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SYNONYMY OF THE FOSSIL WOMBAT *VOMBATUS PLIOCENUS* (McCOY) WITH THE LIVING SPECIES *VOMBATUS HIRSUTUS* (PERRY)

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Abstract

The type specimens of the fossil wombat species *Vombatus pliocenus* (McCoy) are redescribed, and evidence presented for synonymy of this species with the living Common Wombat, *Vombatus hirsutus* (Perry). It is demonstrated that McCoy's description of this species was based principally on a specimen from Lake Bullenmerri of Holocene age. It is concluded that acceptance of the validity of this species has been strongly influenced by the presumed Pliocene age of the type specimen from Dunolly. The sediments from which this fossil came may be as old as Late Miocene, but it is suggested that the fossil could have been an intrusive burial.

Introduction

The discovery of a fossil wombat jaw at Dunolly in 1856 caused considerable interest, and some newspaper publicity, but it was not until 1861 that the fossil was recorded in the scientific literature by Professor Frederick McCoy. He said (p. 168) 'I have likewise recognised the bones of the Wombat (Phascolomys) in the solid, hard, stony, ferruginous, auriferous drift called "cement" by the gold diggers, at a great depth in the sinkings at Dunolly, the material being so hard that the jaws could only be cleared by a stonemasons chisel; this determination enables me to say that the age of the gold drift of Victoria, like that of Russia, is as Sir Roderick Murchison showed for the latter country, that of the "Mammiliferous crag" of England'.

McCoy named the fossil *Phascolomys pliocenus* in an essay for the Intercolonial Exhibition of 1866, the first printing of which appeared in a French translation in 1866, but it was not until 1874 that a full description and illustrations appeared in the first decade of his *Prodromus of the Palaeontology of Victoria*. The occurrence of this fossil wombat was quoted by authors such as Barkly (1869) and Smyth (1874, 1876) as the chief evidence for the Pliocene age of the gold drifts. It was referred to by Howitt (1913) and Walcott (1920) mentioned the occurrence in a paper on the age of the mammal bearing gold drifts of Australia. It was listed in the fossil catalogue prepared by Etheridge (1878) and illustrated in *Australasian Fossils* (Chapman, 1914). Tate (1951) accepted the species as valid when he reviewed the family Vombatidae, and placed it in the genus *Vombatus*, a generic determination accepted by Stephenson (1967) in a later review. Gill (1972) presented evidence for a probable Upper Pliocene age for the Dunolly fossil wombat, and briefly reviewed the circumstances of its discovery, and the literature concerning it.

The validity of the species has never been called into question, at least as far as the literature is concerned, and the name has been applied to several other fossil wombats of varying age from Victoria. The significance of the type specimens from Lake Bullenmerri has not previously been recognized. As part of a review of the family Vombatidae, the author has made a careful examination of the type specimens. Comparisons have been made with living and fossil wombats of comparable size to the living species. All the specimens referred to are in the collection of the National Museum of Victoria, and are numbered with the prefix P.

Provenance and age of the Type Specimens

P7422, DUNOLLY, VICTORIA.

The earliest known reference to the Dunolly fossil wombat is in *The Courier of Mines and Bendigo Daily Mail* of 30 September 1856, No. 253, p. 2, col. 6, in which a Mr Ferguson of the firm of Dennis and Ferguson at Dunolly reported the discovery of a jaw bone in cement at 30 feet. (Cement was the miners' term for silicified or ferruginized gold bearing conglo-

merates). In the same journal on 8 October 1856, No. 260, p. 4, col. 1, there is a report of Warden J. A. Panton receiving the fossil at Bendigo, via 'Mr. Dixon of the Shamrock' (Hotel), and mentioning 50 ft. as the depth. Panton thought it to be a kangaroo. Flett (1956, p. 33) records that the fossil was dug up from the hard cement of Gooseberry Hill, and displayed for a time in the window of Mantell and Wills, gold brokers at Dunolly, but does not cite the source of this information.

Panton forwarded the specimen to Melbourne, but the details of the acquisition are not known. The Mining Commission Letterbook at the National Museum contains a copy of a letter from the clerk G. Ulrich to Panton (30 June 1857, p. 34) advising that the Palaeontologist of the Geological Survey (F. McCoy) had determined the fossil as *Phascolomys*, and requesting Panton to provide details of its 'exact position, depth and circumstances'. This information may have been duly provided by Panton, but there is no evidence that it was.

McCoy's earliest reference (1861) gives the locality as being 'at a great depth in the sinkings at Dunolly'. The depth is not stated in this, or any other of McCoy's references (1862, 1866, 1868, 1874), nor is a precise locality given. There is now no original label with the specimen, although Walcott (1920) refers to one. A letter written by A. R. C. Selwyn, Government Geologist, to the Editor of *The Age*, published on 28 February 1861, includes a quotation from this label 'Phascolomys. From the "cement" of the gold drifts of Dunolly, 30 feet deep. Pliocene tertiary. Presented by Mr Panton'. (This letter was written to refute a claim by R. Brough Smyth that kangaroo fossils found in Canard's claim at Yandoit in 1861 were the first which would enable the age of the auriferous deposits to be determined).

Gill (1972) stated that the fossil came from a depth of 50 feet (15 metres) at the bottom of a shaft on Slaughteryard Hill, Dunolly. This locality was given by W. H. Ferguson in an unpublished MS on Dunolly. Gill was aware that Flett (1956) had quoted Gooseberry Hill as the locality, but thought that this was an alternative name for Slaughteryard Hill. The position is further complicated by the fact that the shaft he was shown is actually on Spiller's Hill, as is made clear by comparing the sketch plan provided for him by Mr John Flett of Dunolly, with the Geological Parish Plan of Dunolly. Mr James Flett has been unable to relocate the source of his Gooseberry Hill reference, and no other contemporary references to the site have been located, despite an intensive search (T. A. Darragh, pers. comm.).

The question of exact locality is largely academic, since all three hills are essentially similar in their geological formation. They are part of a line of hill top cappings of Upper Tertiary gravel deposits, which extend from Goldsborough to Betley, paralleling the present day Burnt Creek. Gooseberry Hill is at the western end, followed by Spiller's Hill, and Graveyard Hill with Slaughteryard Hill at the eastern end. The gravels overlie tightly folded Lower Ordovician bedrock, into which the ancestral Burnt Creek was incised. Lithification of these old river gravels has left them more resistant to erosion than the surrounding bedrock, and they now stand in low relief above the valley of Burnt Creek.

Gill (1964) presented evidence for an Upper Pliocene or Lower Pleistocene age for the Dunolly wombat. This was based on its alleged presence in post-Timboon Terrain stream sediments, which had accumulated following the main movements of the Plio-Pleistocene Kosciusko Uplift.

The gravels at Dunolly are equivalent to the White Hills Gravels at Bendigo (Wilkinson, 1977) and like them consist essentially of quartz gravel, which contained rich concentrations of alluvial gold. (The fossil was found during the Burnt Creek rushes of the mid 1850s). Similar gravels at Axedale, about 20 km east of Bendigo, underlie a basalt flow recently dated at 6·95 ± 0·7 m.y. (Department of Minerals and Energy sample VAD 56, Amdel). This puts a minimum age of Late Miocene on these gravels. P.G. Macumber (pers. comm.) considers that the White Hills Gravels and their correlatives are equivalent to the Calivil Formation of the Deep Leads and Murray

Basin. Palaeontological evidence is consistent with a Late Miocene age for this formation also.

The Tertiary age of the sediments is not in doubt, but there is the possibility that the fossil may be intrusive. Living wombats burrow extensively, and burrow lengths of up to 20 m are known. Quite a few fossil wombats are known to be intrusive, and to represent individuals trapped in burrow collapses. An example is a fossil wombat skeleton recovered from a burrow in marine fossiliferous marl at Modewarre near Geelong in 1884 (P1917). In this case the marl is Upper Miocene in age, but the fossil is unlikely to be much older than Late Pleistocene. Although McCoy identified it as *pliocenus*, it is in fact *Vombatus hirsutus*.

The gravels at Dunolly are only partially lithified at depth, and would have represented no great obstacle to a burrowing wombat. If it were absolutely certain that the fossil came from the stated depth, this explanation might be argued against on the grounds that no living wombat has been known to burrow so deep. However, the circumstances surrounding the discovery of the fossil are almost totally unknown, and there is conflicting evidence as to locality and depth. The fossil certainly has an appearance of some antiquity, because of the encrusting matrix, but this can be matched on fossil wombats which are known to be geologically much younger than the gravels at Dunolly. For example, there is a partly matrix encrusted mandible from the ?Upper Pliocene-Pleistocene Shepparton Formation at Bung Bong near Maryborough, Victoria (P7420) which shows some strong similarities to the Dunolly specimen in the degree of mineralization and lithification of matrix. This specimen was collected in 1875, and was also determined by McCoy as *pliocenus*. It too is referrable to *Vombatus hirsutus*.

P7441, P7442, LAKE BULLENMERRI, NEAR CAMPERDOWN, VICTORIA.

The specimens from Lake Bullenmerri are very lightly mineralized, and free of carbonate encrustation. They are typical of fossils which have been collected from the shores of Lake Bullenmerri since the early days of settlement. The Lake Bullenmerri fauna consists of extant species, although this does include *Sarcophilus ursinus* (Tasmanian Devil) now extinct on the mainland. Gill (1953) pointed out that all the Western District post-tuff faunas he had examined contained extant species only, including Lakes Bullenmerri, Gnotuk and Keilambete. Lake Bullenmerri formed in the Holocene period, and the fossils are not likely to be more than a few thousand years old, and may be much younger. The latter possibility is supported by observation of the rapidity with which bones of domestic animals on the shores of Lake Bullenmerri have become mineralized in the 130 years or so of European occupation. The fossil bones are being washed up on the present beach level, presumably from erosion of an earlier terrace below present water level.

No information is recorded of the circumstances involved in the collection of the specimens. McCoy (1874) stated that they were 'From the shores of Lake Bullenmerri near Camperdown'. The drawing used in the *Prodromus* was completed in 1862, and it appears probable that the specimens were collected by Selwyn when he visited Lake Bullenmerri (T. A. Darragh, pers. comm.).

Selection of Lectotype and Lectoparatypes

Gill (1953) listed the type specimens of *pliocenus* as syntypes. Mahoney and Ride (1975) list the Dunolly specimen as the holotype, although McCoy did not designate a type specimen in his 1866 description, nor was there any illustration. It is known that Plates 3-4 of his 1874 description were completed by Ludwig Becker in 1858, and Plate 5 was completed by A. Bartholomew in 1862. It is clear therefore that McCoy had all three specimens to hand when he published the first brief description in 1866. The one character which he offered as a diagnosis of his new species cannot be measured on the Dunolly specimen, although a rough estimate can be made. It seems rather unlikely that McCoy based his new species on the Dunolly specimen alone, even though it is the only one referred to by locality.

It is therefore proposed to designate P7441 from Lake Bullenmerri as the Leetotype. This is the only one of the three speeimens used by MeCoy on whieh his key diagnostic character is adequately preserved (see below), and the evidenee that he used this speeimen in 1866 is very strong. P7442 from Lake Bullenmerri, and P7422 from Dunolly are designated as Leetoparatypes. The name *pliocenus* is therefore fixed on the best preserved speeimen, whieh shows the one diagnostie feature given by MeCoy in 1866, and all the additional features given in 1874.

Systematic Description

Order	Marsupialia
Family	Vombatidae Iredale and Troughton 1934
Genus	*Vombatus* Geoffrey 1803
Type speeies	*Vombatus ursinus* (Shaw) 1800

Vombatus pliocenus (McCoy) 1866

(Plate 1, figures 1, 4. Plate 2, figures 1-2)

Phascolomys pliocenus McCoy, 1866. *Notes sur le zoologie et la palaeontologie de Victoria*: 21-22.

Phascolomys pliocenus McCoy, 1874. *Prod. Pal. Vict.* Dec. 1: 21-22, Pls. 3-5.

Vombatus pliocenus (McCoy) Tate, 1951. *Am. Mus. Novitates* No. 1525: 5.

1. Leetotypc: P7441. Pl. 17, figs. 3-4. Incomplete mandible with ineisors, diastemal region and left ramus with $p\overline{4}$-$m\overline{4}$ preserved.
   Locality: From shore of Lake Bullenmerri, Camperdown, Vietoria. Collected prior to 1862.
   Age: Holocene.
2. Leetoparatype: P7442. Pl. 17, figs. 1-2. Ineomplete mandible with incisors and right molar row preserved, minus $m\overline{4}$.
   Locality: From shore of Lake Bullenmerri, Camperdown, Victoria. Collected prior to 1862.
   Age: Holocene.
3. Material: Lectoparatype: P7422. Plate 18, figs. 1-2. Almost complete mandible with both molar rows preserved, but the incisors obscured by matrix.
   Loeality: From a depth of either 30 or 50 feet (9·1 or 15·2 metres) in an alluvial shaft on either Gooseberry or Slaughteryard Hill, near Burnt Creek, Dunolly, Vietoria. Colleeted in 1856, and presented to National Museum by J. A. Panton. (See diseussion above).
   Age: The eontaining sediments are probably Late Mioeene in age, but the fossil may be intrusive and therefore younger.

Descriptions and Comparisons

The leetotype speeimen from Lake Bullenmerri (P7441) is a ligtly mineralized ineomplete mandible, free of enerusting matrix. The right ramus is well preserved, with a complete molar row. The diastemal region has lost some of its bone, but both ineisors are preserved. The premolar and first molar of the left ramus are also preserved, but the remainder has broken away. The teeth are near perfeet in preservation.

The leetoparatype from Lake Bullenmerri (P7442) is an ineomplete mandible, with most of the left ramus missing. It is less complete on the right side, and $m\overline{4}$ is missing. It is better preserved in the diastemal region than P7441.

The leetoparatype speeimen from Dunolly (P7422) is an almost complete, partly matrix encrusted, heavily mineralized mandible. The left ramus has been freed of matrix, but the outer side of the right ramus, and the incisor region are still encrusted with a ealcareous, ferruginous, silty matrix. Both molar rows are present, but all the oeelusal surfaees are hollowed out. The left ascending ramus is preserved, but the right is missing. The fossil was originally very nearly complete, but appears to have been damaged during the attempt to clear it of matrix.

All three mandibles have in common features which elearly show that they belong to the genus *Vombatus*. These include the V-shaped inter-lobe valleys of the molars, the obliquely set, antero-posteriorly elongated premolars, and the position of the anterior root of the eoronoid opposite the anterior lobe of $m\overline{4}$.

MeCoy recognized that *pliocenus* was eom-

parable to the living *'Phascolomys platyrhinus'* (= *Vombatus hirsutus*) in size, position of symphysis and 'the whole length of the dental series from edge of incisor to hind alveolus of last molar'. He claimed that his new species could be '. . . easily distinguished by the great size of the molar series, these teeth being not only larger transversely, occupying a longer fore and aft space, but extending so very much nearer to the edge of the incisors as to afford an easy mode of discriminating the species'. He laid great stress on the comparatively short diastema between the incisor and premolar, although this region is obscured by matrix in the Dunolly specimen. He also differentiated *pliocenus* on the basis of 'the lower outline of the mandible being rounded with a more uniform curve'; diastema being narrower between the molars; 'outlet of dental canal' (mental foramen) being closer to the 'anterior molar' (premolar) and the incisors being more nearly equal in vertical and transverse diameters.

Comparison by McCoy with other fossil wombats was confined to *Vombatus mitchellii* (Owen) from which McCoy stated that *pliocenus* differed in having much larger molars, and in the symphysis extending further back. It has been shown elsewhere (Wilkinson, 1973; in prep.) that Owen's concept of *mitchellii* included specimens of *Lasiorhinus krefftii*. The differences in position of the symphysis and size of molars referred to by McCoy are in fact features of generic distinction between *Vombatus* and *Lasiorhinus*.

Examination of the characters regarded by McCoy as diagnostic of *pliocenus*, with comments on their validity

(a) *'Great size of the molar series'*

The length of the alveoli of $p\overline{4}$ to $m\overline{4}$ in the type specimens is 55·9 mm in P7422, 56·2 mm in P7441 and 56·1 mm in P7442. The author has measured a specimen of *V. hirsutus* with an alveolar length from $p\overline{4}$ to $m\overline{4}$ of 57·2 mm, but even this is exceeded by the largest specimens in the sample examined by Merrilees (1967, Figs. 1 and 2), which reach about 58 mm. The *pliocenus* types all fall well within the range of variation in *V. hirsutus* in this feature.

(b) *Ratio of length of molar row to 'whole length of dental series'*

McCoy stated that the ratio of the length of $p\overline{4}$ to $m\overline{4}$ to the 'whole length of the dental series from hind edge of last molar alveolus to front edge of incisor 'was 55:100 in *pliocenus* but only 45:100 in *platyrhinus* (= *hirsutus*). In effect he was saying that the living species had a relatively shorter molar row and longer diastema than the fossil. This is the feature on which he laid greatest stress, and claimed that it gave '. . . an easy mode of discriminating the species'. This was tested by measuring the same characters on specimens of *Vombatus hirsutus* and expressing the result as a percentage, for comparison with the percentages obtained from the types. In P7422, the incisors are damaged, and matrix obscured, and the ratio can only be estimated. The length from the tip of $I\overline{1}$ to posterior alveolus of $m\overline{4}$ is estimated to have been about 100 mm, and the percentage of the order of 54 to 56%. In P7441 the corresponding figures are 101·9 mm and 55·5% and in P7442 they are 103·0 mm and 54·5%. The range in a sample of specimens of *V. hirsutus* examined by the author was 95·8 to 112·7 mm and the percentages range from 51·7% to 54·7%. Although the percentage figure for P7441 is slightly higher, overlap between *pliocenus* and *hirsutus* in this feature is demonstrated, and McCoy's claim of an easy distinction is therefore invalid. No *hirsutus* specimen with a percentage as low as 45% has been seen by the author.

(c) *Diastema narrower between the molars*

McCoy measured the distance between the posterior lobes of the 'second molar' or $m\overline{1}$, to support his contention that 'the diastema is narrower between the molars'. In P7422 this is 24·5 mm; in P7441 it is estimated to have been 20·5 mm, and in P7442 it is 19·4 mm. In modern *V. hirsutus* the range is from <18 mm to >28 mm. Once again, the *pliocenus* types fall within the range of variation of the living species.

(d) *Shorter diastema*

McCoy claimed that the diastema was 'much shorter in the fossil'. This was tested by measuring the length of the diastema between $\underline{p4}$ and $\underline{I1}$. In P7422 this is estimated to have been about 27 mm, in P7441 it is 30 mm and in P7442 it is 29 mm. In a small sample of modern *V. hirsutus*, the diastema varied from 26·3 mm, to 32·6 mm. The *pliocenus* types therefore fall completely within this range.

(e) *'Lower outline of the mandible rounded with a more uniform curve'*

This is a subjective judgement, difficult to quantify. However it follows that specimens with a relatively short diastema will tend to look more uniformly rounded, whereas long diastema mandibles tend to have the lower outline more elongated and angular. It is a variable feature of very dubious value for specific distinction.

(f) *Anterior outlet of 'dental canal' (= mental foramen) closer to 'anterior molar' (= premolar).*

This feature is not visible on P7422, but in P7441 the mental foramen is 5·3 mm from the premolar, and in P7442 the distance is 4·0 mm. This is a very variable feature, which varies from as little as 4 mm to in excess of 8 mm in living *V. hirsutus*. The *pliocenus* types P7441, P7442 are within the range of variation in this feature also.

(g) *Greater compression of incisors*

Examination of a large range of specimens makes it clear that incisor cross section is rather variable in *V. hirsutus*. The difference between P7441 and P7442 in this regard is typical of the degree of variation. Incisor cross section cannot be determined on the Dunolly specimen, P7422. Height expressed as a percentage of width is 74·4% in P7441, and 87·2% in P7442. In modern *V. hirsutus*, the range observed is from 70% to almost 100%. The figures calculated for the types of *pliocenus* fall within this range.

The type specimens of *pliocenus* fall within the range of variation of *Vombatus hirsutus* in all the features regarded by McCoy as diagnostic of his new species. He was probably influenced by his belief that all three specimens belonged to the extinct fauna, and the number of comparative specimens of the living species available to him was no doubt very limited. He could hardly have been aware of the degree of variability in *Vombatus hirsutus*. Merrilees (1967) stated that 'Variability is a striking characteristic of modern wombats', and gave details of the abnormalities encountered in 35 out of 52 individuals in the sample examined by him from Dingo Dell—'Fairbank', A.C.T. This was a breeding population, in which variation would be expected to be lower than in the species as a whole.

Other fossil species of *Vombatus* are in doubt for the same reason. Merrilees (1967) has already shown that *Vombatus parvus* (Owen) is a juvenile *V. hirsutus*, and it is almost certain that the same is true of *V. thompsoni* (Owen). Owen's fossil species *V. mitchellii* is based partly on specimens of *Lasiorhinus krefftii* (Wilkinson, 1973). The status of these species is currently under review (Wilkinson, in prep.), and preliminary studies suggest that *Vombatus mitchellii* may also be synonymous with *hirsutus*, although possibly subspecifically distinct. The only other fossil species of *Vombatus* is *V. hacketti* described by Glauert (1910) from Western Australia. It is readily distinguished from the *pliocenus* types and *V. hirsutus* by its narrower molars with more rounded lobes.

Given the degree of variability in modern *V. hirsutus* and the doubtful status of most of the fossil species of *Vombatus*, the conclusion seems inescapable that *Vombatus pliocenus* (McCoy) is a junior synonym of *Vombatus hirsutus* (Perry).

Conclusion

All the diagnostic features given by McCoy in defining *pliocenus* have been carefully examined, and found to be invalid. No other character is evident on any of the types which would warrant their specific separation from *hirsutus*. The lectotype and lectoparatype from Lake Bullenmerri are of Holocene age, and there can be no doubt that they represent the living species. The lectoparatype specimen

from Dunolly cannot be differentiated from *hirsutus* either, although acceptance of *Vombatus pliocenus* McCoy as a valid species appears to have been strongly influenced by its presumed Pliocene age. It has been shown above that this is an assumption which is not supportable by direct evidence, and the possibility of the fossil being intrusive, and therefore younger, must be considered. If it is contemporary with the sediments, then this has important implications for studies of wombat speciation. It could be argued for example that *Vombatus* evolved in the late Miocene, and that the mandible has remained virtually unchanged since then, although other elements of the skeleton might show significant differences. Until better material of known age and provenance becomes available, this cannot be resolved, and it is better to regard the Dunolly specimen in the same light as the Lake Bullenmerri specimens. That is, *Vombatus pliocenus* (McCoy) is a junior synonym of the rather variable modern species *Vombatus hirsutus* (Perry).

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Explanation of Plates

PLATE 17

Vombatus pliocenus (McCoy)

Figure 1—Labial view of lectoparatype, left mandible P7442 from Lake Bullenmerri, Victoria; Holocene.

Figure 2—Occlusal view of same specimen.

Figure 3—Labial view of lectotype, left mandible P7441 from Lake Bullenmerri, Victoria; Holocene.

Figure 4—Occlusal view of same specimen.

PLATE 18

Vombatus pliocenus (McCoy)

Figure 1—Labial view of lectoparatype mandible P7422 from Dunolly, Victoria; ? Late Miocene.

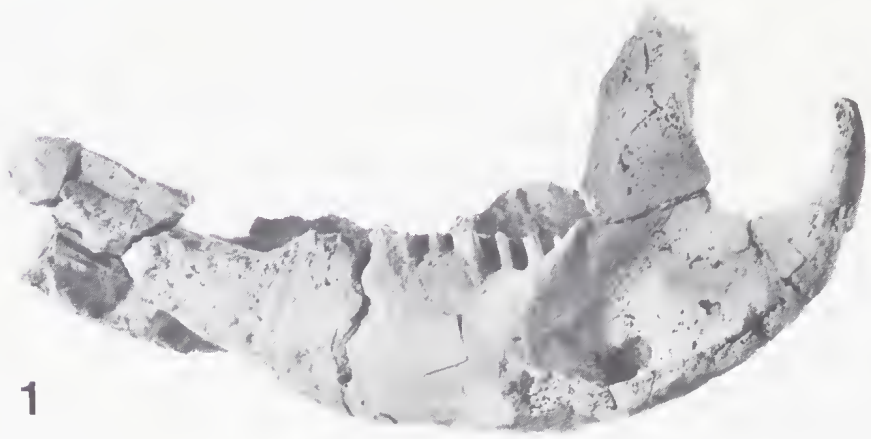
Figure 2—Occlusal view of same specimen.
(All specimens ¾ natural size)

1

2

3

4



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