PARTE II
Nannoplancton calcareo e nannofossili calcarei: tassonomia e biostratigrafia

OUTLINE

- caratteristiche morfologiche e terminologia
- **biostratigrafia e schemi biostratigrafici**
- utilità della biostratigrafia a nannofossili: esempi applicativi

ALCUNE DEFINIZIONI

BIOSTRATIGRAFIA

SETTORE DELLA STRATIGRAFIA CHE SI OCCUPA
DELLO STUDIO DELLA DISTRIBUZIONE NEL TEMPO DEI FOSSILI

CLASSIFICAZIONE BIOSTRATIGRAFICA
l'organizzazione delle rocce in unità (unità biostratigrafiche) sulla base del loro contenuto in fossili

UNITA' BIOSTRATIGRAFICA (BIO-ZONA)
Pacco di sedimenti (corpi di rocce) caratterizzati da un peculiare contenuto in fossili che consente di differenziarli da quelli contigui

UNITÀ FONDAMENTALE ⇒ BIO-ZONA

UNITÀ DI RANGO SUPERIORE: ⇒ SUPERZONA

UNITÀ DI RANGO INFERIORE: ⇒ SOTTOZONA

BIO-ORIZZONTI

- ✓Servono a definire le unità biostratigrafiche (bio-zone)
- ✓comparse/estinzioni controllate dall'evoluzione organica (che sono per definizione sempre sincroni)
- ✓o dall'evoluzione ambientale

EVENTI OMOTASSICI:

eventi che si ripetono nello stesso ordine stratigrafico in successioni diverse e lontane

TIPI DI BIO-ORIZZONTI

Uso degli acronimi

FAD-LAD: comparse/estinzioni controllate dall'evoluzione organica(sono per definizione sempre sincroni)

TUTTI GLI ALTRI TIPI DI BIORIZZONTI SONO CONTROLLATI DALL'EVOLUZIONE AMBIENTALE

FO-LO (LO-HO)

prima presenza-ultima presenza di un *taxon* in una successione

BIO-ORIZZONTI NEL GIURASSICO INFERIORE E MEDIO DELLA BIOPROVINCIA TETIDEA

From MATTIOLI, E. & ERBA, E. (1999) – Synthesis of calcareous nannofossil events in tethyan Lower and Middle Jurassic successions. *Riv. Ital. Paleont. Strat.*, Milano, vol. 105 (3), pp. 343-376.

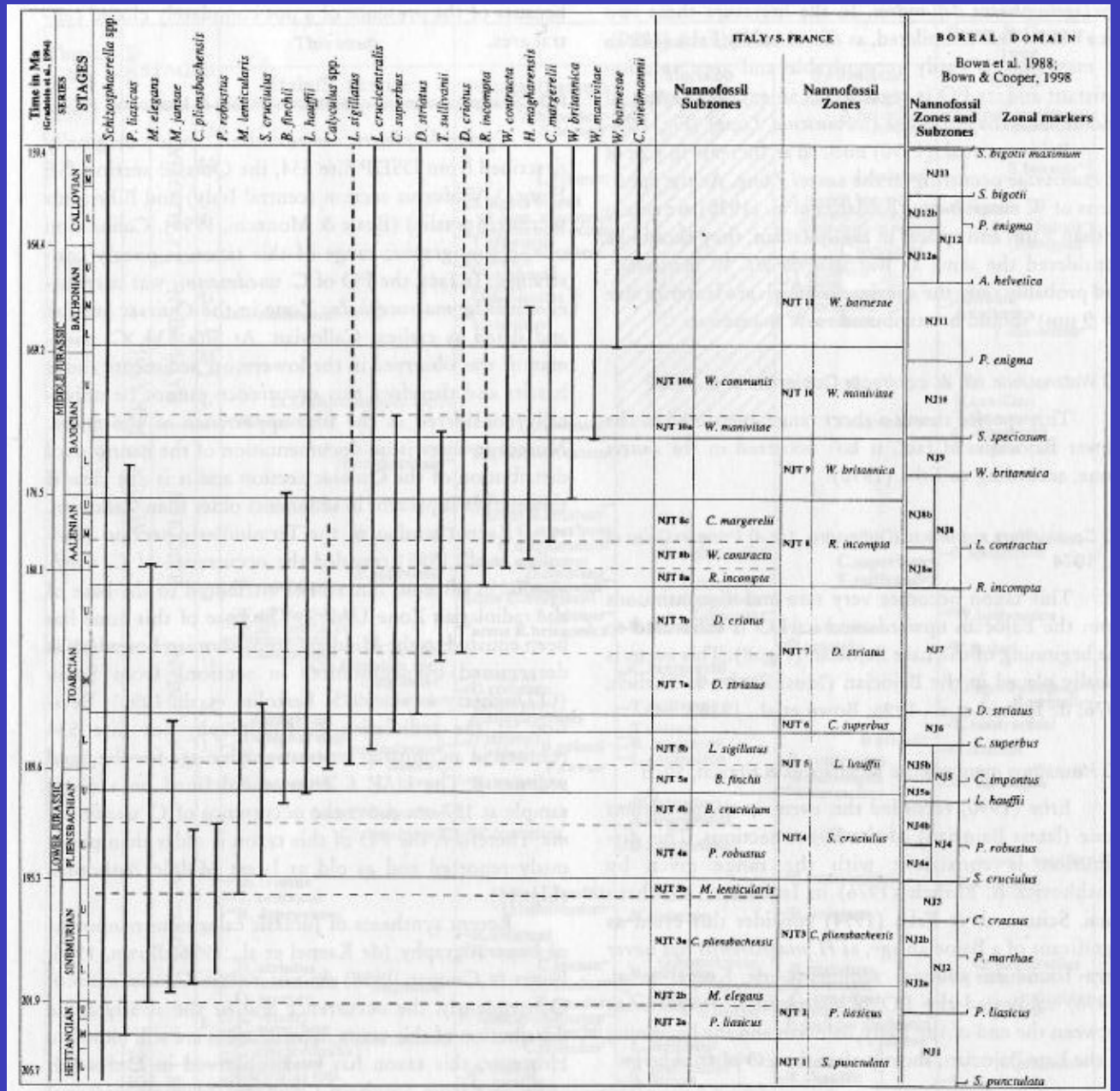
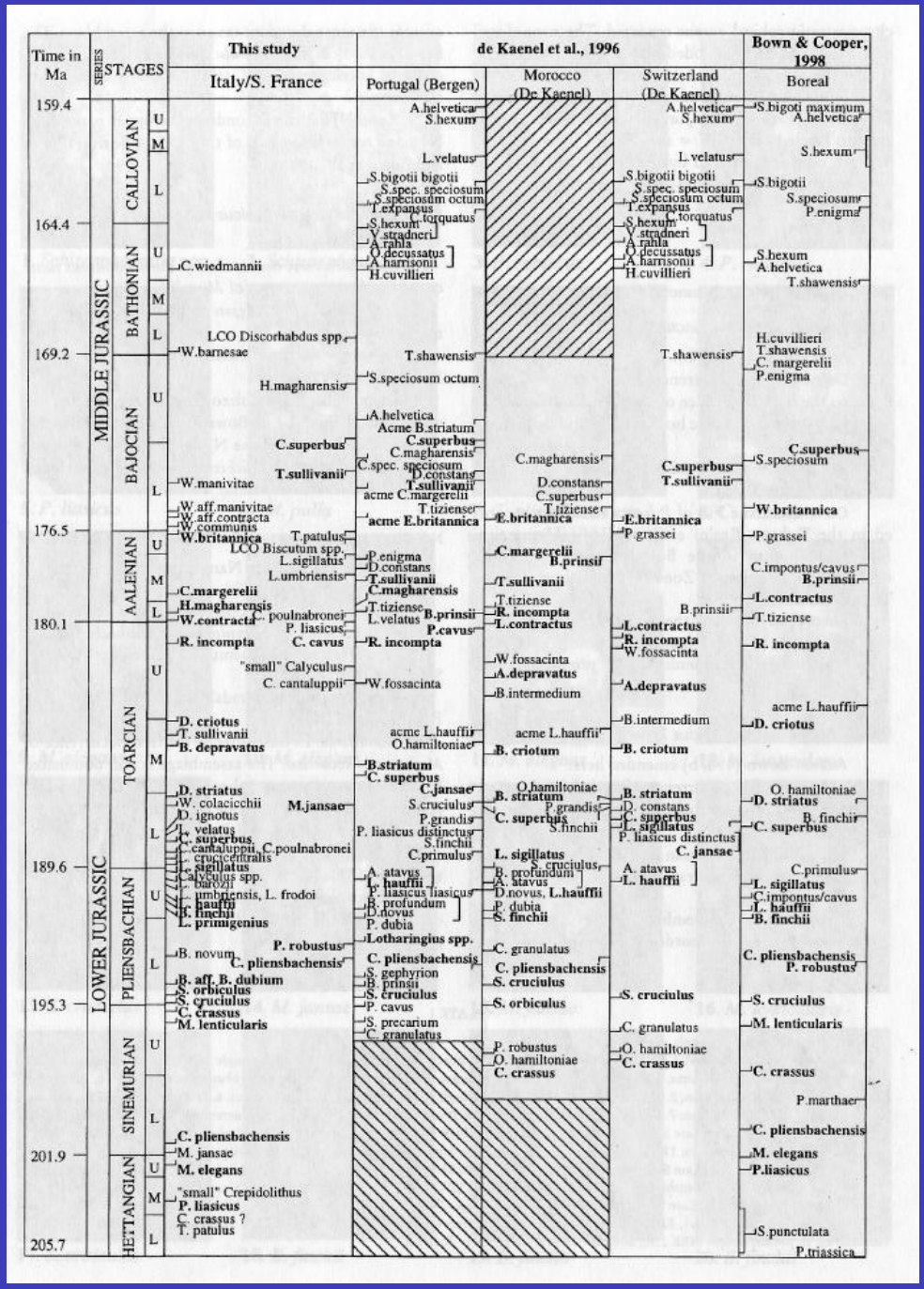


Fig. 12 - Biozonation scheme proposed for Italy and Southern France (Mediterranean Province) compared to the scheme proposed by Bown et al. (1988) and Bown & Cooper (1998) for the Boreal Realm. Time scale after Gradstein et al. (1994).

BIOZONE ED EVENTI DEL GIURASSICO INFERIORE E MEDIO DELLA BIOPROVINCIA TETIDEA

From MATTIOLI, E. & ERBA, E. (1999) – Synthesis of calcareous nannofossil events in tethyan Lower and Middle Jurassic successions. *Riv. Ital. Paleont. Strat.*, Milano, vol. 105 (3), pp. 343-376.



GIURASSICO *p.p.*

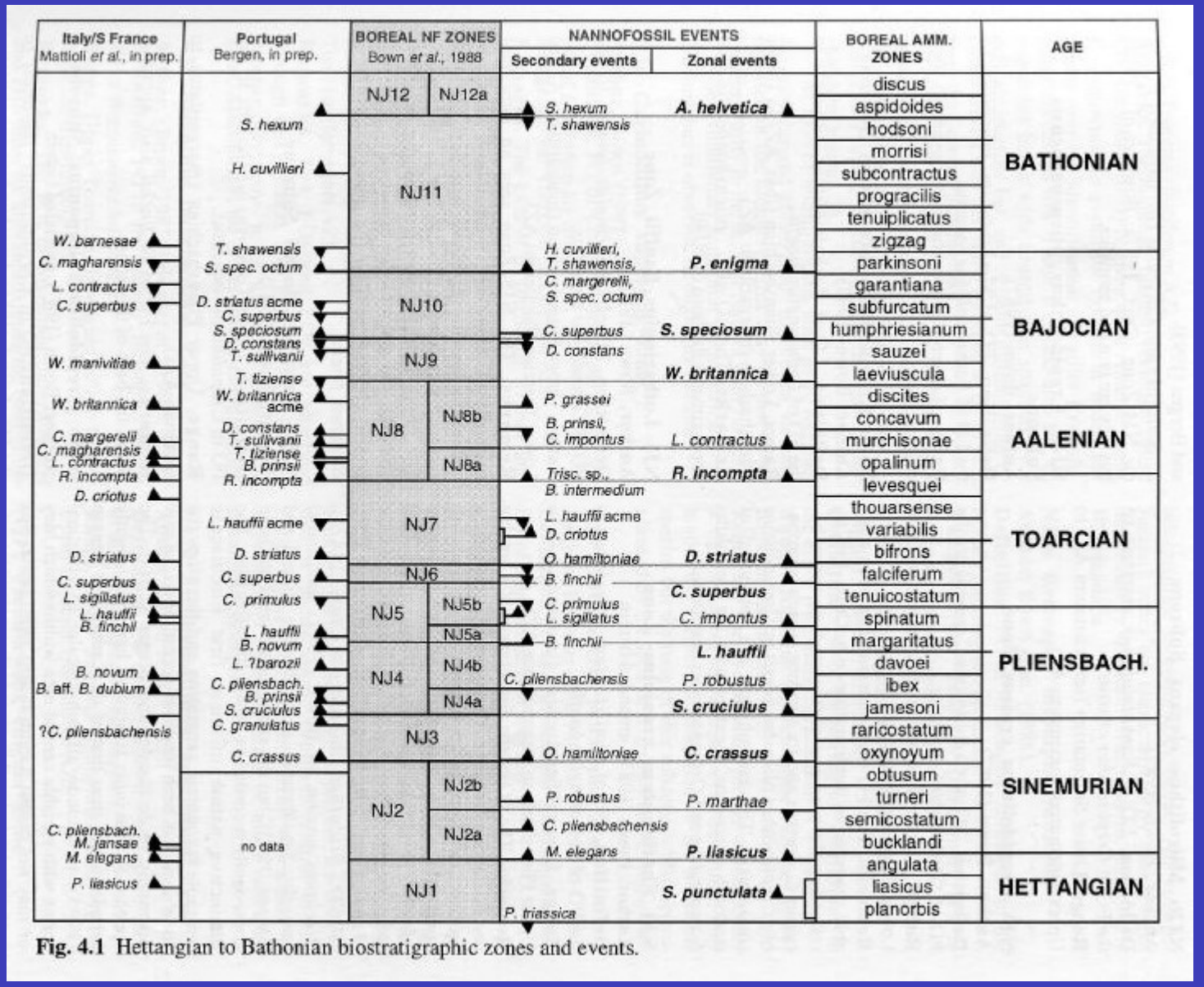


Fig. 4.1 Hettangian to Bathonian biostratigraphic zones and events.

From BOWN P. (1999) – Calcareous nannofossil biostratigraphy. Kluwer Academic

GIURASSICO *p.p.*-Berriasiano

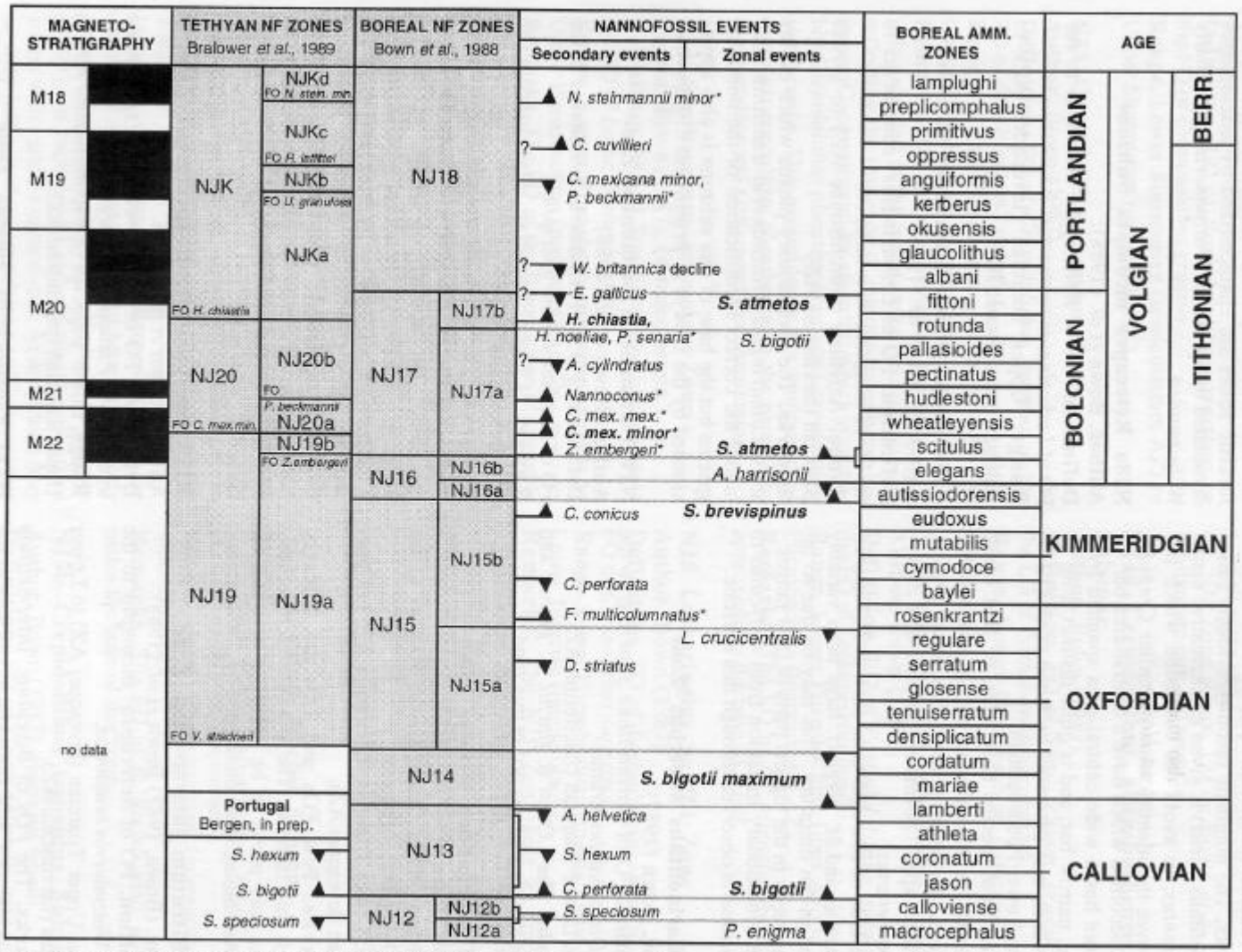
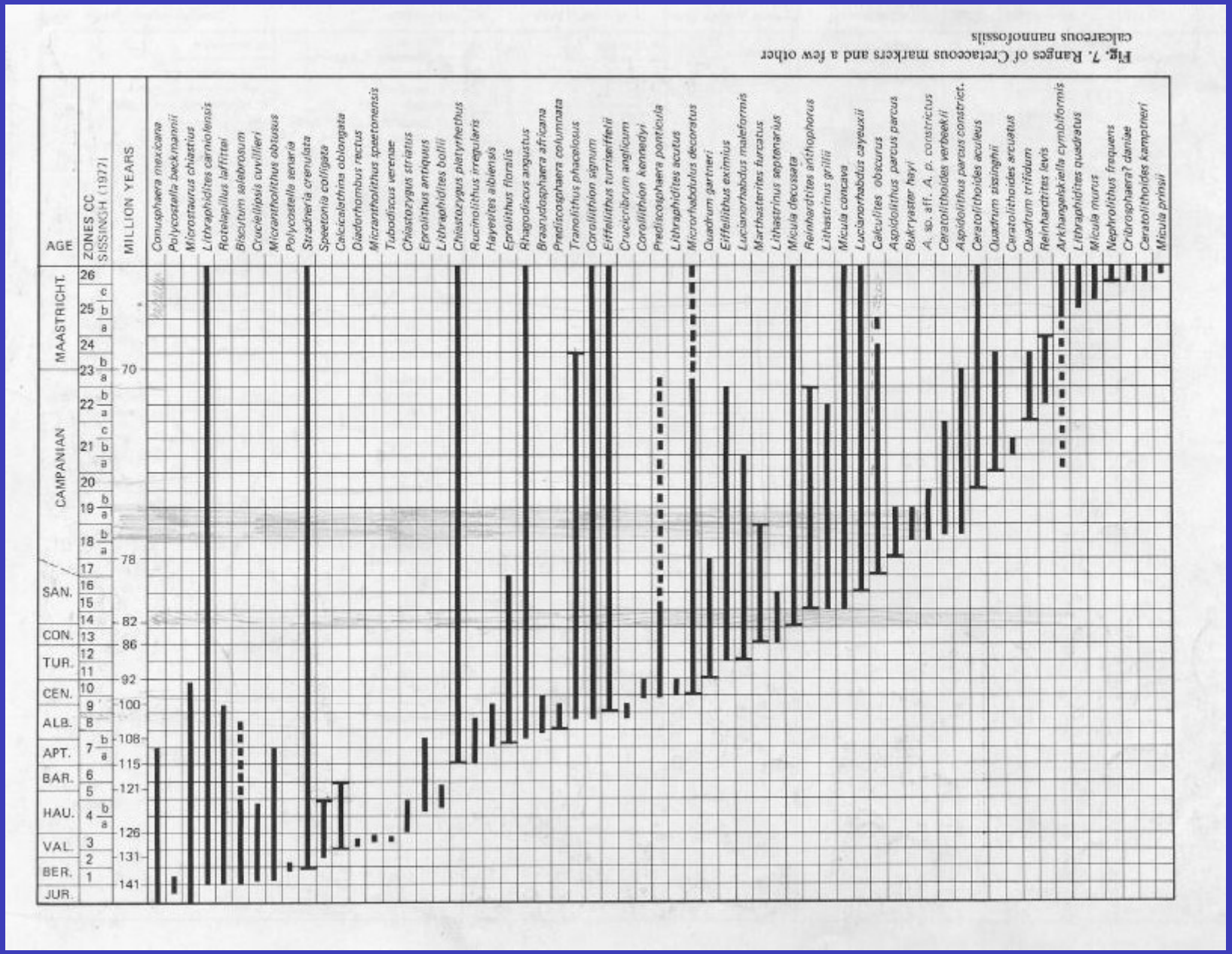


Fig. 4.2 Callovian to Volgian/Tithonian biostratigraphic zones and events (those with an asterix have only been reported from the tethyan area).

From BOWN P. (1999) – Calcareous nannofossil biostratigraphy. Kluwer Academic

BIO-ORIZZONTI NEL CRETACEO



Bolli, H. M., Saunders, J. B. and Perch-Nielsen, K., Plankton Stratigraphy. Cambridge University Press

BERRIASIANO-HAUTERIVIANO

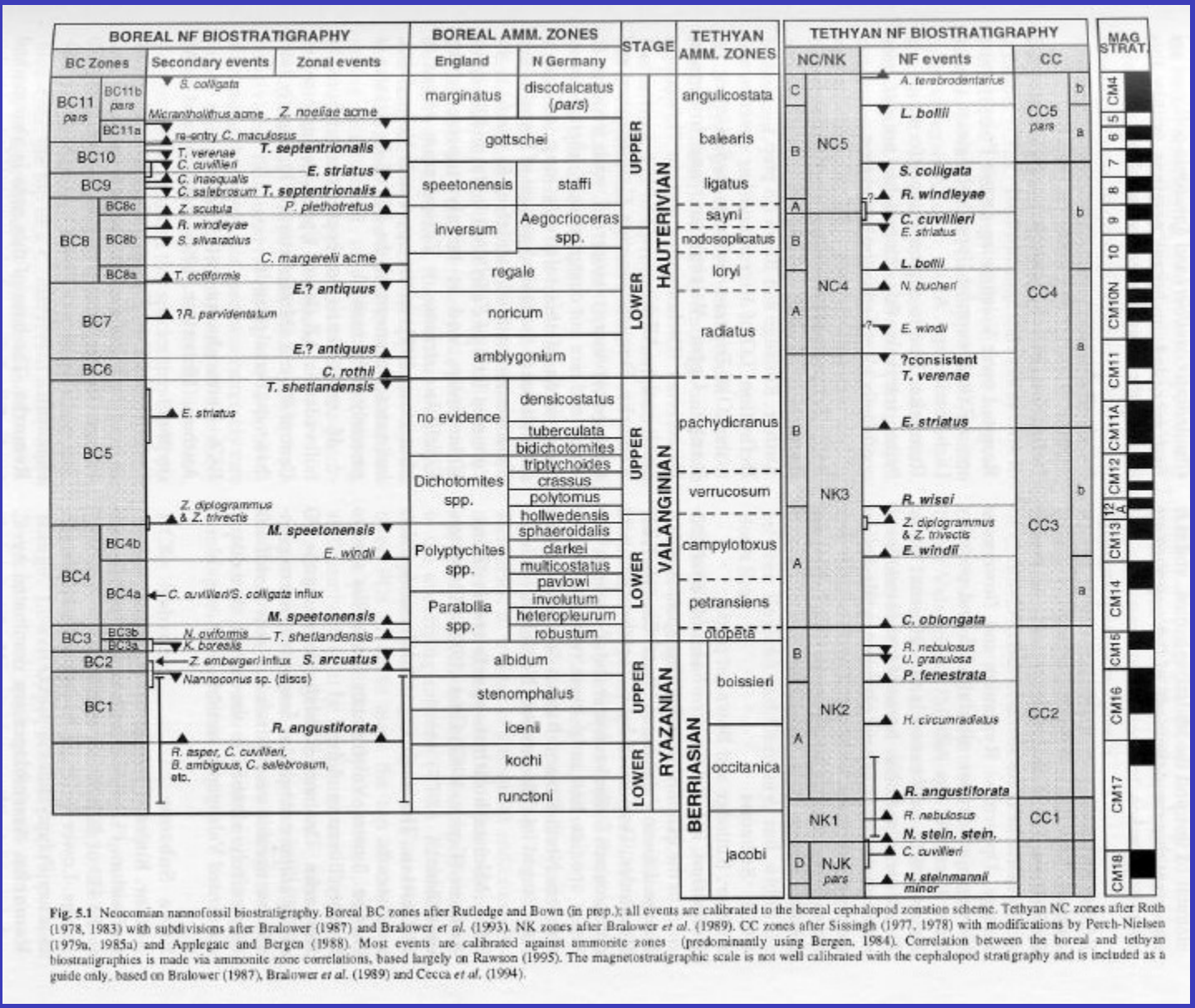


Fig. 5.1 Neocomian nannofossil biostratigraphy. Boreal BC zones after Rutledge and Bown (in prep.); all events are calibrated to the boreal cephalopod zonation scheme. Tethyan NC zones after Roth (1978, 1983) with subdivisions after Bralower (1987) and Bralower *et al.* (1993). NK zones after Bralower *et al.* (1989). CC zones after Sissingh (1977, 1978) with modifications by Perch-Nielsen (1979a, 1985a) and Applegate and Bergen (1988). Most events are calibrated against ammonite zones (predominantly using Bergen, 1984). Correlation between the boreal and tethyan biostratigraphies is made via ammonite zone correlations, based largely on Rawson (1995). The magnetostratigraphic scale is not well calibrated with the cephalopod stratigraphy and is included as a guide only, based on Bralower (1987), Bralower *et al.* (1989) and Cecca *et al.* (1994).

From BOWN P. (1999) – Calcareous nannofossil biostratigraphy. Kluwer Academic

BARREMIANO-ALBIANO

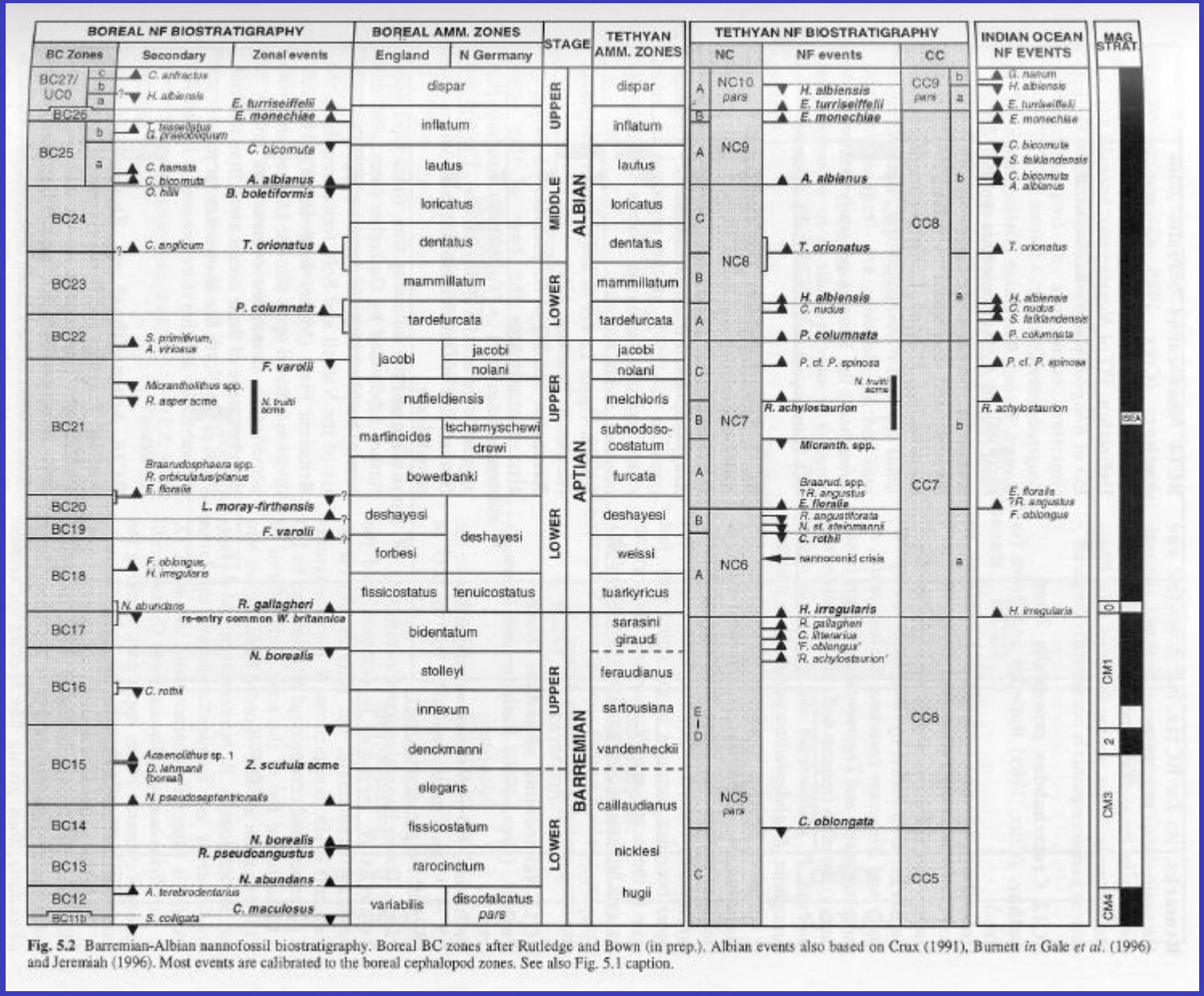


Fig. 5.2 Barremian-Albian nannofossil biostratigraphy. Boreal BC zones after Rutledge and Bown (in prep.). Albian events also based on Crux (1991), Burnett *in* Gale *et al.* (1996) and Jeremiah (1996). Most events are calibrated to the boreal cephalopod zones. See also Fig. 5.1 caption.

From BOWN P. (1999) – Calcareous nannofossil biostratigraphy. Kluwer Academic

ALBIANO *p.p.*-CENOMANIANO

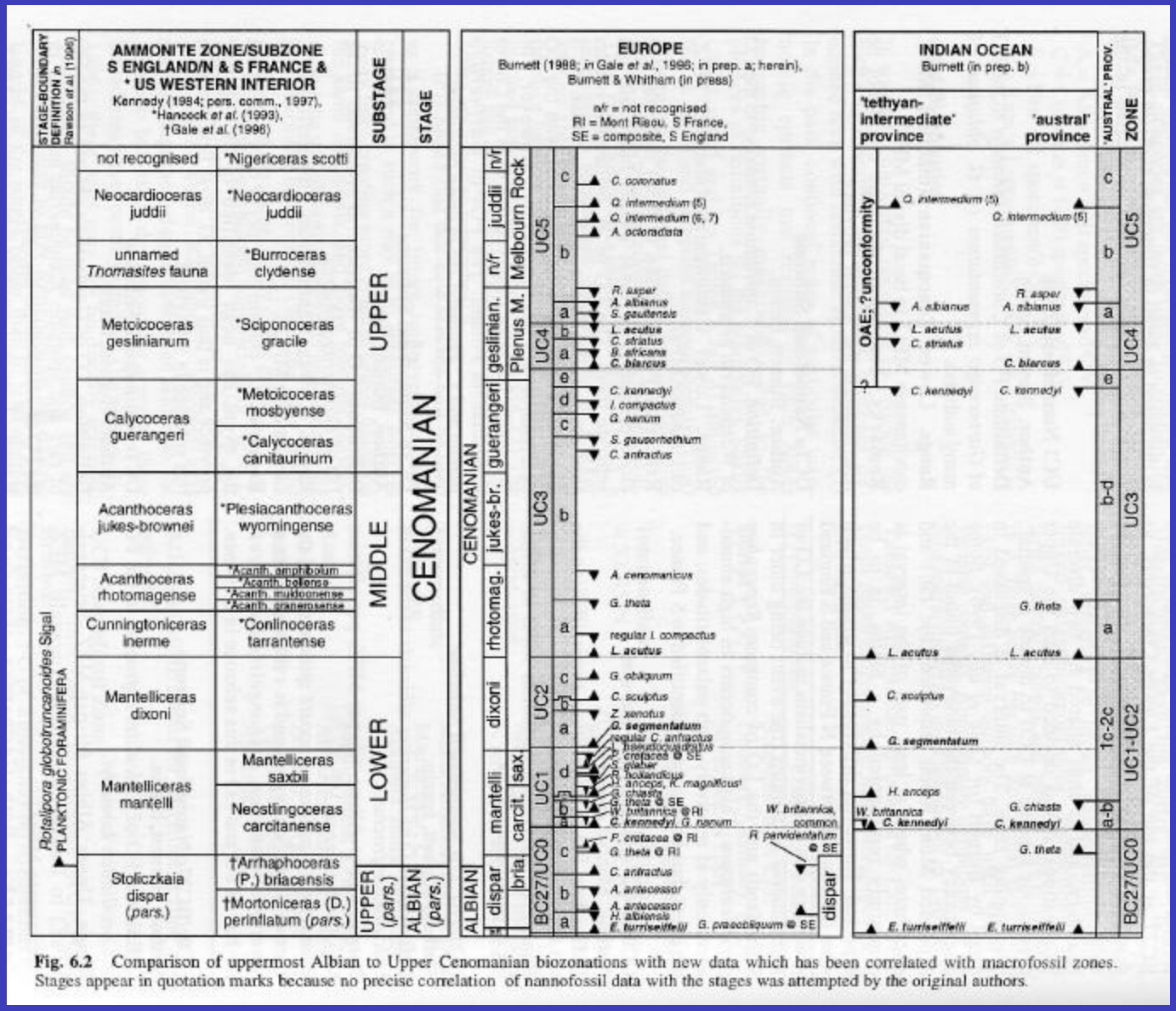


Fig. 6.2 Comparison of uppermost Albian to Upper Cenomanian biozonations with new data which has been correlated with macrofossil zones. Stages appear in quotation marks because no precise correlation of nannofossil data with the stages was attempted by the original authors.

From BOWN P. (1999) – Calcareous nannofossil biostratigraphy. Kluwer Academic

TURONIANO

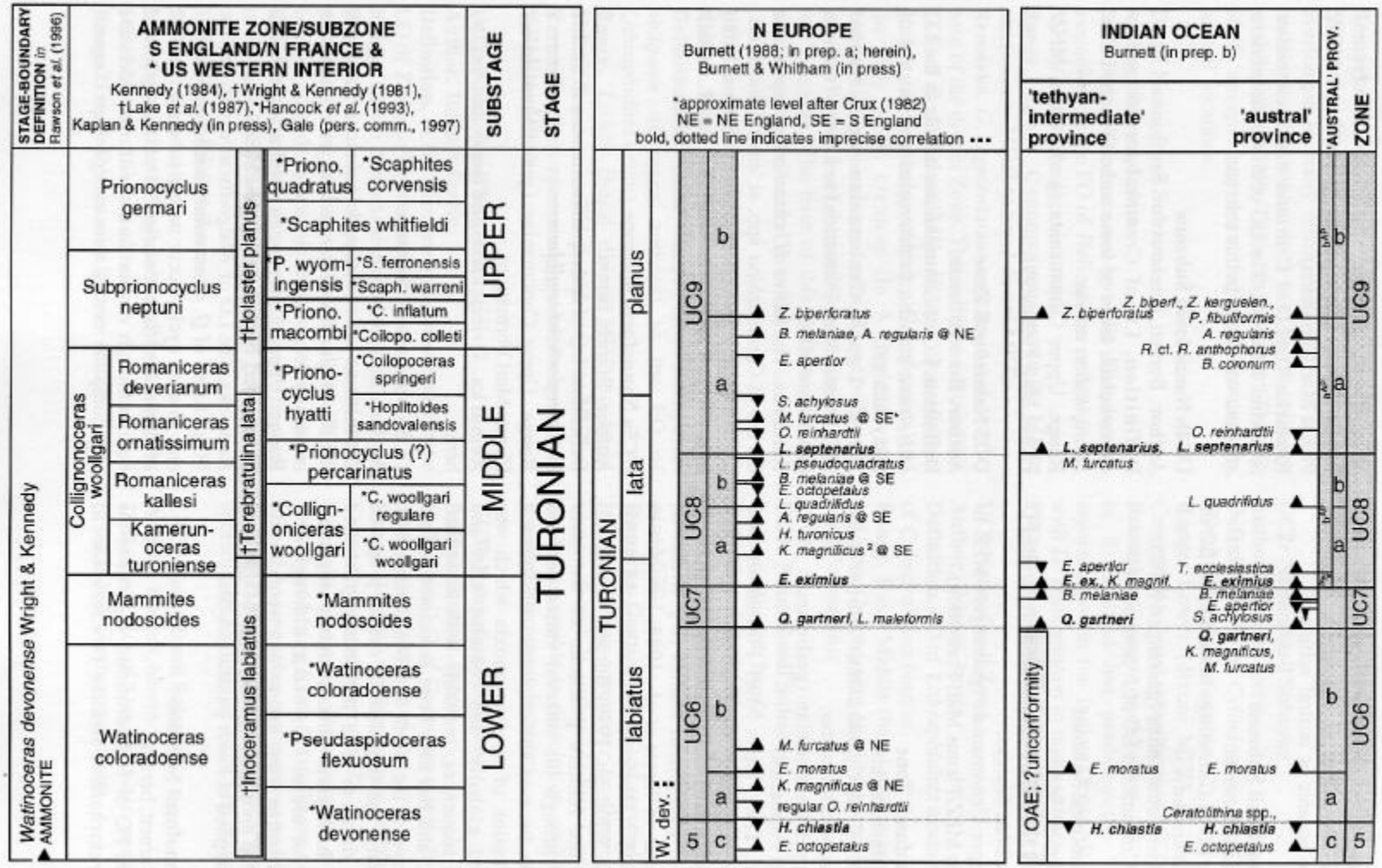


Fig. 6.3 Comparison of Turonian biozonations with new data which has been correlated with macrofossil zones. Stages appear in quotation marks because no precise correlation of nannofossil data with the stages was attempted by the original authors.

From BOWN P. (1999) – Calcareous nannofossil biostratigraphy. Kluwer Academic

CONIACIANO-SANTONIANO

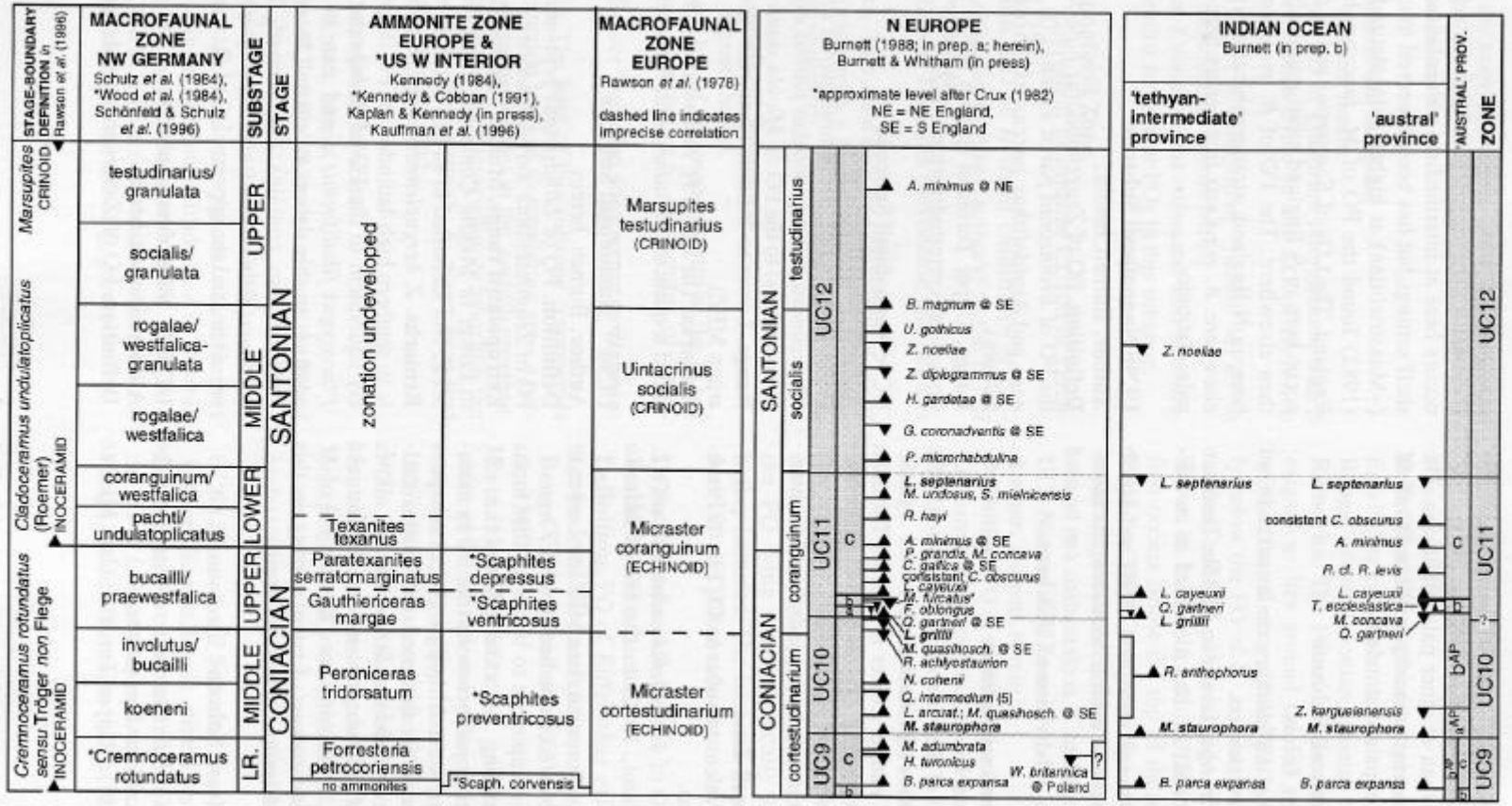


Fig. 6.4 Comparison of Coniacian to Santonian biozonations with new data which has been correlated with macrofossil zones. Stages appear in quotation marks because no precise correlation of nannofossil data with the stages was attempted by the original authors.

From BOWN P. (1999) – Calcareous nannofossil biostratigraphy. Kluwer Academic

CAMPANIANO

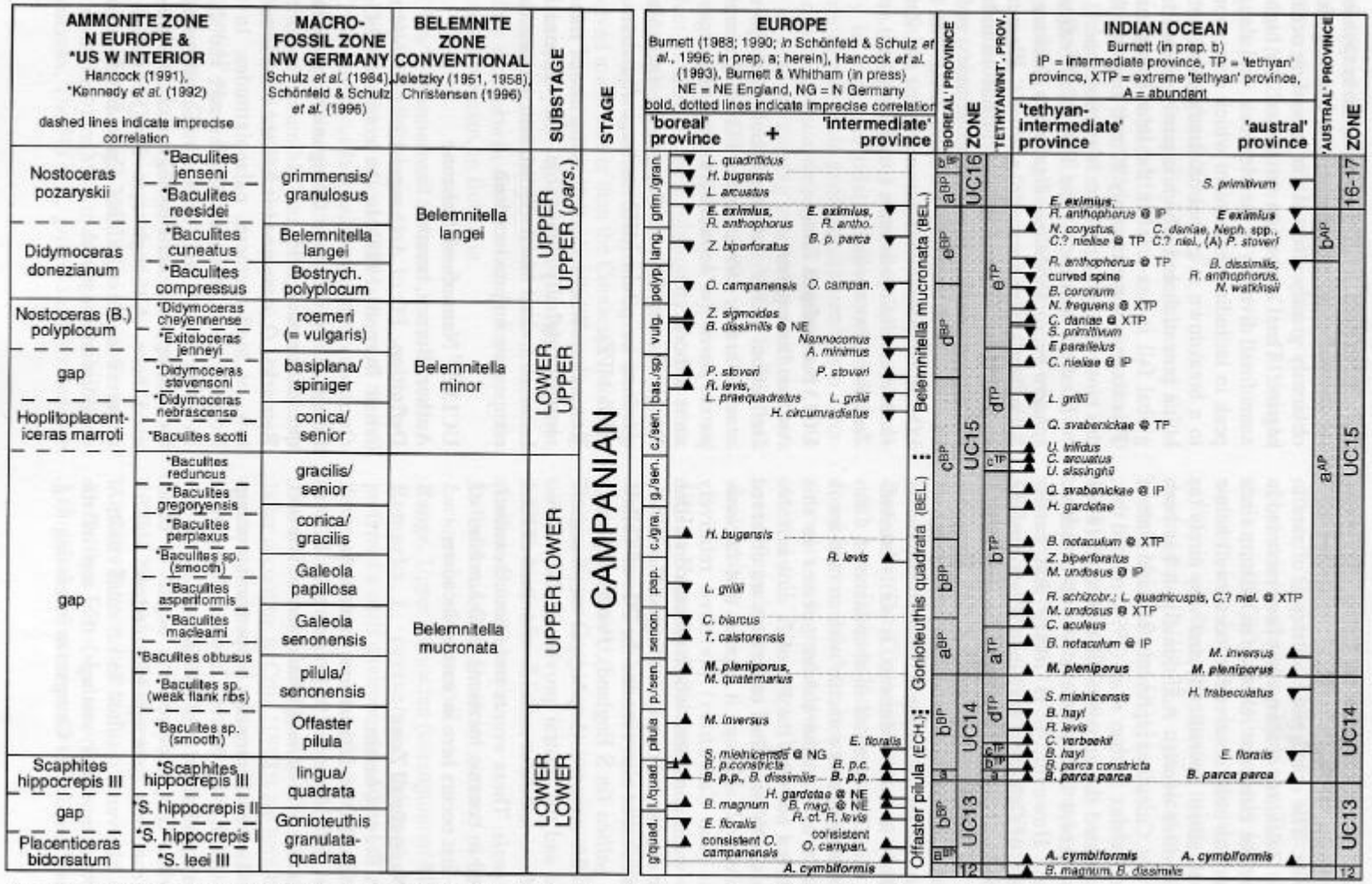


Fig. 6.5 Comparison of Campanian (*pars.*) biozonations with new data which has been correlated with macrofossil zones. Stages appear in quotation marks because no precise correlation of nannofossil data with the stages was attempted by the original authors.

From BOWN P. (1999) – Calcareous nannofossil biostratigraphy. Kluwer Academic

CAMPANIANO *p.p.*-MAASTRICHTIANO

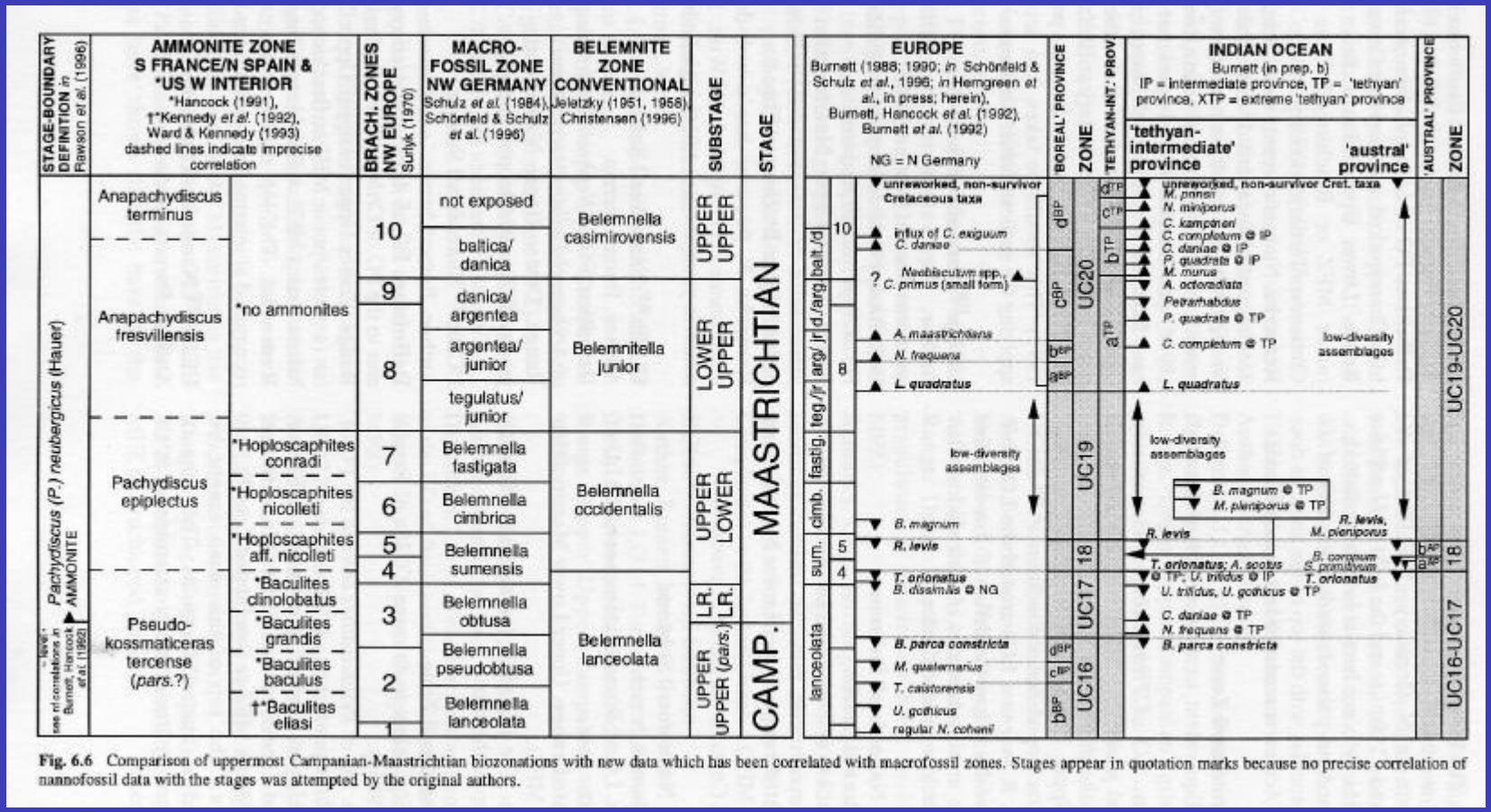


Fig. 6.6 Comparison of uppermost Campanian-Maastrichtian biozonations with new data which has been correlated with macrofossil zones. Stages appear in quotation marks because no precise correlation of nannofossil data with the stages was attempted by the original authors.

From BOWN P. (1999) – Calcareous nannofossil biostratigraphy. Kluwer Academic

BIOSTRATIGRAFIA A MICROFOSSILI CALCAREI NELLA SUCCESSIONE UMBRO-MARCHIGIANA (PREMOLI SILVA & SLITER, 1995)

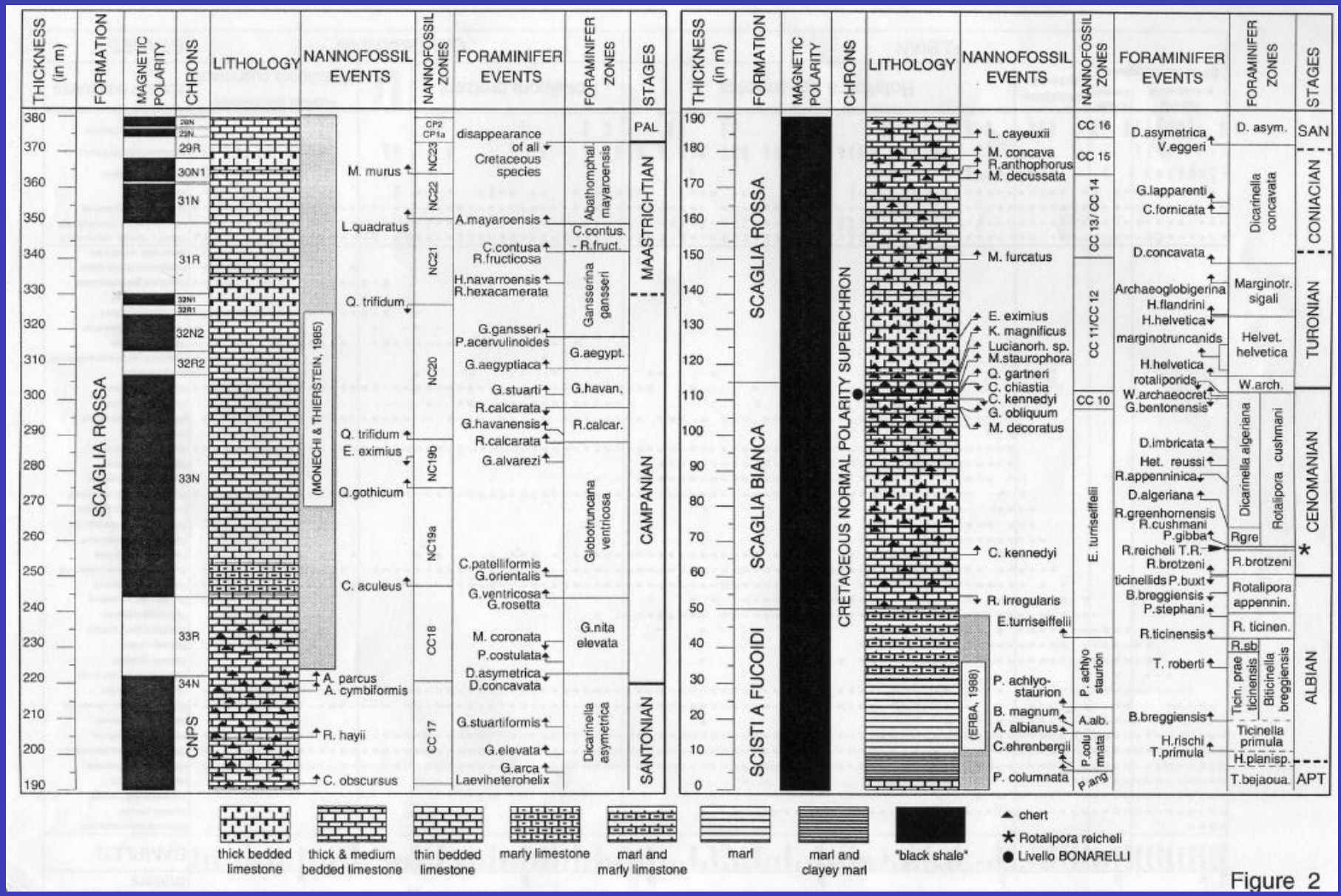


Figure 2