

The potential utility of postnatal skeletal developmental patterns in squamate phylogenetics

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Postnatal patterns of skeletal development, including the sequence of appearance of ossification centres and the distribution of sesamoids, appear to be highly conserved species-level phenomena in squamates. As such, they are a potential source of characters for phylogenetic inquiry. These patterns, from 21 species representing 14 crown squamate clades, form the basis for two analyses. In the first, the sequence of postnatal skeletal events is coded as characters using the sequence unit approach. This analysis reveals that the sequence of postnatal skeletal events might be useful for determining relationships at or above the level of crown clades, but not among them. The second analysis utilizes discrete data from postnatal skeletal development, such as the presence/absence of sesamoids and the number of secondary centres in epiphyseal cartilages. These discrete data appear capable of recovering the deeper divergences within Squamata, but evolve too slowly to be informative at the level of crown clades. Thus, patterns of postnatal skeletal development have the potential to help illuminate relationships throughout the squamate tree. Further progress in this area will require the examination of additional squamate species, the exploration of alternative coding schemes for developmental sequences, and comparable postnatal data for *Sphenodon*. © 2002 The Linnean Society of London, *Zoological Journal of the Linnean Society*, 2002, 136, 277–313.

ADDITIONAL KEYWORDS: ontogeny – ossification centre – secondary centre – sequence unit – sesamoid – Squamata

INTRODUCTION

There is increasing awareness of the importance of an ontogenetic perspective in the formulation of phylogenetic hypotheses (e.g. de Queiroz, 1985; Arnold, 1996; Crawford & Wake, 1998; Striedter, 1998; Catania, Northcutt & Kaas, 1999). There is also a growing desire for more, different 'kinds' of characters to include in total evidence analyses (e.g. Smith & Littlewood, 1994; Sites *et al.*, 1996; Gatesy, O'Grady & Baker, 1999). The recognition of ontogeny as relevant to the coding of adult characters (e.g. Wheeler, 1990; Novacek, 1991; Arnold, 1996) as well as ontogenetic transformation as a potential source of new characters (e.g. Yoder, 1992; Vecchione, 1998) makes the study of ontogeny more timely than ever.

Previous ontogenetic studies of squamates (e.g. Werner, 1971; Bellairs & Kamal, 1981; Shubin & Alberch, 1986) focused almost exclusively on prenatal morphogenesis – the formation of the membranous

and cartilaginous skeletal precursor – rather than pre- and especially postnatal patterns of osteogenesis – the subsequent mineralization of that precursor. This is unfortunate, as several distinctive characteristics of this clade do not develop until after hatching or birth. First, squamates exhibit epiphyseal cartilages that ossify from discrete ossifications called secondary centres (Dollo, 1884); this may be true of lepidosaurs generally, as secondary centres are present in *Sphenodon* (Dollo, 1884) and *Sapheosaurus* (Fuchs, 1908), a Jurassic sphenodontidan or rhynchocephalian (Gauthier, Estes & de Queiroz, 1988). Second, the squamate skeleton contains a large number of sesamoids, small bones that occur in tendons and ligaments and serve to protect these connective tissues from excessive wear due to the flexion and extension of joints (Haines, 1969); again, this may be true of lepidosaurs generally as several sesamoids occur in *Sphenodon* (Howes & Swinnerton, 1901). Only one sesamoid occurs in turtles (Ray, 1959), one in birds, and none in crocodilians (Haines, 1969). Finally, extensive calcification of cartilages is a pervasive phenomenon in squamates (Moodie, 1908) and may be diagnostic of lepidosaurs generally (Gauthier *et al.*,

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1988). For the most part, these distinguishing attributes – secondary centres, sesamoids, and calcified cartilages – do not begin to mineralize in squamates until after hatching or birth (Maisano, 2001).

There has yet to be an attempt to utilize postnatal skeletal developmental events – the appearance of ossification centres and secondary centres, the appearance of calcification in cartilages, the appearance of apophyseal ossifications (surficial ossifications that mark the insertion of muscles or connective tissues (Haines, 1942)), the onset of skeletal fusions – in a phylogenetic analysis of squamates. The objective of this investigation is to subject such data to two phylogenetic analyses: the first utilizes the sequence of appearance of events in postnatal ontogeny; the second utilizes discrete characteristics of those events, such as the number of secondary centres in each epiphysis and the presence/absence of sesamoids. The results of both analyses are compared with phylogenies derived by other workers from more traditional morphological data in order to ascertain whether patterns of postnatal skeletal development might be phylogenetically informative in this clade.

MATERIAL AND METHODS

Species were selected for study based on several criteria. The main objective was to sample as many crown squamate clades as possible; the 21 species investigated represent 14 crown clades (Fig. 1). Within each crown clade an attempt was made to select species that are generally considered basal, in order to shorten branch lengths thereby closely bracketing

ancestral nodes. Another criterion was the availability in the literature of data on hatchling size and maximum size to ensure complete or nearly complete sampling of each species' postnatal size range. The final and most compulsory criterion was the relative abundance of each species in major American herpetological collections, from which specimens were borrowed for clearing and staining.

Densely sampled growth series of each species were constructed (Appendix 1), across genders and localities, based on the snout–vent length (SVL) of individuals; all references to size herein refer to SVL. Specimens were measured to the nearest 0.1 mm using digital calipers and cleared and double-stained following a modified version of the protocol of Pothoff (1984).

All analyses were conducted in PAUP* version 4 (Swofford, 1999) using the branch-and-bound search algorithm (Hendy & Penny, 1982).

Institutional abbreviations are as follows: ASU, Arizona State University; CAS and CAS-SU, California Academy of Sciences; CM, Carnegie Museum of Natural History; KU, University of Kansas Museum of Natural History; JAG, personal collection, Jacques Gauthier, Yale University; LACM, Los Angeles County Museum of Natural History; MVZ, Museum of Vertebrate Zoology, University of California, Berkeley; SDNMH and LMK, San Diego Museum of Natural History; TCWC, Texas Cooperative Wildlife Collection, Texas A & M University; UMMZ and UMFS, University of Michigan Museum of Zoology; USNM, National Museum of Natural History; YPM, Yale Peabody Museum of Natural History.

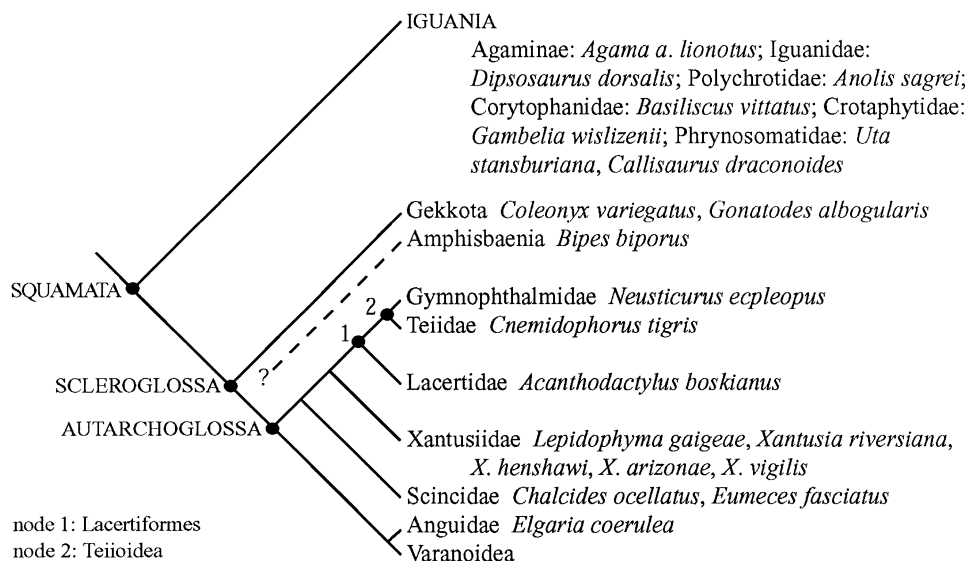


Figure 1. Simplified hypothesis of squamate relationships showing species investigated. Modified from Estes *et al.* (1988) with iguanian nomenclature of Frost & Etheridge (1989).

ANALYSES

INTRASPECIFIC VARIATION

The timing and sequence of postnatal skeletal development in these species is described in detail elsewhere (Maisano, 2000, 2002a, b). Although postnatal skeletal events are not random phenomena (Maisano, 2000), SVL is not perfectly correlated with skeletal maturity in individuals. The term 'disparity' is employed here for departures from the expected occurrence of postnatal skeletal events within a growth series. 'Timing' refers to the absolute timing of an event in ontogeny, whereas 'sequence' refers to an event's position relative to other events (order denoted by '>'). A disparity estimate (Maisano, 2000; Fig. 2) can be calculated for a growth series by dividing the total number of nonoccurrences of events after their initial appearance by the total number of occurrences of all events; if a sequence proceeded in a perfect progression from no events present to all events present, the disparity estimate would equal zero. The disparity estimate will be sensitive to events that appear unusually early in one or two individuals.

Table 1 shows the total number of specimens and the total number of event occurrences for each growth series included in this study, as well as two disparity estimates. The first, percent disparity by SVL

(%DISSVL), is the disparity estimate when specimens are ordered by increasing SVL. This disparity estimate ranges from 1.3 to 14.2%, averaging 7.9%. If *Bipes biporus* is excluded, because virtually all events

	A	B	C	D	E	F	G	H
1	X	X	X		X	X	X	X
2	X		X	X	X	X	X	X
3	X		X	X	X		X	X
4			X	X		X	X	X
5				X	X	X	X	
6					X	X	X	X
7					X	X	X	X
8						X	X	
9					X		X	X
10					X		X	X

$$\text{Disparity estimate} = 9/45 = 20\%$$

Figure 2. Hypothetical example of disparity estimate calculation. Specimens are in columns, postnatal skeletal events are in rows. An X indicates that an event is present in a given specimen.

Table 1 Percent disparity in sequence of postnatal skeletal events when specimens in each growth series are arranged by increasing SVL (%DISSVL) and by increasing skeletal maturity (%DISMAT). Disparity is calculated by dividing the total number of nonoccurrences of events after their initial appearance in a growth series by the total number of occurrences of all events in that growth series (No. events) (Maisano, 2000; Fig. 2)

Species	No. specimens	No. events	%DISSVL	%DISMAT
<i>Agama agama lionotus</i>	23	942	10.5	7.3
<i>Uta stansburiana</i>	33	1781	8.1	4.3
<i>Callisaurus draconoides</i>	43	2446	7.9	4.3
<i>Anolis sagrei</i>	35	1967	8.0	5.0
<i>Basiliscus vittatus</i>	27	868	7.9	6.0
<i>Gambelia wislizenii</i>	25	1217	4.5	3.5
<i>Dipsosaurus dorsalis</i>	29	1374	6.8	4.2
<i>Coleonyx variegatus</i>	24	1083	12.5	5.2
<i>Gonatodes albogularis</i>	25	920	14.9	4.7
<i>Bipes biporus</i>	30	1271	1.3	0.4
<i>Acanthodactylus boskianus</i>	32	1818	4.2	2.3
<i>Cnemidophorus tigris</i>	40	2212	7.2	5.6
<i>Neusticurus ecleopus</i>	22	1065	5.1	3.0
<i>Elgaria coerulea</i>	37	1583	13.0	8.0
<i>Chalcides ocellatus</i>	36	1941	6.0	3.3
<i>Eumeces fasciatus</i>	36	1735	5.6	4.0
<i>Lepidophyma gaigeae</i>	20	879	3.2	2.0
<i>Xantusia riversiana</i>	22	651	11.1	6.6
<i>X. henshawi</i>	27	1035	8.7	7.1
<i>X. arizonae</i>	33	1928	5.0	3.5
<i>X. vigilis</i>	47	1914	14.2	10.1

occur prior to hatching (Maisano, 2000), the disparity estimate ranges from 3.2 to 14.2%, averaging 8.2%.

These growth series are composed of specimens of both sexes and from diverse geographical localities (Appendix 1); both of these factors undoubtedly contribute to the disparity in the absolute timing of postnatal skeletal events in their ontogenies. For example, the 34.3 mm *Gonatodes albogularis* specimen is a male and the 35.1 mm specimen is a female; both are from Bocas del Toro, Panama and are approximately the same size, yet the female exhibits nine more postnatal events than does the male – a difference of 16%. The 28.7 mm *Neusticurus ecleopus* specimen is from Peru, and the 28.9 mm specimen is from Ecuador; both are female and of approximately the same size, yet the Peruvian specimen exhibits seven more postnatal events than does the Ecuadorian specimen – a difference of 19%.

Individual variation in skeletal maturity at a given SVL that cannot be attributed to sexual bimaturation or interpopulational variation is also a component of the disparity documented in this study; this is evident in the *Chalcides ocellatus* series (Appendix 1). The 39.9, 41.7, 42.5, 44.5, 44.9, and 47.9 mm specimens, the 40.7 mm specimen, and the 42.9, 48.0, 49.4, 50.2, and 52.4 mm specimens each represent a partial growth series that was lab-reared under uniform conditions and systematically euthanized at approximately one-week increments. The 39.9 and 40.7 mm specimens are both neonates, yet the former exhibits six more events than does the latter, which is equivalent to 43% of the events present in the latter. The 47.9 and 48.0 mm specimens are 4 and 8 weeks old, respectively, yet the former exhibits one more event than does the latter. Thus, the skeletal maturity of an individual appears to be subject to sexual, populational, and individual variation, and does not correlate perfectly with SVL – that is to say, the absolute timing of postnatal skeletal events in ontogeny is not totally size-dependent.

Arranging specimens by increasing skeletal maturity (based on the number of events present) rather than increasing SVL permits a more precise estimate of the variability of the postnatal skeletal event sequences themselves, independent of size. As shown in Table 1, the percent disparity by skeletal maturity (%DISMAT) ranges from 0.4 to 10.1%, averaging just 4.8%. When *Bipes biporus* is removed, the estimate ranges from 2.0 to 10.1%, averaging 5.0%. The average reduction in disparity when specimens are arranged by increasing skeletal maturity rather than increasing SVL is 3.1%, roughly 40% of the average %DISSVL.

The sequence disparity estimate does not appear to be dependent upon the number of specimens in a growth series, i.e. a higher level of sequence disparity is not detected when postnatal ontogeny is sampled

more densely. The number of specimens per series ranges from 20 to 47 (Table 1), and linear regression of %DISMAT on number of specimens at the 95% confidence level yields a *P*-value of 0.199. Thus, the data suggest that the sequence of postnatal skeletal events is highly conserved in the species investigated.

PHYLOGENETIC ANALYSIS OF POSTNATAL SKELETAL EVENT SEQUENCES

Obstacles to the analysis

There are three main impediments to conducting a phylogenetic analysis based on the sequence of postnatal skeletal development: how to code the sequences as characters; how to code intraspecific sequence variability, or polymorphism; and, in the case of squamates, the lack of comparable data for an outgroup.

The main difficulty in coding ontogenetic sequences as characters is that they are unwieldy due to their inherent complexity: it is not simply a matter of one event occurring earlier in one sequence than in another, but rather of many events changing relative sequence position from one species to another. There are two extremes as to how sequence data can be treated in phylogenetic analyses. One extreme is to code the entire ontogenetic sequence as the character and each variation in that sequence as a different character state (Mabee & Humphries, 1993). This approach would be unsatisfactory in the present study because it is based on the assumption that the entire sequence of postnatal development behaves as a single character. This cannot be the case, because the events in these sequences change their relative order from one species to another. For example, the ossification centre of distal carpal 4 appears before that of the ulnare in *Agama agama lionotus* and *Coleonyx variegatus* whereas the reverse is true in all other species in which their order could be determined. Using this approach in the present study would yield 21 autapomorphic character states.

The other extreme is to atomize the developmental sequence such that the individual events themselves are the characters. As an initial step this approach almost certainly violates the assumption of character independence, an assumption that is critical to cladistic methodology because each synapomorphy is taken as a separate piece of evidence for shared ancestry (Kluge, 1989). However, atomizing these complex developmental sequences into smaller bits of information makes them more manageable, and *a posteriori* examination of their distribution on a phylogenetic tree enables the identification of instances of nonindependence.

Velhagen (1997) made the distinction between a transformation sequence (e.g. skull unossified > partly

ossified > fully ossified) and what he termed an 'event sequence', which is the ordinal succession of distinct developmental events (e.g. palatine ossifies > pterygoid ossifies > maxilla ossifies); the latter is that which applies here. In his approach, Velhagen (1997) employs 'sequence units' that, for a given sequence, are every possible pairwise combination of events; so, given a sequence of events A, B, and C, all possible pairwise comparisons are A-B, A-C, and B-C. These are the sequence units, and they contain all of the information in an event sequence. For n events there are $n(n-1)/2$ possible sequence units. Each sequence unit is treated as a separate character and the order of the two events relative to each other is treated as the character state. Sequence units are employed here to construct a phylogenetic hypothesis of the included species from their postnatal skeletal event sequences and to comment on that portion of those sequences that is common to Squamata.

Coding of 41 events as sequence units yields 820 characters (Appendix 2). The names of the events themselves comprise the name of the sequence unit, so the first sequence unit is 'neurocentral suture closing – neural arch suture closing'. If the first event precedes the second event in ontogeny it is assigned state '0', if the second event precedes the first it is assigned state '1', and if both events appear simultaneously it is assigned a '?'.

Of the 820 sequence units in the data set, 391 are polymorphic – that is, in at least one species, the first event precedes the second in some individuals whereas the reverse is true in others. Polymorphism is a pervasive phenomenon (Wiens, 1995), and the identification of so much of it in the present study is possible only because the ontogenies of these species are densely sampled. Previously, workers avoided the issue of polymorphism by sampling just one individual per species (as is the case in many molecular investigations) or by excluding polymorphic characters from their analyses based on the assumption that they are less reliable (e.g. Farris, 1966; Kluge & Farris, 1969). However, empirical studies (e.g. Campbell & Frost, 1993; Wiens, 1995) showed that, although polymorphic characters are indeed more homoplastic than invariant characters, they can still contain significant phylogenetic signal.

Although it is now generally agreed that polymorphic characters should be included in phylogenetic analyses to maximize the accuracy of the recovered phylogeny (Wiens & Servedio, 1998; Wiens, 1998; Kornet & Turner, 1999), the best method by which to code them remains a matter of debate. Wiens (1995) tested eight different coding schemes for their ability to estimate a computer-generated phylogeny. He judged their performance by several criteria, including the number of equally parsimonious trees gener-

ated, the number of informative characters, and phylogenetic signal (Hillis, 1991; Huelsenbeck, 1991). Wiens (1995) found the frequency method (Prober, Bell & Moran, 1990) to perform best across all criteria; in this approach, different frequencies of polymorphisms are coded as different character states and ordered on the assumption that a derived feature must go through a polymorphic stage between absence and fixation.

Kornet & Turner (1999) also examined different methods for coding polymorphic characters. They criticized Wiens (1995) because matching the phylogeny that he had generated was not one of the criteria by which he judged the performance of the different coding schemes. Kornet & Turner (1999) also criticized Wiens & Servedio (1997) for assuming that lineages begin their evolution with the terminal frequency of their ancestor, stating that because geographical variation is common, the relevant state may immediately exhibit a frequency that is quite different in the descendant lineage.

Kornet & Turner (1999) contrasted a 'soft start' of a character state in which the origin of an evolutionary novelty (i.e. polymorphism) is considered the beginning of a new character state, and a 'hard start' in which the fixation of an evolutionary novelty is considered the beginning of a new character state. Given that soft starts may simply disappear from one or more descendant lineages by random processes such as drift or lineage sorting (Doyle, 1992), Kornet & Turner (1999) concluded that coding the plesiomorphic state of a polymorphism is to be preferred. If the ancestral state is unknown, then polymorphisms should be coded as ambiguous. Both the frequency and hard start methods of coding polymorphisms are employed in this analysis.

The final difficulty in phylogenetically analysing the detailed event sequences of postnatal skeletal development in the squamates investigated here is the lack of comparable data for an outgroup. Such an outgroup must be extant, as even growth series of the best-known fossil taxa are not well enough preserved to provide sufficient detail on the sequence of postnatal skeletal events. *Sphenodon* is the sole living representative of Rhynchocephalia, the sister clade to Lepidosauria (Gauthier *et al.*, 1988), but suitable data are not available for this taxon: Howes & Swinnerton's (1901) developmental study focused on prenatal chondrification, and Rieppel's (1992a) study was based on a single skull. *Sphenodon* specimens were not available for clearing and staining for inclusion in the present investigation. As mentioned above, archosaurs and turtles virtually lack secondary centres and sesamoids which makes them unsuitable choices for an outgroup.

Using a hypothetical ancestor in phylogenetic analysis is a contentious issue; it is usually done in cases

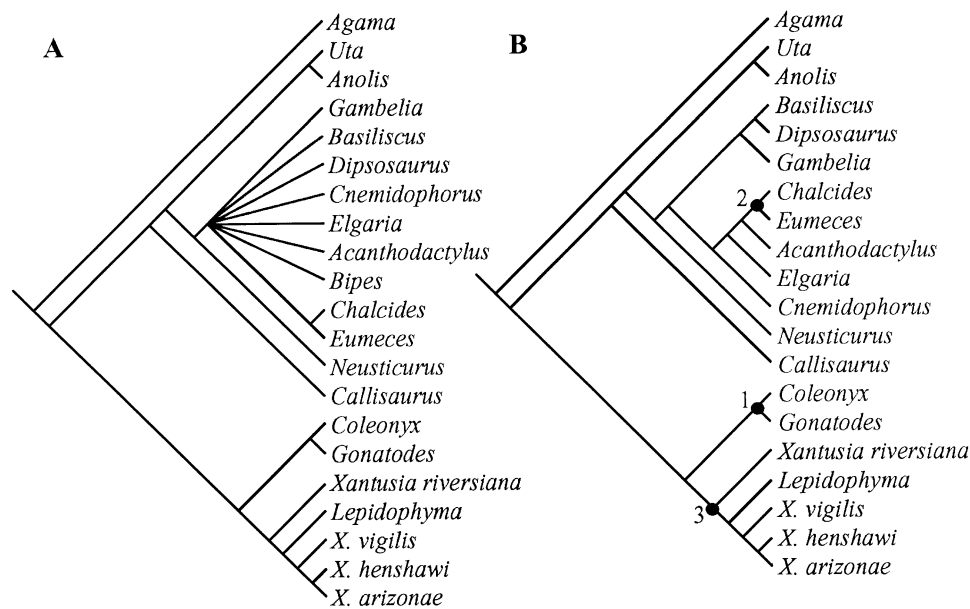


Figure 3. Results of sequence unit analysis with polymorphisms coded by the frequency method of Prober *et al.* (1990) and Wiens (1993). A, strict consensus of two equally parsimonious trees that result when *Bipes biporus* is included. B, single most parsimonious tree that results when *B. biporus* is excluded. Tree length = 2901 steps, CI = 0.40, RI = 0.51. Node 1, Gekkota; node 2, Scincidae; node 3, Xantusiidae.

where several outgroups are known but it is unclear which is the sister to the ingroup (e.g. Chamberlain & Wood, 1987; Werdelin & Solounias, 1990; Wang & Tedford, 1994; Livezey, 1996; McGuire, 1996). Alternatively, part or all of the ingroup can be used to construct a hypothetical ancestor, based on the notion that the more common character states are plesiomorphic (e.g. Hecht, 1976; Crisci & Stuessy, 1980; Crisci, Gamundí & Cabello, 1988; Russell, 1988); however, many workers argue that this assumption is unsupported (e.g. Stevens, 1980; Watrous & Wheeler, 1981; Wheeler, 1981).

Given the controversy over the use of hypothetical ancestors and the lack of comparable data for a real outgroup, this analysis is unrooted. In Appendix 2, the character states in parentheses are those derived by frequency coding using nonoverlapping frequencies of 10% increments. The lack of an outgroup renders the hard start coding method equivalent to treating all polymorphisms as unknown or missing data.

Results

In the first analysis polymorphisms were coded using the frequency method. This resulted in two equally parsimonious trees that differ only in placement of *Bipes*; their strict consensus is shown in Figure 3A. Due to its incredibly advanced state of ossification at hatching (Maisano, 2001) and lack of hindlimbs, *Bipes* is plagued by a tremendous amount of missing data –

it could be coded for only 53 out of the 820 sequence units. As it could be removed without affecting the remaining tree topology, and with only a minute change in tree length (2 steps), it was deleted from the remaining sequence unit analyses. Removal resulted in a single most parsimonious tree (Fig. 3B); length = 2901 steps, consistency index (CI) = 0.40, and retention index (RI) = 0.51. Of the 820 sequence units, 303 are uninformative.

The overall topology of the tree is highly inconsistent with conventional hypotheses of squamate relationships (e.g. that of Estes *et al.*, 1988; Fig. 1); most striking is the inability of the sequence units to separate Iguania and Scleroglossa, the two major clades within Squamata. The monophyly of Iguania and of Scleroglossa is supported by 13 and 27 synapomorphies, respectively (Estes *et al.*, 1988), yet not one sequence unit state unambiguously diagnoses either clade. Because Iguania and Scleroglossa are so conflated in the tree topology, none of the less inclusive clades within Scleroglossa (Autarchoglossa, Scincomorpha, Anguimorpha) are recovered either.

Although the content of Scincomorpha (Scincidae, Cordylidae, Xantusiidae, Lacertidae, Teiidae, and Gymnophthalmidae) is not contentious, the relationship between these clades is (e.g. Estes, 1983; Estes *et al.*, 1988; Presch, 1988; Evans & Chure, 1998; Lee, 1998). One point of agreement is that Teiidae and Gymnophthalmidae form a monophyletic Teiioidea (Estes, 1983; Presch, 1983; Estes *et al.*, 1988).

Teiioidea, represented here by *Cnemidophorus tigris* (Teiidae) and *Neusticurus ecleopus* (Gymnophthalmidae), is not recovered in this analysis (Fig. 3B). Only one sequence unit state is uniquely shared by these two species: (723) ilium, ischium and pubis fusing > neural spines ossifying.

Four crown squamate clades are represented in this investigation by more than one species: Phrynosomatidae, Gekkota, Scincidae, and Xantusiidae. Phrynosomatidae, represented by *Uta stansburiana* and *Callisaurus draconoides*, is not recovered by the sequence units (Fig. 3B); however, the monophyly of this clade is broadly accepted (e.g. Etheridge, 1964; Etheridge & de Queiroz, 1988; Frost & Etheridge, 1989). Not one sequence unit state is uniquely shared by *Uta* and *Callisaurus*; however, they are uniquely polymorphic at different frequencies for four sequence units: (360) proximal epiphyseal cartilages of metatarsals ossifying > ischial symphysis calcifying; (501) proximal epiphyseal cartilages of metacarpals ossifying > proximal epiphyseal cartilages of metatarsals ossifying; (502) astragalus and calcaneum fusing > proximal epiphyseal cartilages of metatarsals ossifying; and (630) astragalus and calcaneum fusing > proximal epiphyseal cartilages of metacarpals ossifying.

Gekkota, represented here by *Coleonyx variegatus* and *Gonatodes albogularis*, is a clade whose monophyly is well established (e.g. Kluge, 1967, 1987; Estes *et al.*, 1988). Gekkota is recovered in this analysis (Fig. 3B, node 1) and is uniquely supported by 29 sequence unit states:

(211) neural spines ossifying > distal epiphyseal cartilages of metacarpals ossifying; (310) neural spines ossifying > ossification centre of distal tarsal 3 present; (341) neural spines ossifying > distal epiphyseal cartilages of metatarsals ossifying; (371) neural spines ossifying > ischial symphysis calcifying; (373) cartilage capping cephalic condyle of quadrate ossifying > ischial symphysis calcifying; (375) apophyseal ossification on deltopectoral crest of humerus present > ischial symphysis calcifying; (377) cartilage capping dorsal end of ilium ossifying > ischial symphysis calcifying; (378) apophyseal ossification on internal trochanter of femur present > ischial symphysis calcifying; (379) scapula and coracoid fusing > ischial symphysis calcifying; (383) ischial tubercle of ischium ossifying > ischial symphysis calcifying; (434) cartilage capping dorsal end of ilium ossifying > ossification centre of distal carpal 5 present; (481) neural spines ossifying > proximal epiphyseal cartilages of hindlimb ossifying; (487) cartilage capping dorsal end of ilium ossifying > proximal epiphyseal cartilages of hindlimb ossifying; (493) ischial tubercle of ischium ossifying >

proximal epiphyseal cartilages of hindlimb ossifying; (512) cartilage capping dorsal end of ilium ossifying > proximal epiphyseal cartilages of metatarsals ossifying; (553) neural spines ossifying > proximal epiphyseal cartilages of forelimb ossifying; (557) apophyseal ossification on deltopectoral crest of humerus present > proximal epiphyseal cartilages of forelimb ossifying; (559) cartilage capping dorsal end of ilium ossifying > proximal epiphyseal cartilages of forelimb ossifying; (560) apophyseal ossification on internal trochanter of femur present > proximal epiphyseal cartilages of forelimb ossifying; (565) ischial tubercle of ischium ossifying > proximal epiphyseal cartilages of forelimb ossifying; (581) cartilage capping dorsal end of ilium ossifying > distal epiphyseal cartilages of hindlimb ossifying; (587) ischial tubercle of ischium ossifying > distal epiphyseal cartilages of hindlimb ossifying; (596) neural spines ossifying > distal epiphyseal cartilages of forelimb ossifying; (602) cartilage capping dorsal end of ilium ossifying > distal epiphyseal cartilages of forelimb ossifying; (607) ischial tubercle of ischium ossifying > distal epiphyseal cartilages of forelimb ossifying; (640) cartilage capping dorsal end of ilium ossifying > proximal epiphyseal cartilages of metacarpals ossifying; (658) cartilage capping dorsal end of ilium ossifying > astragalus and calcaneum fusing; (691) cartilage capping dorsal end of ilium ossifying > ossification centre of distal carpal 3 present; and (775) cartilage capping dorsal end of ilium ossifying > ossification centre of distal carpal 2 present.

These sequence units are highly redundant: seven (211, 310, 341, 371, 481, 553, and 596) relate to the early onset of neural spine ossification; six (371, 373, 375, 377, 379, and 383) relate to the late calcification of the ischial symphysis; 10 (434, 487, 512, 559, 581, 602, 640, 658, 691, and 775) relate to the early onset of ossification of the cartilage capping the dorsal end of ilium; and five (383, 493, 565, 587, and 607) relate to the early onset of ossification of the ischial tubercle of the ischium, in gekkotans relative to all other squamates examined. The support for Gekkota would decrease from 29 to five shared sequence unit states if each redundant set could be condensed down into one sequence unit (see Discussion).

Scincidae, represented here by *Chalcides ocellatus* and *Eumeces fasciatus*, is another clade whose monophyly is well established (e.g. Greer, 1970; Estes *et al.*, 1988; Presch, 1988). It is recovered in this analysis (Fig. 3B, node 2) but is uniquely supported by only one sequence unit state: (716) cartilage capping cephalic condyle of quadrate ossifying > neural spines ossifying.

The monophyly of Xantusiidae, represented here

by *Lepidophyma gaigeae*, *Xantusia riversiana*, *X. henshawi*, *X. arizonae*, and *X. vigilis*, is not in question (e.g. Bezy, 1972; Crother, Miyamoto & Presch, 1986; Estes *et al.*, 1988; Hedges & Bezy, 1993). This clade is recovered by the sequence units (Fig. 3B, node 3) but uniquely shares only one state: (294) ischial symphysis calcifying > ossification centre of distal tarsal 3 present.

Relationships within Xantusiidae are not well resolved. In the topology recovered here (Fig. 3B), *Xantusia* is rendered paraphyletic by the divergence of *X. riversiana* before *Lepidophyma*. *Xantusia riversiana* was once placed in a separate genus, *Klauberina*, based on nine differences in external morphology and osteology (Savage, 1957). That *Lepidophyma* is more closely related to *X. henshawi*, *X. arizonae*, and *X. vigilis* than is *X. riversiana* is supported in this analysis by 19 sequence unit states:

(10) ischial symphysis calcifying > neurocentral suture closing; (93) pubic symphysis calcifying > proximal epiphyseal cartilages of phalanges/unguals ossifying in manus; (166) pubic symphysis calcifying > proximal epiphyseal cartilages of phalanges/unguals ossifying in pes; (201) pubic symphysis calcifying > distal epiphyseal cartilages of metacarpals ossifying; (300) pubic symphysis calcifying > ossification centre of distal tarsal 3 present; (331) pubic symphysis calcifying > distal epiphyseal cartilages of metatarsals ossifying; (356) ischial symphysis calcifying > ossification centre of distal carpal 4 present; (388) proximal epiphyseal cartilages of hindlimb ossifying > ossification centre of distal carpal 4 present; (390) pubic symphysis calcifying > ossification centre of distal carpal 4 present; (418) pubic symphysis calcifying > ossification centre of distal carpal 5 present; (496) pubic symphysis calcifying > proximal epiphyseal cartilages of metatarsals ossifying; (522) pubic symphysis calcifying > distal epiphyseal cartilages of hindlimb ossifying; (523) pubic symphysis calcifying > distal epiphyseal cartilages of forelimb ossifying; (525) pubic symphysis calcifying > proximal epiphyseal cartilages of metacarpals ossifying; (528) pubic symphysis calcifying > ossification centre of distal carpal 3 present; (535) pubic symphysis calcifying > ossification centre of distal carpal 2 present; (543) pubic symphysis calcifying > ossification centre of lateral centrale present; (664) ischial tubercle of ischium ossifying > astragalus and calcaneum fusing; (806) pectineal tubercle of pubis ossifying > ilium, ischium, and pubis fusing.

These sequence units are extremely redundant: two (10 and 356) relate to the early appearance of calcification in the ischial symphysis; and 14 (93, 166, 201, 300, 331, 390, 418, 496, 522, 523, 525, 528, 535, and

543) relate to the early appearance of calcification in the pubic symphysis, in *Lepidophyma* and *Xantusia* exclusive of *X. riversiana*, relative to *X. riversiana*. The support for paraphyly of *Xantusia* would decrease from 19 to five shared sequence unit states if each redundant set could be condensed down into one sequence unit.

Phylogenies based on allozymes (Bezy & Sites, 1987) and mtDNA sequences (Hedges, Bezy & Maxson, 1991; Hedges & Bezy, 1993) indicate that *Xantusia riversiana* is nested within *Xantusia*. Seven sequence unit states unambiguously support the monophyly of *Xantusia*:

(484) apophyseal ossification in elbow present > proximal epiphyseal cartilages of hindlimb ossifying; (485) apophyseal ossification on deltopectoral crest of humerus present > proximal epiphyseal cartilages of hindlimb ossifying; (681) ischial tubercle of ischium ossifying > lunulae ossifying; (700) neural spines ossifying > ossification centre of pisiform present; (712) ischial tubercle of ischium ossifying > ossification centre of pisiform present; (714) ossification centre of medial centrale present > ossification centre of pisiform present; (788) pectineal tubercle of pubis ossifying > cartilage capping dorsal end of ilium ossifying.

Two of these sequence units (484 and 485) relate to the late ossification of the proximal epiphyseal cartilages of the hindlimb, and three (700, 712, and 714) relate to the late appearance of the ossification centre of the pisiform, in *Xantusia* relative to *Lepidophyma*. The support for monophyly of *Xantusia* would decrease from seven to four shared sequence unit states if each redundant set could be condensed down into one sequence unit.

As with Xantusiidae, relationships within *Xantusia* are not well understood. The topology recovered here (Fig. 3B) is congruent with that derived from morphological characters (Bezy, 1967) but not allozymes (Bezy & Sites, 1987) and mtDNA sequences (Hedges *et al.*, 1991; Hedges & Bezy, 1993). A (*henshawi* + *arizonae*) clade is supported by two sequence unit states: (13) neurocentral suture closing > ossification centre of ulnare present, and (619) apophyseal ossification on deltopectoral crest of humerus present > ossification centre of radiale present. A (*vigilis* (*henshawi* + *arizonae*)) clade is unambiguously supported by only one sequence unit state: (663) pectineal tubercle of pubis ossifying > astragalus and calcaneum fusing.

A close relationship between Gekkota and Xantusiidae has been previously proposed (e.g. McDowell & Bogert, 1954; Savage, 1963; Arnold, 1984; Lee, 1998). A sister-group relationship between the two (Fig. 3B) is uniquely supported by 23 sequence unit states:

(214) apophyseal ossification in elbow present > distal epiphyseal cartilages of metacarpals ossifying; (313) apophyseal ossification in elbow present > ossification centre of distal tarsal 3 present; (431) apophyseal ossification in elbow present > ossification centre of distal carpal 5 present; (432) apophyseal ossification on deltopectoral crest of humerus present > ossification centre of distal carpal 5 present; (484) apophyseal ossification in elbow present > proximal epiphyseal cartilages of hindlimb ossifying; (506) neural spines ossifying > proximal epiphyseal cartilages of metatarsals ossifying; (509) apophyseal ossification in elbow present > proximal epiphyseal cartilages of metatarsals ossifying; (510) apophyseal ossification on deltopectoral crest of humerus present > proximal epiphyseal cartilages of metatarsals ossifying; (513) apophyseal ossification on internal trochanter of femur present > proximal epiphyseal cartilages of metatarsals ossifying; (578) apophyseal ossification in elbow present > distal epiphyseal cartilages of hindlimb ossifying; (579) apophyseal ossification on deltopectoral crest of humerus present > distal epiphyseal cartilages of hindlimb ossifying; (582) apophyseal ossification on internal trochanter of femur present > distal epiphyseal cartilages of hindlimb ossifying; (599) apophyseal ossification in elbow present > distal epiphyseal cartilages of forelimb ossifying; (600) apophyseal ossification on deltopectoral crest of humerus present > distal epiphyseal cartilages of forelimb ossifying; (634) neural spines ossifying > proximal epiphyseal cartilages of metacarpals ossifying; (637) apophyseal ossification in elbow present > proximal epiphyseal cartilages of metacarpals ossifying; (638) apophyseal ossification on deltopectoral crest of humerus present > proximal epiphyseal cartilages of metacarpals ossifying; (641) apophyseal ossification on internal trochanter of femur present > proximal epiphyseal cartilages of metacarpals ossifying; (652) neural spines ossifying > astragalus and calcaneum fusing; (655) apophyseal ossification in elbow present > astragalus and calcaneum fusing; (656) apophyseal ossification on deltopectoral crest of humerus present > astragalus and calcaneum fusing; (659) apophyseal ossification on internal trochanter of femur present > astragalus and calcaneum fusing; and (820) apophyseal ossification on internal trochanter of femur present > distal epiphyseal cartilages of forelimb ossifying.

These sequence units are highly redundant: nine (214, 313, 431, 484, 509, 578, 599, 637, and 655) relate to the early appearance of apophyseal ossification in the elbow and six (432, 510, 579, 600, 638, and 656) to its early appearance on the deltopectoral crest of the humerus; three (506, 634, and 652) relate to the early

ossification of the neural spines and five (513, 582, 641, 659, and 820) to the early appearance of apophyseal ossification on the internal trochanter of the femur, in gekkotans and xantusiids relative to all other squamates examined. The support for a sister-group relationship between Gekkota and Xantusiidae would decrease from 23 to four shared sequence unit states if each redundant set could be condensed down into one sequence unit. All of these sequence units relate to the relatively early appearance of apophyseal ossifications, or conversely, the relatively late appearance of secondary centres and ossification centres and relatively late fusion of the astragalus and calcaneum, in these two clades.

The uninformative sequence units from the frequency coding analysis can be used to reconstruct that part of the sequence of postnatal skeletal events that is shared, as far as can be resolved from the data, by all 21 species in this investigation; the determination of whether this sequence is synapomorphic for Squamata or for Lepidosauria will require similar data for *Sphenodon*. The following sequence is invariant or at most varies in one species:

ossification centre of astragalus present > ossification centre of calcaneum present > ossification centre of distal tarsal 4 present > distal epiphyseal cartilages of metatarsals ossifying > distal epiphyseal cartilages of metacarpals ossifying > proximal epiphyseal cartilages of metatarsals ossifying > palmar sesamoid ossifying; cartilage capping cephalic condyle of quadrate ossifying; ilium, ischium and pubis fusing; and ossification centre of medial centrale present.

All other postnatal skeletal events examined change their timing relative to at least one other event in at least two of the species included in this investigation.

The topology that results from hard start coding is shown in Figure 4A; length = 1091 steps, CI = 0.51, and RI = 0.61. Whereas Gekkota (node 1) and Xantusiidae (node 2) are still recovered, Scincidae is not. Excluding all polymorphic characters from the analysis (Fig. 4B) results in an almost completely unresolved topology, a finding that is consistent with that of Campbell & Frost (1993) and Wiens (1995) that polymorphic characters can contain significant phylogenetic signal.

In summary, the sequence units fail to recover a hypothesis of squamate clade relationships that approximates hypotheses derived from more traditional types of data. It appears that these sequences evolve too quickly to recover deep divergences within Squamata; however, the fact that three of the four crown clades represented here by more than one species – Gekkota, Scincidae, and Xantusiidae – are recovered (using frequency coding) suggests that post-

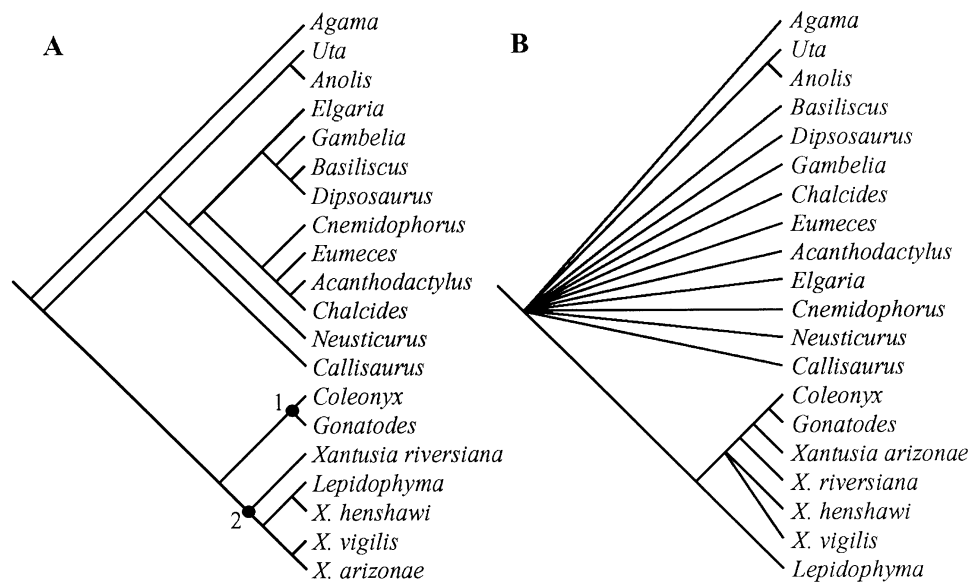


Figure 4. Results of sequence unit analyses. A, single most parsimonious tree that results when polymorphisms are coded by hard start method of Kornet & Turner (1999). Tree length = 1091 steps, CI = 0.51, RI = 0.61. Node 1, Gekkota; node 2, Xantusiidae. B, strict consensus of 69 equally parsimonious trees that result when polymorphic characters are excluded.

natal skeletal event sequences may be informative at or above the level of crown clades.

PHYLOGENETIC ANALYSIS OF DISCRETE POSTNATAL SKELETAL DEVELOPMENTAL CHARACTERS

Characters

In addition to event sequences, postnatal skeletal development is a potential source of discrete characters for phylogenetic analysis. As described previously (Maisano, 2000, 2002a, b), squamate species vary not only in the sequence in which they mineralize skeletal elements but also the manner in which this mineralization is accomplished; most notable are differences in the number of epiphyseal secondary centres and the presence of various apophyseal ossifications and sesamoids. Although sesamoids fall more under the purview of osteological rather than developmental characters, osteological studies have neglected their distribution in squamates; this may be because they rarely survive the skeletonization process, and when they do they are largely obscured by connective tissue. Their distribution is easily documented in cleared and double-stained specimens, thus they are included here.

The treatment of the discrete data (Appendix 3) is much more straightforward than was that of the event sequences: most characters are binary and there are no polymorphisms. However, the analysis must still be left unrooted due to the lack of data for a suitable outgroup. All characters are unordered.

Results

Analysis of 45 discrete characters yielded seven equally parsimonious trees, the strict consensus of which is shown in Figure 5; length = 127 steps, CI = 0.39, and RI = 0.57. The overall topology is much more consistent with established hypotheses of squamate relationships (e.g. that of Estes *et al.*, 1988; Fig. 1) than was that derived from the event sequences. The following may be considered potential synapomorphies of Squamata pending their determination in *Sphenodon*:

1. Number of cartilages on retroarticular process = one (4.0 [character 4, state 0]; further transformed in skinks).
2. Dorsal and ventral postaxial tibiofemoral lunulae present (32.1; R [reversed] in *Dipsosaurus*).
3. Apophysis on basal tuber present (3.1; R in *Gonatodes* and *Lepidophyma*).
4. Neural arch suture interdigitating (6.1; R in *Agama*, *Dipsosaurus*, gekkotans and xantusiids).
5. Neural spines ossify endochondrally and apophyseally (7.0; further transformed in phrynosomatids and scleroglossans).
6. Apophysis on posterolateral corner of epicoracoid present (11.1; R in *Agama*, *Basiliscus*, *Dipsosaurus* and *Elgaria*).
7. Number of secondary centres in distal humeral epiphyseal cartilage = one (13.0; further transformed within iguanians and in *Coleonyx* and *Acanthodactylus*).

8. Number of secondary centres in proximal radial epiphyseal cartilage = one (14.0; further transformed in *Dipsosaurus* and *Acanthodactylus*).

9. Ulnar patella present (16.1; R in teioids, *Xantusia riversiana* and *X. vigilis*).

10. Palmar sesamoid present (19.1; R in gekkotans).

11. Number of secondary centres in proximal phalangeal/ungual epiphyseal cartilages = two (20.1; further transformed in *Gonatodes*, *Cnemidophorus*, *Chalcides* and xantusiids).

12. Cartilage capping dorsal end of ilium ossifies endochondrally and apophyseally (25.2; further transformed in *Callisaurus* and autarchoglossans).

13. Tibial patella present (29.1; R in *Agama* and *Basiliscus*).

14. Tibial lunula present (31.1).

15. Number of secondary centres in distal tibial epiphyseal cartilage = one (37.0; further transformed in *Acanthodactylus*, skinks, *X. arizonae* and *Elgaria*).

16. Sesamoid between metatarsal I and astragalocalcaneum present (40.1; R in *Basiliscus*, *Gambelia*, *Dipsosaurus* and autarchoglossans; however, if this sesamoid is homologous to the 'meniscus' of Howes & Swinnerton [1901] then this character state is plesiomorphic for squamates.).

17. Apophyses on diaphyses of metatarsals II and III present (45.1; R in *Basiliscus*, teioids and xantusiids).

Although the seven iguanian species collapse into a polytomy (Fig. 5), two character states may be considered potential synapomorphies of Iguania:

1. Number of secondary centres in distal humeral epiphyseal cartilage = three (13.2; further transformed in *Anolis*; R in *Agama*; C [convergent] in *Coleonyx* and *Acanthodactylus*).

2. Intermedium absent (18.0; C in gekkotans and *Bipes*).

A monophyletic Scleroglossa is recovered (Fig. 5, node 1) although the placement of *Bipes* remains unclear. The following may be considered potential synapomorphies of Scleroglossa:

1. Neural spines ossify only apophyseally (7.1; C in phrynosomatids; R in *Chalcides*).

2. Apophyses on vertebral shoulders present (8.1; R in *Acanthodactylus*, *Lepidophyma* and *Xantusia arizonae*).

3. Sacral ribs fuse to each other distally (9.2; C in *Gambelia*; R in *Acanthodactylus* and *Cnemidophorus*).

4. Fibular lunula present (30.1; Camp [1923] noted the presence of a 'parafibula' in some iguanian species that may be the same element; however, this sesamoid was not observed in the seven iguanians examined here, thus the presence of a fibular lunula

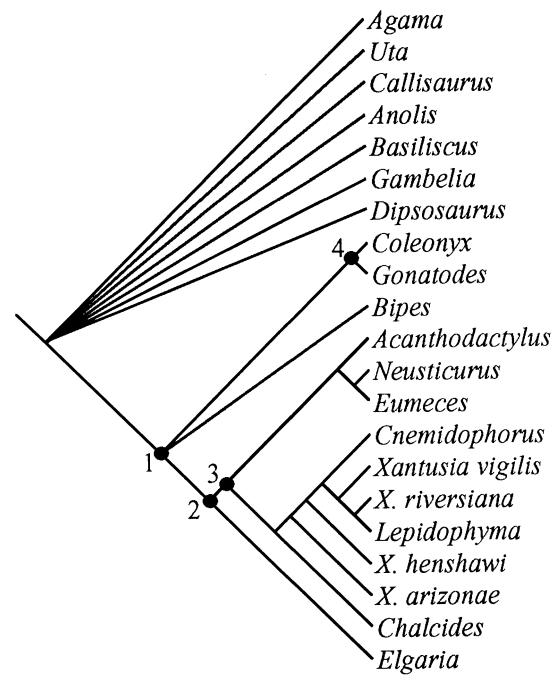


Figure 5. Strict consensus of seven equally parsimonious trees that result from analysis of discrete data. Tree length = 127 steps, CI = 0.39, RI = 0.57. Node 1, Scleroglossa; node 2, Autarchoglossa; node 3, Scincomorpha; node 4, Gekkota.

is tentatively considered to be a synapomorphy of scleroglossans.).

5. Preaxial ligament sesamoid present (33.1).

A monophyletic Autarchoglossa is recovered (Fig. 5, node 2) and the following may be considered potential synapomorphies of this clade:

1. Cartilage capping dorsal end of ilium ossifies endochondrally (25.0; R in *Acanthodactylus*, *X. henshawi* and *X. arizonae*; further transformed in *X. riversiana*, *X. vigilis* and *Lepidophyma*).

2. Number of secondary centres in distal tibial epiphyseal cartilage = two (37.1; R in teioids and xantusiids).

3. Plantar sesamoid present (38.1).

4. Sesamoid between metatarsal I and astragalocalcaneum absent (40.0; R of possible squamate synapomorphy; sesamoid present in *Neusticurus* and *X. vigilis*).

A monophyletic Scincomorpha is recovered (Fig. 5, node 3) and the following may be considered potential synapomorphies of this clade:

1. Secondary centres present in distal epiphyseal cartilages of phalanges (21.1; R in *Acanthodactylus*,

Cnemidophorus, *Lepidophyma*, *X. riversiana* and *X. arizonae*).

2. Ventral ligament sesamoid present (34.1; R in *Cnemidophorus*, *Lepidophyma*, *X. riversiana* and *X. henshawi*).

The discrete characters appear more capable of retrieving deeper divergences within Squamata than were the postnatal event sequences that recovered none of these more inclusive clades. However, the discrete data fail to recover the crown clades represented by more than one species in this investigation, except Gekkota (Fig. 5, node 4); the following may be considered potential synapomorphies of this clade:

1. Ascending process of tectum synoticum absent (2.0).
2. Neural arch suture straight (6.0; C in *Agama*, *Dipsosaurus* and xantusiids).
3. Palmar sesamoid absent (19.0; R of squamate synapomorphy).
4. Apophysis on dorsal surface of proximal femoral epiphysis present (26.1).
5. Number of secondary centres in proximal tibial epiphyseal cartilage = one (36.0; C in *Anolis*, *Lepidophyma* and *Xantusia riversiana*).

Although not recovered as a clade (Fig. 5), skinks (*Chalcides ocellatus* and *Eumeces fasciatus*) share one potential synapomorphy: number of cartilages on retroarticular process = two (4.1). Phrynosomatids (*Uta stansburiana* and *Callisaurus draconoides*) share two potential synapomorphies: neural spines ossify only apophyseally (7.1; C in scleroglossans) and sesamoid ventral to proximal fibular epiphysis present (35.1). Xantusiids (*Xantusia* and *Lepidophyma gaigeae*) share two potential synapomorphies: neural arch suture straight (6.0; C in *Agama*, *Dipsosaurus* and gekkotans) and lateral astragalar sesamoid present (42.1; C in *Neusticurus*).

The phylogenetic position of Amphisbaenia (represented by *Bipes biporus*) remains problematic. *Bipes* is too skeletally mature at hatching (Maisano, 2001) for postnatal skeletal developmental patterns to help resolve this issue; even for the 45 discrete characters (Appendix 3) it could be scored for only 14. Estes *et al.* (1988) placed Amphisbaenia in *Scleroglossa incertae sedis*, a placement that is supported here by one character state: apophyses present on vertebral shoulders (8.1). Within *Scleroglossa*, Amphisbaenia has been variously placed in close affinity with skinks (Rieppel, 1981), with teioids (e.g. Boulenger, 1884; Böhme, 1981), as sister to Serpentes (e.g. Rage, 1982a, b), and as sister to Dibamidae (e.g. Greer, 1985; Lee, 1998). Here, the discrete data place *Bipes* in a polytomy with Gekkota and Autarchoglossa although only the

absence of the intermedium (18.0) suggests a close affinity to gekkotans.

DISCUSSION

This initial foray into the phylogenetic analysis of postnatal skeletal developmental patterns supports the supposition of previous workers (e.g. Hikida, 1978; Rieppel, 1992b, 1993, 1994; Caldwell, 1995) that these patterns might be useful in resolving relationships within Squamata. Specifically, the sequence of postnatal events generally recovers crown clades that evolved in the Tertiary and therefore might be useful in the analysis of relationships at or above that level. The discrete characteristics of the events themselves recover deeper divergences within Squamata but appear to evolve too slowly to diagnose crown clades.

The failure of postnatal event sequences to recover deep divergences within Squamata might be due to several shortcomings of this analysis. First, there is an immediate need for detailed postnatal skeletal developmental data for *Sphenodon*, the sole living representative of the sister to Squamata and the only reptilian outgroup to exhibit secondary centres and sesamoids. Second, one cannot hope to characterize postnatal skeletal development in a clade of roughly 6000 species from observations of just 21; more species must be sampled. Third, whereas the sequence unit approach provides an excellent starting point for the comparison and phylogenetic treatment of postnatal skeletal developmental data, this analysis has shown that a set of sequence unit states may be highly redundant for a given clade. Because those same sequence units are not redundant across all taxa, the set cannot simply be reduced to one character; a way to eliminate redundancy in sequence units, as well as other possible coding methods, must be explored. Ultimately, it may be that event sequences simply evolve too quickly to recover deeper divergences within Squamata: out of 41 postnatal skeletal events included in this analysis, only seven maintain their sequence position relative to each other in all 21 species investigated (including autapomorphic exceptions).

The determination of whether postnatal skeletal event sequences are informative at the level of crown clades, as suggested by the recovery of three out of four of those represented by more than one species in this investigation, will require more intensive sampling within crown clades. Xantusiidae, the only crown clade represented here by more than two species, is not the best exemplar because relationships within it have been difficult to resolve even with more traditional characters. Analyses of crown squamate clades whose ingroup relationships are better established, such as Corytophanidae (Etheridge & de Queiroz, 1988; Frost & Etheridge, 1989; Lang, 1989)

and Tropicuridae (Etheridge & de Queiroz, 1988; Frost & Etheridge, 1989), would provide a more explicit means of evaluating the congruence of topologies derived from postnatal event sequences with those derived from other types of characters, and thus a better estimate of the phylogenetic informativeness of postnatal event sequences at the level of crown clades.

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APPENDIX 1

SPECIMENS EXAMINED

Specimen numbers followed by SVL (in mm). *denotes SVL estimated in previously prepared specimens by measuring from the tip of the snout to the posterior margin of the neural arch of the second sacral vertebra; ** denotes SVL measured by someone other than the author.

Agama agama lionotus (all CAS): 199003, 28.8; 199024, 31.0*; 199001, 31.2; 154502, 33.0; 198910, 34.9; 103649, 35.9; 198998, 37.5; 161265, 39.0; 159921, 41.1; 123151, 42.7; 130748, 44.1; 151190, 45.0; 142926, 49.1; 122137, 49.4; 111878, 51.3; 111816, 53.9; 111881, 57.4; 122135, 60.8; 139804, 64.5; 111817, 71.6; 111879, 82.6; 130808, 92.5; 130806,

- 106.2. *Uta stansburiana*: CAS 87668, 21.2; YPM R7578, 21.6; YPM R7561, 22.3; CAS 87567, 22.8; YPM R7563, 24.1; YPM R7570, 24.2; USNM 239163, 25.6; CAS 87478, 25.8; CAS 87462, 27.2; YPM R7557, 27.5; YPM R7554, 28.5; CAS 87644, 29.5; USNM 239341, 30.4; YPM R7560, 30.6; USNM 239172, 30.8; YPM R7549, 32.1; YPM R7546, 34.0; USNM 239200, 34.0; YPM R7548, 34.1; USNM 239205, 35.1; YPM R7547, 37.1; YPM R7755, 38.9; YPM R7757, 39.9; USNM 239192, 40.0; CAS 87498, 42.6; YPM R7747, 42.7; YPM R7774, 44.8; CAS 87496, 45.2; YPM R7748, 47.4; USNM 239332, 48.9; YPM R7776, 50.3; YPM R7533, 51.8; USNM 239335, 54.5. *Callisaurus draconoides*: CAS 91239, 24.2; KU 78528, 29.4; CAS 91240, 29.6; CM P1281, 30.1; MVZ 205090, 31.1; KU 72121, 31.7; KU 78541, 32.1; KU 72118, 34.2; CM P1275, 34.7; CAS 91008, 36.9; CAS 90939, 37.1; MVZ 63999, 37.7; USNM 205347, 38.2; MVZ 205089, 38.7; CAS 91087, 38.8; MVZ 73787, 41.9; CAS 152338, 42.1; USNM 205332, 42.3; CAS-SU 16947, 44.4; USNM 205358, 45.0; CAS 148856, 47.2; USNM 205320, 47.9; CAS-SU 16922, 49.0; CAS 148988, 50.2; MVZ 64825, 51.5; MVZ 76995, 52.0; KU 91452, 53.6; KU 78547, 55.0; CM 56443, 56.3; KU 78545, 58.4; KU 91454, 59.5; CM P1304, 59.9; USNM 198076, 60.7; USNM 205317, 61.9; CAS-SU 16991, 65.3; MVZ 207871, 66.7; MVZ 68213, 69.5; CAS 90999, 71.7; USNM 205315, 73.3; MVZ80198, 73.4; MVZ 161451, 76.4; MVZ 64831, 78.4; CM 55789, 80.5. *Anolis sagrei*: CM 64126, 15.9; MVZ 215192, 18.6; KU 248656, 21.0; CM 64148, 21.8; KU 248655, 21.8; CM 21054av, 22.5; KU 248893, 23.4; KU 248428, 25.0; KU 248154, 25.8; MVZ 86780, 26.2; KU 248424, 26.6; KU 248890, 27.1; CM 21028ae, 28.1; CM 21028z, 29.1; CM 21054 gg, 29.6; CAS 165978, 30.2; CM 91118, 30.9; MVZ 75915, 32.1; CAS 166676, 33.5; MVZ 215173, 34.3; CAS 174346, 35.2; MVZ 215183, 35.8; MVZ 215170, 37.8; MVZ 215187, 40.0; MVZ 83948, 41.1; KU 248572, 41.2*; MVZ 215175, 45.7; MVZ 215178, 46.0; CM 54366, 48.0; MVZ 215213, 50.5; KU 248566, 52.1*; MVZ 215196, 53.2; KU 248693, 56.2*; CM S8622, 59.6; MVZ 75912, 63.9. *Basiliscus vittatus*: KU 157296, 35.7; CM 44467, 36.5; KU 184174, 36.9; CM 90996, 37.4; CAS 142608, 38.6; KU 59591, 38.7; USNM 242515, 39.0; KU 67208, 39.8; USNM 242576, 40.3; CAS 74381, 43.0; USNM 242573, 43.0; USNM 242583, 44.4; KU 59588, 45.8; USNM 242512, 47.7; USNM 242514, 49.3; KU 190749, 50.9; USNM 242582, 52.6; CM 90956, 57.1; KU 184168, 58.1; KU 59597, 60.2; CM 91126, 65.7; CM 28994, 69.0; USNM 242570, 75.8; KU 190742, 80.1; KU 184166, 91.3; USNM 242585, 96.6; USNM 242584, 110.7. *Gambelia wislizenii*: MVZ 74614, 40.9; MVZ 74613, 44.5; MVZ 67608, 46.0; KU 61451, 48.3; MVZ 205091, 49.2; CM 61779, 50.6; KU 10927, 52.6; MVZ 74615, 53.6; KU 121695, 55.4; CM 83688, 56.7; CM 47750, 64.2; CAS 21235, 65.3; USNM 246135, 65.6; CM 70814, 68.9; MVZ 50268, 72.8; USNM 246123, 75.2; CAS 203130, 79.6; CAS 88768, 84.9; USNM 246130, 88.5; MVZ 172830, 92.7; MVZ 86365, 96.0; MVZ 198502, 100.1; MVZ 198503, 103.9; CAS 89540, 107.3; MVZ 173647, 110.9. *Dipsosaurus dorsalis*: KU 78592, 41.9; KU 48776, 43.3; KU 78605, 43.9; KU 78579, 47.6; CM 53847, 48.7; MVZ 147696, 49.9; CAS 88759, 50.0; MVZ 223454, 51.4; CAS 190080, 53.0; CAS 181363, 53.8; CAS 181360, 54.2; MVZ 62125, 59.0; MVZ 198462, 62.8; MVZ 24144, 63.7; MVZ 66308, 64.7; CAS 154921, 67.5; MVZ 64769, 70.0; MVZ 147693, 74.1; CAS 195776, 76.7; CAS 181365, 77.3; MVZ 35628, 79.1; CAS 20764, 82.5; CM 68490, 84.8; CAS 88602, 91.2; CM 53828, 93.9; MVZ 198464, 99.1; MVZ 105191, 100.8; CAS 195765, 116.8; CAS 195772, 122.7. *Coleonyx variegatus*: CM 64362, 27.9; MVZ 197986, 31.6; CAS 88160, 33.2; MVZ 66312, 34.8; CM 51463, 34.9; MVZ 78167, 36.4; CAS 191144, 37.2; CM 40361, 38.6; YPM R9209, 40.2; MVZ 172794, 40.8; MVZ 63962, 44.2; YPM R9210, 44.9; CAS 89280, 45.9; YPM R9211, 47.3; CAS-SU 8906, 49.4; CAS-SU 18315, 52.3; YPM R9212, 54.2; MVZ 201150, 56.1; CAS 154868, 56.7; MVZ 179992, 58.2; YPM R9213, 59.4; YPM R9214, 62.8; MVZ 214627, 67.4; MVZ 197984, 72.8. *Gonatodes albogularis*: USNM 338152, 17.3; MVZ 83391, 17.6; KU 96505, 18.0; CAS 152989, 18.1; KU 61381, 18.7; MVZ 83362, 20.5; USNM 338150, 21.1; KU 96498, 21.3; KU 113045, 22.0; USNM 338149, 22.1; USNM 338496, 23.6; MVZ 83390, 25.9; MVZ 83373, 26.8; USNM 338494, 27.5; MVZ 83396, 28.9; KU 113041, 29.9; USNM 338492, 30.6; CAS 54792, 31.5; USNM 338491, 34.3; KU 96512, 35.1; MVZ 149566, 36.4; USNM 338138, 37.7; MVZ 83380, 38.0; USNM 338132, 40.1; USNM 338131, 43.8. *Bipes biporus* (all CAS): 151639, 90.1; 151692, 97.0; 151644, 101.0; 134842, 105.9; 151625, 106.4; 142306, 107.3; 151626, 109.3; 142276, 113.1; 134856, 110.1; 142307, 122.1; 151620, 123.5; 142304, 126.4; 142302, 131.8; 134866, 135.0; 151669, 140.2; 142251, 143.0; 142288, 146.3; 142301, 151.1; 142349, 152.5; 151665, 156.3; 142295, 162.9; 142281, 168.0; 151664, 175.1; 151605, 177.5; 142328, 182.9; 142269, 189.6; 151601, 198.6; 151583, 199.8; 142262, 215.7; 142265, 231.0. *Acanthodactylus boskianus* (YPM unless otherwise noted): CAS 134176, 27.5; R5629, 31.6; CM 56496 m, 32.3; R5203, 32.6; CM 56557L, 34.1; CM 56496L, 34.5; CM 56490, 34.7; R5207, 34.8; R5459, 36.9; R5462, 37.6; R5206, 39.0; R5446, 39.2; R4987, 40.3; R5469, 41.3; R5621, 42.7; CM 56680j, 43.5; CM 56535, 44.0; R4827, 45.0; R5453, 45.8; R5204, 47.4; CM 56582o, 49.3; R5625, 49.9; R4822, 51.7; R4841, 53.8; R4830, 55.5; R5430, 60.8; R5441, 63.4; CM 56582n, 65.6; R5052, 68.8; R4839, 70.4; R5051, 74.3; R4818, 79.5. *Cnemidophorus tigris*: KU 78876, 37.0; MVZ 176759, 39.2; MVZ 176756, 40.3; CAS 189033, 40.5; MVZ 66232, 41.8; KU 72357, 43.5; MVZ 206245, 43.9; KU 72374,

- 44.5; MVZ 176758, 44.7; MVZ 39302, 46.0; MVZ 176755, 46.2; CAS 47913, 48.2; MVZ 74644, 48.9; CAS-SU 7143, 50.0; USNM 248380, 51.5; CAS 154911, 51.6; MVZ 44604, 53.4; USNM 248385, 53.5; MVZ 44597, 54.6; CAS-SU 7135, 57.8; CAS-SU 21420, 59.2; USNM 248381, 59.4; KU 78840, 61.4; CAS-SU 21422, 63.4; MVZ 44602, 64.2; USNM 248384, 65.1; KU 72377, 68.5; MVZ 179879, 70.6; USNM 248365, 72.1; CAS 195821, 75.9; MVZ 179998, 77.2; USNM 248371, 77.6; CAS 189022, 80.7; MVZ 51951, 82.2; USNM 248376, 83.1; CAS 154901, 87.6; USNM 248375, 92.1; MVZ 56745, 96.7; CAS 181811, 105.3. *Neusticurus eupleopus* (MVZ unless otherwise noted): KU 148246, 22.4; USNM 316870, 22.9; 163166, 23.6; KU 109803, 23.6; KU 148251, 25.8; 174949, 26.7; KU 109781, 27.3; 174920, 28.7; KU 109809, 28.9; 174928, 30.5; 174905, 31.8; KU 109789, 32.8; 163147, 34.3; 174901, 37.9; 174899, 39.0; 163185, 40.7; 174953, 45.2; 174896, 47.6; 163187, 51.1; 163145, 55.6; 163202, 59.1; 174891, 63.2. *Elgaria coerulea*: MVZ 139873, 28.8*; CAS 203466, 30.7*; CAS 203461, 32.3; CAS 65922, 33.3; CAS 171950, 33.8; CAS 65923, 34.6; MVZ 191223, 36.6*; CAS 188816, 37.4; MVZ 139731, 37.7*; MVZ 140204, 40.3*; CAS 21012, 40.5; MVZ 140257, 41.1*; MVZ 140332, 43.6; MVZ 140336, 45.0*; MVZ 147923, 45.1*; MVZ 140331, 45.9; MVZ 140496, 47.6*; CAS-SU 22614, 48.0; MVZ 140423, 48.1*; MVZ 139946, 49.6*; MVZ 140424, 49.7; MVZ 140339, 50.7; MVZ 140142, 52.2*; MVZ 139898, 52.5*; MVZ 140254, 58.3*; MVZ 140337, 58.7; MVZ 35543, 61.8*; MVZ 198022, 62.4; MVZ 139989, 62.7*; MVZ 140341, 65.1; CAS 188823, 69.2; MVZ 191271, 70.3*; MVZ 198029, 74.0; CAS 23047, 78.4; MVZ 140431, 83.3; MVZ 140430, 93.4*; CAS 188828, 110.7. *Chalcides ocellatus* (YPM unless otherwise noted): R9197, 39.9; R9198, 40.7; R9199, 41.7; R9200, 42.5; R9201, 42.9; R9202, 44.5; R9203, 44.9; R4250, 45.9; R4255, 47.0; R9204, 47.9; R9205, 48.0; R9206, 49.4; R9207, 50.2; R4233, 51.3; R9208, 52.4; R5130, 54.3; R4251, 54.7; R5161, 55.5; R4256, 57.6; R4248, 57.7; R4232, 58.5; USNM 134192, 59.1; R4242, 61.3; R4240, 64.7; R5126, 66.5; USNM 134754, 69.2; R4215, 71.9; R5137, 72.3; R4253, 76.3; R4265, 78.4; R4239, 82.2; R5150, 86.3; R4212, 88.5; R4206, 98.2; R5148, 105.7; R4231, 114.0. *Eumeces fasciatus*: KU 88448, 22.4; KU 88442, 23.2; KU 88440, 24.0; USNM 325473, 24.5; CM 136769, 25.7; CM 124434, 26.3; CM 34040, 28.3; CM 141639, 29.4; KU 176570, 31.8; CM 141588, 32.7; KU 176565, 34.1; CM 141638, 34.9; CM 141587, 36.2; USNM 325416, 36.8; CAS 71556, 37.0; CAS 71887, 38.0; KU 88422, 39.8; CAS 71558, 40.3; KU 88469, 41.8; CAS 71592, 41.8; CAS 71888, 42.5; CM S5488, 44.0; CM 74105, 44.8; CM 140362, 47.0; CAS 71537, 47.6; CM 121438, 48.7; KU 174847, 50.1; CM 124446, 52.7; KU 176581, 54.0; CM 75372, 57.3; KU 88463, 58.9; USNM 325428, 60.5; KU 176558, 63.1; CAS 71563, 65.2; CM S8687, 68.1; CM 67126, 74.3. *Lepidophyma gaigeae* (all TCWC): 38609, 24**; 35616, 24.5**; 40686, 26.5**; 32347, 26.5**; 29682, 29.5**; 27821, 30.5**; 29690, 32.5**; 29683, 34**; 32343, 38.5**; 29640, 40.9**; 33057, 44.5**; 30672, 46.5**; 38611, 48.5**; 35617, 49**; 29686, 55**; 32320, 55**; 29619, 57**; 27804, 59**; 38608, 59.5**; 27797, 61.5**. *Xantusia riversiana*: MVZ 80517, 31.1; LACM 108714, 33**; LACM 108757, 34**; LACM 108746, 35**; LACM 108717, 35**; MVZ 51225, 37.0; LACM 108723, 41**; MVZ 80951, 43.2; YPMR 6611, 46.1; LACM 108733, 47**; LACM 108736, 48**; YPMR 6598, 50.0; YPMR 6606, 54.6; LACM 108439, 56**; YPMR 6604, 57.7; MVZ 51237, 59.2; YPMR 6600, 64.1; LACM 108434, 66**; MVZ 80510, 70.0; YPMR 6602, 77.4; LACM 108425, 85**; LACM 108424, 93**. *Xantusia henshawi*: SDMNH 49886, 26.5**; SDMNH 16504, 28**; YPM R9246, 28.4; SDMNH 56765, 28.5**; YPM R9247, 29.5; LMK 38042, 30**; YPM R9248, 30.8; YPM R9249, 31.3; CAS-SU 22022, 31.7; YPM R9250, 31.9; YPM R9251, 34.8; YPM R9252, 37.4; YPM R9253, 38.4; YPM R9254, 40.6; CAS-SU 22592, 41.3; YPM R9255, 41.4; LACM 106804, 41.5**; SDMNH 58392, 42.5**; YPM R9256, 43.4; SDMNH 49949, 44**; CAS-SU 22599, 46.3; CAS-SU 22589, 49.4; YPM R9257, 51.8; YPM R9258, 53.4; YPM R9259, 53.6; YPM R9260, 59.4; SDMNH 57695, 62**. *Xantusia arizonae* (YPM unless otherwise noted): R9216, 27.2; CAS 80572, 28**; UMMZ 172106, 28.5**; R9217, 29.5; R9218, 30.0; R9219, 31.1; R9220, 35.6; R9221, 41.3; R9222, 43.5; R9223, 44.9; R9224, 45.3; R9225, 46.3; R9226, 46.4; R9227, 47.5; R9228, 47.6; R9229, 49.4; R9230, 49.5; R9231, 49.7; R9232, 50.2; R9233, 50.5; R9234, 51.1; R9236, 51.6; R9235, 51.7; R9237, 52.1; R9238, 52.9; R9239, 53.2; R9240, 54.2; R9241, 54.9; R9242, 55.0; R9243, 55.3; R9244, 55.4; R9245, 55.7; UMMZ 172102, 56.6**. *Xantusia vigilis*: UMFS 00457, 20**; UMFS 00460, 21**; UMFS 00463, 21**; UMFS 00456, 21**; UMFS 00469, 21**; UMFS 00459, 21**; UMFS 00466, 21**; UMFS 00465, 22**; UMFS 00462, 22**; UMFS 00468, 22**; UMFS 00472, 23**; UMFS 00458, 23**; UMFS 00464, 23**; UMFS 00467, 23**; UMFS 00461, 23**; UMFS 00471, 24**; UMFS 00470, 25**; CM 64563, 25.6; MVZ 66792, 26.5; CAS 1888605, 28.2; MVZ 213574, 29.2; MVZ 213561, 29.7; MVZ 213556, 30.0; MVZ 213366, 30.6; ASU 11390, 30.8; LACM 134565, 32**; UMFS 00437, 32**; MVZ 73879, 32.7; UMFS 00455, 33**; UMFS 00442, 34**; JAG 3, 34.9*; UMFS 00441, 35**; UMFS 00450, 35**; UMFS 00436, 36**; UMFS 00439, 37**; YPM R9261, 37.6; UMFS 00452, 38**; YPM R9262, 39.3; YPM R9263, 39.8; JAG 1, 41.3*; LACM 72333, 42**; JAG 2, 42.2*; JAG 4, 43.0*; JAG 5, 43.8*; LACM 134559, 45**; LACM 76135, 50**; LACM 134550, 50**.

APPENDIX 2

SEQUENCE UNIT CHARACTERS EMPLOYED IN
PHYLOGENETIC ANALYSIS

The names of the postnatal skeletal events comprise the name of the sequence unit. If the first event precedes the second in ontogeny the sequence unit is assigned state '0'; if the second event precedes the first it is assigned state '1'; if the sequence unit is polymorphic it is assigned a 'p'; if both events appear simultaneously it is assigned a '?'. Character states in parentheses are those derived from frequency coding of polymorphisms using nonoverlapping frequencies of 10% increments.

Abbreviations: as/ca: astragalus and calcaneum fusing; ast: ossification centre of astragalus present; cal: ossification centre of calcaneum present; dc2: ossification centre of distal carpal 2 present; dc3: ossification centre of distal carpal 3 present; dc4: ossification centre of distal carpal 4 present; dc5: ossification centre of distal carpal 5 present; dfore: distal epiphyseal cartilages of forelimb ossifying; dhind: distal epiphyseal cartilages of hindlimb ossifying; dmcs: distal epiphyseal cartilages of metacarpals ossifying; dmts: distal epiphyseal cartilages of metatarsals ossifying; dp: apophyseal ossification (surficial ossification marking insertion of muscle or connective tissue) on deltopectoral crest of humerus present; dt3: ossification centre

of distal tarsal 3 present; dt4: ossification centre of distal tarsal 4 present; elbow: apophyseal ossification in elbow present; ilcap: cartilage capping dorsal end of ilium ossifying; intr: apophyseal ossification on internal trochanter of femur present; iscsym: ischial symphysis calcifying; isctub: ischial tubercle of ischium ossifying; latcen: ossification centre of lateral centrale present; lun: lunulae (sesamoids inside knee joint) ossifying; medcen: ossification centre of medial centrale present; ncsut: neurocentral suture closing; neurar: neural arch suture closing; neursp: neural spines ossifying; palm: palmar sesamoid ossifying; pectub: pectineal tubercle of pubis ossifying; pelvis: ilium, ischium, and pubis fusing; p/uman: proximal epiphyseal cartilages of phalanges/unguals ossifying in manus; p/upes: proximal epiphyseal cartilages of phalanges/unguals ossifying in pes; pfore: proximal epiphyseal cartilages of forelimb ossifying; phind: proximal epiphyseal cartilages of hindlimb ossifying; pis: ossification centre of pisiform present; pmcs: proximal epiphyseal cartilages of metacarpals ossifying; pmts: proximal epiphyseal cartilages of metatarsals ossifying; pubsym: pubic symphysis calcifying; quad: cartilage capping cephalic condyle of quadrate ossifying; raapo: apophyseal ossification on retroarticular process present; rad: ossification centre of radiale present; sc/co: scapula and coracoid fusing; uln: ossification centre of ulnare present.

SU	1 ncsut - neurar	2 ncsut - p/uman	3 ast - ncsut	4 ncsut - p/pues	5 ncsut - dmcs	6 cal - ncsut	7 dt4 - ncsut	8 dt3 - ncsut	9 ncsut - dmcs	10 ncsut - iscsym	11 dt4 - ncsut	12 dt5 - ncsut	13 uln - ncsut	14 ncsut - phind	15 ncsut - pmts	16 ncsut - pubsym	17 pfore - ncsut	18 dhind - ncsut	19 dfore - ncsut	20 rad - ncsut	21 ncsut - pmcs	22 ncsut - as/cac	23 ncsut - lun	24 dt3 - ncsut	25 ncsut - pis	26 ncsut - neursp	27 ncsut - palm
Agam	?	?	?	?	0	(2) 1	(2) 1	1	0	0	1	(2) 1	1	0	0	0	(2) 1	1	1	(3) 1	0	0	0	1	0	0	0
Uta	0	1	0	1	1	0	0	0	1	(2) p	0	0	0	1	(1) p	0	0	0	0	0	(1) p	1	0	0	0	0	0
Call	0	0	?	0	?	?	?	?	?	0	?	?	?	?	0	0	?	?	?	?	0	0	0	?	0	0	0
Anol	?	1	0	1	1	0	0	0	1	(3) 1	0	0	0	1	(2) 1	(1) p	0	0	0	0	(2) 1	1	0	0	0	0	0
Basi	1	0	0	0	0	0	0	0	0	(1) p	0	(1) p	0	0	0	0	(2) 1	1	1	(2) p	0	0	0	0	0	0	0
Gamb	?	1	0	1	1	0	0	0	1	0	0	0	0	?	0	0	0	0	0	0	0	0	0	0	0	0	0
Dips	?	0	?	0	0	?	?	?	0	0	?	?	?	?	0	0	?	?	?	?	0	0	0	?	0	0	0
Cole	1	0	0	0	0	0	0	1	0	0	?	(2) 1	1	0	0	0	(2) 1	1	1	(3) 1	0	0	0	1	0	0	?
Gona	0	0	0	0	0	0	0	1	0	0	1	(2) 1	0	0	0	0	(2) 1	1	1	(3) 1	0	0	0	1	0	0	?
Acan	?	?	0	1	1	0	0	0	1	?	0	(2) 1	0	1	?	?	0	0	0	0	0	0	1	0	?	0	?
Cnem	?	?	?	?	?	?	?	?	?	0	?	?	?	?	?	?	?	?	?	?	?	0	0	?	0	0	0
Neus	?	?	?	?	?	?	?	?	?	0	?	?	?	?	?	?	?	?	?	?	?	0	0	?	0	0	0
Elga	0	1	0	1	1	0	0	0	1	?	0	0	0	?	(2) 1	?	0	?	?	?	(2) 1	0	?	0	0	0	0
Chal	0	1	0	1	1	0	0	0	1	?	0	(2) 1	0	?	(2) 1	0	0	?	0	?	?	0	0	?	0	0	0
Eume	0	1	0	1	1	0	0	0	1	(3) 1	0	0	0	1	(2) 1	(2) 1	0	0	0	0	(2) 1	0	0	0	1	0	(1) p
Lepi	?	0	0	0	0	0	0	1	0	(3) 1	?	(2) 1	0	1	0	(2) 1	?	1	1	(1) p	0	0	0	1	0	0	0
Xriv	0	0	0	0	0	0	0	1	0	0	1	(2) 1	0	0	0	0	(2) 1	1	1	(1) p	0	0	0	1	0	0	0
Xhen	0	0	0	0	0	(1) p	(1) p	1	0	(3) 1	1	(2) 1	1	0	0	0	(1) p	1	1	(3) 1	0	0	0	1	0	0	0
Xari	?	0	0	0	0	?	(2) 1	1	0	?	1	(2) 1	1	0	0	?	(2) 1	1	1	(3) 1	0	0	0	1	0	0	0
Xvig	?	0	0	?	?	0	0	0	?	(3) 1	?	?	0	?	?	(2) 1	?	?	?	0	?	0	?	?	0	?	0
Bipe	?	?	?	?	?	?	?	?	?	?	?	?	?	?	?	?	?	?	?	?	?	?	?	?	?	?	?

SU	28 ncsut - quad	29 ncsut - elbow	30 ncsut - dp	31 dt2 - ncsut	32 ncsut - ilcap	33 ncsut - intr	34 ncsut - sc/co	35 ncsut - pelvis	36 ncsut - raapo	37 ncsut - pectub	38 ncsut - isctub	39 lateen - ncsut	40 ncsut - medeen	41 neurar - p/uman	42 ast - neurar	43 p/pues - neurar	44 dmcs - neurar	45 cal - neurar	46 dt4 - neurar	47 dt3 - neurar	48 dmcs - neurar	49 neurar - iscsym	50 dt4 - neurar	51 dt5 - neurar	52 uln - neurar	53 phind - neurar	54 neurar - pmts	
Agam	0	0	0	(2) 1	0	0	0	0	0	0	0	(2) 1	0	?	?	?	1	1	1	1	1	0	1	1	(2) 1	1	0	
Uta	0	(1) p	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	(1) p	0	0	0	0	(1) p	
Call	0	0	0	?	0	0	0	0	0	0	0	(2) 1	?	0	0	(1) p	0	0	0	0	0	0	0	0	0	0	0	
Anol	0	(3) 1	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	(2) 1	0	0	0	0	(2) 1	
Basi	?	0	0	(1) p	0	0	0	0	0	0	0	(1) p	0	0	?	(2) 1	1	?	?	1	1	0	?	1	?	1	0	
Gamb	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	?	0	0	
Dips	0	0	0	?	0	0	0	0	0	0	0	?	0	0	?	(2) 1	1	?	?	?	?	1	0	?	?	?	0	
Cole	0	0	0	(2) 1	0	0	0	0	0	0	0	(2) 1	0	0	?	(2) 1	1	?	?	1	1	1	0	1	1	(2) 1	1	0
Gona	0	(3) 1	0	(2) 1	0	0	0	0	0	0	0	(2) 1	0	1	0	0	1	0	0	1	1	0	0	1	0	1	0	
Acan	0	0	0	(2) 1	0	0	0	0	0	0	0	0	(2) p	?	0	0	0	0	0	0	0	?	0	1	0	0	?	
Cnem	0	0	0	?	0	0	0	0	0	0	0	?	0	?	?	?	?	?	?	?	?	0	?	?	?	?	?	
Neus	?	0	0	?	0	0	0	0	0	0	0	?	0	?	?	?	?	?	?	?	?	0	?	?	?	?	?	
Elga	0	0	0	0	0	0	0	0	0	0	0	0	(3) 1	1	0	0	0	0	0	0	0	(2) 1	0	0	0	0	(2) 1	
Chal	0	0	0	(2) 1	0	0	0	0	0	0	0	(2) 1	0	1	0	0	0	0	0	0	0	(2) 1	0	0	0	0	(2) 1	
Eume	0	0	0	0	(1) p	0	0	0	0	0	0	0	(1) p	1	0	0	0	0	0	0	0	(2) 1	0	0	0	0	(2) 1	
Lepi	?	(2) p	0	(2) 1	0	0	0	0	0	0	0	(2) 1	0	0	0	(2) 1	1	0	0	1	1	(2) 1	?	1	0	0	0	
Xriv	?	0	0	(2) 1	0	0	0	0	0	0	0	(2) 1	0	0	0	(2) 1	1	0	0	1	1	0	?	1	0	1	0	
Xhen	?	(1) p	(1) p	(2) 1	0	0	0	0	0	0	0	(2) 1	0	0	0	?	1	0	0	1	1	(2) 1	1	1	(1) p	?	0	
Xari	?	(3) 1	0	(2) 1	0	0	0	0	0	0	0	(2) 1	0	0	0	(2) 1	1	?	?	1	1	?	1	1	(2) 1	1	0	
Xvig	?	(3) 1	?	?	0	?	?	?	0	0	?	?	?	0	0	0	?	?	0	0	0	(2) 1	?	?	?	0	?	?
Bipe	?	0	0	?	?	?	?	?	?	0	?	?	?	?	?	?	?	?	?	?	?	?	?	?	?	?	?	

SU	55 neurar - pubsym	56 pfore - neurar	57 dhind - neurar	58 dfore - neurar	59 rad - neurar	60 neurar - pmcs	61 neurar - as/cac	62 neurar - lun	63 dc3 - neurar	64 neurar - pis	65 neurar - neursp	66 neurar - palm	67 neurar - quad	68 neurar - elbow	69 neurar - dp	70 dc2 - neurar	71 neurar - ilcap	72 neurar - intrr	73 neurar - sc/co	74 neurar - pelvis	75 neurar - raapo	76 neurar - pectub	77 neurar - isctub	78 neurar - latcen	79 neurar - medcen	80 ast - p/uman	81 p/upes - p/uman	82 dmcs - p/uman
<i>Agam</i>	0	1	1	1	(3) 1	0	0	0	1	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	?	?	(2) 1
<i>Uta</i>	0	0	0	0	0	1	(2) 1	0	0	0	0	0	0	(2) p	0	0	0	0	0	0	0	0	0	1	0	?	?	?
<i>Call</i>	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	(1) p	0
<i>Anol</i>	(1) p	0	0	0	0	1	(2) 1	0	0	0	0	0	0	(3) 1	0	0	0	0	0	0	0	0	0	1	0	0	?	(1) p
<i>Basi</i>	0	1	1	1	(3) 1	0	0	0	?	0	0	0	?	0	0	1	0	0	0	0	0	0	0	0	0	0	0	(2) 1
<i>Gamb</i>	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	?	0
<i>Dips</i>	0	?	?	?	?	0	0	0	?	0	0	0	0	0	0	?	0	0	0	0	0	0	0	?	0	?	?	0
<i>Cole</i>	0	1	1	1	(3) 1	0	0	0	1	0	0	?	0	0	0	1	0	0	0	0	0	0	0	0	0	0	?	(2) 1
<i>Gona</i>	0	1	1	1	(3) 1	0	0	0	1	0	1	?	0	(3) 1	1	1	(2) 1	1	0	0	?	0	1	0	0	0	?	(2) 1
<i>Acan</i>	?	0	0	0	0	0	0	1	0	?	0	?	0	0	0	1	0	0	0	0	0	0	0	1	(1) p	0	0	0
<i>Cnem</i>	?	?	?	?	?	?	0	0	?	0	0	0	0	0	0	?	0	0	0	0	0	0	0	?	0	?	?	?
<i>Neus</i>	0	?	?	?	?	?	0	0	?	0	0	0	?	0	0	?	0	0	0	0	0	0	0	?	0	?	?	?
<i>Elga</i>	(2) 1	0	0	0	0	1	0	1	0	?	0	0	0	0	0	0	0	0	0	0	0	0	0	1	(3) 1	0	?	(2) 1
<i>Chal</i>	(2) 1	0	0	0	0	1	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	?	0
<i>Eume</i>	(2) 1	0	0	0	0	1	(1) p	1	0	1	0	1	(1) p	0	0	0	(1) p	?	0	0	0	0	0	1	(2) p	0	?	?
<i>Lepi</i>	(2) 1	?	1	1	(2) p	0	0	0	1	0	0	0	?	(1) p	0	1	0	0	0	0	0	0	0	0	0	0	?	?
<i>Xriv</i>	0	1	1	1	(1) p	0	0	0	1	0	0	0	?	0	0	1	0	0	0	0	0	0	0	0	0	0	?	?
<i>Xhen</i>	?	0	1	1	(3) 1	0	0	0	1	0	0	0	?	(3) 1	1	1	0	0	0	0	0	0	0	0	0	0	0	?
<i>Xari</i>	?	1	1	1	(3) 1	0	0	0	1	0	0	0	?	(3) 1	0	1	0	0	0	0	0	0	0	0	0	0	0	0
<i>Xvig</i>	(2) 1	?	?	?	0	?	0	?	?	0	?	0	?	(3) 1	?	?	0	?	?	0	0	?	?	?	0	0	0	0
<i>Bipe</i>	?	?	?	?	?	?	?	?	?	?	?	?	?	0	0	?	?	?	?	?	0	?	?	?	?	?	?	?

SU	83 cal - p/uman	84 dt4 - p/uman	85 dt3 - p/uman	86 p/uman - dmcs	87 p/uman - iscsym	88 dc4 - p/uman	89 dc5 - p/uman	90 uln - p/uman	91 phind - p/uman	92 p/uman - pnts	93 p/uman - pubsym	94 pfore - p/uman	95 dhind - p/uman	96 dfore - p/uman	97 rad - p/uman	98 p/uman - pmcs	99 p/uman - as/cac	100 p/uman - lun	101 dc3 - p/uman	102 p/uman - pis	103 p/uman - neursp
<i>Agam</i>	(2) 1	(2) 1	(2) 1	(3) 1	0	(2) 1	(2) 1	(3) 1	1	0	0	1	(2) 1	(2) 1	(2) 1	0	0	0	(3) 1	0	0
<i>Uta</i>	?	?	?	?	0	?	?	?	?	0	0	?	?	?	?	0	0	0	?	0	0
<i>Call</i>	0	0	0	0	(2) p	0	0	0	0	0	0	0	0	0	0	(2) p	0	0	0	1	0
<i>Anol</i>	0	0	(1) p	(1) p	(1) p	0	0	0	0	(1) p	(1) p	0	0	0	(2) 1	(1) p	(1) p	0	(1) p	0	0
<i>Basi</i>	0	0	0	(2) p	(3) 1	0	0	0	0	0	0	0	0	0	0	0	(3) p	0	0	0	0
<i>Gamb</i>	0	0	0	?	0	0	0	0	1	0	0	0	?	(1) p	(1) p	0	0	0	0	0	0
<i>Dips</i>	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	(2) p	0	0	0	0
<i>Cole</i>	0	0	(2) 1	?	0	0	(2) 1	(1) p	1	0	0	1	(2) 1	(2) 1	(2) 1	0	0	0	(3) 1	0	1
<i>Gona</i>	0	0	(2) 1	(3) 1	0	0	(2) 1	0	1	0	0	1	(2) 1	(2) 1	(2) 1	0	0	0	(3) 1	0	1
<i>Acan</i>	0	0	0	0	?	0	(2) 1	0	0	?	?	0	0	0	0	0	0	1	0	?	0
<i>Cnem</i>	?	?	?	?	0	?	?	?	?	?	?	?	?	?	?	?	0	0	?	0	0
<i>Neus</i>	?	?	?	?	0	?	?	?	?	?	0	?	?	?	?	?	0	0	?	0	0
<i>Elga</i>	(1) p	(1) p	(1) p	(3) 1	0	(1) p	(1) p	(2) p	1	0	0	1	(2) 1	(2) 1	(1) p	0	0	0	(2) p	0	0
<i>Chal</i>	0	0	?	0	0	0	(2) 1	0	1	?	0	?	(2) 1	?	(2) 1	0	0	0	?	0	0
<i>Eume</i>	0	0	?	?	0	0	(2) 1	0	?	0	0	0	?	?	0	0	0	0	(3) 1	?	0
<i>Lepi</i>	0	0	0	?	(3) 1	0	?	0	0	0	(2) 1	0	?	(2) 1	0	0	0	?	0	?	0
<i>Xriv</i>	0	0	0	0	(3) 1	0	0	0	0	0	0	0	(1) p	(1) p	0	0	?	0	(3) 1	0	?
<i>Xhen</i>	0	0	?	?	(3) 1	?	(2) 1	0	0	0	(2) 1	0	(2) 1	(2) 1	?	0	0	0	?	0	0
<i>Xari</i>	0	0	0	0	(3) 1	0	0	0	0	?	(2) 1	0	0	0	?	?	0	?	0	?	1
<i>Xvig</i>	0	0	0	0	(3) 1	0	0	0	0	(2) 1	(2) 1	0	0	0	0	(3) 1	0	1	0	0	1
<i>Bipe</i>	?	?	?	?	?	?	?	?	?	?	?	?	?	?	?	?	?	?	?	?	?

Agam	104 p/uman - palm	105 p/uman - quad	106 p/uman - elbow	107 p/uman - dp	108 dc2 - p/uman	109 p/uman - ilcap	110 p/uman - intrr	111 p/uman - sc/co	112 p/uman - pelvis	113 p/uman - raapo	114 p/uman - pectub	115 p/uman - isticub	116 p/uman - lateen	117 p/uman - medeen	118 ast - p/upes	119 ast - dmcs	120 ast - cal	121 ast - dt4	122 ast - dt3	123 ast - dmts	124 ast - iscsym	125 ast - dc4	126 ast - dc5	127 ast - uln	128 ast - phind	129 ast - pmts	130 ast - pubsym	131 ast - pfore	132 ast - dhind
<i>Agam</i>	0	0	0	0	(3) 1	0	0	0	0	0	0	0	0	0	?	0	0	0	0	0	0	0	0	0	0	0	0	0	0
<i>Uta</i>	0	0	0	0	?	0	0	0	0	0	0	0	?	0	?	?	?	?	?	?	0	?	?	?	?	?	0	?	?
<i>Call</i>	0	0	0	0	0	0	0	0	0	0	0	0	0	?	0	?	?	?	?	?	0	?	?	?	?	0	0	?	?
<i>Anol</i>	0	0	(1) p	0	(1) p	0	0	0	0	0	0	(2) p	0	0	0	0	?	?	?	0	0	0	0	0	0	0	0	?	?
<i>Basi</i>	0	?	0	0	0	0	0	0	0	0	0	(3) 1	0	0	0	0	?	?	?	0	0	?	0	?	0	0	0	0	0
<i>Gamb</i>	0	0	0	0	0	0	0	0	0	0	0	?	0	0	0	0	?	?	?	0	0	?	0	?	0	0	0	0	0
<i>Dips</i>	0	0	0	0	0	0	0	0	0	0	0	(3) 1	0	0	0	0	?	?	?	0	0	?	?	?	?	0	0	?	?
<i>Cole</i>	?	0	(2) p	0	(3) 1	0	0	0	0	0	0	0	0	0	0	0	?	?	?	0	0	0	0	0	0	0	0	0	0
<i>Gona</i>	?	0	(3) 1	1	(3) 1	1	(2) 1	0	0	0	0	1	0	0	0	0	?	?	?	0	0	0	0	0	0	0	0	0	0
<i>Acan</i>	?	0	(3) 1	0	(3) 1	0	0	0	0	0	0	(3) 1	(1) p	0	?	?	?	?	?	?	0	?	?	?	?	?	0	?	?
<i>Cnem</i>	0	0	0	0	?	0	0	0	0	0	0	?	0	?	?	?	?	?	?	?	0	?	?	?	?	?	?	?	?
<i>Neus</i>	0	?	0	0	?	0	0	0	0	0	0	?	0	?	?	?	?	?	?	?	0	?	?	?	?	?	0	?	?
<i>Elga</i>	0	0	0	0	(2) p	0	0	0	0	0	0	(1) p	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
<i>Chal</i>	0	0	0	0	(3) 1	0	0	0	0	0	0	0	0	0	0	?	?	?	?	?	0	?	?	?	?	0	0	0	0
<i>Eume</i>	0	0	0	0	(3) 1	0	0	0	0	0	0	0	0	0	0	0	?	?	?	0	0	?	?	?	?	0	0	0	0
<i>Lepi</i>	0	?	(3) 1	1	?	0	(2) 1	?	0	0	0	?	0	0	0	?	?	?	?	0	0	0	0	0	0	0	0	0	0
<i>Xriv</i>	0	?	(3) 1	1	(3) 1	0	(2) 1	(1) p	0	?	0	?	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
<i>Xhen</i>	0	?	(3) 1	1	?	0	(1) p	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
<i>Xari</i>	?	?	(3) 1	1	?	0	(2) 1	?	0	(2) 1	?	1	?	?	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
<i>Xvig</i>	(1) p	?	(3) 1	1	0	0	(2) 1	(2) 1	0	(1) p	1	1	(3) 1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
<i>Bipe</i>	?	?	0	0	?	?	?	?	?	0	?	?	?	?	?	?	?	?	?	?	?	?	?	?	?	?	?	?	?

SU	133 ast - dfore	134 ast - rad	135 ast - pincs	136 ast - as/cac	137 ast - lun	138 ast - dc3	139 ast - pis	140 ast - neursp	141 ast - palm	142 ast - quad	143 ast - elbow	144 ast - dp	145 ast - dc2	146 ast - ilcap	147 ast - intr	148 ast - sc/co	149 ast - pelvis	150 ast - raapo	151 ast - pectub	152 ast - isctub	153 ast - lateen	154 ast - medeen	155 dmcs - p/upes	156 cal - p/upes	157 dt4 - p/upes	158 dt3 - p/upes	159 dmits - p/upes	160 p/upes - iscsym	161 dc4 - p/upes	162 dc5 - p/upes
Agam	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	(2) 1	(2) 1	(2) 1	1	0	(2) 1	(2) 1
Uta	?	?	0	0	0	?	0	0	0	0	0	0	?	0	0	0	0	0	0	0	?	0	?	?	?	?	?	0	?	?
Call	?	?	0	0	0	?	0	0	0	0	0	0	?	0	0	0	0	0	0	0	0	?	0	0	0	0	0	(1) p	0	0
Anol	?	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	?	0	0	(1) p	0	?	0	0
Basi	0	0	0	0	0	?	0	0	0	?	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	1	(2) 1	0	0
Gamb	0	0	0	0	0	?	0	0	0	0	0	0	?	0	0	0	0	0	0	0	0	0	0	0	0	0	?	0	0	0
Dips	?	?	0	0	0	?	0	0	0	0	0	0	?	0	0	0	0	0	0	0	?	0	0	0	0	0	0	0	0	0
Cole	0	0	0	0	0	0	0	0	?	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	(2) 1	?	0	0	(2) 1
Gona	0	0	0	0	0	0	0	0	?	0	?	0	0	0	0	0	0	0	0	0	0	0	1	0	0	(2) 1	1	0	0	(2) 1
Acan	?	?	0	0	?	?	0	0	0	0	0	0	?	0	0	0	0	0	0	0	?	0	?	?	?	?	?	0	?	(2) 1
Cnem	?	?	?	0	0	?	0	0	0	0	0	0	?	0	0	0	0	0	0	0	?	0	?	?	?	?	?	0	?	?
Neus	?	?	?	0	0	?	0	0	0	?	0	0	?	0	0	0	0	0	0	0	?	0	?	?	?	?	?	0	?	?
Elga	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	(1) p	(1) p	(1) p	1	0	(1) p	(1) p
Chal	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	?	0	0	0	(2) 1
Eume	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	?	0	0	?	?	0	0	(2) 1
Lepi	0	0	0	0	0	0	0	0	0	?	0	0	0	0	0	0	0	0	0	0	0	0	?	0	0	0	?	(2) 1	0	?
Xriv	0	0	0	0	0	0	0	0	0	?	0	0	0	0	0	0	0	0	0	0	0	0	?	0	0	0	0	(2) 1	0	0
Xhen	0	0	0	0	0	0	0	0	0	?	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	(2) 1	1	(2) 1	(2) 1	(2) 1
Xari	0	0	0	0	0	0	0	0	0	?	?	0	0	0	0	0	0	0	0	0	0	0	0	0	0	(1) p	0	(2) 1	?	?
Xvig	0	0	0	0	0	0	0	0	0	?	0	0	0	0	0	0	0	0	0	0	0	0	?	0	0	0	?	(2) 1	?	?
Bipe	?	?	?	?	?	?	?	?	?	?	?	?	?	?	?	?	?	?	?	?	?	?	?	?	?	?	?	?	?	?

SU	163 uln - p/upes	164 phind - p/upes	165 p/upes - pmts	166 p/upes - pubsym	167 pfore - p/upes	168 dhind - p/upes	169 dfore - p/upes	170 p/upes - rad	171 p/upes - pmcs	172 p/upes - as/cac	173 p/upes - lun	174 dc3 - p/upes	175 p/upes - pis	176 p/upes - neursp	177 p/upes - palm	178 p/upes - quad	179 p/upes - elbow	180 p/upes - dp	181 dc2 - p/upes	182 p/upes - ilecap	183 p/upes - intr	184 p/upes - sc/co	185 p/upes - pelvis	186 p/upes - raapo	187 p/upes - pectub	188 p/upes - istcub
Agam	(3) 1	1	0	0 1	(2) 1	(2) 1	0	0	0	0	(3) 1	0	0	0	0	0	0	(3) 1	0	0	0	0	0	0	0	
Uta	?	?	0	0 ?	?	?	?	?	0	0	0	?	0	0	0	0	0	?	0	0	0	0	0	0	0	
Call	0	0	(1) p	0 0	0	0	0	(3) 1	(1) p	(1) p	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
Anol	0	0	?	0 0	0	0	0	0	?	0	0	0	0	0	0	0	(1) p	0	(1) p	0	0	0	0	0	0	
Basi	0	0	0	0 0	0	0	0	(1) p	0	(1) p	0	0	0	0	0	?	0	0	0	0	0	0	0	0	0	
Gamb	0	1	0	0 0	0	?	(1) p	(2) p	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
Dips	0	0	0	0 0	0	0	0	(3) 1	0	(2) p	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
Cole	(1) p	1	0	0 1	(2) 1	(2) 1	0	0	0	0	(3) 1	0	1	?	?	0	(2) p	0	(3) 1	0	0	0	0	0	0	
Gona	0	1	0	0 1	(2) 1	(2) 1	0	0	0	0	(3) 1	0	1	?	?	0	(3) 1	1	(3) 1	1	1	0	0	0	1	
Acan	?	?	0	0 ?	?	?	?	?	0	0	?	?	0	0	0	0	0	0	?	0	0	0	0	0	0	
Cnem	?	?	?	?	?	?	?	?	?	0	0	?	0	0	0	0	0	0	?	0	0	0	0	0	0	
Neus	?	?	?	?	?	?	?	?	?	0	0	?	0	0	?	?	0	0	?	0	0	0	0	0	0	
Elga	(2) p	1	0	0 1	(2) 1	(2) 1	(2) p	0	0	0	(2) p	0	0	0	0	0	0	(2) p	0	0	0	0	0	0	0	
Chal	0	1	?	0 ?	(2) 1	?	0	0	0	0	?	0	0	0	0	0	0	(3) 1	0	0	0	0	0	0	0	
Eume	0	?	0	0 0	?	?	(3) 1	0	0	(3) 1	?	0	0	0	0	0	0	(3) 1	0	0	0	0	0	0	0	
Lepi	0	0	0	1 0	?	(2) 1	(3) 1	0	0	?	?	0	?	0	?	(3) 1	1	?	?	0	1	?	0	0	0	
Xriv	0	0	0	0 0	(1) p	(1) p	(3) 1	0	?	?	(3) 1	0	?	?	?	(3) 1	1	(3) 1	0	1	(1) p	0	?	0	0	
Xhen	(1) p	?	0	?	(2) 1	(2) 1	0	0	0	0	(3) 1	0	0	0	?	(3) 1	1	(3) 1	0	0	0	0	0	0	0	
Xari	0	0	0	1 0	(1) p	0	0	0	0	0	(1) p	0	1	0	?	(3) 1	1	(3) 1	0	1	0	0	?	0	1	
Xvig	0	?	?	1 ?	?	?	(3) 1	?	?	?	?	?	?	?	?	(3) 1	?	?	?	?	?	?	?	?	?	
Bipe	?	?	?	?	?	?	?	?	?	?	?	?	?	?	?	?	?	?	?	?	?	?	?	?	?	

SU	189 latcen - p/upes	190 p/upes - medcen	191 cal - dmcs	192 dt4 - dmcs	193 dt3 - dmcs	194 dmcs - dmcs	195 dmcs - iscsym	196 dc4 - dmcs	197 dc5 - dmcs	198 uln - dmcs	199 phind - dmcs	200 dmcs - pmts	201 dmcs - pubsym	202 pfore - dmcs	203 dhind - dmcs	204 dfore - dmcs	205 dmcs - rad	206 dmcs - pmcs	207 dmcs - as/cac	208 dmcs - lun	209 dc3 - dmcs	210 dmcs - pis	211 dmcs - neursp	212 dmcs - palm	213 dmcs - quad	214 dmcs - elbow
Agam	(2) 1	0	?	?	(3) 1	?	0	(2) 1	(2) 1	(3) 1	1	0	0	1	(2) 1	(2) 1	0	0	0	0	(3) 1	0	0	0	0	0
Uta	?	0	?	?	?	?	0	?	?	?	?	0	0	?	?	?	?	0	0	0	?	0	0	0	0	0
Call	(2) 1	?	?	?	?	?	0	?	?	?	?	0	0	?	?	?	?	0	0	0	?	0	0	0	0	0
Anol	0	0	0	0	(1) p	0	?	0	0	0	0	?	0	0	0	0	0	?	0	0	0	0	0	0	0	(1) p
Basi	0	0	0	0	0	0	1	0	0	0	0	?	0	0	0	0	(2) 1	0	1	0	0	0	0	0	?	0
Gamb	?	0	0	0	0	1	0	0	?	0	1	0	0	?	(2) 1	(2) 1	0	0	0	0	0	0	0	0	0	0
Dips	0	0	0	0	0	?	0	0	0	0	0	0	0	0	0	0	(2) 1	0	0	0	0	0	0	0	0	0
Cole	(2) 1	0	0	0	(2) p	0	0	0	(2) 1	(1) p	1	0	0	1	(2) 1	(2) 1	0	0	0	0	(3) 1	0	(2) 1	?	0	(2) 1
Gona	(2) 1	0	0	0	?	?	0	0	(2) 1	0	?	0	0	0	?	?	0	0	0	1	(3) 1	0	(2) 1	?	0	(2) 1
Acan	?	0	?	?	?	?	0	?	(2) 1	?	?	0	0	?	?	?	?	0	0	?	?	0	0	0	0	0
Cnem	?	0	?	?	?	?	0	?	?	?	?	?	?	?	?	?	?	?	0	0	?	0	0	0	0	0
Neus	?	0	?	?	?	?	0	?	?	?	?	?	0	?	?	?	?	?	0	0	?	0	0	0	?	0
Elga	(1) p	0	0	0	0	?	0	(1) p	(1) p	(2) p	1	0	0	1	(2) 1	(2) 1	(1) p	0	0	0	(1) p	0	0	0	0	0
Chal	(2) 1	0	?	?	(3) 1	?	0	?	(2) 1	?	1	0	0	1	(2) 1	(2) 1	0	0	0	0	(3) 1	0	0	0	0	0
Eume	(2) 1	0	0	0	?	?	0	0	(2) 1	0	?	0	0	0	?	?	(2) 1	0	0	0	(3) 1	?	0	0	0	0
Lepi	?	0	0	0	0	?	1	0	?	0	0	0	1	0	?	(2) 1	(2) 1	0	0	?	0	?	0	?	?	(2) 1
Xriv	?	0	0	0	0	0	1	0	0	0	0	0	0	0	(1) p	(1) p	(2) 1	0	?	0	(3) 1	0	?	?	?	(2) 1
Xhen	(2) 1	0	0	0	?	?	1	?	(2) 1	0	?	0	1	0	(2) 1	(2) 1	?	0	0	0	?	0	0	?	?	(2) 1
Xari	(2) 1	0	0	0	0	0	1	(2) 1	(2) 1	?	?	0	1	0	(2) 1	0	0	0	0	(2) p	0	(1) p	0	?	?	(2) 1
Xvig	?	0	0	0	0	?	1	?	?	0	?	?	1	?	?	?	(2) 1	?	0	?	?	0	?	?	?	(2) 1
Bipe	?	?	?	?	?	?	?	?	?	?	?	?	?	?	?	?	?	?	?	?	?	?	?	?	?	0

SU	215 dmcs - dp	216 dc2 - dmcs	217 dmcs - ilcap	218 dmcs - intr	219 dmcs - sc/co	220 dmcs - pelvis	221 dmcs - raapo	222 dmcs - pectub	223 dmcs - isticub	224 lateen - dmcs	225 dmcs - medeen	226 cal - dt4	227 cal - dt3	228 cal - dmits	229 cal - iscsym	230 cal - dc4	231 cal - dc5	232 cal - uln	233 cal - phind	234 cal - pmtis	235 cal - pubsym	236 cal - pflore	237 cal - dhind	238 cal - dflore	239 cal - rad	240 cal - pmtis	241 cal - as/cac	242 cal - lun
<i>Agam</i>	0	(2) 1	0	0	0	0	0	0	0	(2) 1	0	?	0	?	0	0	0	0	0	0	0	0	0	0	0	0	0	0
<i>Uta</i>	0	?	0	0	0	0	0	0	0	?	0	?	?	?	0	?	?	?	?	0	0	?	?	?	?	0	0	0
<i>Call</i>	0	?	0	0	0	0	0	0	0	(2) 1	?	?	?	?	0	?	?	?	?	0	0	?	?	?	?	0	0	0
<i>Anol</i>	0	(1) p	0	0	0	0	0	0	0	0	0	?	0	0	0	0	0	0	0	0	0	?	?	?	?	0	0	0
<i>Basi</i>	0	0	0	0	0	0	0	0	0	0	0	?	0	0	0	?	0	?	0	0	0	?	?	?	0	0	0	0
<i>Gamb</i>	0	0	0	0	0	0	0	0	0	(2) 1	0	?	?	0	0	?	0	?	0	0	0	0	0	0	0	0	0	0
<i>Dips</i>	0	0	0	0	0	0	0	0	0	0	0	?	?	0	0	?	?	?	?	0	0	?	?	?	?	0	0	0
<i>Cole</i>	0	(2) 1	0	?	0	0	0	0	0	(2) 1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
<i>Gona</i>	1	(2) 1	1	(2) 1	?	0	1	0	(2) 1	(2) 1	0	?	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
<i>Acan</i>	0	?	0	0	0	0	0	0	0	?	0	?	?	?	0	?	0	?	?	0	0	?	?	?	?	0	0	?
<i>Cnem</i>	0	?	0	0	0	0	0	0	0	?	0	?	?	?	0	?	?	?	?	?	?	?	?	?	?	?	0	0
<i>Neus</i>	0	?	0	0	0	0	0	0	0	?	0	?	?	?	0	?	?	?	?	?	?	?	?	?	?	?	0	0
<i>Elga</i>	0	(1) p	0	0	0	0	0	0	0	(1) p	0	?	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
<i>Chal</i>	0	(2) 1	0	0	0	0	0	0	0	(2) 1	0	?	0	?	0	?	0	?	0	0	0	0	0	0	0	0	0	0
<i>Eume</i>	0	(2) 1	0	0	0	0	0	0	0	(2) 1	0	?	0	0	0	?	0	?	0	0	0	0	0	0	0	0	0	0
<i>Lepi</i>	1	?	0	(2) 1	?	0	0	0	0	?	0	?	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
<i>Xriv</i>	1	(2) 1	0	(2) 1	(1) p	0	?	0	0	?	0	?	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
<i>Xhen</i>	1	?	0	(1) p	0	0	0	0	0	(2) 1	0	0	0	0	(2) p	0	0	0	0	0	0	0	0	0	0	0	0	0
<i>Xari</i>	1	(2) 1	0	(2) 1	0	0	0	0	(1) p	(2) 1	0	0	0	0	?	0	0	0	0	0	?	0	0	0	0	0	0	0
<i>Xvig</i>	?	?	0	?	?	0	0	?	?	?	0	(1) p	0	0	(1) p	0	0	(1) p	0	0	0	0	0	0	(1) p	0	0	0
<i>Bipe</i>	0	?	?	?	?	?	0	?	?	?	?	?	?	?	?	?	?	?	?	?	?	?	?	?	?	?	?	?

SU	243 cal - dc3	244 cal - pis	245 cal - neursp	246 cal - palm	247 cal - quad	248 cal - elbow	249 cal - dp	250 cal - dc2	251 cal - ilcap	252 cal - intr	253 cal - sc/co	254 cal - pelvis	255 cal - raapo	256 cal - pectub	257 cal - isticub	258 cal - lateen	259 cal - medeen	260 dt4 - dt3	261 dt4 - dmits	262 dt4 - iscsym	263 dt4 - dc4	264 dt4 - dc5	265 dt4 - uln	266 dt4 - phind	267 dt4 - pmtis	268 dt4 - pubsym	269 dt4 - pflore	270 dt4 - dhind	271 dt4 - dflore	272 dt4 - rad
<i>Agam</i>	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	?	0	0	0	0	0	0	0	0	0	0	0	0
<i>Uta</i>	?	0	0	0	0	0	0	?	0	0	0	0	0	0	0	?	0	?	?	0	?	?	?	?	?	?	?	?	?	?
<i>Call</i>	?	0	0	0	0	0	0	?	0	0	0	0	0	0	0	?	?	?	?	0	?	?	?	?	?	?	?	?	?	?
<i>Anol</i>	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	?	?	?	?
<i>Basi</i>	?	0	0	0	?	0	0	0	0	0	0	0	0	0	0	0	0	0	0	?	?	?	?	?	?	?	?	?	?	?
<i>Gamb</i>	?	0	0	0	0	0	0	?	0	0	0	0	0	0	0	0	?	?	0	?	?	?	?	?	?	?	?	?	?	?
<i>Dips</i>	?	0	0	0	0	0	0	?	0	0	0	0	0	0	0	?	?	?	?	0	?	?	?	?	?	?	?	?	?	?
<i>Cole</i>	0	0	0	?	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
<i>Gona</i>	0	0	0	?	0	?	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
<i>Acan</i>	?	0	0	0	0	0	0	?	0	0	0	0	0	0	0	?	?	?	?	0	?	?	?	?	?	?	?	?	?	?
<i>Cnem</i>	?	0	0	0	0	0	0	?	0	0	0	0	0	0	0	?	?	?	?	0	?	?	?	?	?	?	?	?	?	?
<i>Neus</i>	?	0	0	0	?	0	0	?	0	0	0	0	0	0	0	?	?	?	?	0	?	?	?	?	?	?	?	?	?	?
<i>Elga</i>	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
<i>Chal</i>	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	?	?	0	?	?	?	?	?	?	?	?	?	?
<i>Eume</i>	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	?	?	?	?	?	?	?	?	?	?	?
<i>Lepi</i>	0	0	0	0	?	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
<i>Xriv</i>	0	0	0	0	?	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
<i>Xhen</i>	0	0	0	0	?	0	0	0	0	0	0	0	0	0	0	0	0	0	(1) p	0	0	0	0	0	0	0	0	0	0	0
<i>Xari</i>	0	0	0	0	?	(2) 1	0	0	0	0	0	0	0	0	0	0	0	0	(2) 1	0	0	0	0	0	0	(2) 1	(1) p	0	0	0
<i>Xvig</i>	0	0	0	0	?	(1) p	0	0	0	0	0	0	0	0	0	0	0	0	(1) p	0	0	(1) p	0	0	(1) p	0	0	0	(1) p	0
<i>Bipe</i>	?	?	?	?	?	?	?	?	?	?	?	?	?	?	?	?	?	?	?	?	?	?	?	?	?	?	?	?	?	?

SU	273 dt4 - pmes	274 dt4 - as/cac	275 dt4 - lun	276 dt4 - dc3	277 dt4 - pis	278 dt4 - neuersp	279 dt4 - palm	280 dt4 - quad	281 dt4 - elbow	282 dt4 - dp	283 dt4 - dc2	384 dt4 - ilcap	285 dt4 - intr	286 dt4 - sc/co	287 dt4 - pelvis	288 dt4 - raapo	289 dt4 - pectub	290 dt4 - istsub	291 dt4 - lateen	292 dt4 - medeen	293 dt3 - dmts	294 dt3 - iscsym	295 dc4 - dt3	296 dt3 - dc5	297 dt3 - uln	298 dt3 - phind	299 dt3 - pmts	300 dt3 - pubsym	301 dt3 - pfore	302 dt3 - dhind	
Agam	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	(2) 1	0	(2) 1	0	0	0	0	0	0	0	
Uta	0	0	0	?	0	0	0	0	0	0	?	0	0	0	0	0	0	0	?	0	?	0	?	?	?	?	0	0	?	?	
Call	0	0	0	?	0	0	0	0	0	0	?	0	0	0	0	0	0	0	0	?	?	0	?	?	?	?	0	0	?	?	
Anol	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	(2) 1	(1) p	0	(2) 1	1	1	(1) p	0	1	(2) 1	
Basi	0	0	0	?	0	0	0	?	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
Gamb	0	0	0	?	0	0	0	0	0	0	?	0	0	0	0	0	0	0	0	0	0	0	?	0	?	0	0	0	0	0	
Dips	0	0	0	?	0	0	0	0	0	0	?	0	0	0	0	0	0	0	?	0	0	0	?	?	?	?	0	0	?	?	
Cole	0	0	0	0	0	0	?	0	0	0	0	0	0	0	0	0	0	0	0	0	(2) 1	0	0	0	1	0	0	0	0	0	
Gona	0	0	0	0	0	0	?	0	?	0	0	0	0	0	0	0	0	0	0	?	?	0	0	0	1	?	0	0	1	?	
Acan	0	0	?	?	0	0	0	0	0	0	?	0	0	0	0	0	0	0	?	0	?	0	?	0	?	?	?	0	0	?	?
Cnem	?	0	0	?	0	0	0	0	0	0	?	0	0	0	0	0	0	0	?	0	?	0	?	?	?	?	?	?	?	?	
Neus	?	0	0	?	0	0	0	?	0	0	?	0	0	0	0	0	0	0	?	0	?	0	?	?	?	?	?	0	?	?	
Elga	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	(2) 1	0	0	0	0	0	0	0	
Chal	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	(2) 1	0	0	0	0	1	0	?	0	?	0	
Eume	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	?	0	0	0	1	?	0	0	1	?	
Lepi	0	0	0	0	0	0	0	?	0	0	0	0	0	0	0	0	0	0	0	0	0	(2) 1	0	0	1	1	0	1	1	0	
Xriv	0	0	0	0	0	0	0	?	0	0	0	0	0	0	0	0	0	0	0	0	(1) p	(2) 1	0	(2) 1	1	1	0	0	1	(1) p	
Xhen	0	0	0	0	0	0	0	?	0	0	0	0	0	0	0	0	0	0	0	?	(2) 1	?	?	0	1	1	0	1	1	0	
Xari	0	0	0	0	0	0	0	?	(2) 1	0	0	0	0	0	0	0	0	0	0	(2) 1	(2) 1	(1) p	(1) p	1	1	0	1	1	?		
Xvig	0	0	0	0	0	0	0	?	(1) p	0	0	0	0	0	0	0	0	0	0	0	?	(2) 1	?	?	1	?	?	1	?	?	
Bipe	?	?	?	?	?	?	?	?	?	?	?	?	?	?	?	?	?	?	?	?	?	?	?	?	?	?	?	?	?	?	

SU	303 dt3 - dfore	304 dt3 - rad	305 dt3 - pmes	306 dt3 - as/cac	307 dt3 - lun	308 dc3 - dt3	309 dt3 - pis	310 dt3 - neuersp	311 dt3 - palm	312 dt3 - quad	313 dt3 - elbow	314 dt3 - dp	315 dt3 - dc2	316 dt3 - ilcap	317 dt3 - intrr	318 dt3 - sc/co	319 dt3 - pelvis	320 dt3 - raapo	321 dt3 - pectub	322 dt3 - isctub	323 dt3 - latcen	324 dt3 - medcen	325 dmts - iscsym	326 dc4 - dmts
Agam	0	0	0	0	0	(2) 1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	(2) 1	
Uta	?	?	0	0	0	?	0	0	0	0	0	0	?	0	0	0	0	0	0	0	?	0	?	
Call	?	?	0	0	0	?	0	0	0	0	0	0	?	0	0	0	0	0	0	0	0	?	?	
Anol	(2) 1	(1) p	(1) p	0	0	0	0	0	0	0	(1) p	0	(1) p	0	0	0	0	0	0	0	1	0	0	
Basi	0	0	0	0	0	0	0	0	0	?	0	0	0	0	0	0	0	0	0	0	0	1	0	
Gamb	0	0	0	0	0	?	0	0	0	0	0	0	?	0	0	0	0	0	0	0	0	0	0	
Dips	?	?	0	0	0	?	0	0	0	0	0	0	?	0	0	0	0	0	0	0	?	0	0	
Cole	0	(2) p	0	0	0	(2) 1	0	(2) 1	?	0	(2) 1	(2) p	0	(1) p	(2) p	0	0	0	0	0	0	0	0	
Gona	?	0	0	0	1	(2) 1	0	(2) 1	?	0	(2) 1	(3) 1	0	(2) 1	(3) 1	?	0	(2) 1	0	(2) 1	0	0	0	
Acan	?	?	?	0	?	?	0	0	0	0	0	0	?	0	0	0	0	0	0	0	?	0	?	
Cnem	?	?	?	0	0	?	0	0	0	0	0	0	?	0	0	0	0	0	0	0	?	0	?	
Neus	?	?	?	0	0	?	0	0	0	?	0	0	?	0	0	0	0	0	0	0	?	0	?	
Elga	0	0	0	0	0	(2) 1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	(1) p	
Chal	?	0	0	0	0	?	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	?	
Eume	?	(3) 1	0	0	0	(2) 1	?	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
Lepi	0	(2) p	0	0	0	?	0	0	0	?	(2) 1	(1) p	0	0	(1) p	0	0	0	0	0	0	0	1	
Xriv	(1) p	(3) 1	0	0	0	(2) 1	0	0	0	?	(2) 1	(3) 1	0	0	(2) p	(1) p	0	0	0	0	0	0	1	
Xhen	0	?	0	0	0	?	0	0	0	?	(2) 1	(3) 1	?	0	(1) p	0	0	0	0	0	0	0	1	
Xari	(2) 1	0	0	0	0	(1) p	0	(1) p	0	?	(2) 1	(3) 1	0	0	(3) 1	0	0	(1) p	0	(1) p	0	0	(2) 1	
Xvig	?	(3) 1	?	0	?	?	0	?	0	?	(2) 1	?	?	0	?	?	0	0	?	?	?	0	1	
Bipe	?	?	?	?	?	?	?	?	?	?	?	?	?	?	?	?	?	?	?	?	?	?	?	

SU	327 dc5 - dmts	328 uln - dmts	329 phind - dmts	330 dmts - pmts	331 dmts - pubsym	332 pfore - dmts	333 dhind - dmts	334 dfore - dmts	335 dmts - rad	336 dmts - pmts	337 dmts - as/cac	338 dmts - lun	339 dc3 - dmts	340 dmts - pis	341 dmts - neursp	342 dmts - palm	343 dmts - quad	344 dmts - elbow	345 dmts - dp	346 dc2 - dmts	347 dmts - ilcap	348 dmts - intr	349 dmts - sc/co	350 dmts - pelvis	351 dmts - raapo	352 dmts - pectub	353 dmts - isctub
Agam	(2) 1	(2) 1	(2) 1	0	0	1	1	(2) 1	0	0	0	0	(2) 1	0	0	0	0	0	0	(2) 1	0	0	0	0	0	0	0
Uta	?	?	?	0	0	?	?	?	?	0	0	0	?	0	0	0	0	0	0	?	0	0	0	0	0	0	0
Call	?	?	?	0	0	?	?	?	?	0	0	0	?	0	0	0	0	0	0	?	0	0	0	0	0	0	0
Anol	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	(1) p	0	(2) 1	0	0	0	0	0	0	0
Basi	0	0	0	0	0	0	0	0	(3) p	0	(1) p	0	0	0	0	0	?	0	0	0	0	0	0	0	0	0	0
Gamb	0	0	(2) 1	0	0	0	?	(1) p	(1) p	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Dips	0	0	0	0	0	0	0	0	(4) 1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Cole	(2) 1	(1) p	(2) 1	0	0	1	1	(2) 1	0	0	0	0	(2) 1	0	1	?	0	(2) p	0	(2) 1	0	0	0	0	0	0	0
Gona	(2) 1	0	?	0	0	0	?	?	0	0	0	1	(2) 1	0	1	?	0	(3) 1	1	(2) 1	1	(2) 1	?	0	1	0	1
Acan	(2) 1	?	?	0	0	?	?	?	?	0	0	?	?	0	0	0	0	0	0	?	0	0	0	0	0	0	0
Cnem	?	?	?	?	?	?	?	?	?	?	0	0	?	0	0	0	0	0	0	?	0	0	0	0	0	0	0
Neus	?	?	?	?	0	?	?	?	?	?	0	0	?	0	0	0	?	0	0	?	0	0	0	0	0	0	0
Elga	(1) p	(1) p	(2) 1	0	0	1	1	(2) 1	(2) p	0	0	0	(1) p	0	0	0	0	0	0	(1) p	0	0	0	0	0	0	0
Chal	(2) 1	?	(2) 1	0	0	1	1	(2) 1	0	0	0	0	(2) 1	0	0	0	0	0	0	(2) 1	0	0	0	0	0	0	0
Eume	(2) 1	0	?	0	0	0	?	?	(4) 1	0	0	0	(2) 1	?	0	0	0	0	0	(2) 1	0	0	0	0	0	0	0
Lepi	?	0	0	0	1	0	?	(2) 1	(4) 1	0	0	?	0	?	0	0	?	(3) 1	1	?	0	(2) 1	?	0	0	0	0
Xriv	0	0	(1) p	0	0	0	1	(2) 1	(4) 1	0	0	0	(2) 1	0	0	0	?	0	1	(2) 1	0	?	0	0	0	0	0
Xhen	(2) 1	0	0	0	1	0	1	(2) 1	?	0	0	0	?	0	0	0	?	(3) 1	1	?	0	(1) p	0	0	0	0	0
Xari	(2) 1	(2) 1	(2) 1	0	1	0	1	?	0	0	0	0	(2) 1	0	0	0	?	(3) 1	?	(2) 1	0	?	0	0	0	0	0
Xvig	?	0	?	?	?	1	?	?	(4) 1	?	0	?	?	0	?	0	?	(3) 1	?	?	0	?	?	?	0	?	?
Bipe	?	?	?	?	?	?	?	?	?	?	?	?	?	?	?	?	?	?	?	?	?	?	?	?	?	?	?

SU	354 dmts - latcen	355 dmts - medcen	356 dc4 - iscsym	357 dc5 - iscsym	358 uln - iscsym	359 phind - iscsym	360 iscsym - pmts	361 iscsym - pubsym	362 pfore - iscsym	363 dhind - iscsym	364 dfore - iscsym	365 rad - iscsym	366 iscsym - pmes	367 iscsym - as/cac	368 iscsym - lun	369 dc3 - iscsym	370 iscsym - pis	371 iscsym - neursp	372 iscsym - palm	373 iscsym - quad	374 iscsym - elbow	375 iscsym - dp	376 dc2 - iscsym	377 iscsym - ileap
<i>Agam</i>	0	0	(1) p	(2) p	(2) p	1	0	0	(3) 1	1	1	(3) 1	0	0	0	1	0	0	0	0	0	0	(2) 1	0
<i>Uta</i>	?	0	0	0	0	0	(2) p	0	0	0	0	0	(1) p	(3) p	0	0	0	0	0	0	(1) p	0	0	0
<i>Call</i>	0	?	0	0	0	0	(1) p	0	0	0	0	0	?	(1) p	0	0	0	0	0	0	0	0	0	0
<i>Anol</i>	?	0	0	0	0	0	?	0	0	0	0	(3) 1	?	0	0	0	0	0	0	0	(1) p	0	(1) p	0
<i>Basi</i>	(2) 1	0	0	(1) p	0	1	0	0	(3) 1	1	1	(2) p	0	0	0	0	0	0	?	0	0	(1) p	(1) p	0
<i>Gamb</i>	?	0	0	0	0	0	(3) 1	0	0	0	0	0	(2) 1	(4) 1	(1) p	0	0	(1) p	0	0	(2) p	(2) p	0	0
<i>Dips</i>	(2) 1	0	0	0	0	0	0	0	0	0	0	0	0	(3) p	0	0	0	0	0	0	0	0	0	0
<i>Cole</i>	0	0	0	0	0	0	(3) 1	1	0	0	0	0	(2) 1	(4) 1	(2) 1	0	1	(2) 1	?	1	(4) 1	(3) 1	0	1
<i>Gona</i>	0	0	0	0	0	0	(3) 1	1	0	0	0	0	(2) 1	(4) 1	(2) 1	0	1	(2) 1	?	1	(4) 1	(3) 1	0	1
<i>Acan</i>	?	0	0	(3) 1	0	0	?	?	0	0	0	0	0	0	(2) 1	0	?	0	?	0	0	0	0	0
<i>Cnem</i>	?	0	0	0	0	0	(3) 1	1	0	0	0	0	(2) 1	(2) p	0	0	?	0	?	0	0	0	0	0
<i>Neus</i>	?	0	0	0	0	0	(3) 1	0	0	0	0	0	(2) 1	0	0	0	0	0	?	0	0	0	0	0
<i>Elga</i>	(1) p	0	0	0	0	?	(3) 1	?	0	?	?	0	(2) 1	0	?	0	0	0	0	0	0	0	0	0
<i>Chal</i>	0	0	0	(3) 1	0	?	(3) 1	0	0	?	0	?	?	0	0	0	?	0	0	0	0	0	(2) 1	0
<i>Eume</i>	0	0	0	?	0	0	?	?	0	0	0	0	?	0	0	?	1	0	0	0	0	0	?	0
<i>Lepi</i>	?	0	(2) 1	(3) 1	0	?	0	?	(3) 1	1	1	(3) 1	0	0	0	1	0	0	0	?	0	0	(2) 1	0
<i>Xriv</i>	0	0	0	(3) 1	0	1	0	0	(1) p	1	1	0	0	0	0	1	0	0	0	?	(1) p	0	(2) 1	0
<i>Xhen</i>	0	0	(2) 1	(3) 1	(3) 1	1	0	0	(2) p	1	1	(3) 1	0	0	0	1	0	0	0	?	(1) p	(1) p	(2) 1	0
<i>Xari</i>	0	0	(2) 1	(3) 1	(3) 1	1	0	?	(3) 1	1	1	(3) 1	0	0	0	1	0	0	0	?	(4) 1	0	(2) 1	0
<i>Xvig</i>	?	0	(2) 1	(3) 1	(1) p	1	0	0	(3) 1	1	1	(1) p	0	0	0	1	0	0	0	?	(3) p	0	(2) 1	0
<i>Bipe</i>	?	?	?	?	?	?	?	?	?	?	?	?	?	?	?	?	?	?	?	?	?	?	?	?

SU	378 iscsym - intrr	379 iscsym - sc/co	380 iscsym - pelvis	381 iscsym - raapo	382 iscsym - pectub	383 iscsym - isctub	384 lateen - iscsym	385 iscsym - medeen	386 dc4 - dc5	387 dc4 - uln	388 dc4 - phind	389 dc4 - pmts	390 dc4 - pubsym	391 dc4 - pfore	392 dc4 - dhind	393 dc4 - dfore	394 dc4 - rad	395 dc4 - pmcs	396 dc4 - as/cac	397 dc4 - lun	398 dc4 - dc3	399 dc4 - pis	400 dc4 - neursp	401 dc4 - palm	402 dc4 - quad	403 dc4 - elbow	404 dc4 - dp	405 dc4 - dc2
Agam	0	0	0	0	0	0	1	0	?	0	(1) p	(1) p	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Uta	0	0	0	0	0	0	0	0	?	?	?	0	0	?	?	?	?	0	0	0	?	0	0	0	0	0	0	?
Call	0	0	0	0	0	0	1	?	?	?	?	0	0	?	?	?	?	0	0	0	?	0	0	0	0	0	0	?
Anol	0	0	0	0	0	0	0	0	?	?	?	0	0	1	(2) 1	1	0	0	0	0	0	0	0	0	0	0	0	0
Basi	0	0	0	0	0	0	0	0	0	?	0	0	0	0	0	0	0	0	0	0	?	0	0	0	?	0	0	0
Gamb	(1) p	0	0	1	0	0	0	(2) 1	0	?	0	0	0	0	0	0	0	0	0	0	?	0	0	0	0	0	0	?
Dips	0	0	0	0	0	0	0	0	?	?	?	0	0	?	?	?	?	0	0	0	?	0	0	0	0	0	0	?
Cole	(2) 1	1	0	1	(2) 1	1	0	(2) 1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	?	0	0	0	0
Gona	(2) 1	1	1	1	(1) p	1	0	(2) 1	0	1	0	0	0	0	0	0	0	0	0	0	0	0	1	?	0	(2) 1	(1) p	0
Acan	0	0	0	0	0	0	0	(1) p	0	?	?	0	0	?	?	?	?	0	0	?	?	0	0	0	0	0	0	?
Cnem	0	0	0	0	0	0	0	0	?	?	?	?	?	?	?	?	?	?	0	0	?	0	0	0	0	0	0	?
Neus	0	0	0	0	0	0	0	0	?	?	?	?	0	?	?	?	?	?	0	?	?	0	0	0	?	0	0	?
Elga	0	0	0	0	0	0	0	(2) 1	1	?	0	0	0	0	0	0	?	0	0	0	?	0	0	0	0	0	0	?
Chal	0	0	0	0	0	0	1	0	0	?	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Eume	0	0	0	0	0	0	?	0	0	?	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Lepi	0	0	0	0	0	0	1	0	0	1	(2) 1	0	1	?	0	0	(1) p	0	0	0	0	0	0	0	?	(1) p	0	0
Xriv	0	0	0	0	0	0	1	0	0	1	0	0	0	0	0	0	(1) p	0	0	0	0	0	0	0	?	0	0	0
Xhen	0	0	0	0	0	0	1	0	0	1	(2) 1	0	1	1	0	0	?	0	0	0	?	0	0	0	?	(2) 1	(2) 1	?
Xari	0	0	0	0	0	0	1	0	?	1	(2) 1	0	1	1	(1) p	1	0	0	0	0	(1) p	0	1	0	?	(2) 1	(2) 1	0
Xvig	0	0	0	0	0	0	1	0	?	?	?	?	1	?	?	?	(2) 1	?	0	?	?	0	?	0	?	(2) 1	?	?
Bipe	?	?	?	?	?	?	?	?	?	?	?	?	?	?	?	?	?	?	?	?	?	?	?	?	?	0	0	?

SU	406 dc4 - ilcap	407 dc4 - intrr	408 dc4 - sc/co	409 dc4 - pelvis	410 dc4 - raapo	411 dc4 - pectub	412 dc4 - isctub	413 dc4 - lateen	414 dc4 - medeen	415 uln - dc5	416 dc5 - phind	417 dc5 - pmts	418 dc5 - pubsym	419 dc5 - pfore	420 dc5 - dhind	421 dc5 - dfore	422 dc5 - rad	423 dc5 - pmes	424 dc5 - as/cac	425 dc5 - lun	426 dc3 - dc5	427 dc5 - pis	428 dc5 - neursp	429 dc5 - palm	430 dc5 - quad
Agam	0	0	0	0	0	0	0	0	0	1	(2) p	(1) p	0	0	0	0	0	0	0	0	(2) 1	0	0	0	0
Uta	0	0	0	0	0	0	0	?	0	?	?	0	0	?	?	?	?	0	0	0	?	0	0	0	0
Call	0	0	0	0	0	0	0	0	?	?	?	0	0	?	?	?	?	0	0	?	?	0	0	0	0
Anol	0	0	0	0	0	0	0	0	0	?	?	0	0	(3) 1	(3) 1	(2) 1	0	0	0	0	(2) 1	0	0	0	0
Basi	0	0	0	0	0	0	0	0	0	0	(1) p	0	0	(2) p	(1) p	(1) p	(1) p	0	0	0	0	0	0	0	?
Gamb	0	0	0	0	0	0	0	0	0	0	0	0	0	?	0	0	0	0	0	0	0	0	0	0	0
Dips	0	0	0	0	0	0	0	?	0	?	?	0	0	?	?	?	?	0	0	0	?	0	0	0	0
Cole	0	0	0	0	0	0	0	0	0	0	0	0	(1) p	0	0	0	(2) 1	(1) p	0	0	?	0	1	?	0
Gona	(1) p	(2) 1	0	0	0	0	(1) p	0	0	0	(3) 1	0	(2) p	(3) 1	(3) 1	(2) 1	(2) 1	0	(1) p	1	?	0	1	?	0
Acan	0	0	0	0	0	0	0	?	0	0	(3) 1	(3) 1	(3) 1	(3) 1	(3) 1	(2) 1	(2) 1	?	?	1	0	1	0	1	0
Cnem	0	0	0	0	0	0	0	?	0	?	?	?	?	?	?	?	?	?	0	0	?	0	0	0	0
Neus	0	0	0	0	0	0	0	?	0	?	?	?	0	?	?	?	?	?	0	0	?	0	0	0	?
Elga	0	0	0	0	0	0	0	?	0	0	0	(2) p	0	(1) p	0	0	(2) 1	(1) p	0	0	0	0	0	0	0
Chal	0	0	0	0	0	0	0	0	0	0	(3) 1	(3) 1	?	(3) 1	(3) 1	(2) 1	(2) 1	(2) 1	0	0	0	1	0	0	0
Eume	0	0	0	0	0	0	0	0	0	0	(3) 1	?	?	(3) 1	(3) 1	(2) 1	(2) 1	?	0	0	?	1	0	0	0
Lepi	0	0	0	0	0	0	0	0	0	0	(3) 1	0	(3) 1	(3) 1	?	0	(2) 1	0	0	?	0	?	0	0	?
Xriv	0	0	0	0	0	0	0	0	0	0	0	0	0	(3) 1	0	0	(2) 1	0	0	0	(2) 1	0	0	0	?
Xhen	0	(1) p	0	0	0	0	0	0	0	0	(3) 1	0	(3) 1	(3) 1	0	?	(2) 1	0	0	0	0	0	?	0	?
Xari	0	(2) 1	0	0	?	0	(2) 1	0	0	0	(3) 1	0	(3) 1	(3) 1	(2) p	(2) 1	0	0	0	(1) p	0	1	0	?	?
Xvig	0	?	?	?	0	?	?	?	0	0	?	?	(3) 1	?	?	?	(2) 1	?	0	?	?	?	?	?	?
Bipe	?	?	?	?	0	?	?	?	?	?	?	?	?	?	?	?	?	?	?	?	?	?	?	?	?

SU	431 dc5 - elbow	432 dc5 -dp	433 dc5 - dc2	434 dc5 - ilcap	435 dc5 - intr	436 dc5 - sc/co	437 dc5 - pelvis	438 dc5 - raapo	439 dc5 - pectub	440 dc5 - isctub	441 dc5 - lateen	442 dc5 - medcen	443 uln - phind	444 uln - pmts	445 uln - pubsym	446 uln - pfore	447 uln - dhind	448 uln - dfore	449 uln - rad	450 uln - pmes	451 uln - as/ca	452 uln - lun	453 uln - dc3
Agam	0	0	0	0	0	0	0	0	0	0	0	0	(2) p	(1) p	(1) p	(1) p	(1) p	0	0	0	0	0	
Uta	0	0	?	0	0	0	0	0	0	0	?	0	?	0	0	?	?	?	?	0	0	0	?
Call	0	0	?	0	0	0	0	0	0	0	0	?	?	0	0	?	?	?	?	0	0	0	?
Anol	0	0	0	0	0	0	0	0	0	0	0	0	?	0	0	(3) 1	(2) 1	1	0	0	0	0	0
Basi	0	0	(1) p	0	0	0	0	0	0	0	(1) p	0	0	0	0	0	0	0	0	0	0	0	?
Gamb	0	0	(2) 1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	?
Dips	0	0	?	0	0	0	0	0	0	0	?	0	?	0	0	?	?	?	?	0	0	0	?
Cole	1	1	0	1	1	0	0	0	0	(1) p	0	0	0	0	0	0	0	0	(1) p	(1) p	0	0	0
Gona	1	1	0	1	1	1	0	1	(1) p	(2) 1	0	0	0	0	0	0	0	0	0	0	0	0	0
Acan	0	0	(2) 1	0	0	0	0	0	0	0	(2) 1	(2) 1	?	0	0	?	?	?	?	0	0	?	?
Cnem	0	0	?	0	0	0	0	0	0	0	?	0	?	?	?	?	?	?	?	?	0	0	?
Neus	0	0	?	0	0	0	0	0	0	0	?	0	?	?	0	?	?	?	?	?	0	0	?
Elga	0	0	(2) 1	0	0	0	0	0	0	0	(2) 1	(1) p	0	0	0	0	0	0	?	0	0	0	?
Chal	0	0	?	0	0	0	0	0	0	0	?	0	0	0	0	0	0	0	0	0	0	0	0
Eume	0	0	?	0	0	0	0	0	0	0	?	0	0	0	0	0	0	0	0	0	0	0	0
Lepi	1	1	?	0	1	?	0	0	0	0	?	0	0	0	0	0	0	0	0	0	0	0	0
Xriv	1	?	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	(1) p	0	0	0	0	0
Xhen	1	1	(2) 1	0	1	0	0	0	?	0	0	0	(1) p	0	(1) p	(2) p	0	0	0	0	0	0	0
Xari	1	1	0	0	1	0	0	?	0	(2) 1	0	0	?	0	(2) 1	(3) 1	0	1	0	0	0	0	(1) p
Xvig	1	?	?	0	?	?	0	0	?	?	?	0	0	0	0	0	0	0	(2) p	0	0	0	0
Bipe	0	0	?	?	?	?	?	0	?	?	?	?	?	?	?	?	?	?	?	?	?	?	?

SU	454 uln - pis	455 uln - neursp	456 uln - palm	457 uln - quad	458 uln - elbow	459 uln - dp	460 uln - dc2	461 uln - ilcap	462 uln - intr	463 uln - sc/co	464 uln - pelvis	465 uln - raapo	466 uln - pectub	467 uln - isctub	468 uln - lateen	469 uln - medcen	470 phind - pmts	471 phind - pubsym	472 pfore - phind	473 dhind - phind	474 dfore - phind	475 phind - rad	476 phind - pmes	477 phind - as/ca	478 phind - lun	479 phind - dc3	480 phind - pis	481 phind - neursp
Agam	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	0	0	0	0	0	0	0
Uta	0	0	0	0	0	0	?	0	0	0	0	0	0	0	?	0	0	0	?	?	?	?	0	0	0	?	0	0
Call	0	0	0	0	0	0	?	0	0	0	0	0	0	0	0	?	0	0	?	?	?	?	0	0	0	?	0	0
Anol	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Basi	0	0	0	?	0	0	0	0	0	0	0	0	0	0	0	0	0	0	?	0	?	(1) p	0	0	0	(2) 1	0	0
Gamb	0	0	0	0	0	0	?	0	0	0	0	0	0	0	0	0	0	0	0	0	0	(2) 1	0	0	0	(2) 1	0	0
Dips	0	0	0	0	0	0	?	0	0	0	0	0	0	0	?	0	0	0	?	?	?	?	0	0	0	?	0	0
Cole	0	(2) p	?	0	(3) 1	(1) p	0	(1) p	(1) p	0	0	0	0	(1) p	0	0	?	(1) p	?	?	?	(2) 1	1	?	0	(2) 1	?	(2) 1
Gona	0	0	?	0	(3) 1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	?	?	?	0	0	0	1	0	(2) 1
Acan	0	0	0	0	0	0	?	0	0	0	0	0	0	0	?	0	?	?	?	?	?	?	?	0	?	?	0	0
Cnem	0	0	0	0	0	0	?	0	0	0	0	0	0	0	?	0	?	?	?	?	?	?	?	0	?	?	0	0
Neus	0	0	0	?	0	0	?	0	0	0	0	0	0	0	?	0	?	0	?	?	?	?	?	0	0	?	0	0
Elga	0	0	0	0	0	0	?	0	0	0	0	0	0	0	?	0	1	?	0	?	?	(2) 1	1	0	?	(2) 1	0	0
Chal	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	?	0	?	?	0	0	(2) 1	?	0
Eume	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	?	?	(2) 1	0	0	0	0	?	0
Lepi	0	0	0	?	0	0	0	0	0	0	0	0	0	0	0	0	0	?	1	1	1	0	0	0	0	0	0	0
Xriv	0	0	0	?	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	(2) 1	0	0	0	0	0	0
Xhen	0	0	0	?	(2) p	(2) p	0	0	(1) p	0	0	0	0	0	0	0	0	?	0	1	1	0	0	0	0	0	0	0
Xari	0	(1) p	0	?	(3) 1	(3) 1	0	0	(2) 1	0	0	0	0	(2) p	0	0	0	(2) 1	0	1	0	0	0	0	0	(1) p	0	(1) p
Xvig	0	0	0	?	(1) p	0	0	0	0	0	0	0	0	0	0	0	?	(2) 1	?	?	?	(2) 1	?	0	?	?	0	?
Bipe	?	?	?	?	0	0	?	?	?	?	?	?	?	?	?	?	?	?	?	?	?	?	?	?	?	?	?	?

SU	482 phind - palm	483 phind - quad	484 phind - elbow	485 phind - dp	486 phind - dc2	487 phind - ilcap	488 phind - intr	489 phind - sc/co	490 phind - pelvis	491 phind - raapo	492 phind - pectub	493 phind - isctub	494 phind - lateen	495 phind - medeen	496 pmts - pubsym	497 pfore - pmts	498 dhind - pmts	499 dfore - pmts	500 rad - pmts	501 pmts - pmcs	502 pmts - as/ca	503 pmts - lun	504 dc3 - pmts	505 pmts - pis	506 pmts - neursp	507 pmts - palm	508 pmts - quad
Agam	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	0	0	0	1	0	0	0	
Uta	0	0	0	0	?	0	0	0	0	0	0	0	?	0	0	0	0	0	0	(1) p	(2) p	0	0	0	0	0	
Call	0	0	0	0	?	0	0	0	0	0	0	0	0	?	0	0	0	0	0	(2) p	(1) p	0	0	0	0	0	
Anol	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	?	0	0	0	0	0	0	
Basi	0	?	0	0	1	0	0	0	0	0	0	0	1	0	0	0	0	0	0	?	(3) 1	0	0	0	0	?	
Gamb	0	0	0	0	1	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	
Dips	0	0	0	0	?	0	0	0	0	0	0	0	?	0	0	0	0	0	0	0	(3) 1	0	0	(1) p	0	(1) p	
Cole	?	(1) p	1	1	?	1	(2) 1	?	0	0	0	(2) 1	?	?	(1) p	?	?	?	?	(3) 1	?	0	0	?	1	?	
Gona	?	0	1	1	0	1	(2) 1	?	0	1	0	(2) 1	0	0	(2) p	0	0	0	1	?	(3) 1	1	0	?	1	?	
Acan	0	0	0	0	?	0	0	0	0	0	0	0	?	0	?	0	0	0	0	0	0	1	0	?	0	?	
Cnem	0	0	0	0	?	0	0	0	0	0	0	0	?	0	?	?	?	?	?	?	0	0	?	0	0	0	
Neus	0	?	0	0	?	0	0	0	0	0	0	0	?	0	0	?	?	?	?	?	0	0	?	0	0	?	
Elga	0	0	0	0	1	0	0	0	0	0	0	0	1	1	0	?	1	1	0	?	0	0	0	0	0	0	
Chal	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	?	1	?	1	0	0	0	?	0	0	0	
Eume	0	0	0	0	0	0	0	0	0	0	0	0	0	0	?	0	0	0	0	?	0	0	?	(2) 1	0	0	
Lepi	0	?	0	0	0	0	0	0	0	0	0	0	0	0	(3) 1	0	0	?	0	?	0	1	0	(2) 1	?	?	
Xriv	0	?	1	1	0	0	(1) p	(1) p	0	0	0	0	0	0	0	0	0	0	0	0	(3) 1	0	?	0	1	0	
Xhen	0	?	1	1	0	0	0	0	0	0	0	0	0	0	(3) 1	0	?	0	0	?	0	0	0	1	0	?	
Xari	0	?	1	1	0	0	(2) 1	0	0	0	0	(1) p	0	0	(3) 1	0	0	0	?	(3) 1	0	?	0	?	1	?	
Xvig	0	?	1	?	?	0	?	?	0	0	?	?	?	0	(3) 1	?	?	?	?	?	0	?	?	0	?	?	
Bipe	?	?	?	?	?	?	?	?	?	?	?	?	?	?	?	?	?	?	?	?	?	?	?	?	?	?	

SU	509 pmts - elbow	510 pmts - dp	511 dc2 - pmts	512 pmts - ilcap	513 pmts - intrr	514 pmts - sc/co	515 pmts - pelvis	516 pmts - raapo	517 pmts - pectub	518 pmts - isctub	519 lateen - pmts	520 pmts - medeen	521 pfore - pubsym	522 dhind - pubsym	523 dfore - pubsym	524 rad - pubsym	525 pmcs - pubsym	526 as/ca - pubsym	527 pubsym - lun	528 pubsym - dc3	529 pubsym - pis	530 pubsym - neursp	531 pubsym - palm
<i>Agam</i>	0	0	(2) 1	0	0	0	0	0	0	0	1	0	?	?	(2) 1	1	(3) 1	(3) 1	0	(3) 1	0	0	0
<i>Uta</i>	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	(1) p	(1) p	0	0
<i>Call</i>	0	0	0	0	0	0	0	0	0	0	1	?	0	0	0	0	0	0	0	0	0	0	0
<i>Anol</i>	(2) p	0	(1) p	0	0	0	0	0	0	0	0	0	0	0	0	(1) p	0	(1) p	0	0	0	0	0
<i>Basi</i>	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	(2) 1	0	(4) 1	(2) 1	1
<i>Gamb</i>	(1) p	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	(2) 1	0	(4) 1	(2) 1	1
<i>Dips</i>	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	(2) 1	0	(4) 1	(2) 1	1
<i>Cole</i>	(3) 1	1	?	1	1	?	0	0	0	1	?	?	(1) p	(1) p	(1) p	(1) p	(1) p	(1) p	(1) p	(1) p	(3) p	(2) 1	?
<i>Gona</i>	(3) 1	1	?	1	1	(2) 1	?	1	(2) p	1	?	?	0	0	0	(2) 1	(2) p	(2) p	(2) 1	(2) p	(2) p	(2) 1	?
<i>Acan</i>	0	0	0	0	0	0	0	0	0	0	0	(1) p	0	0	0	0	(3) 1	(3) 1	(2) 1	0	?	0	?
<i>Cnem</i>	0	0	?	0	0	0	0	0	0	0	?	0	?	?	?	?	?	(3) 1	0	?	0	0	0
<i>Neus</i>	0	0	?	0	0	0	0	0	0	0	?	0	0	0	0	0	0	0	0	0	0	0	0
<i>Elga</i>	0	0	0	0	0	0	0	0	0	0	0	?	0	?	?	0	0	(3) 1	?	0	0	0	0
<i>Chal</i>	0	0	(2) 1	0	0	0	0	0	0	0	1	0	0	0	0	0	0	(3) 1	0	0	(4) 1	0	0
<i>Eume</i>	0	0	?	0	0	0	0	0	0	?	0	0	0	0	0	0	?	(3) 1	0	?	(4) 1	0	0
<i>Lepi</i>	(3) 1	1	0	0	1	(2) 1	0	0	0	?	0	0	(2) 1	(2) 1	(2) 1	(2) 1	(3) 1	(3) 1	0	(3) 1	0	0	0
<i>Xriv</i>	(3) 1	1	(2) 1	0	1	(1) p	0	1	(1) p	?	0	0	0	0	0	0	0	0	(2) 1	0	?	(2) 1	0
<i>Xhen</i>	(3) 1	1	0	0	1	?	0	0	(3) 1	?	?	?	0	(2) 1	(2) 1	(2) 1	(3) 1	(3) 1	0	(3) 1	0	0	0
<i>Xari</i>	(3) 1	1	?	0	1	?	0	1	?	1	?	?	(2) 1	(2) 1	(2) 1	(2) 1	(3) 1	(3) 1	0	(3) 1	0	0	0
<i>Xvig</i>	(3) 1	?	?	0	?	?	0	0	?	?	?	0	(2) 1	(2) 1	(2) 1	0	(3) 1	(3) 1	0	(3) 1	0	0	0
<i>Bipe</i>	?	?	?	?	?	?	?	?	?	?	?	?	?	?	?	?	?	?	?	?	?	?	?

SU	532 pubsym - quad	533 elbow - pubsym	534 pubsym - dp	535 dc2 - pubsym	536 pubsym - ilcap	537 intrr - pubsym	538 pubsym - sc/co	539 pubsym - pelvis	540 pubsym - raapo	541 pubsym - pectub	542 pubsym - isctub	543 lateen - pubsym	544 pubsym - medcen	545 pfore - dhind	546 pfore - dfore	547 pfore - rad	548 pfore - pmes	549 pfore - as/ca	550 pfore - lun	551 pfore - dc3	552 pfore - pis	553 pfore - neursp	554 pfore - palm	555 pfore - quad
Agam	0	(2) 1	0	(4) 1	0	(2) 1	0	0	0	0	0	(3) 1	0	?	0	0	0	0	0	0	0	0	0	
Uta	0	0	0	0	0	0	?	0	0	0	0	0	0	?	?	?	0	0	0	?	0	0	0	
Call	0	(2) 1	0	0	0	(2) 1	0	0	0	0	0	(3) 1	?	?	?	?	0	0	0	?	0	0	0	
Anol	0	(1) p	(1) p	(1) p	0	(2) 1	0	0	0	0	0	0	0	?	?	0	0	0	0	0	0	0	0	
Basi	?	0	(4) 1	0	(3) 1	0	(2) 1	(2) p	1	?	(3) 1	0	(4) 1	1	?	(2) p	0	0	0	1	0	0	?	
Gamb	(2) 1	0	(4) 1	0	?	0	?	(3) 1	1	0	(3) 1	0	(4) 1	0	0	0	0	0	1	0	0	0		
Dips	(2) 1	0	(4) 1	0	(3) 1	0	(2) 1	(3) 1	1	(1) p	(1) p	0	(4) 1	?	?	?	0	0	0	?	0	0	0	
Cole	(1) p	0	(3) p	(2) p	(2) p	0	(1) p	0	0	(1) p	(2) p	(1) p	(3) p	?	?	(3) 1	1	?	0	1	?	1	(1) p	
Gona	0	0	(4) 1	(3) p	(3) 1	0	(2) 1	(1) p	1	(1) p	(3) 1	(2) p	(1) p	0	0	0	0	0	?	0	0	1	?	
Acan	0	(2) 1	0	0	0	(2) 1	0	0	0	0	0	0	(2) p	?	?	?	?	0	?	?	0	0	0	
Cnem	0	(2) 1	0	?	0	(2) 1	0	0	0	0	0	?	0	?	?	?	?	0	?	?	0	0	0	
Neus	?	0	(2) p	0	0	(1) p	0	0	0	0	0	0	0	?	?	?	?	0	0	?	0	0	?	
Elga	0	(2) 1	0	0	0	(2) 1	0	0	0	0	0	0	(4) 1	0	0	(3) 1	?	0	0	1	0	0	0	
Chal	0	(2) 1	0	?	0	(2) 1	0	0	0	0	0	?	0	0	?	0	0	0	?	?	0	0	0	
Eume	0	(2) 1	0	?	0	(2) 1	0	0	0	0	0	?	0	0	0	(2) p	0	0	0	0	0	0	0	
Lepi	?	(2) 1	0	(4) 1	0	(2) 1	0	0	0	0	0	(3) 1	0	0	0	(1) p	0	0	0	0	0	0	?	
Xriv	?	0	(4) 1	0	(1) p	0	(2) 1	(3) 1	1	(2) p	(3) 1	0	(4) 1	0	0	(2) p	0	0	0	0	0	0	?	
Xhen	?	0	(4) 1	(4) 1	0	(2) 1	0	0	0	0	0	(3) 1	0	0	0	0	0	0	0	0	0	0	?	
Xari	?	0	0	(4) 1	0	(2) 1	0	0	0	0	0	(3) 1	0	0	0	0	0	0	0	0	0	0	?	
Xvig	?	0	0	(4) 1	0	(2) 1	0	0	0	0	0	(3) 1	0	?	?	(3) 1	?	0	?	?	?	?	?	
Bipe	?	?	?	?	?	?	?	?	?	?	?	?	?	?	?	?	?	?	?	?	?	?	?	

SU	556 pfore - elbow	557 pfore - dp	558 pfore - dc2	559 pfore - ilcap	560 pfore - intrr	561 pfore - sc/co	562 pfore - pelvis	563 pfore - raapo	564 pfore - pectub	565 pfore - isctub	566 pfore - latcen	567 pfore - medcen	568 dhind - dfore	569 dhind - rad	570 dhind - pmes	571 dhind - as/ca	572 dhind - lun	573 dhind - dc3	574 dhind - pis	575 dhind - neursp	576 dhind - palm	577 dhind - quad	578 dhind - elbow	579 dhind - dp	580 dhind - dc2	581 dhind - ilcap	582 dhind - intrr	
Agam	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
Uta	0	0	?	0	0	0	0	0	0	0	?	0	?	?	0	0	0	?	0	0	0	0	0	0	?	0	0	
Call	0	0	?	0	0	0	0	0	0	0	0	?	?	?	0	0	0	?	0	0	0	0	0	0	?	0	0	
Anol	0	0	0	0	0	0	0	0	0	0	0	0	?	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
Basi	0	0	1	0	0	0	0	0	0	0	1	0	0	(2) p	0	0	0	(2) 1	0	0	0	?	0	0	(1) p	0	0	
Gamb	0	0	1	0	0	0	0	0	0	0	0	0	(1) p	(1) p	0	0	0	(2) 1	0	0	0	0	0	0	(2) 1	0	0	
Dips	0	0	?	0	0	0	0	0	0	0	?	0	?	?	0	0	0	?	0	0	0	0	0	0	?	0	0	
Cole	(2) 1	1	?	1	1	?	0	0	0	1	?	?	?	(3) 1	1	?	0	(2) 1	?	(3) 1	?	(1) p	1	1	?	1	1	
Gona	(2) 1	1	0	1	1	0	0	1	0	1	0	0	?	0	0	0	1	0	0	(3) 1	?	0	1	1	0	1	1	
Acan	0	0	?	0	0	0	0	0	0	0	?	0	?	?	0	0	?	?	0	0	0	0	0	0	?	0	0	
Cnem	0	0	?	0	0	0	0	0	0	0	?	0	?	?	?	0	0	?	0	0	0	0	0	0	?	0	0	
Neus	0	0	?	0	0	0	0	0	0	0	?	0	?	?	?	0	0	?	0	0	0	?	0	0	?	0	0	
Elga	0	0	1	0	0	0	0	0	0	0	1	?	?	(3) 1	1	0	?	(2) 1	0	0	0	0	0	0	(2) 1	0	0	
Chal	0	0	0	0	0	0	0	0	0	0	0	0	(2) 1	?	?	0	0	(2) 1	?	0	0	0	0	0	0	0	0	
Eume	0	0	0	0	0	0	0	0	0	0	0	0	?	(3) 1	0	0	0	0	?	0	0	0	0	0	0	0	0	
Lepi	(1) p	0	0	0	0	0	0	0	0	0	0	0	0	(3) 1	0	0	?	(2) 1	?	0	0	?	1	1	?	0	1	
Xriv	0	0	0	0	0	0	0	0	0	0	0	0	?	(3) 1	0	(1) p	0	0	0	(1) p	0	?	1	1	0	0	1	
Xhen	(2) 1	?	0	0	0	0	0	0	0	0	0	0	(2) 1	(3) 1	?	0	0	(2) 1	0	(3) 1	0	?	1	1	(2) 1	0	1	
Xari	(2) 1	0	0	0	0	0	0	0	0	0	0	0	(2) 1	0	0	0	0	(1) p	0	(2) p	0	?	1	1	0	0	1	
Xvig	(2) 1	?	?	0	?	?	0	?	?	?	?	?	(3) 1	?	?	0	?	?	0	?	?	0	?	1	?	?	?	?
Bipe	0	0	?	?	?	?	?	0	?	?	?	?	?	?	?	?	?	?	?	?	?	?	?	?	?	?	?	

SU	583 dhind - sc/co	584 dhind - pelvis	585 dhind - raapo	586 dhind - pectub	587 dhind - isctub	588 dhind - lateen	589 dhind - medcen	590 dfore - rad	591 dfore - pmes	592 dfore - as/ca	593 dfore - lun	594 dfore - dc3	595 dfore - pis	596 dfore - neursp	597 dfore - palm	598 dfore - quad	599 dfore - elbow	600 dfore - dp	601 dfore - dc2	602 dfore - ilcap	603 dfore - sc/co	604 dfore - pelvis	605 dfore - raapo	606 dfore - pectub	607 dfore - isctub
Agam	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
Uta	0	0	0	0	0	?	0	?	0	0	0	?	0	0	0	0	0	0	?	0	0	0	0	0	
Call	0	0	0	0	0	0	?	?	0	0	0	?	0	0	0	0	0	0	?	0	0	0	0	0	
Anol	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
Basi	0	0	0	0	0	(2) 1	0	(1) p	0	0	0	0	1	0	0	?	0	0	(1) p	0	0	0	0	0	
Gamb	0	0	0	0	0	?	0	?	0	0	0	1	0	0	0	0	0	0	(2) 1	0	0	0	0	0	
Dips	0	0	0	0	0	?	0	?	0	0	0	?	0	0	0	0	0	0	?	0	0	0	0	0	
Cole	?	0	0	0	(2) 1	?	?	(2) 1	1	?	0	1	?	(2) 1	?	(1) p	1	1	?	1	?	0	0	0	
Gona	?	0	(2) 1	0	(2) 1	0	0	0	0	0	1	0	0	(2) 1	?	0	1	1	0	1	?	0	(2) 1	0	
Acan	0	0	0	0	0	?	0	?	0	0	?	?	0	0	0	0	0	0	?	0	0	0	0	0	
Cnem	0	0	0	0	0	?	0	?	?	0	0	?	0	0	0	0	0	0	?	0	0	0	0	0	
Neus	0	0	0	0	0	?	0	?	?	0	0	?	0	0	0	?	0	0	?	0	0	0	0	0	
Elga	0	0	0	0	0	(2) 1	1	(2) 1	1	0	?	1	0	0	0	0	0	0	(2) 1	0	0	0	0	0	
Chal	0	0	0	0	0	0	0	0	0	0	0	?	0	0	0	0	0	0	0	0	0	0	0	0	
Eume	0	0	0	0	0	0	0	(2) 1	0	0	0	0	?	0	0	0	0	0	0	0	0	0	0	0	
Lepi	?	0	0	0	0	?	0	(2) 1	?	0	1	1	1	?	0	?	1	1	(2) 1	0	(2) 1	0	0	0	
Xriv	(1) p	0	(1) p	(1) p	0	(1) p	0	(2) 1	0	(1) p	0	0	0	(1) p	0	?	1	1	0	0	(1) p	0	(1) p	(1) p	
Xhen	?	0	0	(2) 1	?	?	?	(2) 1	0	0	0	1	0	?	0	?	1	1	(2) 1	0	0	0	0	?	
Xari	0	0	(1) p	0	(1) p	0	0	0	0	0	0	0	0	0	0	?	1	?	0	0	0	0	0	0	
Xvig	?	0	0	?	?	?	0	(2) 1	?	0	?	?	?	?	0	?	1	?	?	0	?	0	?	?	
Bipe	?	?	?	?	?	?	?	?	?	?	?	?	?	?	?	?	0	0	?	?	?	?	?	?	

SU	608 dfore - lateen	609 dfore - medcen	610 rad - pmes	611 rad - as/ca	612 rad - lun	613 dc3 - rad	614 rad - pis	615 rad - neursp	616 rad - palm	617 rad - quad	618 rad - elbow	619 rad - dp	620 rad - dc2	621 rad - ilcap	622 rad - intr	623 rad - sc/co	624 rad - pelvis	625 rad - raapo	626 rad - pectub	627 rad - isctub	628 rad - lateen	629 rad - medcen	630 pmes - as/ca	631 pmes - lun	632 dc3 - pmes
Agam	0	0	(1) p	(2) p	(1) p	(2) 1	0	0	0	(1) p	0	0	0	0	0	0	0	0	0	0	0	0	0	0	(2) 1
Uta	?	0	0	0	0	?	0	0	0	0	0	0	?	0	0	0	0	0	0	?	0	(2) p	0	0	
Call	0	?	0	0	0	?	0	0	0	0	0	0	?	0	0	0	0	0	0	0	?	(1) p	0	0	
Anol	0	0	(2) 1	(1) p	0	0	0	0	0	0	(1) p	0	(1) p	0	0	0	0	0	0	0	(2) 1	0	0	0	
Basi	(2) 1	0	0	0	0	0	0	0	0	?	0	0	(1) p	0	0	0	0	0	0	0	(2) 1	0	(3) 1	0	
Gamb	(1) p	0	0	0	0	0	0	0	0	0	0	0	(2) 1	0	0	0	0	0	0	(1) p	0	0	0	0	
Dips	?	0	0	0	0	?	0	0	0	0	0	0	?	0	0	0	0	0	0	?	0	(3) 1	0	0	
Cole	?	?	0	0	0	(2) 1	0	1	?	0	(3) 1	?	0	?	(2) 1	0	0	0	0	0	0	0	0	(1) p	
Gona	0	0	(2) 1	(3) 1	(2) 1	0	1	1	?	?	(3) 1	1	(2) 1	1	(2) 1	1	1	1	(1) p	1	(2) 1	1	(3) 1	1	
Acan	?	0	0	0	?	?	0	0	0	0	0	0	?	0	0	0	0	0	0	?	0	?	1	0	
Cnem	?	0	?	0	0	?	0	0	0	0	0	0	?	0	0	0	0	0	0	?	0	0	0	?	
Neus	?	0	?	0	0	?	0	0	0	?	0	0	?	0	0	0	0	0	0	?	0	0	0	?	
Elga	(2) 1	1	0	0	0	?	0	0	0	0	0	0	?	0	0	0	0	0	0	?	0	0	0	0	
Chal	0	0	?	0	0	0	?	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
Eume	0	0	0	0	0	(2) 1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	?	
Lepi	(2) 1	0	0	0	0	(1) p	0	0	0	?	(2) p	0	0	0	0	0	0	0	0	0	0	0	0	1	
Xriv	(1) p	0	0	0	0	(2) 1	0	0	0	?	(1) p	0	0	0	0	0	0	0	0	0	0	(3) 1	?	0	
Xhen	0	0	0	0	0	?	0	0	0	?	(3) 1	1	?	0	(1) p	0	0	0	0	0	0	0	0	0	
Xari	?	0	(2) 1	0	?	0	?	1	?	?	(3) 1	1	?	0	(2) 1	?	0	1	?	1	?	?	0	?	
Xvig	?	0	0	0	0	(2) 1	0	0	0	?	(1) p	0	0	0	0	0	0	0	0	0	0	0	?	?	
Bipe	?	?	?	?	?	?	?	?	?	?	0	0	?	?	?	?	?	0	?	?	?	?	?	?	

SU	633 pmcs - pis	634 pmcs - neursp	635 pmcs - palm	636 pmcs - quad	637 pmcs - elbow	638 pmcs - dp	639 dc2 - pmcs	640 pmcs - ilcap	641 pmcs - intr	642 pmcs - sc/co	643 pmcs - pelvis	644 pmcs - raapo	645 pmcs - pectub	646 pmcs - istsub	647 lateen - pmcs	648 pmcs - medeen	649 as/ca - lun	650 dc3 - as/ca	651 as/ca - pis	652 as/ca - neursp	653 as/ca - palm	654 as/ca - quad	655 as/ca - elbow	656 as/ca - dp	657 dc2 - as/ca
<i>Agam</i>	0	0	0	0	0	0	(2) 1	0	0	0	0	0	0	0	1	0	0	(2) 1	0	0	0	0	0	0	1
<i>Uta</i>	0	0	0	0	(2) p	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
<i>Call</i>	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	?	0	0	0	0	0	0	0	0	0
<i>Anol</i>	0	0	0	0	(2) p	0	(1) p	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	(2) p	0	0
<i>Basi</i>	0	0	0	?	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	?	0	0	0
<i>Gamb</i>	0	0	0	0	(1) p	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	(1) p	0	0
<i>Dips</i>	(1) p	0	(1) p	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	(1) p	0	(1) p	0	0	0	0
<i>Cole</i>	0	1	?	(1) p	(3) 1	1	(2) 1	1	1	0	0	0	0	?	1	0	0	0	?	(3) 1	?	(2) p	(4) 1	(2) 1	?
<i>Gona</i>	?	1	?	0	(3) 1	1	?	1	1	1	?	1	(1) p	1	?	?	1	(1) p	0	(3) 1	?	0	(4) 1	(2) 1	1
<i>Acan</i>	(2) 1	0	(2) 1	0	0	0	0	0	0	0	0	0	0	0	0	1	1	0	(3) 1	0	(4) 1	0	0	0	0
<i>Cnem</i>	0	0	0	0	0	0	?	0	0	0	0	0	0	0	?	0	0	0	(2) p	0	(2) p	0	0	0	0
<i>Neus</i>	0	0	0	?	0	0	?	0	0	0	0	0	0	0	?	0	0	0	0	0	0	?	0	0	0
<i>Elga</i>	0	0	0	0	0	0	0	0	0	0	0	0	0	0	?	?	1	0	(3) 1	(2) p	0	0	(3) p	(1) p	0
<i>Chal</i>	?	0	0	0	0	0	(2) 1	0	0	0	0	0	0	0	1	0	0	0	(3) 1	(1) p	0	(1) p	0	0	0
<i>Eume</i>	(2) 1	0	0	0	0	0	?	0	0	0	0	0	0	0	?	0	1	0	(3) 1	0	0	(1) p	0	0	0
<i>Lepi</i>	(2) 1	?	0	?	(3) 1	1	0	0	1	1	0	0	0	0	0	0	1	0	(3) 1	(3) 1	0	?	(4) 1	(2) 1	0
<i>Xriv</i>	0	1	0	?	(3) 1	1	0	0	1	1	1	1	(2) p	1	0	?	0	(2) 1	0	?	0	?	(4) 1	(2) 1	1
<i>Xhen</i>	0	1	0	?	(3) 1	1	0	0	1	?	0	0	(3) 1	?	?	?	1	0	0	(3) 1	0	?	(4) 1	(2) 1	0
<i>Xari</i>	?	1	?	?	(3) 1	1	?	0	1	?	0	1	?	1	?	?	0	0	(3) 1	(3) 1	(4) 1	?	(4) 1	(2) 1	0
<i>Xvig</i>	0	?	0	?	(3) 1	?	?	0	?	?	0	0	?	?	?	0	1	0	(3) 1	(3) 1	(3) p	?	(4) 1	(2) 1	0
<i>Bipe</i>	?	?	?	?	0	0	?	?	?	?	?	0	?	?	?	?	?	?	?	?	?	?	?	?	?

SU	658 as/ca - ilcap	659 as/ca - intr	660 as/ca - sc/co	661 as/ca - pelvis	662 as/ca - raapo	663 as/ca - pectub	664 as/ca - istsub	665 lateen - as/ca	666 as/ca - medeen	667 dc3 - lun	668 pis - lun	669 neursp - lun	670 palm - lun	671 lun - quad	672 elbow - lun	673 dp - lun	674 dc2 - lun	675 lun - ilcap	676 intr - lun	677 sc/co - lun	678 lun - pelvis
<i>Agam</i>	0	0	0	0	0	0	0	1	0	(1) p	(2) 1	(3) 1	(2) 1	(1) p	(2) 1	(2) 1	1	0	(2) 1	(2) 1	0
<i>Uta</i>	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	(2) p	0	0	0
<i>Call</i>	0	0	0	0	0	0	0	1	?	0	?	0	0	0	?	0	0	0	0	0	0
<i>Anol</i>	0	0	0	0	0	0	0	0	0	0	0	(1) p	(2) 1	0	0	0	0	(3) 1	0	0	(2) p
<i>Basi</i>	0	0	0	0	0	0	0	0	0	0	0	0	0	?	?	?	0	(3) 1	?	0	(2) p
<i>Gamb</i>	0	0	0	0	0	0	0	0	0	0	(1) p	?	(1) p	(2) 1	0	0	0	0	0	(2) 1	(1) p
<i>Dips</i>	0	0	0	0	0	0	0	0	0	0	0	?	0	0	0	0	0	0	0	?	0
<i>Cole</i>	(2) 1	(2) 1	?	0	0	0	1	?	?	0	0	0	?	(2) 1	0	0	0	(3) 1	0	0	0
<i>Gona</i>	(2) 1	(2) 1	(2) 1	0	(2) 1	(1) p	1	1	0	(2) 1	(2) 1	0	?	0	0	0	1	(3) 1	0	(2) 1	0
<i>Acan</i>	0	0	0	0	0	0	0	0	(2) 1	?	(2) 1	(3) 1	(2) 1	0	(2) 1	(2) 1	?	0	(2) 1	(2) 1	0
<i>Cnem</i>	0	0	0	0	0	0	0	0	0	0	0	(3) 1	0	(1) p	(1) p	(1) p	0	0	(1) p	(1) p	0
<i>Neus</i>	0	0	0	0	0	0	0	0	0	0	0	(3) 1	(2) 1	?	0	0	0	0	0	?	?
<i>Elga</i>	(1) p	0	(2) 1	0	0	0	0	0	(2) 1	0	(2) 1	(3) 1	(2) 1	0	(2) 1	(2) 1	0	0	(2) 1	(2) 1	0
<i>Chal</i>	0	0	0	0	0	0	0	0	(1) p	0	0	(2) p	(2) 1	(2) 1	(2) 1	(2) 1	0	0	(2) 1	(2) 1	0
<i>Eume</i>	(1) p	(1) p	0	0	0	0	0	0	(2) 1	0	0	(3) 1	(2) 1	0	(2) 1	(2) 1	0	(1) p	(2) 1	(2) 1	0
<i>Lepi</i>	?	(2) 1	(2) 1	0	(1) p	0	1	0	?	0	?	(3) 1	(2) 1	?	0	0	?	0	0	?	0
<i>Xriv</i>	0	(2) 1	(1) p	0	?	0	0	?	0	0	(2) 1	0	(2) 1	0	0	0	0	0	0	0	(3) 1
<i>Xhen</i>	0	(2) 1	(2) 1	(1) p	(2) 1	(2) 1	1	0	(2) 1	0	(2) 1	0	(2) 1	?	0	0	0	0	0	0	0
<i>Xari</i>	(1) p	(2) 1	(2) 1	(2) p	(2) 1	(2) 1	1	0	(2) 1	0	?	0	?	?	0	0	?	0	0	?	0
<i>Xvig</i>	(1) p	(2) 1	(2) 1	?	(2) 1	(2) 1	1	0	(2) 1	?	(2) 1	?	(2) 1	?	0	?	?	0	?	?	0
<i>Bipe</i>	?	?	?	?	?	?	?	?	?	?	?	?	?	?	?	?	?	?	?	?	?

SU	679 lun - raapo	680 lun - pectub	681 lun - isctub	682 lateen - lun	683 medeen - lun	684 dc3 - pis	685 dc3 - neursp	686 dc3 - palm	687 dc3 - quad	688 dc3 - elbow	689 dc3 - dp	690 dc3 - dc2	691 dc3 - ilcap	692 dc3 - intrr	693 dc3 - sc/co	694 dc3 - pelvis	695 dc3 - raapo	696 dc3 - pectub	697 dc3 - isctub	698 dc3 - lateen	699 dc3 - medeen	700 neursp - pis	701 pis - palm
<i>Agam</i>	0	0	0	1	(3) 1	(1) p	(1) p	0	(1) p	(1) p	(1) p	(1) p	0	0	(1) p	0	0	0	0	0	0	(2) p	0
<i>Uta</i>	(3) p	(1) p	1	0	(2) p	0	0	0	0	0	0	?	0	0	0	0	0	0	0	?	0	(1) p	0
<i>Call</i>	(1) p	0	0	0	?	0	0	0	0	0	0	?	0	0	0	0	0	0	0	?	0	0	(1) p
<i>Anol</i>	(2) p	0	1	0	(2) p	0	0	0	0	(1) p	0	0	0	0	0	0	0	0	0	0	0	0	0
<i>Basi</i>	?	0	?	0	0	0	0	0	?	0	0	0	0	0	0	0	0	0	0	0	0	0	?
<i>Gamb</i>	(4) 1	0	0	0	0	0	0	0	0	0	0	?	0	0	0	0	0	0	0	0	0	(3) p	0
<i>Dips</i>	?	0	0	0	0	0	0	0	0	0	0	?	0	0	0	0	0	0	0	?	0	(4) 1	(1) p
<i>Cole</i>	0	0	1	0	0	0	(2) 1	?	0	(2) 1	(3) 1	0	1	(2) 1	0	0	0	0	(1) p	0	0	0	?
<i>Gona</i>	(4) 1	0	1	1	(3) 1	0	(2) 1	?	0	(2) 1	(3) 1	0	1	(2) 1	(3) 1	0	(2) 1	(1) p	(2) 1	0	0	0	?
<i>Acan</i>	0	0	0	?	(3) 1	0	0	0	0	0	0	?	0	0	0	0	0	0	0	?	0	(4) 1	?
<i>Cnem</i>	0	0	0	0	0	0	0	0	0	0	0	?	0	0	0	0	0	0	0	?	0	(4) 1	(2) 1
<i>Neus</i>	0	0	0	0	(3) 1	0	0	0	?	0	0	?	0	0	0	0	0	0	0	?	0	(4) 1	0
<i>Elga</i>	0	0	0	0	0	0	0	0	0	0	0	?	0	0	0	0	0	0	0	?	0	(4) 1	0
<i>Chal</i>	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	(4) 1	0
<i>Eume</i>	0	0	0	0	(1) p	(2) 1	0	0	0	0	0	?	0	0	0	0	0	0	0	?	0	(4) 1	0
<i>Lepi</i>	0	0	0	?	(3) 1	0	0	0	?	(2) 1	(2) p	0	0	(1) p	0	0	0	0	0	0	0	(4) 1	0
<i>Xriv</i>	(4) 1	(2) p	1	0	?	0	(2) 1	0	?	(2) 1	(3) 1	0	0	(2) 1	(2) p	0	(2) 1	(2) p	?	1	0	0	0
<i>Xhen</i>	(2) p	(3) 1	1	0	0	0	0	0	?	(2) 1	(3) 1	?	0	(1) p	0	0	0	0	0	0	0	0	(1) p
<i>Xari</i>	(4) 1	?	1	?	?	0	(2) 1	0	?	(2) 1	(3) 1	0	0	(2) 1	0	0	(1) p	0	(2) 1	0	0	0	?
<i>Xvig</i>	0	?	?	?	(3) 1	0	?	0	?	(2) 1	?	?	0	?	?	0	0	?	?	?	?	?	(1) p
<i>Bipe</i>	?	?	?	?	?	?	?	?	?	0	0	?	?	?	?	?	0	?	?	?	?	?	?

SU	702 pis - quad	703 pis - elbow	704 pis - dp	705 dc2 - pis	706 pis - ilcap	707 intrr - pis	708 pis - sc/co	709 pis - pelvis	710 pis - raapo	711 pis - pectub	712 isctub - pis	713 lateen - pis	714 pis - medeen	715 neursp - palm	716 neursp - quad	717 elbow - neursp	718 dp - neursp	719 dc2 - neursp	720 neursp - ilcap	721 neursp - intrr	722 neursp - sc/co	723 neursp - pelvis
<i>Agam</i>	(1) p	0	0	1	0	1	(1) p	(1) p	0	0	1	1	0	(2) p	(1) p	1	0	1	0	0	0	0
<i>Uta</i>	0	1	(1) p	0	0	0	(2) p	0	0	0	1	0	0	0	0	0	(2) 1	0	0	(2) 1	(3) p	0
<i>Call</i>	0	?	(2) 1	0	0	0	(3) 1	0	(1) p	0	1	0	?	(1) p	0	(3) 1	0	0	0	(1) p	(1) p	0
<i>Anol</i>	0	1	(2) 1	0	(4) 1	0	(3) 1	(3) p	(2) p	0	0	0	(2) p	0	0	0	0	0	(4) 1	(2) 1	(5) 1	(2) p
<i>Basi</i>	?	0	0	0	?	1	?	0	0	0	1	0	(3) 1	0	?	(3) 1	(2) 1	0	0	0	0	0
<i>Gamb</i>	0	1	(2) 1	0	0	0	0	0	(3) 1	0	1	0	(3) 1	(2) p	(2) p	0	0	0	0	0	0	(1) p
<i>Dips</i>	0	0	0	0	0	1	0	0	0	0	1	0	(1) p	(3) 1	0	0	0	0	0	(2) 1	?	0
<i>Cole</i>	(2) p	1	(2) 1	?	(4) 1	0	?	0	0	0	0	?	?	?	0	(2) p	(2) 1	1	0	0	0	0
<i>Gona</i>	0	1	(2) 1	?	(4) 1	0	(3) 1	?	(3) 1	(1) p	0	?	?	?	0	0	(2) 1	1	0	0	0	0
<i>Acan</i>	0	0	0	0	0	1	0	0	0	0	1	0	(1) p	(3) 1	0	0	0	0	0	(2) 1	(5) 1	0
<i>Cnem</i>	0	0	0	0	0	1	0	0	0	0	1	0	0	(3) 1	(3) p	0	0	0	(1) p	(2) 1	(4) p	(3) 1
<i>Neus</i>	?	1	(2) 1	0	0	0	0	0	0	0	1	0	0	(3) 1	?	0	0	0	?	(2) 1	(5) 1	(3) 1
<i>Elga</i>	0	0	0	0	0	1	0	0	0	0	1	0	(3) 1	0	0	0	(2) 1	0	(2) p	0	(2) p	0
<i>Chal</i>	0	0	0	1	0	1	0	0	0	0	1	1	0	0	(4) 1	(3) 1	(2) 1	0	0	0	0	0
<i>Eume</i>	0	0	0	1	0	1	0	0	0	0	1	1	0	(3) 1	(4) 1	(1) p	(1) p	0	(3) p	(2) 1	0	0
<i>Lepi</i>	?	1	(2) 1	?	0	0	?	0	0	0	1	?	0	0	?	0	0	0	0	(2) 1	(5) 1	0
<i>Xriv</i>	?	1	(2) 1	0	(2) p	0	(3) 1	(4) 1	(3) 1	(2) p	0	0	(3) 1	0	?	0	0	1	0	(2) 1	(3) p	0
<i>Xhen</i>	?	1	(2) 1	0	(3) p	0	(3) 1	(2) p	(3) 1	(3) 1	0	0	(3) 1	0	?	0	0	0	0	(2) 1	0	0
<i>Xari</i>	?	1	(2) 1	?	0	0	?	0	(3) 1	?	0	?	?	0	?	0	0	1	0	(2) 1	0	0
<i>Xvig</i>	?	1	(2) 1	0	(1) p	0	(3) 1	0	(2) p	(3) 1	0	0	(3) 1	0	?	0	?	?	?	?	?	?
<i>Bipe</i>	?	0	0	?	?	?	?	?	0	?	?	?	?	?	?	?	?	?	?	?	?	?

SU	724 neursp - raapo	725 neursp - pectub	726 neursp - isticub	727 lateen - neursp	728 neursp - medeen	729 palm - quad	730 elbow - palm	731 dp - palm	732 dc2 - palm	733 palm - ilcap	734 int troch - palm	735 palm - sc/co	736 palm - pelvis	737 palm - raapo	738 palm - pectub	739 palm - isticub	740 lateen - palm	741 medeen - palm	742 elbow - quad	743 dp - quad	744 dc2 - quad	745 ilcap - quad
<i>Agam</i>	0	0	0	(2) 1	0	(1) p	(1) p	(2) p	(1) p	0	1	(1) p	(1) p	0	0	0	1	(3) 1	(2) p	(2) p	(1) p	(2) p
<i>Uta</i>	0	0	0	0	0	0	0	0	0	0	0	(3) 1	0	(3) 1	0	?	0	0	0	0	0	0
<i>Call</i>	(1) p	0	0	(1) p	?	0	(1) p	0	0	0	0	(2) p	(1) p	0	0	0	0	?	0	0	0	(3) p
<i>Anol</i>	(3) p	0	1	0	(1) p	0	0	0	0	(4) 1	0	(3) 1	(3) 1	(3) 1	1	1	0	0	0	0	0	0
<i>Basi</i>	0	0	0	0	(2) p	?	(3) 1	(3) 1	0	?	1	?	0	0	0	0	0	0	?	?	?	?
<i>Gamb</i>	(4) 1	0	0	0	(3) 1	(2) 1	0	0	0	0	0	0	(1) p	(3) 1	0	0	0	0	0	0	0	(4) 1
<i>Dips</i>	?	0	0	0	(3) 1	0	(2) p	(3) 1	0	0	1	0	0	0	0	0	0	(2) p	0	0	0	0
<i>Cole</i>	0	0	0	(2) 1	0	?	?	?	?	?	?	?	?	?	?	?	?	?	0	0	(1) p	0
<i>Gona</i>	0	0	0	(2) 1	0	?	?	?	?	?	?	?	?	?	?	?	?	?	0	0	0	0
<i>Acan</i>	(2) p	0	0	0	(3) 1	0	(3) 1	(3) 1	0	0	1	0	0	0	0	0	0	(2) p	0	0	0	(1) p
<i>Cnem</i>	0	(1) p	0	0	(3) 1	0	(3) 1	(3) 1	0	0	1	0	0	0	0	0	0	(3) 1	(1) p	(1) p	0	(4) 1
<i>Neus</i>	0	0	0	0	(3) 1	?	0	0	0	0	0	(3) 1	(3) 1	0	0	0	0	(2) p	?	?	?	?
<i>Elga</i>	0	0	0	0	(3) 1	(1) p	0	(1) p	0	(3) p	0	(3) 1	(2) p	(1) p	0	0	0	0	0	(1) p	0	0
<i>Chal</i>	0	0	0	0	(3) 1	(2) 1	(1) p	(3) 1	0	0	1	0	0	0	0	0	0	0	(4) 1	(3) 1	0	(4) 1
<i>Eume</i>	0	0	0	0	(3) 1	0	(3) 1	(3) 1	0	(1) p	1	0	0	0	0	0	0	(2) p	(3) p	(2) p	0	(1) p
<i>Lepi</i>	0	0	?	0	0	?	0	0	0	(4) 1	0	(3) 1	?	(3) 1	1	1	0	0	?	?	?	?
<i>Xriv</i>	?	0	0	?	0	?	0	0	0	(4) 1	0	(3) 1	(3) 1	(3) 1	1	1	0	0	?	?	?	?
<i>Xhen</i>	0	?	0	0	(3) 1	?	0	0	0	(2) p	0	(3) 1	(2) p	(3) 1	1	1	0	0	?	?	?	?
<i>Xari</i>	0	0	?	(2) 1	0	?	0	0	?	0	0	?	0	(3) 1	?	1	?	?	?	?	?	?
<i>Xvig</i>	0	?	?	?	0	?	0	0	0	0	0	(3) 1	(1) p	(2) p	1	1	0	(1) p	?	?	?	?
<i>Bipe</i>	?	?	?	?	?	?	(3) 1	(3) 1	?	?	?	?	?	0	?	?	?	?	?	?	?	?

SU	746 int troch - quad	747 sc/co - quad	748 pelvis - quad	749 raapo - quad	750 quad - pectub	751 quad - isticub	752 lateen - quad	753 medeen - quad	754 elbow - dp	755 dc2 - elbow	756 elbow - ilcap	757 elbow - intr	758 elbow - sc/co	759 elbow - pelvis	760 elbow - raapo	761 elbow - pectub	762 elbow - isticub	763 lateen - elbow	764 elbow - medeen	765 dp
<i>Agam</i>	(3) p	(2) p	(2) 0 or	(3) p	(2) p	(1) p	(2) p	(3) 1	0	(2) 1	0	0	0	0	0	0	0	(2) 1	0	?
<i>Uta</i>	0	0	0	0	(4) 1	(3) 1	0	0	0	0	0	0	0	0	0	0	0	0	0	0
<i>Call</i>	0	0	(2) p	(1) p	(3) p	(2) p	0	?	(3) 1	0	0	(3) 1	(4) 1	0	(2) p	0	0	0	?	0
<i>Anol</i>	0	0	0	0	(4) 1	(3) 1	0	0	0	(1) p	0	0	0	0	0	0	0	(1) p	0	0
<i>Basi</i>	?	?	?	?	?	?	?	?	?	0	(2) 1	?	(4) 1	(1) p	?	0	?	0	(2) 1	0
<i>Gamb</i>	0	(4) 1	(2) p	0	0	0	0	0	0	0	0	0	0	0	(3) p	0	0	0	(1) p	0
<i>Dips</i>	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	(2) 1	0
<i>Cole</i>	0	(1) p	(3) 1	(4) 1	0	(2) p	(1) p	(2) p	0	(2) 1	0	0	0	0	0	0	0	(2) 1	0	1
<i>Gona</i>	0	0	0	0	(4) 1	(3) 1	0	0	0	(2) 1	0	0	0	0	0	0	0	(2) 1	0	1
<i>Acan</i>	0	0	(1) p	0	0	(2) p	0	0	0	0	0	0	(3) p	0	0	0	0	0	(2) 1	0
<i>Cnem</i>	(1) p	(2) p	(1) p	(4) 1	(1) p	0	0	0	(2) p	0	0	(2) p	(1) p	0	0	0	0	0	(2) 1	0
<i>Neus</i>	?	?	?	?	?	?	?	?	0	0	0	0	0	0	0	0	0	0	0	0
<i>Elga</i>	0	0	(1) p	(2) p	0	0	0	0	0	0	(1) p	(3) 1	(2) p	0	0	0	0	0	(2) 1	0
<i>Chal</i>	(4) 1	(4) 1	(3) 1	(4) 1	0	0	0	(1) p	0	0	0	0	(3) p	(1) p	0	0	0	0	(2) 1	0
<i>Eume</i>	(2) p	(3) p	(3) 1	(4) 1	0	0	0	0	0	0	0	(3) 1	0	0	0	0	0	0	(2) 1	0
<i>Lepi</i>	?	?	?	?	?	?	?	?	(1) p	(2) 1	0	(1) p	0	0	0	0	0	(2) 1	0	1
<i>Xriv</i>	?	?	?	?	?	?	?	?	0	(2) 1	0	0	0	0	0	0	0	(2) 1	0	1
<i>Xhen</i>	?	?	?	?	?	?	?	?	0	(2) 1	0	0	0	0	0	0	0	(2) 1	0	1
<i>Xari</i>	?	?	?	?	?	?	?	?	0	(2) 1	0	0	0	0	0	0	0	(2) 1	0	1
<i>Xvig</i>	?	?	?	?	?	?	?	?	0	(2) 1	0	0	0	0	0	0	0	(2) 1	0	?
<i>Bipe</i>	?	?	?	?	?	?	?	?	0	0	?	?	(4) 1	?	(1) p	?	?	0	(2) 1	0

SU	766 dp - ilcap	767 dp - intr	768 dp - sc/co	769 dp - pelvis	770 dp - raapo	771 dp - pectub	772 dp - isctub	773 latcen - dp	774 medcen - dp	775 dc2 - ilcap	776 dc2 - intr	777 dc2 - sc/co	778 dc2 - pelvis	779 dc2 - raapo	780 dc2 - pectub	781 dc2 - isctub	782 dc2 - latcen	783 dc2 - medcen	784 int troch - ilcap	785 sc/co - ilcap	786 ilcap - pelvis	787 raapo - ilcap	788 ilcap - pectub
<i>Agam</i>	0	0	(1) p	(1) p	0	0	0	1	(2) 1	0	0	(1) p	(1) p	0	0	0	0	0	?	(3) p	(2) p	(3) 1	0
<i>Uta</i>	0	(4) 1	(3) 1	0	0	0	0	0	(2) 1	0	0	0	0	0	0	0	?	0	0	0	(2) p	0	(2) p
<i>Call</i>	0	(1) p	(1) p	0	0	0	0	0	?	0	0	0	0	0	0	0	?	0	0	0	(4) 1	0	(3) 1
<i>Anol</i>	(1) p	0	(1) p	(1) p	0	0	0	0	(1) p	0	0	0	0	0	0	0	1	0	(4) 1	(4) 1	0	(3) 1	0
<i>Basi</i>	(3) 1	?	(3) 1	(2) p	?	0	?	0	0	0	0	0	0	0	0	0	1	0	(4) 1	?	0	(3) 1	0
<i>Gamb</i>	0	0	0	0	(2) 1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	?	(4) 1	0	0
<i>Dips</i>	0	(4) 1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	?	0	0	0	?	0	0
<i>Cole</i>	?	(4) 1	0	0	0	0	0	1	(2) 1	1	(2) 1	?	0	0	0	1	?	?	0	(4) 1	0	(3) 1	0
<i>Gona</i>	(1) p	(2) p	0	0	0	(1) p	1	(2) 1	1	(2) 1	(3) 1	?	?	1	(1) p	1	?	?	(2) p	(4) 1	0	(3) 1	0
<i>Acan</i>	(3) 1	(4) 1	(3) 1	(3) 1	(2) 1	1	(2) 1	0	0	0	0	0	0	0	0	0	?	0	0	0	0	0	0
<i>Cnem</i>	0	(2) p	(1) p	(1) p	0	0	0	0	0	0	0	0	0	0	0	0	?	0	0	0	(4) 1	(3) 1	(3) 1
<i>Neus</i>	0	?	0	0	0	0	0	0	(2) 1	0	0	0	0	0	0	0	?	0	0	0	(4) 1	(3) 1	0
<i>Elga</i>	(2) p	(2) p	(2) p	(2) p	0	0	0	0	0	0	0	0	0	0	0	0	?	0	(3) p	(2) p	(1) p	(3) 1	0
<i>Chal</i>	(1) p	(3) p	(3) 1	(3) 1	0	0	0	0	0	0	0	0	0	0	0	0	?	0	(1) p	(1) p	(3) p	(2) p	(1) p
<i>Eume</i>	(2) p	(4) 1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	?	0	(2) p	(4) 1	0	(3) 1	0
<i>Lepi</i>	0	?	0	0	0	0	0	1	(2) 1	0	(2) 1	?	0	0	0	0	?	0	0	0	0	(1) p	0
<i>Xriv</i>	0	0	0	0	0	0	0	1	(2) 1	0	(2) 1	(2) p	(2) p	1	(1) p	1	1	0	0	0	(4) 1	0	(3) 1
<i>Xhen</i>	0	0	0	0	0	0	0	1	(2) 1	0	(1) p	0	0	0	0	0	0	0	0	0	(2) p	0	(3) 1
<i>Xari</i>	0	?	0	0	0	0	0	1	(2) 1	0	(2) 1	?	0	1	?	1	?	?	0	0	(2) p	0	(3) 1
<i>Xvig</i>	0	?	?	0	0	?	?	?	(2) 1	0	?	?	0	0	?	?	?	0	0	0	(2) p	0	(3) 1
<i>Bipe</i>	?	?	(3) 1	?	(1) p	?	?	0	0	?	?	?	?	0	?	?	?	?	?	?	?	?	?

SU	789 ilcap - isctub	790 latcen - ilcap	791 ilcap - medcen	792 intr - sc/co	793 intr - pelvis	794 int troch - raapo	795 int troch - pectub	796 int troch - isctub	797 latcen - intr	798 medcen - intr	799 sc/co - pelvis	800 sc/co - raapo	801 sc/co - pectub	802 sc/co - isctub	803 latcen - sc/co	804 medcen - sc/co	805 raapo - pelvis	806 pelvis - pectub	807 pelvis - isctub	808 latcen - pelvis	809 medcen - pelvis
<i>Agam</i>	0	1	0	(2) p	(2) p	0	0	0	(2) 1	(3) 1	?	(2) p	(1) p	(2) p	(1) p	(2) 1	(2) p	(2) p	(1) p	(1) p	(3) 1
<i>Uta</i>	(3) 1	0	0	0	0	0	0	0	0	(3) 1	0	0	0	0	0	(2) 1	(1) p	(3) p	(3) 1	0	(1) p
<i>Call</i>	(3) 1	0	?	0	0	0	0	0	(1) p	?	0	(1) p	0	0	0	?	(1) p	(4) p	(2) p	0	?
<i>Anol</i>	0	0	0	(3) p	(1) p	0	0	0	0	(2) p	0	0	0	0	0	(1) p	(2) p	(1) p	(2) p	0	(2) p
<i>Basi</i>	0	0	(2) 1	(4) 1	(2) p	?	0	?	0	0	0	0	0	0	0	0	(2) p	(1) p	(1) p	0	0
<i>Gamb</i>	(3) 1	0	(2) 1	0	0	1	0	0	0	0	1	(3) 1	0	(3) 1	0	0	0	0	(1) p	0	0
<i>Dips</i>	0	0	(2) 1	0	0	0	0	0	0	0	0	?	0	0	0	0	0	0	0	0	0
<i>Cole</i>	0	1	0	0	0	0	0	0	(2) 1	(3) 1	0	0	0	(3) 1	?	?	0	(5) 1	(3) 1	0	0
<i>Gona</i>	?	1	0	0	0	0	0	(1) p	(2) 1	(3) 1	0	(3) 1	0	(3) 1	(3) 1	(2) 1	0	(2) p	(3) 1	?	?
<i>Acan</i>	(2) p	0	(2) 1	(4) 1	(3) 1	0	0	0	0	0	0	0	0	0	0	0	0	0	(2) p	0	0
<i>Cnem</i>	0	0	(2) 1	(1) p	0	0	0	0	0	0	(2) p	0	(1) p	0	0	0	(4) 1	(1) p	0	0	0
<i>Neus</i>	0	0	(2) 1	0	0	0	0	0	0	(3) 1	?	0	0	0	0	(2) 1	(4) 1	0	0	0	(3) 1
<i>Elga</i>	0	0	(2) 1	(4) 1	(2) p	0	0	0	0	0	0	0	0	0	0	0	(3) p	0	0	0	0
<i>Chal</i>	(1) p	0	(2) 1	(4) 1	(3) 1	0	0	0	0	0	?	0	0	0	0	0	(4) 1	0	0	0	0
<i>Eume</i>	0	0	(1) p	0	0	0	0	0	0	(1) p	(1) p	0	(1) p	0	0	0	(4) 1	0	0	0	0
<i>Lepi</i>	(3) 1	0	?	0	0	0	0	0	(2) 1	(3) 1	0	0	0	0	?	(2) 1	0	(5) 1	(3) 1	0	0
<i>Xriv</i>	(3) 1	0	(2) 1	(2) p	0	0	0	0	(2) 1	(3) 1	0	(1) p	0	(1) p	(2) p	(2) 1	0	(3) p	(3) 1	0	(3) 1
<i>Xhen</i>	(3) 1	0	(2) 1	0	0	0	0	0	(2) 1	(3) 1	0	0	(2) 1	?	?	?	(1) p	(5) 1	(3) 1	0	0
<i>Xari</i>	(3) 1	0	(2) 1	0	0	0	0	0	(2) 1	(3) 1	0	(3) 1	?	(3) 1	?	?	0	(5) 1	(3) 1	0	0
<i>Xvig</i>	(3) 1	0	(2) 1	?	0	0	?	?	?	(3) 1	0	0	?	?	?	(2) 1	(1) p	(5) 1	(3) 1	0	0
<i>Bipe</i>	?	?	?	?	?	?	?	?	?	?	?	0	?	?	?	?	?	?	?	?	?

SU	810 raapo - pectub	811 raapo - isctub	812 lateen - raapo	813 medeen - raapo	814 isctub - pectub	815 lateen - pectub	816 medeen - pectub	817 lateen - isctub	818 medeen - isctub	819 lateen - medeen	820 dfore - int troch
<i>Agam</i>	?	?	?	(4) 1	?	?	(4) 1	?	(2) 1	0	0
<i>Uta</i>	0	(3) 1	0	(3) p	0	0	(2) p	0	(2) 1	0	0
<i>Call</i>	(1) p	(2) p	0	?	?	0	?	0	?	?	0
<i>Anol</i>	0	(3) 1	0	(2) p	0	0	(1) p	0	(1) p	0	0
<i>Basi</i>	0	?	0	0	0	0	0	0	0	0	0
<i>Gamb</i>	0	0	0	0	0	0	0	0	0	0	0
<i>Dips</i>	0	0	0	0	?	0	0	0	0	0	0
<i>Cole</i>	(2) 1	(3) 1	0	0	0	0	0	1	(2) 1	?	1
<i>Gona</i>	0	(3) 1	1	(4) 1	0	(1) p	(2) p	1	(2) 1	?	1
<i>Acan</i>	0	0	0	0	0	0	0	0	0	0	0
<i>Cnem</i>	(2) 1	?	0	0	(3) 1	0	0	0	0	0	0
<i>Neus</i>	0	(2) p	0	0	0	0	0	0	0	0	0
<i>Elga</i>	0	(1) p	0	0	0	0	0	0	0	0	0
<i>Chal</i>	0	(3) 1	0	0	0	0	0	0	0	0	0
<i>Eume</i>	(1) p	?	0	0	(2) p	0	0	0	0	0	0
<i>Lepi</i>	0	(3) 1	0	?	0	0	?	0	(2) 1	0	1
<i>Xriv</i>	0	0	?	(4) 1	(1) p	0	(3) p	0	(2) 1	0	1
<i>Xhen</i>	(2) 1	(3) 1	0	0	(3) 1	(2) 1	(4) 1	?	?	?	1
<i>Xari</i>	0	(3) 1	1	(4) 1	0	?	?	1	(2) 1	?	?
<i>Xvig</i>	(2) 1	(3) 1	0	(1) p	?	?	(4) 1	?	(2) 1	0	?
<i>Bipe</i>	?	?	0	0	?	?	?	?	?	?	?

APPENDIX 3

CHARACTERS EMPLOYED IN PHYLOGENETIC ANALYSIS

Discrete characters (described in Maisano, 2000) employed in phylogenetic analysis. Numerical coding of character states (0, 1, 2) is arbitrary and not intended to indicate relative plesiomorphy.

1. Calcified endolymph in dorsal intracranial endolymphatic sacs: (0) never present; (1) present in less than 50% of specimens; (2) present in more than 50% of specimens

2. Ascending process of tectum synoticum: (0) absent; (1) present

3. Apophysis on basal tuber: (0) absent; (1) present

4. Number of cartilages on retroarticular process: (0) one; (1) two

5. Endochondral calcification in trachea: (0) absent; (1) present

6. Neural arch suture: (0) straight; (1) interdigitating

7. Neural spines ossify: (0) endochondrally and apophyseally; (1) only apophyseally

8. Apophyses on vertebral shoulders: (0) absent; (1) present

9. Sacral ribs: (0) never contact each other distally; (1) contact but never fuse; (2) fuse

10. Apophysis on ventral surface of coracoid: (0) absent; (1) present

11. Apophysis on posterolateral corner of epicoracoid: (0) absent; (1) present

12. Sesamoid in glenoid cavity: (0) absent; (1) present

13. Number of secondary centres in distal humeral epiphyseal cartilage: (0) one; (1) two; (2) three

14. Number of secondary centres in proximal radial epiphyseal cartilage: (0) one; (1) two

15. Sesamoid near dorsal aspect of proximal radial epiphysis: (0) absent; (1) present

16. Ulnar patella: (0) absent; (1) present

17. Apophysis on medial aspect of distal ulnar epiphysis: (0) absent; (1) present

18. Intermedium: (0) absent; (1) present

19. Palmar sesamoid: (0) absent; (1) present

20. Number of secondary centres in proximal phalangeal/ungual epiphyseal cartilages: (0) one; (1) two

21. Secondary centres in distal phalangeal epiphyseal cartilages: (0) absent; (1) present

22. Extra distal phalangeal sesamoids: (0) absent; (1) present

23. Sesamoids ventral to distal metacarpal/metatarsal epiphyses: (0) absent; (1) present

24. Sesamoids ventral to proximal ends of diaphyses of penultimate phalanges: (0) absent; (1) present

25. Cartilage capping dorsal end of ilium ossifies: (0) endochondrally; (1) apophyseally; (2) both
26. Apophysis on dorsal surface of proximal femoral epiphysis: (0) absent; (1) present
27. Sesamoid in ligaments ventrolateral to proximal femoral epiphysis: (0) absent; (1) present
28. Number of secondary centres in distal femoral epiphyseal cartilage: (0) one; (1) two
29. Tibial patella: (0) absent; (1) present
30. Fibular lunula: (0) absent; (1) present
31. Tibial lunula: (0) absent; (1) present
32. Dorsal and ventral postaxial tibiofemoral lunulae: (0) absent; (1) present
33. Preaxial ligament sesamoid: (0) absent; (1) present
34. Ventral ligament sesamoid: (0) absent; (1) present
35. Sesamoid ventral to proximal fibular epiphysis: (0) absent; (1) present
36. Number of secondary centres in proximal tibial epiphyseal cartilage: (0) one; (1) two; (2) three
37. Number of secondary centres in distal tibial epiphyseal cartilage: (0) one; (1) two
38. Plantar sesamoid: (0) absent; (1) present
39. Dorsal preaxial tarsal sesamoid: (0) absent; (1) present
40. Sesamoid between metatarsal I and astragalocalcaneum: (0) absent; (1) present
41. Preaxial tarsal sesamoid: (0) absent; (1) present
42. Lateral astragalar sesamoid: (0) absent; (1) present
43. Ventral astragalar sesamoid: (0) absent; (1) present
44. Sesamoid in preaxial niche of proximal epiphysis of metatarsal IV: (0) absent; (1) present
45. Apophyses on diaphyses of metatarsals II and III: (0) absent; (1) present

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33
<i>Agam</i>	0	1	1	0	0	0	0	0	1	0	0	0	0	0	0	1	0	0	1	1	0	1	0	0	2	0	0	0	0	0	1	1	0
<i>Uta</i>	1	1	1	0	1	1	1	0	1	0	1	0	2	0	0	1	1	0	1	1	0	0	1	0	2	0	0	1	1	0	1	1	0
<i>Call</i>	1	1	1	0	1	1	1	0	1	0	1	1	2	0	0	1	1	0	1	1	0	1	0	0	1	0	0	1	1	0	1	1	0
<i>Anol</i>	2	1	1	0	1	1	0	0	0	1	1	0	1	0	0	1	1	0	1	?	0	0	1	0	2	0	0	0	1	?	1	1	0
<i>Basi</i>	1	1	1	0	1	1	?	0	0	0	0	0	2	0	0	1	0	0	1	1	0	0	1	0	2	0	0	0	0	?	1	1	0
<i>Gamb</i>	1	1	1	0	1	1	0	0	2	0	1	0	2	0	0	1	1	0	1	1	0	1	0	0	2	0	0	1	1	0	1	1	0
<i>Dips</i>	1	1	1	0	1	0	0	0	1	0	0	0	2	1	0	1	1	0	1	1	0	1	0	0	2	0	0	1	1	0	1	0	0
<i>Cole</i>	1	0	1	0	1	0	1	1	2	0	1	1	2	0	0	1	0	0	0	1	0	0	1	0	2	1	0	?	1	1	1	1	1
<i>Gona</i>	2	0	0	0	1	0	1	1	2	0	1	0	0	0	1	1	0	0	0	0	0	0	1	0	2	1	0	0	1	1	1	1	1
<i>Acan</i>	1	1	?	0	1	?	?	1	?	0	1	0	?	?	0	1	0	0	1	?	?	0	0	0	?	?	?	?	?	?	?	?	?
<i>Cnem</i>	1	1	1	0	0	1	1	0	1	0	1	0	2	1	0	1	1	1	1	1	0	1	1	1	2	0	1	1	1	1	1	1	1
<i>Neus</i>	1	1	1	0	1	?	1	1	1	0	1	1	0	0	0	0	0	1	1	0	0	1	0	0	0	0	0	0	1	1	1	1	1
<i>Elga</i>	2	1	1	0	0	?	1	1	2	1	1	0	0	0	1	0	1	1	1	1	1	0	1	1	0	0	0	0	1	1	1	1	1
<i>Chal</i>	1	1	1	0	0	1	1	1	2	1	0	0	0	0	0	?	0	1	1	1	0	0	0	1	0	0	0	1	1	1	1	1	1
<i>Eume</i>	1	1	1	1	0	1	0	1	2	0	1	0	0	0	0	1	1	1	1	0	1	0	0	0	0	0	0	0	1	1	1	1	1
<i>Lepi</i>	1	1	1	1	0	1	1	1	2	0	1	0	0	0	0	1	1	1	1	1	1	0	1	0	0	0	1	0	1	1	1	1	1
<i>Xriv</i>	1	1	0	0	1	0	1	0	2	0	1	0	0	0	1	?	1	1	1	0	0	0	1	0	1	0	0	0	1	1	1	1	1
<i>Xhen</i>	1	1	1	0	1	0	1	1	2	0	1	0	0	0	0	0	1	1	1	0	0	0	0	0	1	0	0	0	1	1	1	1	1
<i>Xari</i>	1	1	1	0	1	0	1	1	2	0	1	1	0	0	0	1	1	1	1	0	1	0	0	0	2	0	0	0	1	1	1	1	1
<i>Xvig</i>	2	1	?	0	1	0	1	0	2	0	1	1	0	0	0	1	1	1	1	0	1	0	0	0	2	0	0	0	1	1	1	1	1
<i>Bipe</i>	1	1	1	0	1	0	1	1	2	0	1	0	0	0	0	0	1	1	1	0	0	0	0	0	1	0	0	0	1	1	1	1	1

34 35 36 37 38 39 40 41 42 43 44 45

<i>Agam</i>	0	0	1	0	0	0	1	0	0	0	0	1
<i>Uta</i>	0	1	1	0	0	1	1	0	0	0	0	1
<i>Call</i>	0	1	1	0	1	1	1	0	0	0	0	1
<i>Anol</i>	0	0	0	0	0	1	1	0	0	0	0	1
<i>Basi</i>	0	0	1	0	0	0	0	0	0	0	0	0
<i>Gamb</i>	0	0	2	0	0	1	0	0	0	0	0	1
<i>Dips</i>	0	0	2	0	0	0	0	0	0	0	0	1
<i>Cole</i>	0	0	0	0	0	1	1	0	0	0	0	1
<i>Gona</i>	0	0	0	0	?	1	1	0	0	0	1	1
<i>Acan</i>	?	?	?	?	?	?	?	?	?	?	?	?
<i>Cnem</i>	1	0	1	1	1	1	0	1	0	1	1	1
<i>Neus</i>	0	0	1	0	1	0	0	0	0	1	0	0
<i>Elga</i>	1	?	1	0	1	1	1	1	1	1	0	0
<i>Chal</i>	0	0	1	1	1	1	0	0	0	0	0	1
<i>Eume</i>	1	0	1	1	1	0	0	0	0	0	0	1
<i>Lepi</i>	1	0	1	1	1	1	0	0	0	0	0	1
<i>Xriv</i>	0	0	0	0	1	1	0	1	1	0	1	0
<i>Xhen</i>	0	0	0	0	1	0	0	1	1	0	0	0
<i>Xari</i>	0	0	1	0	1	0	0	1	1	0	0	0
<i>Xvig</i>	1	0	1	1	1	0	0	0	1	0	0	0
<i>Bipe</i>	1	0	1	0	1	0	1	0	1	0	0	0