Appendix: Taxonomic remarks

As full taxonomic treatment is not intended here, taxa are listed alphabetically. The generic and even higher level classification of Hettangian ammonites is far from settled (for two different approaches, see Donovan et al., 1981; Guex, 1987). For practical reasons we mainly follow the scheme used by Guex (1980; 1987; 1995) as it is conveniently applicable to the Nevadan and Alpine faunas to which our Alaskan material shows remarkable affinity. Uncertainty in generic assignment of early schlotheimiids reflects the fact that critical ventral features are rarely preserved in the Alaskan material.

Arnioceras cf. *arnouldi* (Dumortier)

A large specimen exceeding 25 cm in diameter was found *in situ* (Level 24) on a bedding surface in the intertidal platform where its removal was not feasible. It is identical in coiling and curved rursiradiate ribbing to *A. arnouldi* known from the Queen Charlotte Islands (Pálfy et al., 1994). A smaller, fragmentary specimen (Fig. 5K), is also referred to *Arnioceras.*

Badouxia? sp. (Fig. 5E, F)

Several specimens from Levels 19-22 are comparable to *B. columbiae*, but differ in the occasional presence of bifurcating ribs on the inner whorls (see Fig. 5F), a feature common in *Schlotheimia* or other schlotheimiids. The venter of the slightly crushed specimens is not well preserved, but it doesn't appear to show a schlotheimiid-type, well-defined sulcus or abrupt termination of ribs such as seen on a specimen of *Schlotheimia* sp. figured by Imlay (1981, pl. 2, fig. 16-17) from Puale Bay.

Schlotheimiid indet.

One very large specimen (D > 40 cm) from Level 22 that resembles both "*Charmasseiceras*" and the "*marmorea*" group (sensu Bloos, 1988) in its inner whorls. The last whorl becomes almost completely smooth.

Discamphiceras aff. *reissi* (Tilmann) (Fig. 4C)

Two crushed, weakly ornamented specimens from Levels 13-14 are more involute than *D.* cf. *silberlingi* and show weaker and less regular ribbing. They closely resemble *D.* aff. *reissi* from Nevada as figured by Guex (1995, pl. 2, fig. 13-19). The typical *D. reissi* itself is distinguished by its regular, more prominent ribs which persist to the upper flank as shown by the holotype (Quinzio Sinn, 1987, pl. 1, fig. 12, pl. 2, fig. 1; Tilmann, 1917, pl. 21, fig. 4) and other South American specimens (Hillebrandt, 1994, pl. 1, fig. 12). We note that there are transitional forms between *D.* aff. *reissi* and *D. silberlingi* in both the Nevadan (Guex, 1995, pl. 15, fig. 13-16) and Alaskan material.

Discamphiceras cf. *silberlingi* Guex (Fig. 4A, D)

Four crushed specimens from Levels 2, 7, and 12 show midvolute coiling and slightly prorsiradiate ribs that are strongest on mid-flank and fade towards the venter. This form appears to be the most common species of *Discamphiceras* in the section and similar specimens were referred to *D.* cf. *toxophorum* by Imlay (1981, pl. 1, fig. 3, 4, 8-10) who also discussed their affinities to other species of *Discamphiceras* from the Eastern Alps. As Guex (1995) noted, at least some of the specimens figured by Imlay can be identified with *D. silberlingi*, a species originally described from Nevada. We favor the assignment of the Alaskan form to *D. silberlingi* while emphasizing its similarity to the Alpine species. The South American *D. reissi* (see below) is also closely related (see Hillebrandt, 1994, pl. 1, fig. 13).

Eolytoceras cf. *tasekoi* Frebold (Fig. 5D, H)

This species is common in the middle part of the section (Levels 18-21) where it is represented by small, presumably juvenile specimens. Widely spaced constrictions, faint and irregular ribbing, and an evolute coiling with moderate expansion rate suggest assignment to *E. tasekoi*.

Euphyllites? sp.

Several crushed specimens of small size from Levels 12-13 resemble *Euphyllites* in their evolute coiling, moderate expansion of whorls, and lack of ornamentation except for nodes on the nucleus. Positive indentification is precluded by the poor preservation and lack of larger specimens. The least involute and most weakly ornamented *Discamphiceras* species are also morphologically similar, but differ from *Euphyllites* by their lack of nodes on the innermost whorls. Our form also resembles a specimen from Puale Bay figured by Imlay (1981, pl. 1, fig. 2) as *Psiloceras* cf. *planorbis* that differs in being more evolute.

Franziceras? sp. (Fig. 4M)

Four crushed specimens from Levels 8, 10, and 11 show moderately evolute coiling and simple, straight, rectiradiate ribs with rounded profile that fade approaching the ventro-lateral margin. Stratigraphically unbiased identification of such simple forms at the given state of preservation is difficult. Similar morphologies occur among early Hettangian *Psiloceras* (especially *P. polymorphum* Guex) and *Caloceras* (especially *C. peruvianum* Lange, see Tilmann, 1917, pl. 22, fig. 2-3, and Riccardi et al., 1991, pl. 4, fig. 3-5, and *C. crassicostatum* Guex, 1995, pl. 5, fig. 1, 2, 5-10), middle Hettangian *Franziceras* (e.g., *F. ruidum* Buckman), and the late Hettangian *Sunrisites*. The specimen with the best preserved nucleus shows tuberculate innermost whorls, a common feature of *Franziceras* (e.g., *F. coronoides* Guex (Guex, 1989; Guex, 1995)) and *Psiloceras* but not in *Caloceras* or *Sunrisites*.

Kammerkarites ex gr. *megastoma* (Gümbel) (Fig. 4R)

A single large body chamber fragment was recovered from Level 3. The entire specimen would have a diameter of about 30 cm and it shows straight, slightly prorsiradiate ribs that fade above mid-flank.

Several species of *Kammerkarites* have similar morphology at a comparable diameter. These include *K. megastoma* (e.g., Guérin-Franiatte, 1990, pl. 12, fig. 4), *K. longipontinum* (Oppel) (e.g., Guérin-Franiatte, 1990, pl. 15, fig. 2, Riccardi et al., 1991, fig. 4/7-8), and *K. armanense* (Repin) (Repin, 1988, pl. 1, fig. 7). *K. haploptychus* (Wähner) is also closely related, but it differs in its ribs persisting higher on the upper flank (e.g., Wähner, 1882, pl. 17, fig. 1-5, Guex, 1995, pl. 15, fig. 1-2).

Kammerkarites? cf. *frigga* (Wähner) (Fig. 4B, E, F, H)

Several tens of mostly crushed specimens of *Kammerkarites* cf. *frigga* were collected as the most common ammonoid in the basal part of the Jurassic section (Levels 1, 4-8, and 10-11). Their size does not exceed 30 mm in diameter. The shell is evolute and strongly costate, the ribs are projected forward near the ventro-lateral margin. This form was identified as *Waehneroceras* cf. *W. tenerum* by Imlay (1981, p. 30, pl. 2, fig. 1-6). *W. tenerum* is abundantly illustrated from the middle Hettangian of Nevada (Guex, 1995, pl. 10, fig. 21-42) where it is said to be identical to the material from its type locality in the Eastern Alps (e.g., figured under *Teneroceras* in Lange, 1952, pl. 12, fig. 1-16). The Alaskan specimens differ in their sharper rib profile and more pronounced forward projection of ribs.

A closer comparison can be made to *K. frigga*, known from the middle Hettangian Megastoma Zone of the Eastern Alps (Lange, 1952; Wähner, 1882-1898), Western Carpathians (Rakús, 1993), and Nevada (Guex, 1995). Also comparable are several specimens from the South American Middle Hettangian Reissi Zone which were referred to *Storthoceras* sp. (Hillebrandt, 1990, pl. 3, fig. 16-18) and *Curviceras* sp. (Hillebrandt, 1994, pl. 1, fig. 3).

Strongly resembling the Alaskan *K.* cf. *frigga* are specimens from northeast Siberia figured as *Primapsiloceras primulum* Repin (Polubotko and Repin, 1972, pl. 1, fig. 1-2, especially fig. 2). It was suggested that this species represents a basal Jurassic horizon below the Planorbis Zone (Repin, 1988), a claim refuted by Guex and Rakús (1991) who showed that *Primapsiloceras primulum* can be regarded as a juvenile or microconch *Kammerkarites*, consistent with a reassignment of *Psiloceras suberugatum*, an index ammonite from higher levels in northeast Siberia, to *Pleuroacanthites*.

Lytoceratid indet. (Fig. 4K)

Only one quarter of a body chamber of a large specimen (D > 13 cm) is available from Level 14. Only faint, irregular ribbing is seen together with widely spaced flares, one of which terminates in an indistinct node.

Mullerites cf. *pleuroacanthitoides* Guex (Fig. 4N, O)

This species is described in detail by Guex (1980; 1995). The larger of the two Alaskan specimens from Level 11 clearly shows a change in ribbing style from straight and rectiradiate to aborally curved and possesses several fine, broadly parabolic striae superimposed on ribs of the same trajectory. An apparent increase exists in the expansion rate of the last whorl of the Alaskan specimen, a change not seen in the Nevadan type material. It may be the result of post-depositional distortion and differential preservation of the body chamber.

Paracaloceras cf. *rursicostatum* Frebold (Fig. 5C, J)

A few poorly preserved fragments from Level 18 and a float specimen show evolute coiling, carinate-bisulcate venter, and coarse, dense, rursiradiate ribbing that suggest comparison with *P. rursicostatum*, a common species at numerous other localities thoughout the East Pacific realm.

Pleuroacanthites ex gr. *mulleri* Guex (Fig. 4L)

A single specimen of small size (D = 20 mm) from Level 9 shows highly evolute coiling, well-developed nodes on the innermost whorls and irregular ribbing interspersed with prominent parabolic nodes between shell diameters of 10 and 20 mm, consistent with its assignment to *Pleuroacanthites.*

Similar sized specimens of *P. mulleri* Guex, known only from the middle Hettangian of Nevada, bear strong resemblance to the Alaskan specimen (Guex, 1995, p. 43, especially pl. 24, figs. 5-6 and 11-12). The Alaskan form is also close to small specimens of *P. biformis* (Sowerby) from the Megastoma Zone of Austrian Alps (Lange, 1952, p. 93, pl. 11, fig. 4; Wähner, 1894, especially pl. 5, figs. 3-6), and the Hettangian of West Carpathians (Rakús, 1993, p. 13, pl. 6, fig. 7). Distinction between *P. mulleri* and *P. biformis* is based on features of the adult body chamber (Guex, 1980; Guex, 1995) which is not preserved in our specimen.

Psiloceratid indet. (Fig. 4P, Q)

One specimen from Level 9 appears very similar to Imlay's (1981, pl. 1, fig. 2) *Psiloceras* cf. *planorbis*. It shows strongly nodose inner whorls, a feature common to *Psiloceras*, *Pleuroacanthites*, and other psiloceratids (Guex, 1995).

Saxoceras? ex gr. *portlocki* (Wright) (Fig. 4I)

Three incomplete, crushed internal molds from Levels 6 and 7 differ from *K.* cf. *frigga* in their higher whorl and nearly straight, rectiradiate ribbing. Such forms from Puale Bay were previously referred to *Waehneroceras portlocki* by Imlay (1981, pl. 2, fig. 7, 10-11, 14-15). Several closely related species, such as *S. extracostatum* (Wähner) and *S. panzneri* (Wähner), are known from the Eastern Alps. According to Donovan (1952) and Imlay (1981), the first species is a possible synonym of *S. portlocki*. We note that the latter species (illustrated in Wähner, 1882, pl. 15, fig. 1-2; Lange 1952, pl. 16, fig. 12-14) is closer to our form in its high whorls. There may be a continuum of whorl height distribution and species distinction on this basis would remain arbitrary. A recent

treatment of the *portlocki* species group from France by Guérin-Franiatte (1990) includes "*Waehneroceras*" *prometheus* (Reynès) (lectotype refigured by Guérin-Franiatte (1990, pl. 12, fig. 2)) which our form also closely resembles. Assignment of these species to *Saxoceras* follows Guex (1995, p. 35).

Saxoceras? sp. (Fig. 4G, J)

This form, occurring in Levels 4, 6, and 8, is distinguished from other representatives of *Saxoceras* and/or *Kammerkarites* by its marked coarsening of ribbing on the body chamber. Two specimens from Puale Bay figured by Imlay (1981, pl. 2, fig. 12, 13) as *Waehneroceras* cf. *portlocki* closely match our form but clearly differ from similar-sized specimens which do not show an abrupt change in rib density. A specimen from the Eastern Alps figured by Wähner (1882, pl. 16, fig. 1) as *Aegoceras* n. f. indet., cf. *extracostatum* shows abrupt coarsening of ribs although at somewhat larger diameter. Guérin-Franiatte (1990) mentions some change in ribbing of "*Waehneroceras*" *portlocki* but it appears to be less pronounced than in the Alaskan form. This form may be a new species but better preserved material is needed for a definitive treatment.

Sunrisites? sp. (Fig. 5A, B)

A single specimen from Level 16 shows evolute coiling and coarse, blunt, rectiradiate ribbing. It is morphologically similar to *Franziceras*? sp. discussed above, although they are clearly separated stratigraphically and occur within different ammonite assemblages. The lack of tuberculation of the inner whorls serves as a distinguishing feature. The ribs are less flexuous and more widely spaced than in *S. sunrisense* Guex or *S. hadroptychum* (Wähner). Reasonable comparison can be made with *S. peruvianum* (Lange) that was originally assigned to *Caloceras* but is now placed within *Sunrisites* based on its stratigraphic position within the upper Hettangian (Hillebrandt, 1994). Two specimens figured as *Psiloceras* (*Franziceras*) sp. from northern Alaska by Imlay (1981, pl. 1, fig. 11, 15-16) were assigned to *Sunrisites* by Guex (1995) and are close to the Puale Bay specimen differing only

by their rectiradiate ribbing trend. Comparable coarse ribbing also occurs in Nevadan specimens referred to *Alsatites nigromontanus* (Gümbel) (Guex, 1995). The latter species is said to show transitional forms towards *Sunrisites* (Waehner, 1886, Guex, 1995).

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