosya section (Figs 9 and 13)

309C4-C5
Laffitteina mengaudi (Astre), *L*. aff. *mengaudi*, Textularia sp. Miliolidae
Lower-Middle Paleocene (Danian-Selandian)

309C6
Laffitteina erki (Sirel), Miliolidae
Upper Danian - Selandian

309C8
Laffitteina mengaudi (Astre), Miliolidae
Lower-Middle Paleocene (Danian-Selandian)

309C9
Kayseriella decastroi Sirel, *Ankaraella trochidea* Sirel, *Laffitteina* cf. *mengaudi*, Valvulina? sp., Miliolidae, Lituolidae
Lower Paleocene (Upper Danian)

309C10
Abundant milliolids, unidentified genus. Sirel (1998) has classified this facies as Danian.

309C11, 12, 13, 14
Ankaraella? sp., *Laffitteina erki* (Sirel), abundant Miliolidae
Uppermost Danian - lowermost Selandian

309C15
Haymanella paleocenica Sirel, *Laffitteina* cf. *erki* (Sirel), Miliolidae

Uppermost Danian – Selandian

309C16
Laffitteina erki (Sirel), Miliolidae
Upper Danian - Selandian

309C17
Haymanella paleocenica Sirel, *Laffitteina* cf. *erki* (Sirel), Miliolidae
Uppermost Danian – Selandian

309C18
Miliolidae, Totaliidae
Paleocene

309C19
Haymanella paleocenica Sirel, *Laffitteina* sp., Miliolidae
Lower-Middle Paleocene

309C20
Laffitteina sp., Miliolidae,
More Selandian than Danian

309C21-23
Haymanella paleocenica Sirel, *Laffitteina* sp., Miliolidae
Lower-Middle Paleocene

309C24
Globoflarina sphaeroidea (Fleury), *Idalina*? sp., Miliolidae
Selandian

Pervanekaya Tepesi – Boyabat section (Figs. 9, 12b and 13)

319D1-D10
Bryozoa- bearing limestone with few foraminifera. Within these samples there is an unidentified rotaliinid genus, illustrated in Sirel (1998 page, plate 61, Figs. 1-19). This genus is found with Lower-Middle Paleocene foraminifera in the Eastern Pontides (Ordu, Gölköy).

Kusuri Formation (Lower – Middle Eocene)

PONT48 – 7071
Location: Ayancık, west of Sinop, 36 T 06 32 086 N – 46 44 826 E

Nannofossils
Overall abundance – Common
Preservation – Moderate/Good
Diagnostic taxa: *Nannotetrina cristata*
Dominant taxa: *Cyclicargolithus floridanus, Coccolithus pelagicus*
Other taxa: *Neococcolithes dubius, Pontosphaera multipora, Chiasmolithus solitus, Sphenolithus editus, Helicosphaera seminulum, Sphenolithus radians, Coccolithus formosus.*
Comments: common Cretaceous (*Watzaueria, Micula, Arkhangelskiella*) and lower Eocene (*Toweius* spp.) reworking.

Age: middle Eocene, Zone NP15 based on the presence of *Nannotetrina cristata*.

Slightly younger than suggested by Hippolyte et al. (2016)

PONT45

Overall abundance – Few
Preservation – Moderate
Diagnostic taxa: *Sphenolithus conspicuus, Cyclicargolithus floridanus, Helicosphaera, Discoaster kuepperi.*
Other taxa: *Girgisia* (*Toweius*) *gammation, Sphenolithus radians, Sphenolithus editus, Toweius pertusus, Toweius callosus, Helicosphaera seminulum, Helicosphaera lophota, Coccolithus pelagicus, Coccolithus formosus, Zygrhablithus bijugatus.*
Comments: Conspicuous Cretaceous reworking.
Age: lower Eocene, Zone NP12, based on the presence of *Cyclicargolithus floridanus* (reticulofenestrids), *Helicosphaera* and *Sphenolithus conspicuus*.

Akçasu section (Figs. 10 and 13)

396A
Nummulites sp., *Assilina* sp., orthophragminid species
Age: Lower-Middle Eocene (ES).