

bottom to top (DNPC1 to DNPC14). Informal subzones are indicated by the subdivision of DNPC2 into DNPC2A and DNPC2B, and of DNPC3 into DNPC3A and DNPC3B. The alphanumeric designations for the Tertiary (i.e. NP4, NP5, etc.) are widely used codes for the "standard" zones of Martini (1971).

Table 4 shows the Geological Survey of Canada (GSC) palynological zonation for the Mesozoic-Cenozoic strata of the Scotian Basin as developed by Williams (1975), Williams and Bujak (1977), Bujak and Williams (1977, 1978), and Barss et al. (1979). The calibration of the Early and Middle Jurassic zones against the international geochronologic scale of ages was revised by Williams et al. (1990). The age names are those used in Harland et al. (Figs. 5.2 and 5.4, 1982) except for the Portlandian, which is used in Table 4 as the youngest Jurassic age. The Portlandian stage is used because latest Jurassic Scotian Basin paleomorphs are best correlated with those from southern England, where the Portlandian is defined.

The zonation scheme given in Table 4 is the same as that illustrated by Barss et al. (Table 1, 1979) except for the revision of ages noted above. The names of many individual zones have changed, in some cases because the nominal name was recombined with another genus; thus *Hystrophaeridium chaonophorum* is now *Melitasphaeridium chaonophorum*, *Adnatosphaeridium reticulense* is now *Nematosphaeropsis reticulensis*, *Ceratopsis speciosa* is now *Cerodinium speciosum*, *Cordosphaeridium truncigerum* is now *Pervosphaeridium truncigerum*, *Spinidinium cf. vestitum*, *Systematopora schindewolfii* is now *Hystrophaerina schindewolfii*, *Aptea attadalica* is now *Circulodinium attadalicum*, *Doidyx anaphrissa* is now *Pseudoceratium anaphrissum*, *Clenodinium panneum* is now *Dichadogonyaulax pannea*, *Gonyaulacysta cladophora* is now *Rhynchodinopsis cladophora*, *Gonyaulacysta filipacata* is now *Dichadogonyaulax filipacata*, and *Classopolis meyeriana* is now *Corallina meyeriana*. In other cases, a previously informally-named species has now been formally named; thus *Apteoedinium sp.* A is now *Apteoedinium spiridoides* and *Cannospaeropsis sp.* A is now *Reticulatosphaera actinocrorata*. In a third situation, the original nominal species was taxonomically synonymized with another species whose name has nomenclatural priority; thus *Chiropteridium dispersum* is now considered to be circumscribed by *Chiropteridium mesoplana* and *Compositosphaeridium costatum* by *Compositosphaeridium polonicum*. Finally, specimens from offshore Eastern Canada which were originally assigned to the Australasian species *Cleistosphaeridium* (now *Kokansium*) polytypes are now reassigned to *Kokansium williamsi*.

Table 5 shows the detailed Late Triassic to Late Jurassic zonation of E. H. Davies (Bujak Davies Group) for the southern part of the Scotian Basin. This zonation was defined from, and/or applied in, the following wells: Acadia K-62, Albabross B-13, Bluenose 2G-47, Bonnet P-23, Glooscap C-36, Moheida P-15, Mohican I-100, Penobscot L-30, Uniacke G-72, and West Olympia O-51. Note: From Tables 4 and 6 on map sheet Biostatigraphy and Maturation Data (this volume) both GSC and Bujak Davies zonations were applied to the Mohican I-100 and Acadia K-62 wells. All analyzed wells other than those listed above have been zoned using the GSC scheme only. The zonation shown in Table 5 was first outlined in Williams et al. (1990) and slightly modified for inclusion here. A detailed description of this zonation is currently in preparation.

Table 3 shows the offshore eastern Canada zonation for Late Paleozoic miospores as provided in Williams et al. (1990), and based on earlier work by Barss and Haquebard (1967), Haquebard (1972), and Utting (1980). This zonation was erected principally for the Sydney Basin. Only one offshore Sydney Basin well in the main report area (North Sydney P-05) was analyzed palynologically, although the presence of Upper Paleozoic rocks was also demonstrated palynologically in the Hermine E-94 well.

In the alphanumeric codes for the palynological zones, "S" represents Scotian Shelf, "CB" represents Cape Breton (Sydney Basin), "P" represents palynology, "Z" represents Late Paleozoic, "J" represents Jurassic (although the first "Jurassic" zone is indicated in Table 4 as extending below the Triassic-Jurassic boundary), "C" represents Cretaceous, "T" represents Tertiary, and "E" represents zones proposed by E. H. Davies (Bujak Davies Group). The zones are numbered from bottom to top within each geologic period. Subzones are indicated by a suffixed letter.

Table 1 shows the zonations for various inorganic-walled microfossil groups. This figure, from Ascoli (1990) presents, with minimal changes, the latest versions of the zonations as reported in Williams et al. (1990) which are based on the zonations in Ascoli (1976, 1981, 1984, 1988a, b), Ascoli et al. (1984) and Jansa et al. (1980). Although there is some overlap, the planktonic and calcareous benthic foraminiferal zonations are most applicable in strata deposited in outer neritic and bathyal environments and the arenaceous benthic foraminiferal and ostracod zonations are most applicable to inner neritic deposits. The calponellid zonation presented in Table 1, which encompasses the time interval from the base of the Late Tithonian to the base of the Late Valanginian, is the standard zonation for the Western Mediterranean Province (Allermann et al., 1971) for these microfossils. This "Standard Calponellid Zonation" has been used for precisely establishing the Jurassic-Cretaceous (Tithonian-Berriasian) boundary at both margins of the studied area, and for calibrating the stratigraphic ranges of foraminiferal and ostracod species at and near this boundary (Jansa et al., 1980; Ascoli et al., 1984). Since calponellids are not present in the shallow water "Portlandian facies", but only in the deep-water "Tithonian facies", the term "Tithonian" has been used for characterizing the last stage of the Jurassic period. Relationships between the Tithonian and Portlandian are graphically illustrated in Table 1. The ages against which the zonations in Table 1 have been calibrated follow the "Decade of North American Geology" (DNAG) scheme (Palmer, 1983).

The zonation scheme given in Table 1 is basically the same as that illustrated in Ascoli 1988a (Fig. 2) and Williams et al. (1990). However, the names of three individual zone marker species have been changed, having been referred to another genus and, in one case, also to another species. Thus *Favusella aff. F. washitensis* is now *Ascolella scotiensis*, *Globularia heteriviva* is now *Favusella heteriviva*, and *Macrodentina* sp. 1 is now *?Neothecere* sp. 1.

In the alphanumeric codes for the inorganic-walled microfossil zones, "PF" represents planktonic foraminifera, "CF" represents calcareous benthic foraminifera, "AF" represents agglutinated benthic foraminifera, "OS"

represents ostracods, "CP" represents calponellids, "J" represents Jurassic, "C" represents Cretaceous, and "T" represents Tertiary. Apart from the calponellid zones, which are numbered CP1 to CP5 upward through the Jurassic-Cretaceous boundary beds, the zones are numbered from bottom to top within each period.

TABLE 6. Type and reference sections and biostratigraphic age of lithostratigraphic units, offshore eastern Canada

Lithostratigraphic Unit	Type (T) or Reference (R) Section	Age
Artinian Member <sup>6</sup> (Abenaki Formation)	Shell Demasota G-32 (T) 60° 42' 54.00" W 61° 15.71, 1532 ft (3401-3515 m)	Tithonian au Berriasien-Valanginien (Ascoli, 1988a); Berriasien-Valanginien (R. A. Fensome, personal communication, 1985)
Baccaro Member <sup>7</sup> (Abenaki Formation)	Shell Oneda O-25 (T) 43° 14' 57.49" N 61° 33' 36.38" W -1,955 to -12,192 ft (-3644 to -3716 m)	Oxfordian-Early Kimmeridgian to Berriasien-Valanginien (Barss et al., 1979); Oxfordien zu Berriasien (Ascoli, 1988a)
Misaine Member <sup>1</sup> (Abenaki Formation)	Shell Oneda O-25 (T) 43° 14' 57.49" N 61° 33' 36.38" W -1,955 to -13,998 ft (-3644 to -4090 m)	Callovien au Oxfordien-Early Kimmeridgian (Barss et al., 1979); Callovien-Oxfordien zu Berriasien (Ascoli, 1988a)
Scatarie Member <sup>8</sup> (Abenaki Formation)	Shell Oneda O-25 (T) 43° 14' 57.49" N 61° 33' 36.38" W -1,955 to -12,535 ft (-3644 to -3621 m)	Callovien (Barss et al., 1979); E. H. Davies, personal communication, 1988; Callovien (Ascoli, 1988a)
Mohican Formation <sup>7</sup>	Shell Oneda O-25 (T) 43° 14' 57.49" N 61° 33' 36.38" W -1,955 to -13,998 ft (-3644 to -4090 m)	Callovien (Barss et al., 1979); Callovien (Ascoli, 1988a)
Iroquois Formation <sup>1</sup>	Shell Iroquois J-17 (T) 44° 26' 31.31" N 59° 47' 12.37" W -519 to -6204 ft (-1774 to -2013 m)	Late Sinemurian-Early Pliensbachian (G. L. Williams, personal communication, 1986)
Argo Formation <sup>8</sup>	Shell Arg F-38 (T) 45° 27' 23.22" N 59° 50' 45.38" W 7563 - 10,122 ft (2305 - 3085 m)	Rhaetian to Early Jurassic (Barss et al., 1979)
Eurydice Formation <sup>4</sup>	Shell Eurydice O-36 (T) 45° 25' 27.30" N 59° 50' 45.38" W 7850 - 9,728 ft (2393 - 2965 m)	Rhaetian-Early Sinemurian (Barss et al., 1979)
Naskapi Member <sup>1</sup> (Logan Canyon Formation)	Shell Cree E-35 (T) 43° 44' 23.71" N 59° 47' 12.37" W -7800 to -8370 ft (-2377 to -2551 m)	Apitan (Barss et al., 1979); Apitan-Early Albian (Ascoli, 1988a)
Vernil Canyon Formation	Shell Oneda O-25 (T) 43° 14' 57.49" N 61° 33' 36.38" W -1,955 to -9375 ft (-2498 to -2658 m)	Berriasien to Barremian (Ascoli, 1976); Hauterivian to Apitan (Barss et al., 1979)
Missisauga Formation	The updpd facies of the type section is: Shell Missisauga H-54 (T) 44° 23' 19.79" N 59° 22' 27.78" W 7820 to -11,905 ft (2414 - 2740 m)	The updpd and downdpd type section intervals are dated as Berriasien-Valanginian to Barremian in the type section of the updpd facies in the Missisauga H-54 well.
upper member <sup>5</sup> (Missisauga Formation)	Shell Missisauga H-54 (T) 44° 23' 19.79" N 59° 22' 27.78" W 7820 to -11,905 ft (2414 - 2740 m)	The type sections of the upper and middle members of the Missisauga Formation are included in the type section of the updpd facies in the Missisauga H-54 well.
middle member <sup>5</sup> (Missisauga Formation)	Shell Missisauga H-54 (T) 44° 23' 19.79" N 59° 22' 27.78" W 8895 to -11,905 ft (2740 - 3537 m)	The type sections of the upper and middle members of the Missisauga Formation are included in the type section of the updpd facies in the Missisauga H-54 well.
lower member <sup>5</sup> (Missisauga Formation)	Mobil et al. Venture H-22 (T) 44° 01' 24.13" N 59° 47' 12.37" W 4149 - 5100 m	
Roseway unit <sup>9</sup>	Shell Mohawk B-93 (R) 42° 42' 10.72" N 64° 43' 53.04" W 4089 - 5100 ft (1340 - 1609 m)	Berriasien to Barremian (Barss et al., 1979); Tithonian-Aptian (Ascoli, 1988a)
Mohawk Formation <sup>1</sup>	Shell Mohawk B-93 (T) 42° 42' 10.72" N 64° 43' 53.04" W -5171 to -6861 ft (-1578 to -4501 m)	Berriasien to Barremian (Barss et al., 1979); Tithonian-Aptian (Ascoli, 1988a)
Mic Mac Formation <sup>1</sup>	Shell Mic Mac H-86 (T) 44° 35' 28.87" N 59° 50' 45.38" W -10,125 to -14,375 ft (-3086 to -4382 m)	Bathonian-Callovian to Kimmeridgian-Tithonian (Ascoli, 1988a); Bathonian to Kimmeridgian (Barss et al., 1979)
Abenaki Formation <sup>1</sup>	Shell Oneda O-25 (T) 43° 14' 57.49" N 61° 33' 36.38" W -1,955 to -9375 ft (-2858 to -3821 m)	Callovian to Berriasien-Valanginian (Barss et al., 1979); Callovian to Berriasien (Ascoli, 1988a)
Banquereau Formation <sup>1</sup>	Mobil Sable Island C-67 (T) 43° 56' 04.91" N 59° 55' 01.38" W -540 to -4445 ft (-165 to -1555 m)	Campanian to Plio-Pleistocene (Barss et al., 1979); Campanian to Plio-Pleistocene (Ascoli, 1988a)
Esperanto beds <sup>2</sup> (Banquereau Formation)	Shell Oneda O-25 (R) 43° 14' 57.49" N 61° 33' 36.38" W -900 to -14,260 ft (274 - 394 m)	Middle-Late Oligocene to Middle-Late Miocene (Barss et al., 1979); Middle-Late Oligocene to Middle Miocene (Ascoli, 1988a)
Manhasett beds <sup>2</sup> (Banquereau Formation)	Mobil Sable Island C-67 (T) 43° 56' 04.91" N 59° 55' 01.38" W -1750 to -5750 m	Early Oligocene to Middle-Late Oligocene (Barss et al., 1979); Early Oligocene to Middle Miocene (Ascoli, 1988a)
Nashwaik beds <sup>2</sup> (Banquereau Formation)	Mobil et al. Esperanto K-78 (R) 44° 23' 31.26" N 58° 11' 27.42" W 10,260 to -12,910 ft (494 - 719 m)	Late Paleocene to Middle Eocene (Barss et al., 1979)
Meskonomet beds <sup>2</sup> (Banquereau Formation)	Shell Oneda O-25 (R) 43° 14' 57.49" N 61° 33' 36.38" W -2000 to -12,910 ft (709 - 2129 m)	Campanian to Early Paleocene (Barss et al., 1979); Late Santonian to Middle Eocene (Ascoli, 1988a)
Wyndot Formation <sup>1</sup>	Shell Mic Mac H-86 (T) 44° 27' 02.47" N 59° 27' 23.25" W -2355 to -2645 ft (-718 to -806 m)	Campanian to Maastrichtian (Barss et al., 1979); Santonian to Maastrichtian (Ascoli, 1988a)
Dawson Canyon Formation <sup>1</sup>	Shell Missisauga H-54 (T) 44° 23' 20.39" N 59° 22' 27.60" W -3335 to -9,225 ft (-1037 to -1288 m)	Conomanian to Santonian (Barss et al., 1979); Early Conomanian (Ascoli, 1988a)
Petrel Member <sup>4</sup> (Dawson Canyon Formation)	Shell Oneda O-25 (T) 43° 44' 20.71" N 60° 35' 55.90" W -4730 to -5700 ft (-1595 - 1665 m)	Conomanian to Coniacian (Barss et al., 1979)
Logan Canyon Formation <sup>1</sup>	Shell Cree E-35 (T) 43° 44' 20.71" N 60° 35' 55.90" W -5492 to -5735 ft (-1674 to -1748 m)	Asian to Early Conomanian (Barss et al., 1979); Early Albian to Late Conomanian (Ascoli, 1988a)
Cree Member <sup>5</sup> (Logan Canyon Formation)	Shell Cree E-35 (T) 43° 44' 20.71" N 60° 35' 55.90" W 5924 - 7000 ft (1805 - 2408 m)	Late Albian (Barss et al., 1979); Late Albian (Ascoli, 1988a)

[continued on the next map sheet]

Nantais (1983) a fourni une synthèse majeure des données de maturation de la plate-forme Néo-Écossaise. Il a proposé un modèle de formation des hydrocarbures basé sur la quantité, la qualité et la maturation de la matière organique ainsi que sur les découvertes d'hydrocarbures. La prédominance du gaz et des condensats dans les puits a été attribuée à l'origine terrestre du kérogène dans la zone mature. L'IAT est apparu plus sensible que la réfraction de la vitrinite comme indicateur de maturation à des taux de chauffage élevés. Parmi les autres paramètres qui ont été déterminés mentionnons l'indice de temps-température (ITT), des analyses des gaz des déblais de forage et des températures seuils.

Des analyses visuelles du kérogène de quatre puits (Alma F-67, Chebucto K-90, Evangeline H-98 et Sambo 1-29) ont récemment été entreprises par la Lent International Biostatigraphic Limited (1988). Le kérogène de source terrestre prédomine dans les intervalles plus profonds de chacun des quatre puits. Toutefois, seulement trois des puits ont récupéré la fenêtre de maturation du pétrole: Alma F-67, Chebucto K-90 et Evangeline H-98.

#### CARTE DE LOCALISATION ET ZONATIONS

La figure 1 indique l'emplacement de tous les puits extracôtiers mentionnés dans la section Biostatigraphie et données de maturation du présent atlas.

La zonation de Doeven (1983) basée sur le nannoplankton (coccolithes et discoasters) est la seule zonation publiée de ce groupe de fossiles pour la région extracôtière de l'Est du Canada (voir le tableau 2). Doeven a utilisé quatorze zones, toutes précédemment décrites dans d'autres régions, pour l'intervalle du Albien au Maestrichtien. Il a également analysé des échantillons du Tertiaire, auxquels il a appliqué la zonation de Martini (1971). Lorsque les renseignements sont disponibles, les profondeurs en mètres depuis la surface de rotation jusqu'aux échantillons du sommet et de la base de chaque zone sont indiquées pour chaque puits. Dans certains cas, Doeven (fig. 18, 1983) donnait les profondeurs des échantillons pour les limites d'étages plutôt que pour les limites de zones; à remarquer par exemple la limite entre les échantillons à 720 m et à 762 m dans le puits Mohawk B-93. L'unique zone est représentée par un seul échantillon, c'est la profondeur de cet échantillon qui est indiquée plutôt que les profondeurs du sommet et de la base (par ex. la zone à *Eiffelithus eximus* dans le puits Triumph P-50).

Les codes alphanumériques des zones de Doeven ont les significations suivantes: «D» pour Doeven, «NP» pour nannoplankton et «C» pour Crétacé. Les zones sont numérotées de la base au sommet (DNPC1 à