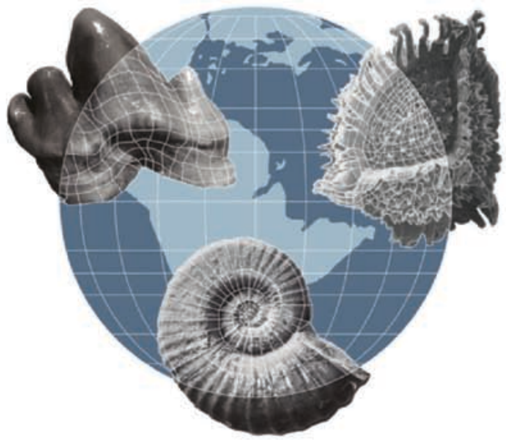
AMEGHINIANA
A GONDWANAN PALEONTOLOGICAL JOURNAL



Submitted: June 11th, 2015 – **Accepted**: November 29th, 2015

To link and cite this article:

doi: 10.5710/AMGH.29.11.2015.2928

http://zoobank.org/F8E1456A-8404-4045-8E42-58D12FE1F1F8

A SMALL BODY SIZED NON-ARISTONECTINE ELASMOSAURID (SAUROPTERYGIA, PLESIOSAURIA) FROM THE LATE CRETACEOUS OF PATAGONIA WITH COMMENTS ON THE RELATIONSHIPS OF THE PATAGONIAN AND ANTARCTIC ELASMOSAURIDS

J.P. O'GORMAN[1,2]

[1] División Paleontología Vertebrados, Museo de La Plata, Universidad Nacional de La Plata, Paseo del Bosque s/n., B1900FWA, La Plata, Argentina.

[2] CONICET: Consejo Nacional de Investigaciones Científicas y Técnicas, Argentina.

joseogorman@fcnym.unlp.edu.ar.

Pages: 34

Figures: 10+ 1 appendix

Tables: 3

O'Gorman: *KAWANECTES*, AN ELASMOSAURID FROM PATAGONIA

Corresponding Author: O'Gorman José Patricio.

Abstract. The systematics of the Late Cretaceous non-aristonectine elasmosaurids from Argentinean Patagonia are poorly known as there is no valid species currently recognized. Here a new non-aristonectine elasmosaurid: *Kawanectes lafquenianum* nov. comb. from the late Campanian–early Maastrichtian Allen Formation is diagnosed. *Kawanectes lafquenianum* is a distinctively small-bodied sized non-aristonectine elasmosaurid characterized by caudal vertebrae with marked laterally projected parapophyses, presence of pelvic bar, high ratio (~1.2) between humerus/femur length and a large posterodistal projection of the humerus which bears a posterior accessory articular facet. A phylogenetic analysis recovered *K. lafquenianum* closely related with *Morenosaurus stocki*, *Vegasaurus molyi* and Aristonectinae, showing the relationships between the elasmosaurids from Patagonia, Western Antarctic, and the Pacific coast of the USA. *Kawanectes lafquenianum* is part of the fauna of the coeval Allen and La Colonia formations that also comprises indeterminate aristonectines and polycotylids . This relatively high diversity plesiosaur fauna includes the three main morphotypes (aristonectines, non-aristonectines elasmosaurids and polycotylids), which is remarkable since the depositional environments of the Allen have been inferred as marginal marine to non-marine environments.

Keywords. Elasmosauridae. Upper Cretaceous. Patagonia. Antarctic Peninsula.

Resumen. UN ESLASMOSÁURIDO NO ARISTONECTINO (SAUROPTERYGIA, PLESIOSAURIA) DE PEQUEÑO TAMAÑO CORPORAL DEL CRETÁCICO SUPERIOR DE PATAGONIA CON COMENTATIOS SOBRE LA RELACIÓN ENTRE LOS ELASMOSÁURIDOS DE ANTÁRTIDA Y PATAGONIA**.** La sistemática de los elasmosáuridos no aristonectinos del Cretácico de la Patagonia Argentina es poco conocida, no habiendo ninguna especie válidas actualmente reconocidas. En esta contribución un nuevo elasmosáurido no aristonectino: *Kawanectes lafquenianum* nov. comb. proveniente de la Formación Allen (Campaniano superior-Maastrichtiano inferior) es diagnosticado. *Kawanectes lafquenianum* nov. comb. es un elasmosáurido no aristonectino de pequeño tamaño corporal que se caracteriza por la presencia de vértebras caudales con parapófisis fuertemente proyectada lateralmente, presencia de barra pélvica, elevada razón longitud del húmero / longitud del fémur (~ 1.2) y una marcada proyección posterodistal del húmero que lleva un carilla articular accesoria. El análisis filogenético recupera a *Kawanectes lafquenianum* nov. comb., estrechamente relacionado con *Vegasaurus molyi*, *Morenosaurus stocki* y los aristonectinos que muestran las relaciones entre los elasmosáuridos del norte de Patagonia, Antártida Occidental y la costa pacífica de USA. *Kawanectes lafquenianum* nov. comb. es parte de la fauna de la Formacion Allen que comprende, además de *Kawanectes lafquenianum* nov. comb., aristonectinos indeterminados y policotílidos mostrando una diversidad relativamente alta, con los tres morfotipos principales presentes (elasmosáuridos aristonectinos, elasmosáuridos no aristonectinos y policotílidos). Esto es notable ya que el ambiente de depositación de la Formación Allen se ha inferido como marino marginal con intercalaciones de ambientes no marinos

Palabras Clave: Elasmosauridae. Cretácico Superior, Patagonia, Península Antártica.

ELASMOSAURID plesiosaurs form a monophyletic group of cosmopolitan diapsid marine reptiles that flourished during the Late Cretaceous (Vincent *et al.*, 2011; Benson and Druckenmiller, 2014). Elasmosaurids comprise the more typical non-aristonectine elasmosaurids, characterised by elongated cervical centra and relatively small cranium, and the aristonectines, with short cervical centra a relatively large cranium, and increased number of teeth (Gasparini *et al.*, 2003; Otero *et al.*, 2012, 2014b).

Elasmosaurids have been collected from southern South America since the XIX century (Gay, 1848; Ameghino, 1893; Gasparini *et al.*, 2007; Otero *et al.*, 2009; O'Gorman *et al.*, 2013b). Late Cretaceous elasmosaurids from southern South America have been collected from the lower levels of the Mata Amarilla Formation (Cenomanian), Allen and Loncoche formations (upper Campanian–lower Maastrichtian), La Colonia Formation (Campanian–Maastrichtian), Dorotea and Quiriquina formations (Maastrichtian–Danian), and the late Maastrichtian levels of the Lefipán and Jagüel formations (Gasparini and Salgado, 2000; Gasparini *et al.*, 2003a,b, 2007; Previtera *et al.*, 2008; Otero *et al.*, 2009; O'Gorman *et al.*, 2011; Varela *et al.*, 2012). In spite of this great amount of records, only two elasmosaurid species from southern South America are currently considered valid: *Aristonectes parvidens* Cabrera, 1941 and *Aristonectes quiriquinensis* Otero, Soto-Acuña, O'Keefe, O'Gorman, Stinnesbeck, Suárez, Rubilar-Rogers, Salazar, Quinzio-Sinn, 2014. The absence of nominated non-aristonectine elasmosaurids from Patagonia is connected with the poor preservation of cranial material and the poorly understood postcranial morphology (Salgado and Gasparini, 2000; Gasparini *et al.*, 2003b).

Gasparini and Goñi (1985) nominated a new species "*Trinacromerum lafquenianum*" based on a well preserved postcranium from the upper Campanian–

lower Maastrichtian Allen Formation, Lago Pellegrini locality, Río Negro, Patagonia (Fig. 1–4). Later, Gasparini and Salgado (2000) described two additional specimens from the same locality and formation and referred them to Elasmosauridae indet. The three mentioned specimens are: the holotype of "*T. lafquenianum*" (MLP 71-III-13-1, where MLP refers to Museo de La Plata, La Plata, Argentina) and the above mentioned two new specimens: MCS PV 4 and MUC Pv 92 (MCS Museo de Cinco Saltos, Rio Negro Province, Argentina; MUC Museo de la Universidad del Comahue, Neuquén Province, Argentina). This taxonomical determination has been followed since then (Gasparini *et al.*, 2001, 2007; Cerda and Salgado, 2008; O'Gorman *et al.*, 2011). These three specimens were reviewed by the author (O'Gorman, 2013), who concluded they belong to the same elasmosaurid species. The aims of this paper are to name *Kawanectes* nov. gen., re-describe *Kawanectes lafquenianum* nov. comb. and discuss its relation with other elasmosaurids from the Weddellian Province *sensu* Zinsmeister, 1979 (*i.e*., Patagonia, Eastern Antarctica. and New Zealand).

***Institutional Abbreviations*. BRSMG**, Bristol City Museum and Art Gallery, Bristol,United Kingdom; **CIT**, California Institute of Technology, Pasadena now in the Natural History Museum of Los Angeles County; **CM**, Canterbury Museum, Christchurch, New Zealand; **DM**, Museum of New Zealand Te Papa Tongarewa, Wellington, New Zealand; **MDNH**, Denver Museum Natural History, Colorado, USA; **MCS**, Museo de Cinco Saltos, Río Negro Province, Argentina; **MCZ**, Museum of Comparative Zoology, Harvard University, Cambridge, Massachusetts, USA; **MIWG**, 'Dinosaur Isle' Museum of Isle of Wight Geology, Sandown, UK; **MLP**, Museo de la Plata, Buenos Aires Province, Argentina; **MML**, Museo Municipal de Lamarque, Río Negro Province, Argentina; **MNA**, Museum of Northern Arizona, Flagstaff, Arizona, USA; **MPEF**, Museo Paleontológico Egidio Feruglio, Chubut Province, Argentina;

MUC, Museo de la Universidad del Comahue, Neuquén Province, Argentina; CD **NZGS**, Nuclear and Geological Science, Lower Hut, New Zealand; **OU**, Geology Museum, University of Otago, Dunedin, New Zealand; **QM**, Queensland Museum, Brisbane, Australia; **SGO.PV**, Museo Nacional de Historia Natural, Santiago, Chile.

***Anatomical Abbreviations*. act**, acetabulum; **af**, accessory facet; **cap**, capitulum; **cr**, cervical rib; **di**, diapophysis; **dlp**, dorsolateral process; **dr**, dorsal rib; **epf**, epipodial foramen; **f**, femur; **ff**, fibular facet; **fi**, fibula; **gr**, glenoid ramus; **hf**, hemal facets; **invf,** intervertebral foramen; **is**, ischium; **lk**, lateral keel; **nc**, neural canal; **ns**, neural spine; **pu**, pubis; **par**, parapophysis; **pb**, pelvic bar; **pez**, prezygapophysis; **pf**, pedicellar facet; **poz**, postzygapophysis; **rf**, radial facet; **rpp**, rib posterior process; **t**, tibia; **tf**, tibial facet; **tp**, transverse process; **tro**, trochanter; **tub**, tubercle; **uf**, ulnar facet; **vf**, ventral foramina; **vn**, ventral notch.

GEOLOGICAL SETTING

The Allen Formation, where the MCS PV 4, MLP 71-III-13-1 and MUC Pv 92 were collected, crops out in the north of Patagonia (Fig. 1.1) (Río Negro, La Pampa and Neuquén provinces). It is a thick succession of sandstones and shales with interbedded carbonate and evaporite rocks in its upper section (Andreis *et al.*, 1974). The Allen Formation yielded vertebrates such as dipnoans, teleosts, elasmosaurids and polycotylid plesiosaurs, ophidians, theropods, sauropods, hadrosaurs, (Martinelli and Forasiepi, 2004; Salgado *et al.*, 2007; Novas *et al.*, 2009; O'Gorman *et al.*, 2011; García, 2013), mammals (Rougier *et al.*, 2009) and some mollusks (Gasparini *et al.*, 2007). This formation was deposited in a marginal marine environment (Barrio, 1990; Gasparini *et al.*, 2007). Based on ostracods and magnetostratigraphy, the Allen Formation is regarded as late Campanian–early Maastrichtian in age (Ballent, 1980; Dingus *et al.*, 2000).

METHODS

The linear measurements were taken using a digital caliper. The indices considered are those proposed by Welles (1952) for the description of vertebral centra, which take into account the length (L), the height (H)- length centrum ratio (HI = 100 * H / L), and the breadth (B) length centrum ratio (BI = 100 * B / L); also, the breadth-height centrum ratio (BHI = 100 * B / H) was considered. Both the breadth and height were measured on the posterior articular face. Also, the degree of vertebral elongation (Vertebral Length Index: Brown, 1981) is used (VLI = L / (0.5 * (H + B))). In the description of propodials, the B:L index (B:L = 100*Bd / Lt), which is the ratio between the distal anteroposterior breadth (Bd) and the total length (Lt) (Welles, 1952), was used.

The ontogenetic developmental categories proposed by (Brown, 1981), based on the fusion of the neural arch to the vertebral centrum, were considered; these were considered to differentiate the "adult" from the "juvenile" stages of growth.

In order to clarify the phylogenetic position of *Kawanectes lafquenianum* nov. comb. within Elasmosauridae, a phylogenetic analysis was performed. The data set is based on the data published by Benson and Druckenmiller (2014), and modified in order to include more Late Cretaceous elasmosaurids. The scoring of the Weddellian Elasmosauridae *Kaiwhekea katiki* Cruickshank and Fordyce, 2002 (OU 12649), *Aristonectes parvidens* Cabrera, 1941 (MLP 40-XI-14-6) *Aristonectes quiriquinensis* (holotype SGO.PV.957 and referred specimen SGO.PV.260) *Tuarangisaurus keyesi* Wiffen and Moisley, 1986 (CD NZGS CD 425 and NZGS CD 426), *Morenosaurus stocki* Welles, 1943 (CIT 2802), *Hydotherosaurus alexandrae* Welles, 1943 (UCMP 33912), *Callawayasaurus colombiensis* Welles, 1962 (UCMP 38349) and *Thalassomedon haningtoni* Welles, 1943 (DMNH 1588) were modified based on personal observations. Additionally, *Elasmosaurus platyurus* Cope, 1869 and

Styxosaurus snowii (Williston, 1890) Welles, 1943 were scored based on bibliography. The final data set comprises 89 taxa. Additionally, three characters were added to the character list of Benson and Druckenmiller (2014), giving a total of 273 characters and additionally some characters were modified (see Supplementary Online Information 1 and 2). A data set was compiled using Mezquite (Maddison and Maddison, 2011) and analyzed using TNT (Goloboff *et al.*, 2008). All the characters are considered unordered. The data set was analysed using a heuristic search (tree bisection reconnection, with 1,000 random addition sequence replicates). Consistency (CI) and retention (RI) indexes (Farris, 1989) were calculated and, Bremer Support (Bremer, 1994) values were calculated for some nods.

SYSTEMATIC PALEONTOLOGY

Superorder SAUROPTERYGIA Owen, 1860

Order PLESIOSAURIA de Blainville, 1835

Superfamily PLESIOSAUROIDEA Welles, 1943

Family ELASMOSAURIDAE Cope, 1869

Genus ***Kawanectes*** nov. gen.

Type species. *Trinacromerum lafquenianum* Gasparini and Goñi, 1985

Derivation of name. *Kawa* for the "Kawas Sea" named given by (Casamiquela, 1978: 137) to the last Mesozoic marine transgression in Patagonia (late Campanian–Danian) and *–nectes*, meaning swimmer in Greek.

Diagnosis. Same as for spcies by monotypy.

Kawanectes lafquenianum nov. comb. (Gasparini and Goñi, 1985)

Figures 2–8; 9.1,10

Trinacromerum lafquenianum: Gasparini and Goñi, 1985: 56

Tricacromerum lafquenianum: Gasparini and Salgado, 2000:15 (incorrect spelling).

Derivation of name. "*lafquenianum*" as for the mapuche word for "sea" (Moesbach, 1984).

Diagnosis. Small sized elasmosaurid (*ca*. 3.8 m long) which belongs to the non-elongated group *sensu* (O'Keefe and Hiller, 2006) that differs from other elasmosaurids by the following combination of characters: vertebral centra broader than long, marked laterally projected parapophyses of caudal vertebrae forming a lateral "knob", presence of pelvic bar, high ratio between humerus/femur length (~1.2) (a proportion only shared among elasmosaurids by *Callawayasaurus colombiensis*), large posterodistal projection of humerus which bears an accessory articular facet (a feature only shared among elasmosaurids by *Morenosaurus*, *Vegasaurus* and *Kaiwhekea)*, and femur with strongly convex capitulum. It differs from *Vegasaurus molyi* in that it presents a not elongated trochanter in the dorsal surface of the femur and from *Vegasaurus molyi* and *Morenosaurus stocki* in the small body size, the laterally projected parapophyses of the caudal vertebrae, higher ratio between humerous/femur length (1.2) and the presence of pelvic bar.

Type material. MLP 71-II-13-1, six cervical vertebrae, three dorsal vertebrae, three sacral vertebrae, nine caudal vertebrae, right femur, right humerus, ilium, one mesopodial element, one caudal phalanx and one caudal rib (Gasparini and Goñi, 1985: lam I, II; Gasparini and Salgado, 2000: fig. 7).

Type locality and horizon. Quarry of the "Bentonitas Patagónicas" company, Northeast of Lago Pellegrini, Río Negro Province, Argentina. Middle Member of the Allen Formation, upper Campanian–lower Maastrichtian (Ballen, 1980; Page *et al*., 1999; Dingus *et al*., 2000).

Referred specimens. MCS PV 4: fifteen cervical vertebrae, three pectoral vertebrae (contra O'Gorman, 2013), fifteen dorsal vertebrae, three caudals, right scapula, part of right coracoid, both pubes and ischia, distal part of a femur and epipodium, phalanges, ribs fragments and 389 gastroliths (Gasparini and Salgado 2000: fig. 1e, 2, 4, 5, 6a,b; Gasparini *et al*., 2007:fig. 3a–e; Cerda and Salgado, 2008: fig.: 2). MUC Pv 92: two cervical vertebrae, three dorsal vertebrae, one sacral and eight caudal vertebrae, fragments of girdles, right femur, two epipodial elements, ribs and phalanges (Gasparini and Salgado, 2000:fig 1a–d, 3. 6c–e; Gasparini *et al*., 2007: fig. 3f–k).

Locality and horizon of referred specimens. The specimen MCS 4 was collected at the northeast of the depression occupied by Pellegrini, middle Member of the Allen Formation (Gasparini and Salgado 2000). The MUCPv 92 specimen, has no precise provenance but it probably it probably comes from the nearby Pellegrini Lake.

DESCRIPTION

Axial skeleton

The cervical region of *K. lafquenianum* is comprised of an unknown number of vertebrae. The anterior and middle cervical vertebrae are longer than high and broader than long. The VLI index reaches 110 in the longest preserved cervical centrum (Table 1). The articular facets are flat to slightly concave with dumbbell-shaped articular facets (Fig. 2.1, 3, 6). Additionally, the lateral surface shows a marked and sharp lateral keel (Fig. 2.2, 5). These three features are absent in the posteriormost vertebral centra, preserved in the holotype (MLP 71-III-13-1) and MCS PV 4, where the vertebral centra are short (VLI~85) with almost elliptical articular facets (slight or absent ventral notch) and without lateral keel (Fig. 2.4, 7, 8, 12). All the vertebrae have two ventral foramina on the ventral surface (Fig. 2.11). The right and left prezygapophyses contact each other along the midline and the same is observed in the postzygapophyses, although its distal tip remains free (Fig. 2.6, 9, 10), a common feature in the Late Cretaceous elasmosaurids (Hiller *et al*., 2005; Sato *et al*., 2003). Most of the neural spines are not well preserved but the posteriormost vertebral centra of MCS PV 4 are complete. These neural spines are tall (about twice the height of the centra) and present a rectangular shape and are slightly cranially inclined in lateral view (Fig. 2.8). In both the anterior and posterior margin the neural spine shows a groove that extends until at least half of the total length (Fig. 2.10). The anterior and middle cervical ribs are relatively short, have anterior and posterior processes and are fused to the centra (Fig. 2.7). On the other side, the posterior cervical ribs are more elongated, bearing closer similarity to the dorsal ribs and they are not fused with the cervical centra, as it is seen due to the free parapophyses (Fig. 2.9, 11,12). This absence of fusion on the posterior cervical centra has been recorded in other elasmosaurids such as *Vegasaurus molyi* O'Gorman, Salgado, Olivero and Marenssi, 2015 and *Futabasaurus suzukii* Sato, Hasegawa and Manabe, 2006.

The pectoral region is well preserved in the specimen MCS PV 4 but it is obscured by the matrix and scapula and, therefore, cannot be described (Fig. 6.1). The dorsal region, well preserved in the specimen MCS PV 4, comprises fifteen vertebrae, one of it still articulated with the pectoral region (Fig. 3.4). The vertebral centra are broader than long and as long as high (Table 1). The articular facets are dorsoventrally depressed to subcircular (Fig. 3.1, 5, 9). The ventral surface usually bears two foramina, and one of the vertebrae has a third smaller foramen (Fig. 3.3). The diapophyses are directed laterally, in an almost horizontal direction (Fig. 3.1, 9). The MCS PV 4 preserves the complete sacral region, formed by three vertebrae (Fig. 3.4). The vertebral centra are broader than high and higher than long (Table 1). The articular facets are kidney-shaped (Fig. 4.1, 5, 7). The diapophyses and parapophyses are convergent as in all elasmosaurids, forming the transverse process that articulates with the sacral rib (Fig. 4.1, 5). Ventrally, there are one or two foramina (Fig. 4.4, 10). Only one sacral rib of the MUC Pv 92 is preserved (Fig. 4.11–14). The proximal facet is divided in two parts, a smaller dorsal part and a large ventral one that form an angle of about 130º between them. In anterior view, the proximal surface shows a concave zone (Fig. 4.13). The distal zone of the sacral rib is strongly rugose (Fig. 4.11, 12).

The caudal region is comprised of an unknown number of vertebrae. The caudal centra are broader than high and higher than long. The pedicellar facets are subtriangular and anteroposteriorly elongated (Fig. 5.3, 11). The parapophyses are strongly laterally projected (Fig. 5.1, 7, 9) with a rib facet varying from circular to elliptical (Fig. 5.2, 11). The hemal facets are well developed (Fig. 5.4, 8, 12). The MLP 71-III-13-1 and MUC Pv 92 a change in the relative development of the anterior and posterior hemal facets along the tail. Ventrally, there are two foramina in the anteriormost caudal vertebrae and one foramen and an almost flat ventral zone in the other vertebrae (Fig. 5.4, 8, 12).

Girdles

The pectoral girdle is not well preserved in any specimen. The scapula, preserved only in the MCS PV 4, shows the typical elasmosaurid morphology with a large ventral ramus and a dorsolateral process. It is not possible to determine whether the scapulae meet each other in the midline. The dorsolateral process is long and slender (Fig. 6.1). The coracoid is not preserved other than fragments in any specimen.

The pelvic girdle of MCS PV 4 is well preserved (Fig. 6.2). The anterior margin of the pubis is strongly convex and the posterior margin forms the anterior limit of the puboischiadic fenestra (Fig. 6.2). The ischia form an almost complete pelvic bar with its pubis, forming a diamond shaped fenestra between them (Fig. 6.2). The ilium is a dorsally tapering element with a bent shaft (Fig. 6.3, 4). The tip of the angle is marked by a posterior knob (Fig. 6.3, 4).

Limbs

The humerus of MLP 71-III-13-1 is 207 mm in length and 141 mm in distal width (anteroposterior distal length), giving a B:L index value of 68%. The capitulum and the tuberosity are not completely convergent (Fig. 7.1, 3). In dorsal view, the tuberosity is slightly displaced towards the posterior margin (Fig. 7.1). It is also observed that there is a bone growth over the posterior margin of the tuberosity, which is visible in ventral view (fig. 7.2). In dorsal view, there is a slight but long depression in the anterior margin (arrow, Fig. 7.2). At the distal end, there is a developed posterior expansion holding much of the posterior ulnar facet. There are two slightly concave distal facets (Fig. 7.1, 2). A third facet, much shorter than the other two, possibly associated with an accessory element, is limiting the posterior expansion and it is almost perpendicular to the two epipodial articular facets (Fig. 7.1, 2).

The femur of MLP 71-III-13-1 is 171 mm long. The distal end is broken and, therefore, it is impossible to calculate the B:L index. At the proximal end, the femur has a strongly convex capitulum. The capitulum and trochanter are not completely confluent (fig. 7.4, 5, 8.1–3) and both are surrounded by a rim that is more conspicuous in the capitulum (Fig. 7.4, 5). In dorsal view, the trochanter is displaced towards the posterior margin of the shaft (Fig. 7.4). In ventral view, it shows there is a prominent roughness associated with muscle attachment (Fig. 7.5). Most of the projection of the shaft coincides with the tibial facet, the only almost completely preserved (is 54 mm) and it is posteriorly followed by a small portion of the fibular facet (Fig. 7.5). The specimen MCS PV4 preserves the distal end of the femur in articulation with the tibia and fibula (fig. 8.4). Both are broader than long and form a well-defined epipodial foramen (Fig.

8.4). The preserved phalanges are short and centrally slightly constricted (Figs. 7.8; 8, 5).

PHYLOGENETIC ANALYSIS

The phylogenetic analysis resulted in 250 trees of 1424 steps (CI=0.284 and RI= 0.673). The relationships outside Elasmosauridae are not the focus of this contribution and are not to be discussed here. Elasmosauridae is recovered as a monophyletic group sustained by ch. 179 (1→0), reduced number of dorsal centra 20–23 to 17–19; ch. 183 (0→1), strong constriction at the base of the dorsal neural spines; ch. 241(1→2) ratio humerus to femur length >1. The internal resolution is relatively low, a feature consistent with previous analyses (Vincent *et al.*, 2011b; Kubo *et al.*, 2012; O'Gorman et al., 2015; Fig. 10). *Kawanectes lafquenianum* is recovered as part of a monophyletic group (*Kawanectes lafquenianum*; *Vegasaurus molyi*; *Morenosaurus stocki*; (*Kaiwhekea katiki*; *Aristonectes parvidens*; *Aristonectes quiriquinensis*) sustained by ch. 23 (3→1), postaxial ossicles or articular face for it on propodials) and ch. 248 (0→1) epipodial facets aligned in humerus. The aristonectine are sustained by ch. 154 (2→1), cervical centra as long as high; ch. 173 (1→2), ratio BI more than 130 in anterior half of the neck; ch. 203 (1→0), scapular dorsolateral process subequal to width at midlength; ch. 254 (2→1), radius longer than broad; ch. 255 (2→1), tibia longer than broad; ch. 261 (1→0) long epipodial foramen.

DISCUSSION

Taxonomic comparisons

Kawanectes lafquenianum shows diagnostic features of Elasmosauridae, such as lateral keel on the cervical vertebrae, cervical vertebrae with dumbbell-shaped articular facets produced by the presence of a ventral notch; cervical centra longer than high; epipodials broader than long (Gasparini *et al.*, 2003a; Kubo *et al.*, 212; Benson and

Druckenmiller, 2014). The specimens MUC Pv 92, MCS PV 4 are clearly adults *sensu* Brown (1981) due to the fusion between the neural arches and the vertebral centra in the cervical and dorsal centra, whereas the MLP 71-II-13-1 shows some neural arches free in the posteriormost cervical centra indicating a less advanced degree of fusion. However, a close observation of the pedicellar facets indicates that the neuro-central closure had started. The MUC Pv 92 and MLP 71-II-13-1 shows the neural arches and caudal centra unfused, a feature usually observed in adult specimens (Gasparini *et al*., 2003a; Hiller *et al*., 2005; O'Gorman *et al*., 2015). A detailed comparison of *K. lafquenianum* with other elasmosaurids has been conducted focusing on the features that allow distinguishing them and summarized in Table 3 for differences with other Weddellian and Pacific elasmosaurids.

The axial skeleton contains useful information, such as the cervical vertebrae with dumbbell-shaped articular facets that are present in all Late Cretaceous elasmosaurids, but absent in the Aptian *Callawayasaurus colombiensis* and other Early Cretaceous elasmosaurids (Kear, 2005; Druckenmiller and Russell, 2006; O'Gorman *et al*., 2015). *K*. *lafquenianum* has cervical vertebrae with a VLI that differs from the extreme elongated condition of the genera *Elasmosaurus* and *Styxosaurus* (O'Keefe and Hilller, 2006) and from the aristonectines *Aristonectes*, *Kaiwhekea* (characterized by a cervical centra shorter than other elasmosaurids; Gasparini *et al.*, 2003a; Cruickshank and Fordyce, 2002; Otero *et al*., 2014b). Other Late Cretaceous elasmosaurids also differ from *K*. *lafquenianum* in their cervical proportions and dorsal vertebral count. For instance, the Cenomanian *Libonectes morgani* (Welles) (Carpenter, 1999, for Cenomanian age of *Libonectes* see Sachs and Kear, 2014) and the Santonian *Hydralmosaurus serpentinus* (Cope) Welles, 1943 have mid-cervical vertebral centra longer than broad (Welles, 1952), unlike those of *K*. *lafquenianum*, that are always broader than long (Table 1). Additionally, the dorsal region of *K. laquenianum* comprises fifteen dorsal vertebrae, less than the 25 vertebrae of the Cenomanian *Thalassomedon haningtoni* Welles, 1943. The caudal vertebrae of *K. lafquenianum* show strongly laterally projected parapophyses (Fig. 5.1, 7, 10). A similar morphology has been recorded in some elasmosaurids (Leidy, 1865: pl V.12; O'Gorman *et al*., 2011: fig. 3.3, 4; O'Gorman *et al*., 2013b: fig. 2.K, L) but it is absent in the closely related *Vegasaurus molyi* and *Morenosaurus stocki* (pers. obs.).

The anatomy of the girdles also distinguishes *K. lafquenianum* from other taxa. The dorsolateral process of *K. lafquenianum* is long and gracile differing from the anteroposterioly long and stocky dorsolateral process of the Albian *Wapuskanectes betsynichollsae* Druckenmiller and Rusell, 2006 and the Maastrichtian *M. stocki*. The presence of pelvic bar is ontogenetically variable but it is useful to compare adult specimens (Carpenter, 1999). *Hydrothersaurus serpentinus* (AMNH 1495), *M. stocki* and *V. molyi*, lack a pelvic bar (Welles, 1943, 1952:fig. 21; Carpenter, 1999: fig. 6C), unlike *K. lafquenianum* (Fig. 6.2). This difference cannot be explained by ontogenetic variation since *H. serpentinus* and *M. stocki* are also adult specimens and larger than *K. lafquenianum* (Table 2). In addition, the pubis of *T. ponteixensis* has a strong concavity in the outer margin (Sato, 2003:fig.12), unlike that of *K. lafquenianum* (Fig. 6.2). The ilium of *K. lafquenianum* has a well developed posterior knob which differs from that of *Futabasaurus suzukii* (Sato *et al.*, 2006:fig.7E, F) and *Zarafasaura oceanis* Vincent, Bardet, Suberbiola, Bouya, Amaghzaz, Meslouh, 2011 (Lomax and Wahl, 2013:fig. 12), where it is absent. The circular cross section of the dorsal part of the ilium of *K. lafquenianum*, differs from that of *M. stocki,* which is strongly laterally compressed (Welles, 1943, J.P. O'G per. obs.). Additionally, the dorsal end of the ilium, although damaged, seems to be unexpanded, which differs from *Hydrotherosaurus alexandrae*

(Welles, 1943; J.P.O'G per. obs.), *Thalassomedon haningtoni* (Welles, 1943:fig. 16) and *Vegasaurus molyi* (O'Gorman *et al*., 2015: fig. 10C, D).

The ratio between humerus and femur in *K. lafquenianum* (1.2) differs from that of *Hydralmosaurus, Terminonatator* and CM Zfr 145, in which the femur is longer than the humerus (an uncommon feature among elamosaurids; Welles, 1943; Sato, 2003; Hiller and Mannering, 2005). In most elasmosaurid genera the humerus is longer than the femur, such as *Morenosaurus stocki* (1.08) and *Hydrotherosaurus alexandrae* (1.14) (Welles, 1943). The humerus of *Futabasaurus* is 18% longer than the femur, a difference regarded as diagnostic of *Futabasaurus suzukii* (Sato *et al*., 2006). In *K. lafquenianum*, the humerus is 21% longer than the femur, so this character is shared with *Futabasaurus suzukii*. Interestingly, the posterior expansion of the humerus of *K. lafquenianum* is similar to that of *Hydralmosaurus serpentinus*, although in the latter there is no accessory articular face (Carpenter, 1999). The only non-aristonectine elasmosaurids that share with *K. lafquenianum* the relatively unusual humerus with a posterior expansion and an accessory articular facet are *Wapuskanectes betsynichollsae*, *Vegasaurus molyi* and *Morenosaurus stocki* (Druckenmiller and Russell, 2006; Welles, 1943; O'Gorman *et al*., 2015). The femur of *K. lafquenianum* has a trochanter that is not dorsally expanded, contrasting with *Vegasaurus molyi*, *Mauisaurus haasti* and the aristonectine *Aristonectes* sp. and *Kaiwhekea*, where the trochanter has a long posterodistal developement (Cruickshank and Fordyce, 2002; Hiller *et al*., 2005; O'Gorman, 2013; O'Gorman *et al*., 2015).

Mauisaurus haasti is currently under revision, however due to the importance of this taxon among the Weddellian elasmosaurids, a special comparison is made to differentiate the two main specimens of *Mauisaurus haasti* (the lectotype DM R1529 and CM Zfr 115 referred by Hiller *et al*., 2005) from *K. lafquenianum*. The first difference between *M. haasti* and *K. lafquenianum* is the body size. Hiller *et al*. (2005) indicate a body length in excess of 8 meters for CM Zfr 115 and, although the body size of *K lafquenianum* is not directly known, it is much smaller and has been inferred to be approximately 3.8 meters (Table 2) by comparing it with the propotions of *V. molyi* (O'Gorman, 2013). Additionally, the femur of *K. lafquenianum* differs from that of the lectotype of *Mauisaurus* because the latter has a long posterior expansion that is absent in *K. lafquenianum*.

The lack of differences on the data set between the *Tuarangisaurus keyesi* and *Kawanectes lafquenianum* is because the formers is known only from cranial material and scarce postcranial elements. This problem cannot be resolved at the moment. However, the phylogenetic analysis did not recover *Tuarangisaurus keyesi* close to *Kawanetes lafquenianum*, giving at least some evidence against the synonymy of *K. lafquenianum* and *Tuarangisaurus keyesi*.

Ontogenetic comparisons

In order to show that *K. lafquenianum* does not represent a juvenile stage of *V. molyi* (which is morphologically similar but larger in body size), an analysis of the relationship between size and proportions of the elements was performed. In particular, three evidences were used to show this: 1) *K. lafquenianum* shows anatomical evidence that is usually related with an adult condition, as was previously mentioned. 2) it is well recorded that during the ontogenetic developement of elasmosaurids there is a trend of the cervical vertebrae to increase the HI and BI due to the relative elongation of the cervical centra (O'Keefe and Hiller, 2006). Figure 9.11shows that the cervical vertebrae of *K. lafquenianum* have higher or similar HI and BI values than the cervical vertebrae of *V. molyi* and 3) the pelvic bar is usually absent in juvenile specimens but is present in *K. lafquenianum* and absent in the holotype of *V. molyi* (whose pelvic girdle is larger than the one of *K. lafquenianum*). This evidence indicates that a putative ontogenetic sequence including the *Kawanectes lafquenianum* materials (holotype and referred specimens) and the *Vegasaurus molyi* holotype would not be consistent with current knowledge on ontogenetic changes in elasmosaurids.

Neck elongation pattern

Three groups of elasmosaurids can be recognised based on the neck elongation patterns (two of them with cervical centra longer than high): the "elongated group" (*Elasmosaurus* and *Styxosaurus*), the non-elongate group (*i.e.*, the "plesiomorphic group" *sensu* Otero *et al*. 2015; *Hydrotherosaurus*; *Hydralmosaurus*; *Vegasaurus*) and the aristonectines characterized by cervical centra higher than long (O'Keefe and Hiller, 2006; Otero *et al*., 2015). Out of these three groups only aristonectines are currently considered to be monophyletic. The definition of the two former groups was given by O'Keefe and Hiller (2006), who defined the elongated group based on the following features: average VLI (125–138), and presence of some mid-cervical vertebrae with VLI between 150 to 200 and, with some exception, the middle cervical centra has VLI higher than 130. Additionally, O'Keefe and Hiller (2006) pointed out that a single mid cervical centra with VLI higher than 135 is a strong indication of an elongated pattern. On the other hand, the "non-elongated" group has an average VLI much lower than (125–138) and usually about 100 but the middle cervical centra are nonetheless longer than high. Finally, the aristonectine are characterized by cervical centra higher than long and average VLI lower than 80. One of the main biogeographical patterns indicated by O'Keefe and Hiller (2006) restricts the "elongated group" to the Western Interior Sea.

Following the definition of the three mentioned groups, the cervical centra of *Kawanectes lafquenianum* clearly belong to the non-elongated group. Previously, Otero *et al*. (2015) inferred the presence of elasmosaurids of the "elongated group" (extreme elongated of Otero *et al*., 2015) in Patagonia during the late Campanian-early Maastrichtian based on the specimens MUC Pv 92, MCS PV 4, and MLP 71-II-13-1 (*i.e*., holotype and referred specimens of *Kawanectes lafquenianum*). Their inference was based on the assumption that the specimens MLP 71-II-13-1, MCS PV 4, and MUC Pv 92 were juveniles and therefore, the centra were not considered to have adult proportions. However, the neural arches of the cervical and dorsal vertebrae of these specimens are fused to the centra indicating their adult condition and, additionally, the pelvic bar of MCS PV 4 is almost formed, showing another adult feature. Furthermore, Otero *et al*. (2015) indicate that the specimen MPEF s/n. (Gasparini *et al*., 2001:fig. 3–4) from La Colonia Formation (not Allen Formation as indicated by Otero *et al*., 2015) has a VLI of ca. 110 and belongs to the “elongated group”. However, this value does not indicate they belong to the elongated group of O'Keefe and Hiller (2006). Therefore, at least the specimens mentioned here do not give evidence of the presence of the “elongated group” outside de WIS during the Late Cretaceous.

Phylogenetic relationships

The result of the phylogenetic analysis (Fig. 10) is mostly congruent with previous analyses, but some differences are present. Elasmosauridae is recovered as a monophyletic group, as in previous studies (O'Keefe, 2001; Druckenmiller and Russell, 2008; Benson and Druckenmiller, 2014). The resolution of Elasmosauridae is relatively low, showing the necessity of further work. Nevertheless, Aristonectinae is recovered as monophyletic and well supported (Bremer support = 3) within Ealsmosauridae, following the results of other studies (Gasparini *et al*., 2003a; Otero *et al*., 2012; Benson and Druckenmiller, 2014). Three other species are recovered forming a well-supported monophyletic group (Bremer Support = 3) along with Aristonectinae: the Antarctic early Maastrichtian *Vegasaurus molyi* (O'Gorman *et al*., 2015), the Maastrichtian

Morenosaurus stocki from the Pacific Coast of California, and the late Campanian–early Maastrichtian *Kawanectes lafquenianum* described in this contribution. This result is congruent and reinforces those of O'Gorman (2013) and O'Gorman *et al*., (2015), which indicated a phylogentic relationship between Weddellian and Pacific non-aristonectine elasmosaurids and Aristonectinae.

Kawanectes *and aristonectine elasmosaurids*

The classical questions about the origin of Aristonectinae are: "Within which clade"?; "How?", "When?" and "Where?". The first point has produced several difficulties because, for many years, the elasmosaurid affinity of Aristonectinae was not considered the most probable hypothesis (Welles, 1962; Cruickshank and Fordyce, 2002; O'Keefe and Street, 2009 but see Cabrera, 1941). Only recently aristonectines were considered forming a clade within Elasmosauridae (Gasparini *et al*., 2003a; Otero *et al*., 2012; 2014b). Taking into consideration the recent consensus about their phylogenetic affinities, it is possible to answer the other questions mentioned. The appearance of the aristonectine (*Aristonectes*; *Kaiwhekea*) features such as short cervical vertebrae, large skulls and high number of teeth probably involved a poorly understood complex sequence of character acquisition; however, this process probably involved some paedomorphic events (O'Gorman, 2013, O'Gorman *et al*., 2014; Araújo *et al.*, 2015). The question of the time of appearance should be answered by the age of the oldest aristonectine record which is, until now, late Campanian–early Maastrichtian (O'Gorman *et al.*, 2013a) and comes from Patagonia (Río Negro Province). Additionally, a fragmentary postcranial specimen from the upper Campanian Herbert Sound Member of the Snow Hill Island Formation was referred to aristonectine by Otero (2014a:fig 6). Therefore, until now the oldest record of aristonectinae seems to be late Campanian in age. However, the Santonian *Futabasaurus suzukii* was recovered within Aristonectinae by Otero *et al*., (2014b) but not by O'Gorman *et al*., (2015) and thus the possibility of an older (at least Santonian) origin has been proposed. Finally, the previous absence of aristonectines outside the Weddellian Province, with the only and controversial possibility of the Japanese *F. suzukii* and the presence of non-aristonectine elasmosaurids closely related with them in the Weddellian Province, was considered as strong support of a Weddellian origin of aristonectines (O'Gorman *et al*., 2015). Nonetheless, a recent record from the lower Maastrichtian of Angola (Araújo *et al*., 2015) generates some doubts as they are now not endemic from the Weddellian Province. The internal relationships between *Kawanectes*, *Vegasaurus*, and *Morenosaurus* are important in order to answer the question about the geographical origin of the aristonectines because if *Kawanectes* and *Vegasaurus* are more closely connected with aristonectines than *Morenosaurus* or *Futabasaurus*, a Weddellian origin can still be considered as more likely. Still, the results of the analysis are not conclusive about this point because the relationships of these taxa are not clear as they are depicted as part of a polytomy in the phylogenetic analysis. Also, the results show an internal relationship between some aristonectines and some non-aristonectine elasmosaurids from the Weddellian Province and California, a relation previously commented by O'Gorman *et al*, (2015).

The Kawas plesiosaur assemblage

The Kawas plesiosaur fauna (comprised the upper Campanian–lower Maastrichtian Allen, Los Alamitos [“Coli Toro Inferior”], and La Colonia formations) is a remarkable association for several reasons. It comprises the three major groups of Late Cretaceous plesiosaurs: polycotylids, aristonectines, and non-aristonectine elasmosaurids (Gasparini and Spalletti, 1990; Gasparini and Salgado, 2000; O'Gorman *et al.*, 2013a, b; O'Gorman and Gasparini, 2013). Each of the three groups are represented by more than one specimen and in particular *Kawanectes* is represented by at least three specimens. The depositional environment of the Allen, La Colonia and Coli Toro formations has been inferred as a marine marginal to non-marine environment (Barrio, 1990; Gasparini and Salgado, 2000; Pascual *et al.*, 2000; Gasparini *et al.*, 2015). Thus, it is remarkable that plesiosaurs are almost the unique faunal elements with strict marine affinities. Therefore this indicate the occupation of a non-marine normal environment by the three groups of plesiosaus in the Weddellian Province, a similar use inferred by Benson *et al*. (2013) in early–middle Albian deposits of Australia. Another particular feature of *Kawanectes,* probably related to the particular environment of the Allen Formation, is its strikingly small size compared to other adult elasmosaurids. A similar case was recorded by Sato *et al.* (2005) at the Dinosaur Park Formation (upper Campanian) where sub-adult specimens were smaller than those recorded in nearby marine formations. Similarly, elasmosaurs from the Allen and La Colonia formations have a smaller body size compared with those from the marine Jagüel Formation (O'Gorman *et al*, 2013b; Gasparini *et al*., 2015).

ACKNOWLEDGMENTS

This research was supported by projects PICT 2012-0748, UNLP N 677, UNLP N 607 and PIP 0433. The author thanks Z. Gasparini and M. Fernández for reading an earlier version of the manuscript and Z. Gasparini, L. Salgado, I. Cerda and Y. Herrera for the fieldwork and L. Acosta Burllaile for the preparation of some specimens. Thanks P. Arregui for improving the English of this constribution. The author also thanks the curator of MLP (M. Reguero) Museo Paleontológico Egidio Feruglio (E. Ruigómez), Museo Municipal de Lamarque (D. Cabaza), Museo de Cinco Saltos (I. Cerda) and, Museo de la Universidad del Comahue (L. Salgado) University of California Palentological Museum (P. Holroy); Los Angeles Natural History Museum (M.

Walsh)), Geology Museum, University of Otago (E. Fordyce) for providing access to the material. Museum of New Zealand Te Papa Tongarewa (A.J.D Tennyson). Finally the author thank R. Otero (Laboratorio de Ontogenia y Filogenia, Departamento de Biología, Facultad de Ciencias, Universidad de Chile) and an anonymous reviewer fot its comment that improve this contribution.

LITERATURE CITED

Ameghino, F. 1893. Sobre la presencia de vertebrados de aspecto mesozoico en la formación Santacruceña de la Patagonia austral. *Revista Del Jardín Zoológico de Buenos Aires* 1: 76–84.

Andreis, R.A., Iñiguez Rodríguez, A.M., Lluch, J.J., and Sabio, D.A. 1974. Estudio sedimentológico de las formaciones del Cretácico Superior del área del Lago Pellegrini (Prov. de Río Negro, Rep. Argentina). *Revista de La Asociación Geológica Argentina* 29: 85–104.

Araújo, R., Polcyn, M.J., Lindgren, J., Jacobs, L.L., Schulp, A.S., Mateus, O., Gonçalves, A.O., and Morais, M-L. 2015. New aristonectine elasmosaurid plesiosaur specimens from the Early Maastrichtian of Angola and comments on paedomorphism in plesiosaurs. *Netherlands Journal of Geosciences-Geologie En Mijnbouw* 94: 93–108.

Ballent, S. 1980. Ostrácodos de ambiente salobre de la Formación Allen (Cretácico Superior) en la Provincia de Río Negro (República Argentina). *Ameghiniana* 17: 67–82.

Barrio, C.A. 1990. Paleogeographic control of Upper Cretaceous Tidal Deposits, Neuquén Basin, Argentina. *Journal of South American Earth Sciences* 3: 31–49.

Benson, R.B.J.R., and Druckenmiller, P.S.P. 2014. Faunal turnover of marine tetrapods during the Jurassic-Cretaceous transition. *Biological Reviews* 89: 1–23.

Benson, R.B.J.R., Fitzgerald, E.E.M.G., Rich, T.H., and Vickers-Rich, P. 2013. Large freshwater plesiosaurian from the Cretaceous (Aptian) of Australia. *Alcheringa: An Australasian Journal of Palaeontology* 37 456–461.

Blainville, H.D. de. 1835. Description de quelques espèces de reptiles de la Californie, précédée de l'analyse d'un système général d'herpetologie et d' amphibiologie. *Nouvelles Archives Du Museum d'Histoire Naturelle* 4: 233-296.

Bremer, K. 1994. Branch support and tree stability. *Cladistics* 10: 295–304.

Brown, D.S. 1981. The English Upper Jurassic Plesiosauroidea eptilia) and a review of the phylogeny and classification of the Plesiosauria. *Bulletin of the British Museum (Natural History), Geology* 17: 253–347.

Cabrera, A. 1941. Un Plesiosaurio nuevo de Cretáceo del Chubut. *Revista Del Museo de La Plata (Nueva Serie)* 2: 113–130.

Carpenter, K. 1999. Carpenter, 1999, Revision of North American elasmosaurs from the Cretaceous of the western interior.pdf. *Paludicola* 2: 148–173.

Casamiquela, R.M. 1978. La zona litoral de la transgresión Maástrichtense en el norte de la Patagonia. Aspectos ecológicos. *Ameghiniana* 15.

Cerda, I.A., and Salgado, L. 2008. Gastrolitos en un plesiosaurio (Sauropterygia) de la Formación Allen (Campaniano-Maastrichtiano), provincia de Río Negro, Patagonia, Argentina. *Ameghiniana* 45: 529–536.

Cope, E.D. 1869. Extinct Batrachia, Reptilia and Aves of North America. *Transactions of the American Philosophical Society* 14: 1–252.

Cruickshank, A.R.I., and Fordyce, R.E. 2002. A new marine reptile (Sauropterygia) from New Zealand: Further evidence for a Late Cretaceous austral radiation of cryptoclidid plesiosaurs. *Palaeontology* 45: 557–575.

Dingus, L., Clarke, J., Scott, G.R., Swisher, C.C., Chiappe, L.M., and Coria, R.A. 2000. Stratigraphy and Magnetostratigraphic/Faunal Constraints for the Age of Sauropod Embryo-Bearing Rocks in the Neuquén Group (Late Cretaceous, Neuquén Province, Argentina). *American Museum Novitates* 3290: 1–11.

Druckenmiller, P.S., and Russell, A.P. 2006. A new elasmosaurid plesiosaur (Reptilia: Sauropterygia) from the Lower Cretaceous Clearwater Formation, northeastern Alberta, Canada. *Paludicola* 5: 184–199.

Druckenmiller, P.S., and Russell, A.P.A. 2008. A phylogeny of plesiosauria (Sauropterygia) and its bearing on the systematic status of *Leptocleidus* Andrews, 1922. *Zootaxa* 1863: 1–120.Farris, J.S. 1989. The retention index and homoplasy excess. *Systematic Biology* 38: 406–407.

García, R.A. 2013. A giant tooth from the Late Cretaceous (middle Campanian-lower Maastrichtian) of Patagonia, Argentina: an enormous titanosaur or a large toothed titanosaur? *Cretaceous Research* 41: 82–85.

Gasparini, Z., and Goñi, R. 1985. Los plesiosaurios cretácicos de América del Sur y del continente antártico. *Congresso Brasileiro de Paleontología* 8: 55–63.

Gasparini, Z., and Spalletti, L. 1990. Un nuevo cocodrilo en depósitos mareales maastrichtianos de la Patagonia noroccidental. *Ameghiniana* 27: 141–150.

Gasparini, Z., and Salgado. 2000. Elasmosáuridos (Plesiosauria) del Cretácico Tardío del norte de Patagonia. *Revista Española de Paleontología* 15: 13–21.

Gasparini, Z., Salgado, L. and Parras, A. 2007. Late cretaceous plesiosaurs from northern Patagonia, Argentina. *Geological Journal* 42: 185–202.

Gasparini, Z., Bardet, N., Martin, J.E., and Fernandez, M. 2003a. The Elasmosaurid Aristonectes Cabrera from the latest Cretaceous of South America and Antarctica. *Journal of Vertebrate Paleontology* 23: 104–115.

Gasparini,Z, Salg, L, Casadí , S., and Casadío, S. 2003b. Maastrichtian plesiosaurs from northern Patagonia. *Cretaceous Research* 24: 157–170.

Gasparini, Z., Casadio, S., Salgado, L., Fernández, M., and Salgado, L. 2001. Marine reptiles from the Late Cretaceous of northern Patagonia. *Journal of South American Earth Sciences* 14: 51–60.

Gasparini, Z., Sterli, J., Parras, A., O'Gorman, J.P., Salgado, L., Varela, J., and Pol, D. 2015. Late Cretaceous reptilian biota of the La Colonia Formation, central Patagonia, Argentina: Occurrences, preservation and paleoenvironments. *Cretaceous Research* 54: 154–168.

Gay, C. 1848. *Historia Física Y Política de Chile*. París. pp. 371

Goloboff, P., Farris, J., and Nixon, K. 2008. TNT, a free program for phylogenetic analysis. *Cladistics* 24: 774–786.

Hiller, N., and Mannering, A.A. 2005. An unusual new elasmosaurid plesiosaur (Sauropterygia) from the Upper Haumurian (Maastrichtian) of the South Island, New Zealand. Memoirs of the Queensland Museum,. *Memoirs of the Queensland Museum* 51: 27–37.

Hiller, N., Mannering, A. A., Jones, C.M., and Cruickshank, A.R.I. 2005. The nature of *Mauisaurus haasti* Hector, 1874 (Reptilia: Plesiosauria). *Journal of Vertebrate Paleontology* 25: 588–601.

Kear, B.P. 2005. Marine reptiles from the Lower Cretaceous (Aptian) deposits of White Cliffs, southeastern Australia: Implications of a high latitude, cold water assemblage. *Cretaceous Research* 26: 769–782.

Kubo, T., Mitchell, M.T.M., and Henderson, D.M.D. 2012. *Albertonectes vanderveldei* , a new elasmosaur (Reptilia, Sauropterygia) from the Upper Cretaceous of Alberta. *Journal of Vertebrate Paleontology* 32: 557–572.

Leidy, J. 1865. Memoir of the extinct reptiles of the Cretaceous formations of the United States. *Smithsonian Contributions to Knowledge* 14:1–135.

Lomax, D.R., and Wahl, W.R.J. 2013. A new specimen of the elasmosaurid plesiosaur Zarafasaura oceanis from the Upper Cretaceous (Maastrichtian) of Morocco. *Paludicola* 9: 97–109.

Maddison, W.P., and D. R. Maddison. 2011. Mesquite: A Modular System for Evolutionary Analysis, version 2.75. http://mesquiteproject. org. Accessed January 4, 2012.

Martinelli, A.G., and Forasiepi, A.M. 2004. Late Cretaceous vertebrates from Bajo de Santa Rosa (Allen Formation), Río Negro province, Argentina, with the description of a new sauropod dinosaur (Titanosauridae). *Revista Del Museo Argentino de Ciencias Naturales* 6: 257–305.

Moesbach, W. de 1984. *Diccionario Español – Mapuche*. Ed. Siringa, Neuquén, .

Novas, F.E., Pol, D., Canale, J.I., Porfiri, J.D., and Calvo, J.O. 2009. A bizarre Cretaceous theropod dinosaur from Patagonia and the evolution of Gondwanan dromaeosaurids. *Proceeding of the Royal Society B: Biological Sciences* 276: 1101–1107.

O'Gorman, J.P. 2013. [Plesiosaurios del Cretácico Superior de Patagonia y Península Antártica, Tomos I y II. PhD thesis, Facultad de Ciencias Naturales y Museo, Universidad Nacional de La Plata, Argentina. 527 p. Unpublished.]. http://sedici.unlp.edu.ar/bitstream/handle/10915/26140/Tomo_I Documento completo.pdf?sequence=4 http://sedici.unlp.edu.ar/bitstream/handle/10915/26140/Tomo_II Documento completo.pdf?sequence=4

O'Gorman, J.P., Gasparini, Z. 2013. Revision of *Sulcusuchus erraini* (Sauropterygia, Polycotylidae) from the Upper Cretaceous of Patagonia, Argentina. *Alcheringa* 37: 163–176.

O'Gorman, J., Salgado, L., and Gasparini, Z. 2011. Plesiosaurios de la Formación Allen (Campaniano- Maastrichtiano) en el área del Salitral de Santa Rosa (Provincia de Río Negro, Argentina). *Ameghiniana* 48: 129–135.

O'Gorman, J.P., Gasparini, Z., and Salgado, L. 2013a. Postcranial morphology of *Aristonectes* (Plesiosauria, Elasmosauridae) from the Upper Cretaceous of Patagonia and Antarctica. *Antarctic Science* 25: 71–82.

O'Gorman, J.P., Salgado, L., Varela, J., and Parras, A. 2013b. Elasmosaurs (Sauropterygia, Plesiosauria) from the La Colonia Formation (Campanian–Maastrichtian), Argentina. *Alcheringa* 37: 259-267.

O'Gorman, J.P., Salgado, L., Olivero, E., and Marenssi, S. 2015. *Vegasaurus molyi* gen. et sp. nov. (Plesiosauria, Elasmosauridae) from the Cape Lamb Member (lower Maastrichtian) of the Snow Hill Island Formation, Vega Island, Antarctica, and remarks on Wedellian Elasmosauridae. *Journal of Vetebrate Paleontology* (DOI: 10.1080/02724634.2014.931285).

O'Keefe, F.R. 2001. A Cladistic Analysis and Taxonomic Revision of the Plesiosauria (Reptilia:Sauropterygia). *Acta Zoologica Fennica* 213: 1–63.

O'Keefe, F.R.., and Hiller, N. 2006. Morphologic and Ontogenetic Patterns in Elasmosaur Neck Length, with Comments on the Taxonomic Utility of Neck Length Variables. *Paludicola* 5: 206–229.

Otero, R.A., Suárez, M.E., and Le Roux, J.P. 2009. Primer Registro de Plesiosaurios Elasmosáuridos (Sauropterygia: Plesiosauria) en estratos superiores de la Formación Dorotea, Cretácico Tardío. *Andean geology* 36: 342–350.

Otero, R.A, Soto-Acuña, S., and Rubilar-Rogers, D. 2012. A postcranial skeleton of an elasmosaurid plesiosaur from the Maastrichtian of central Chile, with comments on the affinities of Late Cretaceous plesiosauroids from the Weddellian Biogeographic Province. *Cretaceous Research* 37: 89–99.

Otero, R.A., Soto-Acuña, S., Salazar S, C., and Oyarzún, J.L. 2015. New elasmosaurids (Sauropterygia, Plesiosauria) from the Late Cretaceous of the Magallanes Basin, Chilean Patagonia: Evidence of a faunal turnover during the Maastrichtian along the Weddellian Biogeographic Province. *Andean Geology* 42: 268–283.

Otero, R.A., Soto-Acuña, S., Vargas, A.O., Rubilar-Rogers, D., Yury-Yáñez, R.E., and Gutstein, C.S. 2014a. Additions to the diversity of elasmosaurid plesiosaurs from the Upper Cretaceous of Antarctica. *Gondwana Research* 26: 772–784.

Otero, R.A., Soto-Acuña, S., O'Keefe, F.R., O'Gorman, J.P., Stinnesbeck, W.S., Suárez, M.E., Rubilar-Rogers, D., Salazar, C., and Quinzio-Sinn, L.A. 2014b. *Aristonectes quiriquinensis*, sp. nov., a new highly derived elasmosaurid from the upper Maastrichtian of central Chile. *Journal of Vertebrate Paleontology* 34: 100–125.

Owen, R. 1860. On the orders of fossil and recent Reptilia, and their distribution in time. *Reports of the British Association for the Advancement of Science* 29: 153–166.

Page, R., Ardolino, A., de Barrio, R.E., Franchi, M., Lizuain, A., Page, S., and Silva Nieto, D., 1999. Estratigrafía del Jurásico y Cretácico del Macizo de Somún Curá, provincias de Río Negro y Chubut. In: R Caminos (Ed), *Geología Argentina*. Servicio Geológico Minero Argentino, Buenos Aires, pp. 460–488.

Pascual, R., Goin, F.J., Gonzalez, P., Ardolino, A., and Puerta, P. 2000. A highly derived docodont from the Patagonian Late Cretaceous: evolutionary implications for Gondwanan mammals. *Geodiversitas* 22: 395–414.

Previtera, E., González Riga. 2008. Vertebrados cretácicos de la Formación Loncoche en Calmu-Co, Mendoza, Argentina. *Ameghiniana* 45: 349–359.

Rougier, G.W., Chornogubsky, L., Casadio, S., Arango, N.P., and Giallombardo, A. 2009. Mammals from the Allen Formation, Late Cretaceous, Argentina. *Cretaceous Research* 30: 223–238.

Sachs, S., and Kear, B.P. 2014. Postcranium of the paradigm elasmosaurid plesiosaurian *Libonectes morgani* (Welles, 1949). *Geological Magazine* 152: 1-17.

Salgado, L., Parras, A., and Gasparini, Z. 2007. Un plesiosaurio de cuello corto (Plesiosauroidea, Polycotylidae) del Cretácico Superior del norte de Patagonia. *Ameghiniana* 44: 349–358.

Sato, T. 2003. *Terminonatator ponteixensis*, a new elasmosaur (Reptilia; Sauropterygia) from the Upper Cretaceous of Saskatchewan. *Journal of Vertebrate Paleontology*.

Sato, T., Eberth, D.A., Nicholls, E.L., and Manabe, M. 2005. Plesiosaurian remains from non-marine to paralic sediment. In: Currie, E.B. and E. Koppelhus (Eds.) , *Dinosaur Provincial Park: A Spectacular Ancient Ecosystem Revealed,* Indiana University Press, Bloomington and Indianapolis, pp. 249–276.

Sato, T., Hasegawa, Y., and Manabe, M. 2006. A new elasmosaurid plesiosaur from the upper cretaceous of Fukushima, Japan. *Palaeontology* 49: 467–484.

Varela, A.N., Poiré, D.G., Martin, T., Gerdes, A., Goin, F.J., Gelfo, J.N., and Hoffmann, S. 2012. U-Pb zircon constraints on the age of the Cretaceous Mata Amarilla Formation, Southern Patagonia, Argentina: its relationship with the evolution of the Austral Basin. *Andean Geology* 39: 359–379.

Vincent, P., Bardet, N., Suberbiola, X., Pereda Suberbiola, X., Bouya, B., Amaghzaz, M., and Meslouh, S. 2011. *Zarafasaura oceanis*, a new elasmosaurid (Reptilia: Sauropterygia) from the Maastrichtian Phosphates of Morocco and the palaeobiogeography of latest Cretaceous plesiosaurs. *Gondwana Research* 19:1062–1073.

Williston, S.W. 1890. A new plesiosaur from the Niobrara Cretaceous of Kansas. En *Transactions of the Annual Meetings of the Kansas Academy of Science*. Kansas Publishing House 12: 174–178.

Welles, S.P. 1943. Elasmosaurid plesiosaurs with description of new material from California and Colorado. *Memoirs of the University of California* 13: 125–254

Welles, S.P. 1952. A review of the North American Cretaceous elasmosaurs. *University of California Publications in Geological Sciences* 29: 47–144.

Welles, S.P. 1962. A new species of elasmosaur from the Aptian of Columbia and a review of the Cretaceous plesiosaurs. *University of California, Publications in the Geological Sciences* 44: 1–96.

Wiffen, J., and Moisley, W.L. 1986. Late Cretaceous reptiles (Families Elasmosauridae and Pliosauridae) from the Mangahouanga Stream, North Island, New Zealand. *New Zealand journal of geology and geophysics* 29: 205–252.

Zinsmeister, W.W.J. 1979. Biogeographic significance of the late Mesozoic and early Tertiary molluscan faunas of Seymour Island (Antarctic Peninsula) to the final breakup of Gondwanaland *Ohio State University, Institute of Polar Studies* pp. 349–355.

FIGURE CAPTIONS.

Figure 1. 1, Aproximate locality where the MLP 71-III-13-1 and MCS 4(*Kawanectes lafquenianum* nov. comb.) were collected. **2–4** material preserved in each specimen, **2**, **MLP** 71-III-13-1(holotype); **3**, **MCS Pv** 4; **4**, **MUC Pv** 92.

Figure 2. *Kawanectes lafquenianum* nov. comb., **MLP** 71-III-13; **1–2,** anterior cervical vertebra in **1,** anterior and **2,** left lateral views; **3–4,** posterior cervical vertebra in **3,** anterior and **4,** left views. **MCS PV** 4; cervical vertebrae in **5,** right lateral and **6,** anterior views; **7,** cervical vertebrae in left lateral view; **8–10,** posterior cervical vertebra in **8,** left lateral; **9,** anterior; **10,** posterior and **11,** ventral views; **12,** posterior cervical vertebra in left lateral view. Scale bar = 20 mm.

Figure 3. *Kawanectes lafquenianum* nov. comb., **MLP** 71-III-13-1; **1–3,** dorsal vertebra in **1,** anterior, **2,** left lateral and **3,** ventral views. **MCS PV** 4; **4,** dorsal and sacral regions in dorsal views. **5–7,** dorsal vertebra in **5,** anterior, **6,** right lateral and **7,** ventral view; **8–9,** 8th dorsal vertebra and rib in **8,** dorsal and **9,** posterior views. Scale bar = 20 mm.

Figure 4. *Kawanectes lafquenianum* nov. comb., **MLP** 71-III-13-1; **1–4,** sacral vertebra in **1,** anterior, **2,** posterior, **3,** dorsal and **4,** ventral views. **MCS PV** 4; **5–6,** sacral vertebrae in **5,** anterior and **6,** dorsal views. **MUC Pv** 92; **7–10,** sacral vertebra in **7,** anterior, **8,** left lateral, **9,** dorsal and **10,** ventral views; **11–14,** sacral rib in **11,** anterior, **12,** posterior and **13,** proximal views; **14,** reconstruction of sacral vertebrae in position. Scale bar = 20 mm.

Figure 5. *Kawanectes lafquenianum* nov. comb., **MLP** 71-III-13-1; **1–2,** caudal vertebra in **1,** anterior, **2,** left lateral, **3,** dorsal and **4,** ventral views; **5,** last caudal vertebrae in left lateral view; **6,** caudal rib. **MCS PV** 4, **7–8,** caudal vertebrae in **7** anterior and **8,** ventral views. **MUC PV** 92, **9–12,** caudal vertebra in **9,** anterior, **10,** left lateral **11,** dorsal and **12,** ventral views. Scale bar = 20 mm.

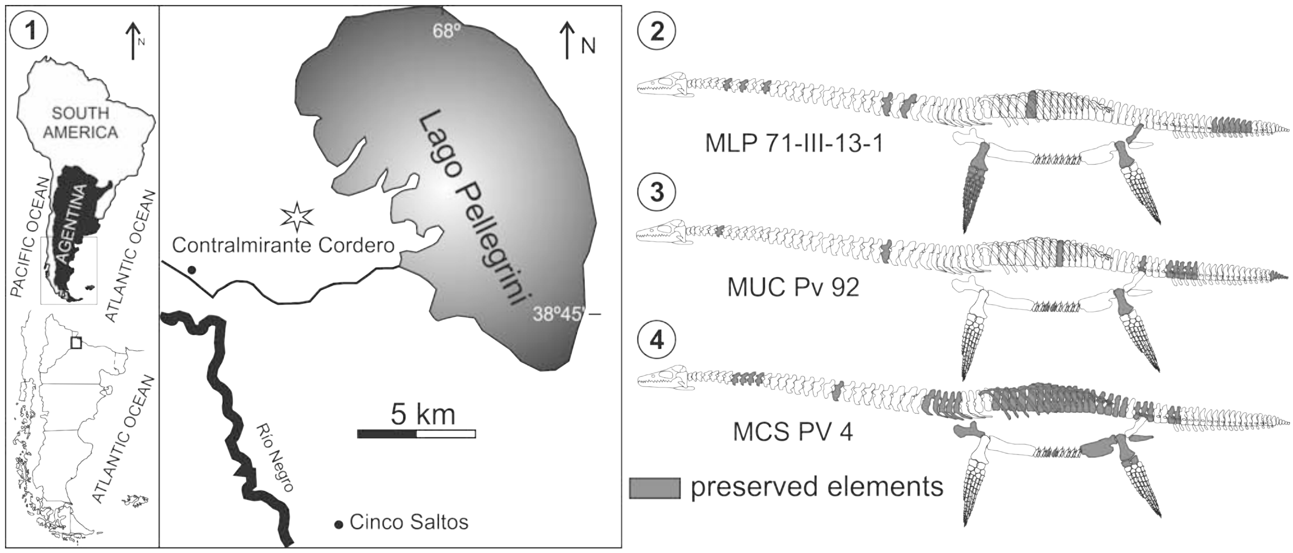
Figure 6. *Kawanectes lafquenianum* nov. comb., **MCS PV** 4; **1,** pectoral region and scapula in right lateral view; **2,** pubis and ischia in dorsal views. **MLP** 71-III-13-1; **3, 4,** ilium in **3,** lateral? and **4,** medial? views. Scale bar = 20mm.

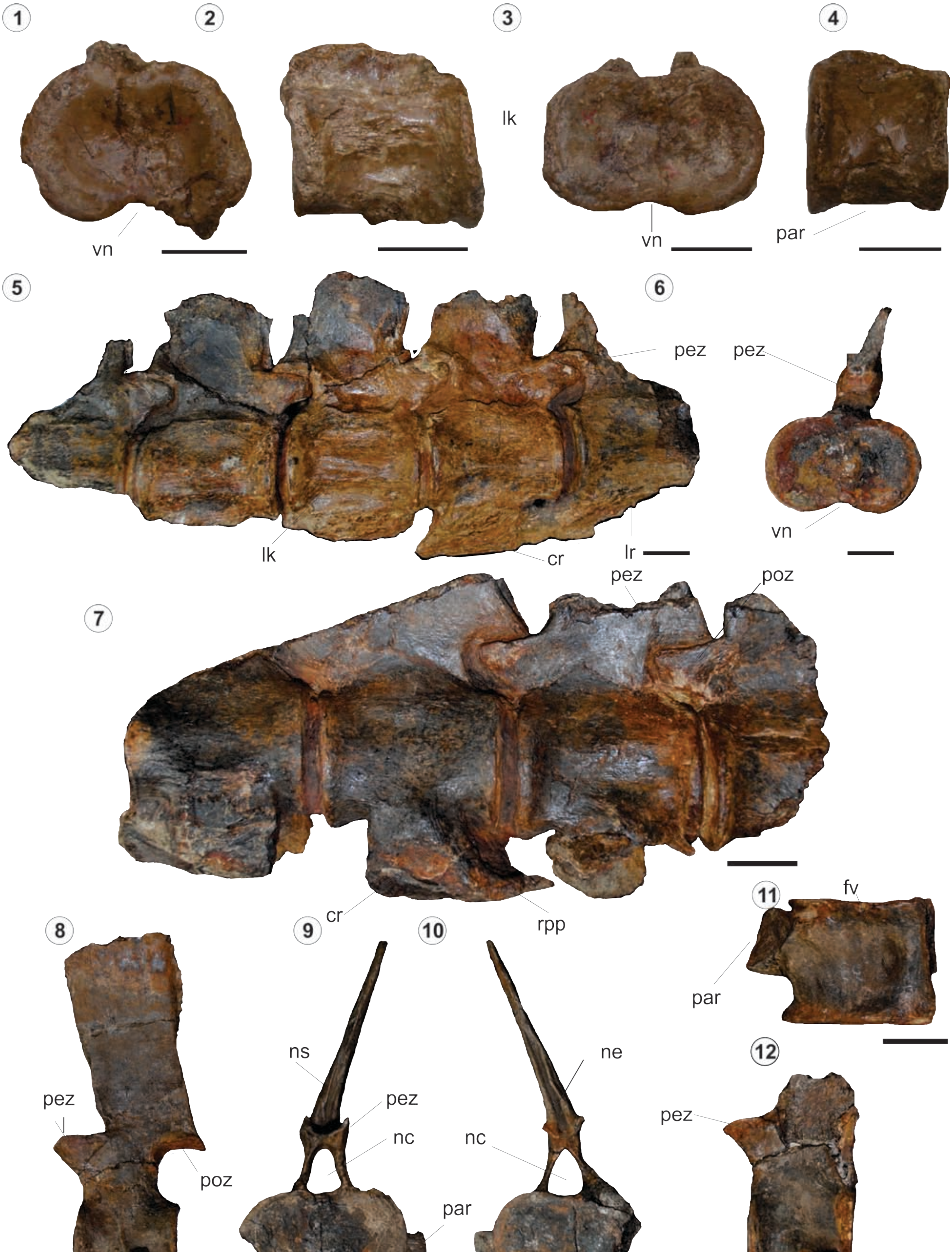
Figure 7. *Kawanectes lafquenianum* nov. comb. **MLP** 71-III-13-1; **1–3,** humerus in **1,** dorsal, **2,** ventral and **3,** proximal views; **4–6,** femur in **4,** dorsal, **5,** ventral and **6,** proximal views; **7,** mesopodial element; **8,** phalanges. Scale bar = 20mm.

Figure 8. *Kawanectes lafquenianum* nov. comb. **MUC Pv** 92; **1–3,** femur in **1,** dorsal, **2,** ventral and **3,** proximal views. **MCS PV** 4; **4,** distal part of right femur and epipodials in dorsal view; **5, MUC Pv,** phalanges. Scale bar = 20 mm.

Figure 9. Comparisson between the humera of Weddellian elasmosaurids, **1–4,** same size and **5–8,** same scale. **1, 5,** *Kawanactes lafquenianum* nov.comb., **2, 6,** *Vegasauru molyi*, **3, 7,** *Morenosaurus stocki*, **4, 8,** *Kaiwhekea katiki*. White arrow indicate the posterior expansion and accessory facet. **9, 10**. Comparisson between **9,** femur of *Mauisaurus haasti* lectotype (DM R1529) and **10**, *Kawanectes* lafquenianum nov. comb. Scale bar = 20 mm. **11**, plot of the BI and HI indexes of *Vegasaurus molyi* (**MLP** 93-I-5-1) and *Kawanectes lafquenianum* (**MLP** 71-II-13-1, **MCS PV** 4 and **MUC Pv** 92).

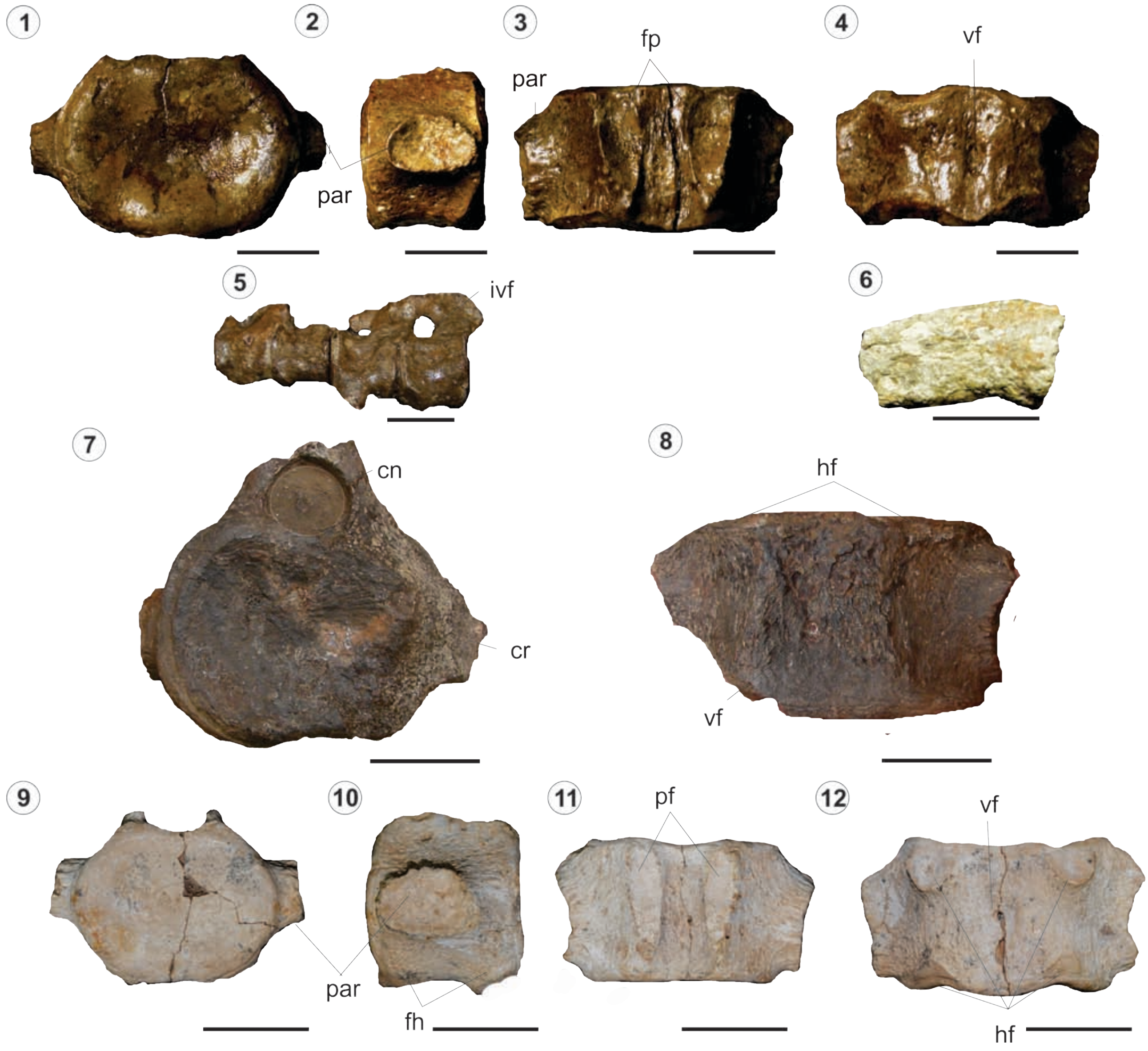
Figure 10. Strict consensus of 250 most parsimonious trees (1424 steps, CI=0.284 and RI= 0.673). Bremer support values are given below some nodes on the cladogram.


1
SOUTH AMERICA
AGENTINA
PACIFIC OCEAN
ATLANTIC OCEAN
ATLANTIC OCEAN
68º
Lago Pellegrini
Contralmirante Cordero
38º45'
5 km
Rio Negro
Cinco Saltos
N
2
MLP 71-III-13-1
3
MUC Pv 92
4
MCS PV 4
preserved elements


1
2
3
4
lk
vn
vn
par
5
6
pez
pez
lk
cr
lr
vn
7
pez
poz
cr
rpp
11
fv
par
8
9
10
ns
ne
pez
pez
nc
nc
poz
par
par
12
pez
par

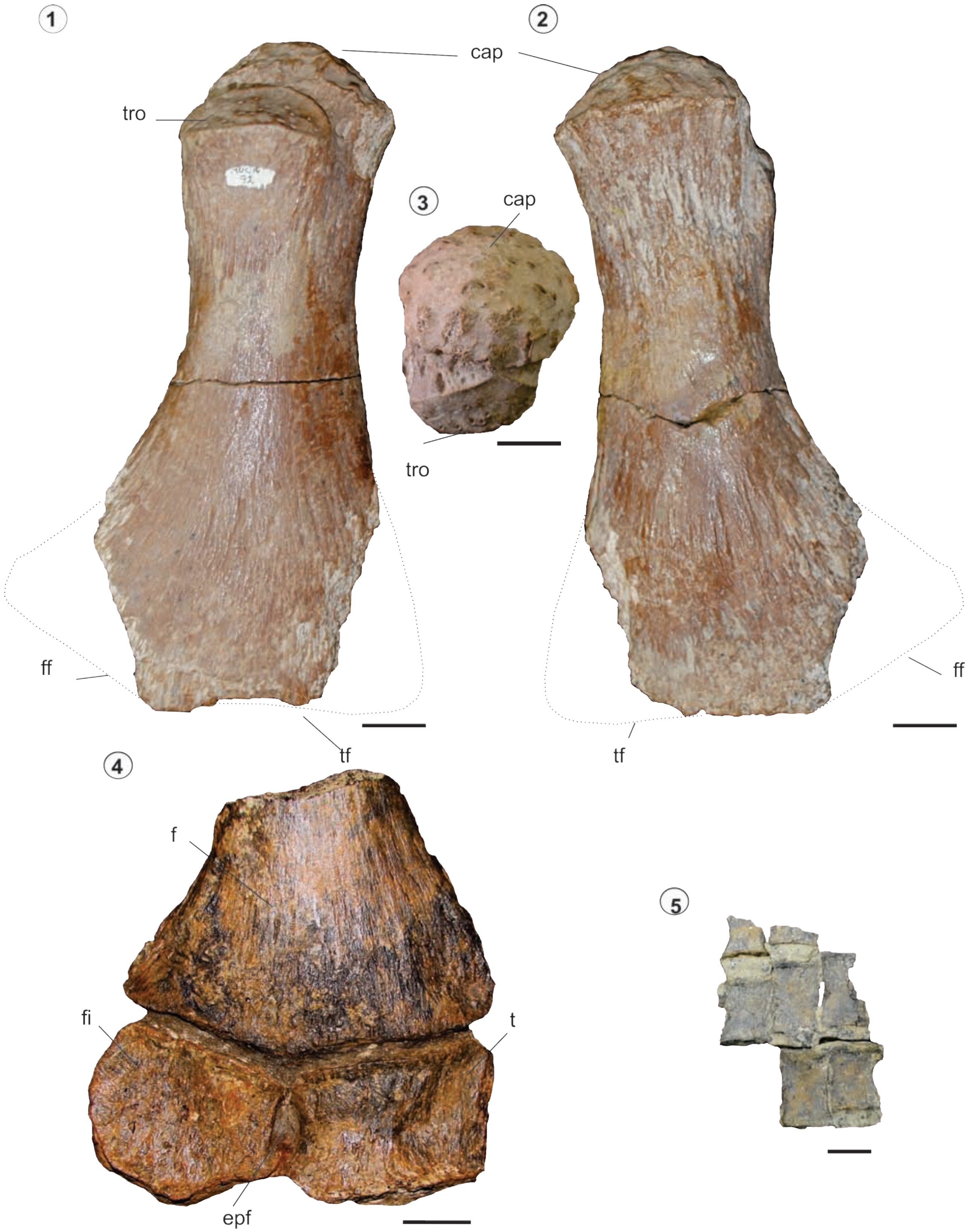
1
poz
cn
2
di
3
vf
4
di
dr
5
en
cn
di
6
7
vf
8
di
dr
9
di
di
cn

1
2
3
4
pez
poz
tp
tp
vf
5
cn
6
tp
7
8
9
10
par
fp
fv
11
12
13
14

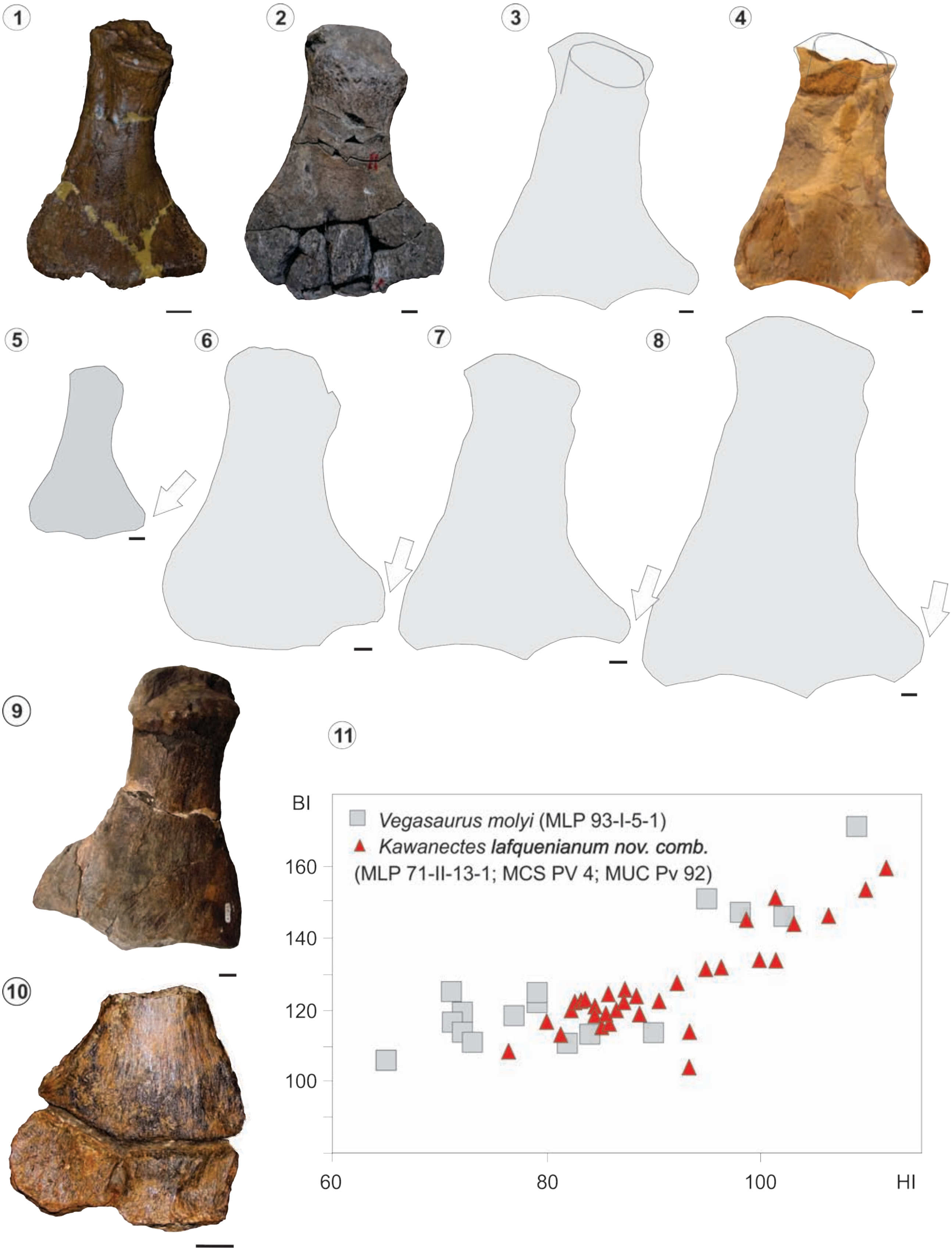

1
2
3
4
par
fp
par
vf
5
ivf
6
7
cn
cr
8
hf
vf
9
10
11
12
pf
vf
par
fh
hf


1
dlp
tp
dr
rg
3
2
4
pu
pb
act
is

1
2
3
4
5
6
7
8
cap
tub
cap
af
rf
uf
uf
rf
tro
cap
ff
tf
ff
tf



1
2
3
4
5
cap
tro
cap
tro
ff
tf
ff
tf
f
fi
t
epf


1
2
3
4
5
6
7
8
9
10
11
BI
Vegasaurus molyi (MLP 93-I-5-1)
Kawanectes lafquenianum nov. comb.
(MLP 71-II-13-1; MCS PV 4; MUC Pv 92)
160
140
120
100
60
80
100
HI


Yungisaurus liae
Eoplesiosaurus antiquior
Stratesaurus taylori
Bobosaurus forojuliensis
Augustasaurus hagdorni
Pistosaurus skull
Pistosaurus postcranium
Anningasaura lymense
Macroplata tenuiceps
Avalonectes arturi
Rhomaleosaurus megacephalus
Eurycleidus arcuatus
Archaeonectrus rostratus
Meyerasaurus victor
Borealonectes russelli
Maresaurus coccai
Rhomaleosaurus thortoni
Rhomaleosaurus zetlandicus
Rhomaleosaurus cramptoni
Thalassiodracon hawkinsii
Hauffiosaurus zanoni
Hauffiosaurus tomistomimus
Hauffiosaurus longirostris
Attenborosaurus conybeary
Marmornectes candrewi
Peloneustes philarchus
Pliosaurus andrewsi
Simolestes vorax
Liopleuridon ferox
QM F51291
Brachauchenius MNA V 94433
Brachauchenius lucasi
Brachauchenius eulerti
Kronosaurus MCZ 1285
Pliosaurus irgisensis
Liopleuridon rossicus
Gallardosaurus iturraldei
Pliosaurus brachydeirus
Pliosaurus BRSMG Cc332
Pliosaurus funkei
Plesiosaurus dolichodeirus
Eretmosaurus rugosus
Westphaliasaurus simosensii
Seeleyosaurus guilelmiimperatoris
Microcleidus tournemirensis
Microcleidus homalospondylus
Microcleidus brachypterygius
Plesiopterys wildi
Cryptoclidus eurymerus
Tatenectes laramiensis
Kimmerosaurus langhami
Tricleidus seeleyi
Pirocleidus beloclis
Muraenosaurus leedsii
Plesiosaurus mansellii
Pantosaurus striatus
Spitrasaurus spp
Djupedalia engeri
Abyssosaurus nataliae
Colymbosaurus trochanterius
+3
Brancasaurus brancai
QM f512912
Plesiopleurodon wellesi
Edgarosaurus muddi
MIWG 1997_302
Hastanectes valdensis
Leptocleidus valdensis
Leptocleidus capensis
Nichollsaura borealis
Umoonasaurus demoscyllus
+3
Gronausaurus
Elasmosauridae
3
Speeton clay plesiosaur
Wapuskanectes betsynicollsae
Callawayasaurus colombiensis
Stixosaurus snowii
Futabasaurus suzukii
Albertonectes vanderveldei
Tuarangisaurus keyesi
Thalassomedon hanintoni
Elasmosaurus platyurus
3
Terminonatator ponteixensis
Hydrotherosaurus alexandrae
Libonectes morgani
Kawanectes lafquenianum nov. comb.
Vegasaurus molyi
Morenosaurus stocki
3
Kaiwhekea katiki
Aristonectes parvidens
Aristonectes quiriquinensis
Aristonectinae
3

TABLE 1–**Kawanectes lafquenianum nov. comb.** ***Vertebral measurements of holotype and reffered specimens (in mm): L, length; H, height and B, breadth, indexes HI, height (H)/length (L) ratio (HI=100*H/L), BI, breadth (B)/length (L) ratio (BI=100*B/L), BHI, breadth/height ratio (BHI=100*B/H) and VLI, Vertebral Length Index [VLI= 100*L / (0.5*(H + B))]. C, cervical, D, dorsal, S, sacral, Ca, caudal.*** **In black articulate vertebrae.**

vertebrae	L	H	B	HI	BI	BHI	VLI
C1	49	32	52	65	106	163	117
C2	45	33	50	73	111	152	108
C3	-	-	-	-	-	-	-
C4	50	36	59	72	118	164	105
C5	48	37	57	77	119	154	102
C6	49	35	57	71	116	163	107
C7	50	36	58	72	116	161	106
C8	52	-	-	-	-	-	-
C9	50	36	60	72	120	167	104
C10	48	38	59	79	123	155	99
C11	48	38	60	79	125	158	98
C12	-	-	-	-	-	-	-
C13	39	37	59	95	151	159	81
C14	41	42	60	102	146	143	80
C15	45	44	66	98	147	150	82
D1	45	47	58	104	129	123	86
D2	47	45	56	96	119	124	93
D3	46	49	60	107	130	122	84
D4	42	50	55	119	131	110	80
D5	44	45	57	102	130	127	87
D6	44	45	55	102	125	122	88
D7	45	43	54	96	120	126	93
D8	48	44	56	92	117	127	96
D9	47	45	56	96	119	124	93
D10	47	-	55	-	117	-	-
D11	45	42	54	93	120	129	94
D12	43	40	50	93	116	125	96
D13	41	38	54	93	132	142	89
D14	40	38	55	95	138	145	86
D15	40	36	50	90	125	139	93
S1	38	36	52	94	136	144	86
S2	37	35	55	94	148	157	82
Ca1	32	34	54	106	169	159	73
Ca2	32	35	-	109	-	-	-
Ca3	31	35	50	113	161	143	73
MLP 71-II 13-1							
C1	43	*36*	49	84	114	136	101
C2	45	37	*50*	82	111	135	103
C3	42	38	48	90	114	126	98
C4	35	38	*60*	109	171	158	71
C5	34	37	57	109	168	154	72
C6	34	39	60	115	176	154	60

D1	33	33	46	100	139	139	83
D2	33	30	*40*	91	121	133	94
D3	35	34	48	97	137	141	86
Ca1	28	33	45	118	161	136	72
Ca2	28	32	43	114	154	134	75
Ca3	27	33	42	122	156	127	72
Ca4	27	32	41	119	152	128	74
Ca5	27	31	39	115	144	126	77
Ca6	28	32	42	114	150	131	77
Ca7	25	30	41	120	164	137	70
Ca8	24	30	40	125	167	133	69
Ca9	25	27	36	108	144	133	79
Ca10	24	28	34	117	142	121	77
MUC Pv 92							
C1	28	20	35	71	125	175	102
C2	33	-	-	-	-	-	-
D1	40	37	50	93	125	135	92
D2	42	41	59	98	140	144	84
D3	50	41	55	86	108	134	104
S1	35	33	48	94	137	145	86
Ca1	30	33	46	110	153	139	76
Ca2	32	34	46	106	144	135	80
Ca3	32	35	46	109	144	131	79
Ca4	32	34	42	106	131	124	84
Ca5	31	33	42	106	135	127	83
Ca6	29	32	40	110	138	125	80
Ca7	29	30	40	103	138	133	83
Ca8	31	30	37	97	119	123	93

***Table 2** – Body length of several elasmosaurids*

Taxon	*Length (m)*	*Ratio with Kawanectes*	*References*
Kawanectes lafquenianum	*ca. 3.8 m (total)*		*O'Gorman, 2013*
Vegasaurus molyi	*6,5 m (total)*	*1.7*	*O'Gorman, 2013*
Thalassomedon haningtoni	*10.86 m (total)*	*3.9*	*Welles, 1952*
Elasmosaurus platyurus	*10.3 m (total)*	*3.7*	*Welles, 1952*
Hydralmosaurus serpentines	*9.44 m (total)*	*3.4*	*Welles, 1952*
Mauisaurus haasti *(based on CM Zfr 115)*	*+8 m*	*+2.9*	*Hiller et al., 2005*
Hydrotherosaurs alexandrae	*7.77 m (total)*	*2.8*	*Welles, 1952*
Futabasaurus suzukii	*6.4-9.2 m*	*2.3-3.3*	*Sato et al., 2006*
Styxosaurus browni	*5.25 m (neck)*		*Welles, 1952*
Libonectes morgani	*5.06 m (neck)*		*Welles, 1952*
Morenosaurus stocki	*3.63 m (trunk and tail)*	*-*	*Welles, 1952*

TABLE 3 –Characters used to differentiate Kawanectes from other Weddellian and Pacific Taxa. 1, cervical centrum proportions; 2, caudal prapophysis laterally projected; 3, ilium dorsal end; 4, pelvic bar; 5, humerus posterior accessory facet; 6, trochanter widely expanded in dorsal view; 7, ratio humerus length /femur length; 8, body length. Data taken from Welles, 1943; Cruickshank and Fordyce, 2002; Hiller et al., 2005; O'Gorman et al., 2015).

	1	2	3	4	5	6	7	8
Kawanectes lafquenianum	**L>H**	**prensent**	**tapering**	**present**	**present**	**absent**	**1.2**	**3.8 m**
Vegasaurus molyi	L>H	absent	expanded	absent	present	present	1.08	6.5 m
Morenosaurus stocki		absent	expanded	absent	present	present	1.08	3.63 m (trunk and tail)
Hydrotherosaurus alexandrae	L>H	absent	expanded	?	absent	absent	1.14	7.77 m (total)
Aristonectes parvidens	L≤H	absent	?	?	absent	?		?
Mauisaurus haasti (DM R1529, holotype)	?	?	?	?		present		?
(CM Zfr 115, reffered)	L>H		?	?	?	absent		+ 8 meters
Kaiwhekea katiki	L≤H	absent	?	?	present	present		6 m

```
#NEXUS
[written Mon Sep 07 19:45:46 ART 2015 by Mesquite  version 3.0 (build 644) at Note-Jose/
10.1.10.76]

BEGIN TAXA;
        TITLE Taxa;
        DIMENSIONS NTAX=89;
        TAXLABELS
                Yunguisaurus_liae Pistosaurus_postcranium Pistosaurus_skull
Augustasaurus_hagdorni Bobosaurus_forojuliensis Macroplata_tenuiceps Anningasaura_lymense
Stratesaurus_taylori Avalonnectes_arturi Eurycleidus_arcuatus Meyerasaurus_victor
Maresaurus_coccai Borealonectes_russelli Rhomaleosaurus_megacephalus
Archaeonectrus_rostratus Rhomaleosaurus_cramptoni Rhomaleosaurus_zetlandicus
Rhomaleosaurus_thorntoni Thalassiodracon_hawkinsii Hauffiosaurus_longirostris
Hauffiosaurus_tomistomimus Hauffiosaurus_zanoni Marmornectes_candrewi
Peloneustes_philarchus Simolestes_vorax Pliosaurus_funkei Pliosaurus_BRSMG_Cc332
Pliosaurus_brachydeirus Gallardosaurus_iturraldei Liopleurodon_rossicus
Pliosaurus_irgisensis Pliosaurus_andrewsi Liopleurodon_ferox Kronosaurus_MCZ_1285
Brachauchenius_eulerti Brachauchenius_lucasi Brachauchenius_MNA_V9433 QM_F51291
Attenborosaurus_conybeari Plesiosaurus_dolichodeirus Eopleiosaurus_antiquior
Eretmosaurus_rugosus Westphaliasaurus_simonsensii Seelyosaurus_guilelmiimperatoris
Microcleidus_tournemirensis Microcleidus_brachypterygius Microcleidus_homalospondylus
Plesiopterys_wildi Cryptoclidus_eurymerus Tricleidus_seeleyi Muraenosaurus_leedsii
Kimmerosaurus_langhami Pantosaurus_striatus Picrocleidus_beloclis Tatenectes_laramiensis
Plesiosaurus_mansellii Colymbosaurus_trochanterius Djupedallia_engeri Spitrasaurus_spp
Abyssosaurus_nataliae Umoonasaurus_demoscyllus Nichollssaura_borealis
Leptocleidus_capensis Leptocleidus_superstes Hastanectes_valdensis MIWG_1997_302
Brancasaurus_brancai Edgarosaurus_muddi Plesiopleurodon_wellesi QM_F512912
Callawayasaurus_colombiensis Gronausaurus Speeton_Clay_plesiosaurian
Wapuskanectes_betsynichollsae Futabasaurus_suzukii Hydrotherosaurus_alexandrae
Libonectes_morgani Elasmosaurus_platyurus Thalassomedon_hanintoni Stixosaurus_snowii
Tuarangisaurus_keyesi Terminonatatot_ponteixensis Albertonectes_vanderveldei
Morenosaurus_stocki Vegasaurus_molyi kawanectes_lafquenianum Aristonectes_quiriquinensis
Aristonectes_parvidens Kaiwhekea_katiki
        ;

END;


BEGIN CHARACTERS;
        TITLE  Character_Matrix;
        DIMENSIONS  NCHAR=275;
        FORMAT DATATYPE = STANDARD GAP = - MISSING = ? SYMBOLS = "  0 1 2 3 4 5 6 7";
        CHARSTATELABELS
6 Character_6, 49 Character_49, 50 Character_50, 272 Character_272, 273 Character_273, 274
Naterior_depresed_ares_in_the_humerus, 275 anterioe_oncave_shafth ;
        MATRIX
        Yunguisaurus_liae                 0001000??10000000??0010010?000010010?000?
000110??200??00?????01020???????????????02?10???????0?0?0010020???10011001100?1001?1????
13??0??????1??????????41000??00?000000?001??0??01210?0?00{2 3}??0??????0?000?
200????????????0?00122011?0000002000??11000?000?0?000000010000100000?????

Pistosaurus_postcranium           ????????????????????????????????????????????????????????
??????????????????????????????????????????????????????????????????????????????????????????
??????20011100000000000110100101100010????101110?00?001?202100??0??001????0122210???
1??????01?1?00000000???0???0?10????????0?????
        Pistosaurus_skull                 010100?0010000000??001001000000?
10000001000001001200?000????0010?0???????????????02??00000??0000?0010020????
20????????????????????{1 2}0100??
00????????????????????????????????????????????????????????????????????????????????????????
```

??
Augustasaurus_hagdorni 010100?0010?00000??00100100000000000000100?
0010012101000010??????0???0?0000??????02??000?0110000?0010000????0?1100?10??1001??1???
01010002100???00??21??41?01??000000200?0?10000011??0000???????????00?000?102?020000?
0??????????????????000??00???100000000???0?100?1000???0?00?????
Bobosaurus_forojuliensis ????????????????
0??
?????????????????????????????02?0?00?00??01?2100000??110?12?000?00??001221100?10{2 3}
1?????????????????????????????????0122010?001??????0???1?000????????0???0?0??0???????????
Macroplata_tenuiceps 1101001??10?10101110{0 2}?001??1001010?0???????
0010????0?????????010100?012?100??01?100211????????????100??00??????1111??0??21???11??
00201001110000100??210220001???110?120100??30?001?11100000?0110000?20110?1????0000000?001?
0001?2012?002?????0?101?0?0?0?0?110?1???010??01??????????
Anningasaura_lymense 111000?0120?00??10000100?0010000100000?
10000010112001000?10?0?1020?0110111010010?00211?1000000011?00?000?111??1110?100?1010?110??
00010011000?0?00??0?0??10010??3?0?120100?031?
1??
???????????
Stratesaurus_taylori 001000?0100100100??0110010000010?0?
00001000001000100100001010110101200200001 0?00102211???01000010110?000000?2?111?
11000110001?0?00100001100 0?0?00??2001?1001001110012010000 3101??1????00?0????????????
1??????????????????????0102211 1?????????????????????????????1???010??010??10?10??
Avalonnectes_arturi ??????????01??10????????10?????01??
0000100000100110010000 1010???????????????????1??????
0??{1 2}??????????2100?00211001??100?
011000110110 1200?0110?00????1?01201???????????????0102?110??1?????????11020?000?110110?
101000010?100?????

Eurycleidus_arcuatus ??
???111???????????1?????????
01110??????????????100100211000201000010100?1?1101????0110100?201101120010201000100?
100010201100 01??????0101?02110010110????1?10????????0?????
Meyerasaurus_victor 10?00?0?21??00??11??0100??0000???
0????????????????????10?0??0101??{0 1}0????????0??????022?0?1?010101111 22?11000101?0111100?
02110211???01?1001010?0???0???1?120?01?????00?20????0???00112110120 02?110?0?0111?0?1????
0201000?0001000102011?0011002100??12020?00021??1101101000110 1100?????
Maresaurus_coccai 110100?1220?1???1120{0 2}1001?0?00?????????????
00001120?10???10?0110?0?????0??????????0??11?000101010?122?1000???200111?00??2100?11???01?
1?011100????0???????0001???2?0?{0 1}??1???
030???
???????????????
Borealonectes_russelli 11010?1?210?102011100?00{1 2}0?0000??010?
0010010000?{0 1}??1?000??0?0???20???12000???????022?1?0????????0??2???201?????111??00???1?
0?110??0{1 2}?1?01?10?00100??21?120001???2?0??20?????30?0????????
1???100??00?????1101012???2?011?0001???11?
1?????
Rhomaleosaurus_megacephalus 10010121220112101000210010 0100?000?
000010000010012001000110101???0?201?000???0??1002111000100011011???00?0002001111?0??20?0?
11??0??00001020?0???0???10120001???1100?201????10?00111?1012001??20?0?0??????????
1??????????????01022110????????00??1?0201001?110?1??1010??0?????0?????
Archaeonectrus_rostratus 100200 2???0?102?1111??00?????????0?000?
1000001001201 1000?1??01??11??1????
1?????????????11120?0???????????2100100111000201???0?11?0110110110010??????0?????0?20?
1??????????????01?2?1100?10001000??1?020?00??11011011010001101100?????
Rhomaleosaurus_cramptoni 10000021220?102010012110 1?00001?1000000???
0001001201100011110?10?0???1?000???????02?1110?0101011012 2?1000000200?11?00??2100?11???01?
1?01020?00?????????200???1211000??1?0?01?1?0002110?100?0????0?????1???????????????1??????
0102?11000?10???00??1?021?001?1??110110100?11?1?00?????
Rhomaleosaurus_zetlandicus 11000??1220?102010012110??00001??000???????
001001?0110?0?1110110?????1?0?0?????????2211??0?1????1?1?2??0??0??2001111000021002110000??

1001020?0??????????200010??110?020100?010?00??2110?1???
01201000?????????????????????????????????1?0??0012120210001211011011010 01?????0??????
Rhomaleosaurus_thorntoni 11??0???2?0?10??1021?1101?00?????0??
0001000?????????????1??????????????????????????????1??01??01?????????????200111??10?11???
11000?11100101000??????????0001???110?000100??10??01?21101?00?0110100??01100120210?0?
000100?10001220110001??????0111?0210000211 0??????????????????????
Thalassiodracon_hawkinsii 0010000111010011120??0?1000???0000000?
1002000000101100001011010101000200001100010 1011?00011001??100?000????0?11101100010000?
1200?00100111001000 0??210131001001110012010000210001110100000101100000201101 1001?
00000001000?0001020111001000200000110100000010?11001010000101100?????
Hauffiosaurus_longirostris 00?20??0?1??12111120??00???2?????????????????????
02????????????01001??0???1?0?????1110??????????????110?0??0?????1001?100?1100?11?
0023010011200??
??
Hauffiosaurus_tomistomimus 00020?10210?1?110??0100?0?0210100100???????00?
00010100?0?101?01011??????1001????111011?0?0100010?100?010??????1000?100?1100?
112002301001120?1100???{0 2}?1231001?11110?1001000020000111010 10001??10???0???1??1?0?
0?????????????00????????00???0?10000120100001 21?01101?1?0?11201?00?????
Hauffiosaurus_zanoni 00?2??1??1???????????????0?0???????????0?
10????????????00?001???010??????????????????11101101?0100010?100?010????20100??100?1100??
12002301{0 1}01120000?00??????310011?11100100100?020?00??????????0?0110000020110 1120??
0020000?010?0001020?2?0001001000??11010?00121??1101101000110 1100?????
Marmornectes_candrewi 0????????????00??0?????00????????????????????????
0????10???0???0??10100110?0000?
111000201021020000000??21?1?0001???1200100100?200?1001??1?00?1?0010000??????1?0??000?00???
00????00220111??2000??00110001000012100?1??1110??011???1?????
Peloneustes_philarchus 100201202111 00210??010001000101?
0100000100200100031211000 10?00101000011000011?10102211100110{0 1}010?12110200???
21101101100000011110002110010200010 00??21?110001?121200110100000011001201100?1?0010001?00?
1011000010000002010??1002301111022000?01??000210001220022101110111101111?????
Simolestes_vorax 110101???21?10210??010001??010??0100000100200?
0003111?000?0?0010100??11000????1???221110???????0?121?0210???210111??10?0000?111000??1?
01010?0??00???1111000111 21?0?1000001200110????11?????0????0??20?10012010?02?000?0????
000230??1102201??010100021010122001110111001110?????????
Pliosaurus_funkei ???????0?????
0??0?{1
2}???01????10?1????0?1??010?11?????????????
0001???1????00???0?00?2?00??1100???????????????????????2000000200?????????????????0??0?
0????2?01012???3?101?0001???1??1?????
Pliosaurus_BRSMG_Cc332 110101?0221110210??0100110?0111?
1100000100200100231111000201001010???1????01???0?012111001???????12110200???1?101?0010?
200???13?00{1 2}11011011??????????????0001???1?00?00?????00???00??
1100???
?????
Pliosaurus_brachydeirus 11?1?????2??102?0??01001???0?????????????????00?
0???1???????????01010???????????????0??????????1?????0?12110200?????101??010?2000??13000{1 2}
11101021?0????????????0001???110??10???0?00?2010??
1100???0???00????0?????1?1???3???1?0??10????
1?????
Gallardosaurus_iturraldei ??0?01?022?1??21????????10??????11?
0000100200100?31?1100020?01101????1?????????????121110???0?010?12110300???211?????1???
0???????????????????1????00??2?11?00011??1?0?110?0??
201??
???????????????
Liopleurodon_rossicus 11?1?1??????10210??01000????1?1?1100000 1??200?
0??3121??1????????0?????????????1?
01011??1000200?2????0?
2??
Pliosaurus_irgisensis ???????0??????21?????????????????11?0000100200?0?
231?11?002??0???1????

1???000??1?
1?0?1??000?200??001?0?????0???
10??1???3???1?0??1111100?????
Pliosaurus_andrewsi 01020?2021??10210??0??00??00???????????????00?
00?3{0 1}211?0??0?00??10??????????????102?11?00110?010?1211020???21111?
011000010111100021100101000100110 2??21000101211001000000200110012 0110??1?
0010000??????????????????????????00230110???200??01??0202101012200321 0?100011001211?????
Liopleurodon_ferox 1101012022111 0210??010001000101?11?
000010020000003121100020100101000?1100001??10102211100110111 0?12110210???2111110010?0010?
1110001111010100011 00??0110100011121200100101000011000?0110????2010100????1??0?000?????0??
01???1????????10320???010???0210101 2?0?2?101?0001???1?11?????
Kronosaurus_MCZ_1285 ??0?0?20?2??????
0???01000?{0 1}?00011000?01110?111?0???????????
12110{2 3}10??????????0???001????0??????01010?011?0??2??00000?11?3211?0?000?0001??0?20?
1??0??2?10000?00?10?0?????02??0020????1????????103??????????????????????????????????
1?????????
Brachauchenius_eulerti 010200?0211100210??1100010?0200?
11100001012001002312100012??00???????????????????011?0?00011000101211031010?21110?0010?
0001?11???00000010100???????????????????
1??
??????????????????????????
Brachauchenius_lucasi 00020120211100210??010001000200?111?
0001012001000312100012??00???????????????????011?0100?1011?0??2100310???211???001?00001{1
2}11????????010?0?0???0?????000002????211?00?????????00??
001??
11111?????
Brachauchenius_MNA_V9433 0102?????1?100210??0100010?0????????0001???00?
002{2 3}1210?0?20?0????0?????????????????????00????110??2110210???2111000010?0001?
1110000000010100???????????0000211?3211100000?200?2?0??01???????????????0?1???????
22200002?????11??0011?10???
QM_F51291 ????01??2?????210??010?????0210?1110000????
0010???12?????????????????????????????????0?00?????????????{2
3}??????????????????????????????????
10??
??
Attenborosaurus_conybeari 00010010???110??112???0010?0?????0??
0001002??????2??10000???11??????????????????1?2??????????????????????????0110??0???
0?????????10100???0?2??????????310??011110????1???0{0 3}00??11101100?0???1???1?20?10?1????
0220000?000?310?02??1?0010001000??1??10?00?????1?001?100???01101?????
Plesiosaurus_dolichodeirus 001100?0110?00100??0010010?000010010000100?
001000100100001010110{0 1}010?02000?1111?10?01100?01000110100?000?1110?0100?100?
1000???????100001110?2???0????01410010121{0 1}00100101003{0 1}0001111110000100001 0{0 1}?
21110110011000000 0?000?0000020121001000 20000?1102010000200110{0 1}1010000?01100?????

Eopleiosaurus_antiquior ???
???
2??????????4100?0111?0?12?1???03??0??????????01000?11?02??1001002?0?0??00???????0??2?11?
00110020000?11010100??1?0110?1010000101100?????

Eretmosaurus_rugosus ???
???{1
2}??????????{3 4}100110?100?12010000?000111??11?0???0000?01????1???????{0 1}?0??0???????
0010201200011000000??11021?10002001101101000020 1100?????

Westphaliasaurus_simonsensii ???
???
2????????????0011021?0??0010?1031000111?1?0010?0000101?211100120??00000001??10000??20?
20001?????000110021000111001101101000 11?1??1?????
Seelyosaurus_guilelmiimperatoris 00000?00?10?02?????0???????0?????0??001100 1????
1?1?01000?0??11???10??100?1010????????

```
100001100?2??????????3100?1221000???1???00?00?1200110010{2 3}10000110110100120l?10030?1?
0???300?02??2000110001000??11020?100?2001101100001120110l?????
	Microcleidus_tournemirensis	0000000?120102100??
00100100000000010111100100100020010001 10?1???{1 2}1?????000?????0112?110000??00?0?
12100100???20???????????????????1100011001 2?????????142101112100?20?100?
0010011200111010?????????20110012021101301 0?010?300122012000110????0??1?020?100?2?
0110110100012?1??1?????
	Microcleidus_brachypterygius	0011000?110102100??
00100100000001010111100100101020010001 00?????1???????????????101??100?0010000?12100000???
20??????????????????????0000110012?????????2321011121?00??1????00100?1201111 0?03100011?
0210???1????20130?0?01???101220?10??01002000??11021?100?2??11010010011101101?????
	Microcleidus_homalospondylus	0000000011010210???0010020?000?000?
0111100100101020010001??1111011001020000 1??001021?1?00????000??2100100???2001001??00?0???
102???10000??0012???????????4210111210002011001001001120111101 0?1000011??1011110001?01?
010101???0012201200001 0?20000011021?100110011011010011201101?????
	Plesiopterys_wildi	00100?0?1???00????????00???00??1?0?0???10??01?
0001001000?00?0?101011102000010010101 10???1????0011?00??00?100???20??100?1000?0?2??0?00?
01110??????????0242001112110 1?001??0001001111?1100003000000?01?11?01201??0??0???010?3?
0102012?001???00?0001102001 01?2??1100101001110 1110?????
	Cryptoclidus_eurymerus	00100?0010?101100??
00100101000010000020100201001011010000000010?1011101101?111011111??00101100011?00?0????
000?02001100?1000?0021?02000011101211111 01?
01310011123201100111000000011101100000000100011210110010102012010202 00?1100210110112010?
1011130320101221013001 10{1 2}2{0 1}{0 1}001211?????
	Tricleidus_seeleyi	01100???????011010?00?0010?000?100????????{1 2}
01001?3001000?000010?00?0111111?????111110?????????011200?000?1100?02011100010 00?0021?
01110011001?11?1101?022100111232011001110001 00?11?01100???????????11011000000201201020 2?
13?????????????210??1011130210101221023001101111101211?????
	Muraenosaurus_leedsii	00????????0?01100??001001??000?10??????????010?
0?????1???0???10?00?0????11?????11011???????????????0????????????0201010002000?0021?
010100110012?1?1101??142101122320120011100010 01??11111000?200?111???????0???0{1 2}????1?
2020?3?1012?021??12????1001230311101221023001100111001210?????
	Kimmerosaurus_langhami	??1??0?1??0?0?????????????0?????10??0??????
2010000010200000000111010102011 01?101111111??????????????200?0????????0200110001000?002??0?
00?01220???1?1001?01?00011??3?01100111???1?
0????????????????????????????????????????????????????????????????????????????????????????????
???????????

Pantosaurus_striatus	??????????????????????????????????????????????????????????????
??????????????????????????????????????????????????????????????????????????????????????????????
?????{3 4}100111?320??00???000100??1??110000?2000111??????????????????????????01001?
021011200??10????0210101??1?1?10???211???1211?????

Picrocleidus_beloclis	?????????????????????????????????????????????????????????
0????0?010?{0 1}0??????????????10012??????????????????????????????1100?1000???2??2?????
11?????1?1101?0241101122320120011100010 0111?011?0?0?200?1010010110020102012010202 01?01?12?
021112200??101???02111012210110010011111?1?10?????
	Tatenectes_laramiensis	???????0?????????????????0??????0??????1??{1
2}?????????2000?0000?????????????????????????????????????11?????????0?
1?????????????????????????????11??????01001????00011??32011001?1000100?110?110000??????????
1011??????{1 2}01??1020101?10?1100210112 10??10????0210101??1?2?001?0211??01??1?????

Plesiosaurus_mansellii	??????????????????????????????????????????????????????????????
????????????????????????????????????????????????????????????????????????????????????????
1111101??2{3 4}1101???320??00?????01?01??1111?????1010011??0????????????2???1?
202????????????????????????????????????????????????2???????????????

Colymbosaurus_trochanterius	??????????????????????????????????????????????????????????????
????????????????????????????????????????????????????????????????????100?1000??????0?????????????1?
1110??2410012??320?200111??01?01??1011??00?2010101??0????????????2??102?2????????????????
```

201??10111?22101012210221011O2?11101211?????
        Djupedallia_engeri   ??????0?????
0???00???????0?
01111????????????????????????????????????020??????????????????00?0??1??2011???100?
510012113201200111030100110??1100??????????????11?0???0?0??01???{1 2}??3????????????2?
0??????1?02?0?012?1???101102???1?1211?0???
        Spitrasaurus_spp   ??????0?????
0???0???00??1010?????????????1??????????????????
0???????????0201?100?1000???2??0?00?01110?20111111??2521012213201200111030100110?
01100??????????????11?0???0?0??01???2???????????????2?11?????1?02{1 2}0?012?1???101102?
1???1{1 2}11?????

Abyssosaurus_nataliae   ??
??2???
1110??1{4 5}1001???3201200111??01?01??1011??0??{1 2}0???????0010000100??2??10?0?001?1?
1101110??2?1??1????10???10?22?0?3??110{0 2}??1001211?????
        Umoonasaurus_demoscyllus   00000100112??1101020??00??00????0??????????0?
002222?10???10?11????1??12?11?0??0??022?????0?????11122?1211000????????0??1111???????
1111010?01????????????1001????20?1??1010??00?110101102000201?00?1???1?01?010?????????????
0???????????21????0111?02001022210?2???1?0??10?1??1?????
        Nichollssaura_borealis   000001001120001010201000110000010 0?
000010010000122301010010011??211?2??0???00000?02211101011000111 22?13110000?0111110??0101?
112??02?1001010100100??2002210010013 2011?010??000??1102?101?00000?????????
10110020??????????????2?12102?01?2??{0 1}0000??1??200101?2101210110001110111 0?1???
        Leptocleidus_capensis   010001?1112?1010102002001?0000?10??0000??
01001022{2 3}201010?0??01??21?????0?????????0221110?01?00011122?12110001?????1110?0111??{1
2}2?111111010101???????????210010??320?1?0100?0?0?0?????
1??2????00????0???????????2???1?0??10?
1????????
        Leptocleidus_superstes   ??0?0??1?1?0???10{1 2}?????1??????????????????
0?10222201010?100011121?0011?01???????02211???????????122??31????
1??{1 2}0?01?0132011001000??00?110?11102???
1011001?10110011020??1?100200102??????????????????01???02001012?0???????????????????????

Hastanectes_valdensis   ??
???
1100???1?1{1 2}1001002320?1101000000001?????1??????
1011000??001???02001021?0????????0????????1?????

MIWG_1997_302   ??
??
????????01?01??0?1??1010??00??10??1102?????????????1???1?02???1??01?10?
0???
        Brancasaurus_brancai   0010?000100000{0 1}?101002001?00000?0?1000???
0101?02223010?0?00?011101101120101000100022?????011000???0???????????01???100?1110???2??
121100111?120100??20014100100232012?010110000011010110200010 1?1011???1?01?0201?10?0?210?
020101210210112 1????0111002001022200321?11???110?1????????
        Edgarosaurus_muddi   100101?0210010201110100 01??0?0??001000010?
200102220011101000110?01?02?2?1?0????1002211?01??????10122?130010020110001101111 0?120011{2
3}110111100?0101000001210 01?1132011201000000000???
01??00?00??????0010?2?0?3?10??0101??
01211?1???
        Plesiopleurodon_wellesi   000100?0?100102?1120?000???2?0????????????1???
222201010?10?11??0001?11???110?1????1{1 2}
000210?0??????????????100?011320?120100?0?0?0??0??110{0 2}???{0 1}0??101???????????20110?
1?01???????????????????????????{2 3}{0 1}?1012?1???????????????????????
        QM_F512912   00010020110011201120?000{1 2}???2?0??00??01010??
1???2222010101100111101??????????????1?022??001???00???1?2?100????1??001??????1???11????
100011020?11101000?0210001{0 1}02320?1201001000100100?1100?0010101001 1??1????????20?
1?????????2010012101120011011011120010122102210110001110 1{1 2}10?????

Callawayasaurus_colombiensis 000010?0?10000{1 2}?10100?0020?000?10???????
0101000022010101000111101 1?{1 2}02?1010??1?002211001????0?0???2?1100???1?1101{0 1}?0??
20?????2??010000110012??????????521010223202200 1111{0 1}0100111211110???????????200100?
11001120010?10?01?????????00??0{0 1}??100?220300102?3101200?10{0 1}0111??2?11??00

Gronausaurus ???
??
????????01?12320?2001111?000?111001110000201 1101????1?????????????0?210???
01012102101021????0112?020000222 10?1???1?0????????1???00

Speeton_Clay_plesiosaurian ???
??
2????????????10101232012001111001001120111 1000?20?1111??1011?1??20??1??002?????
010121011011200??00102103001022?1021001100011101?11?????

Wapuskanectes_betsynichollsae ???
??
???????????????????????????????1??1??0??????????2101{0 1}2?110?1110110?10??3????????????
200???01???0300002 2????????????????03????
Futabasaurus_suzukii 00??000?1?0?00??0??00?0?2?
0000???????????????????0???1????????????????????????????????0110000??????????????
100??????0????{1 2}????100001100??????????????11?22?2022001111?010?
1111011100 0????????????????????????????01301?1??01?0?
1100200000220300102221122101100011101{1 2}10?????
Hydrotherosaurus_alexandrae 000010?0??0000201{1 2}100?002??0000?
0011000100111????2121?111??01??100010?1?
01??112???10?00110012???1?????15211102232022001 11?1010011100111000020 11?11?1001{0 1}
00001011200?020????1201110110 00100?000??12031010123102300110{0 1}01110121111?00
Libonectes_morgani 000010?0110000201020010020 00000?
00110001001110???21??111?00010?010?20201010?00100221100101?00?0?112?1200???2101000101?
2000?012000101001?0012???1?????16211102?320?2001111?01?01??????????????????????21011??????
11100?0?100?1???????????????00??00????????10??????200??01?1????????1???
Elasmosaurus_platyurus ????????????????
11??
1????????????????????0????????????????20????1?002???100???273111???320?2?0111???1?0?1??
011??0??2?1??00??1?11????????????????????
0???
Thalassomedon_hanintoni 0??01000?0???0??1000001?20??0?1?001?00010011????
0201??111???10???????2?0???????????????????????0??????????110100?0??0????0????1110???
0002?1?11?2?0262111022320020011113?1001122011??00??0???????0011?00110?12????
2100011201210010100000????0?12?32010?2210221011 0?0?1?01210?1100
Stixosaurus_snowii 000010???????200??00?0020??0???001?00?10?
11???????1??111????1??110?1??0??0??????????
10???0?3???????????311?1??320?2??1111??1?
011???
???????????
Tuarangisaurus_keyesi 000?10??1?0?002?1020010?20000?1?0??000011011???
0020???111????????0??102??????0?000211??0?0100000???2??200???121102?00?????????????110?
001000???????2?02?21110??320?200111?3?1?
0???
???????10??
Terminonatatot_ponteixensis 00?????0????02?1010??0?1????????01????1???
1?????2????1??????1???1100???1??0???01?1??{0
1}00??010?12??????????211???1320?2001111??1?011???????????1???
1????????????????????????2?12?????1?200??0???11?31??1?22113310110001110?????????

Albertonectes_vanderveldei ???
???2?1?
11?2?02721110?232022?011111?10011100???01?12?0???01?001??01????1??0?????0??12?11???00??
0002?0?0?12?21011?0211211?11?001?101210?01??

```
Morenosaurus_stocki               ????????????????????????????????????????????????????????
??????????????????????????????????????????????????????????????????????????????????????????
????????11?21320??????1???100112001???00?2?0??011?0011?1111??1100?021?002130110?21?01?
10??????12?32011?23122310110?01100?2?03???0

Vegasaurus_molyi                  ????????????????????????????????????????????????????????
????????????????????????????????????????????????????????????????????????????????????21??
11?0?0252111???3200200111??110011?00?1???0?2011?01?20011001110?110010210???120111111??1?
1???????1??32011?23122??????1????0???031011

kawanectes_lafquenianum           ????????????????????????????????????????????????????????
??????????????????????????????????????????????????????????????????????????????????????????
??????2111?2132002001111??1001??00?0??00?2001?011???1?001110?????????????12??010???01?
10??????2??32011?2?11?????1?1??1?0???03??10
        Aristonectes_quiriquinensis       ???????????????????????????????????????????0??
1???????????????????????????????????????????????????0??????????????3?
10?????????????????????????1????2????1111????????????????2?011???????????????0???0011?
00110?1??0??21????1???????????2?0??0?0??????0???2?1?111?1100??1?0?2??3????
        Aristonectes_parvidens            00?010??1?0000201??00200200000??00???{0 1}?11??
01010?3212?1?0000?00?1?01212010???????????????0?10000??????????????01030?0??1000???????
30000?1400?1101102?01?1?11???320?200111??02?0??????????????1?
001??????????????????????????????????????????????????????????????????????????????10??
        Kaiwhekea_katiki                  00001010??000???1020020020?000?????????11????0?
0?32?2111000?00????????????????????????????????????????????????010??10??1000??????
0300001140?2??????????40011121320?2?0111?10200?11111?10???2????0?????????
0?????????????????2??????????210??00??11?32?11??3?211101000001201??03????

;

END;
BEGIN NOTES;

        SUT   TAXA = Taxa TAXON = 77 NAME = color INTEGER = 11;
        SUT   TAXA = Taxa TAXON = 78 NAME = color INTEGER = 11;
        SUT   TAXA = Taxa TAXON = 79 NAME = color INTEGER = 11;
        SUT   TAXA = Taxa TAXON = 80 NAME = color INTEGER = 11;
        SUT   TAXA = Taxa TAXON = 81 NAME = color INTEGER = 11;
        SUT   TAXA = Taxa TAXON = 82 NAME = color INTEGER = 11;
        SUT   TAXA = Taxa TAXON = 83 NAME = color INTEGER = 11;
        SUT   TAXA = Taxa TAXON = 84 NAME = color INTEGER = 11;
        SUT   TAXA = Taxa TAXON = 85 NAME = color INTEGER = 11;
        SUT   TAXA = Taxa TAXON = 86 NAME = color INTEGER = 11;
        SUT   TAXA = Taxa TAXON = 87 NAME = color INTEGER = 11;
        SUT   TAXA = Taxa TAXON = 88 NAME = color INTEGER = 0;
        SUT   TAXA = Taxa TAXON = 89 NAME = color INTEGER = 0;

        SU  C = 1 N = color I = 2;
        SU  T = 79 C = 1 N = color I = 11;
        SU  T = 80 C = 1 N = color I = 11;
        SU  T = 81 C = 1 N = color I = 11;
        SU  T = 82 C = 1 N = color I = 11;
        SU  T = 84 C = 1 N = color I = 11;

        SU  T = 78 C = 2 N = color I = 11;
        SU  T = 79 C = 2 N = color I = 11;
        SU  T = 80 C = 2 N = color I = 11;
        SU  T = 81 C = 2 N = color I = 11;
        SU  T = 82 C = 2 N = color I = 11;
        SU  T = 84 C = 2 N = color I = 11;
```

```
SU  T = 79 C = 3 N = color I = 11;
SU  T = 80 C = 3 N = color I = 11;
SU  T = 81 C = 3 N = color I = 11;
SU  T = 82 C = 3 N = color I = 11;
SU  T = 84 C = 3 N = color I = 11;

SU  T = 79 C = 4 N = color I = 11;
SU  T = 80 C = 4 N = color I = 11;
SU  T = 81 C = 4 N = color I = 11;
SU  T = 82 C = 4 N = color I = 11;
SU  T = 84 C = 4 N = color I = 11;

SU  T = 79 C = 5 N = color I = 11;
SU  T = 80 C = 5 N = color I = 11;
SU  T = 81 C = 5 N = color I = 11;
SU  T = 82 C = 5 N = color I = 11;
SU  T = 84 C = 5 N = color I = 11;

SU  T = 79 C = 6 N = color I = 11;
SU  T = 80 C = 6 N = color I = 11;
SU  T = 81 C = 6 N = color I = 11;
SU  T = 82 C = 6 N = color I = 11;
SU  T = 84 C = 6 N = color I = 11;

SU  T = 79 C = 7 N = color I = 11;
SU  T = 80 C = 7 N = color I = 11;
SU  T = 81 C = 7 N = color I = 11;
SU  T = 82 C = 7 N = color I = 11;
SU  T = 84 C = 7 N = color I = 11;

SU  T = 79 C = 8 N = color I = 11;
SU  T = 80 C = 8 N = color I = 11;
SU  T = 81 C = 8 N = color I = 11;
SU  T = 82 C = 8 N = color I = 11;
SU  T = 84 C = 8 N = color I = 11;

SU  T = 79 C = 9 N = color I = 11;
SU  T = 80 C = 9 N = color I = 11;
SU  T = 81 C = 9 N = color I = 11;
SU  T = 82 C = 9 N = color I = 11;
SU  T = 84 C = 9 N = color I = 11;

SU  T = 79 C = 10 N = color I = 11;
SU  T = 80 C = 10 N = color I = 11;
SU  T = 81 C = 10 N = color I = 11;
SU  T = 82 C = 10 N = color I = 11;
SU  T = 84 C = 10 N = color I = 11;

SU  T = 79 C = 11 N = color I = 11;
SU  T = 80 C = 11 N = color I = 11;
SU  T = 81 C = 11 N = color I = 11;
SU  T = 82 C = 11 N = color I = 11;
SU  T = 84 C = 11 N = color I = 11;

SU  T = 79 C = 12 N = color I = 11;
SU  T = 80 C = 12 N = color I = 11;
SU  T = 81 C = 12 N = color I = 11;
SU  T = 82 C = 12 N = color I = 11;
SU  T = 84 C = 12 N = color I = 11;
```

```
SU  T = 79 C = 13 N = color I = 11;
SU  T = 80 C = 13 N = color I = 11;
SU  T = 81 C = 13 N = color I = 11;
SU  T = 82 C = 13 N = color I = 11;
SU  T = 84 C = 13 N = color I = 11;

SU  T = 79 C = 14 N = color I = 11;
SU  T = 80 C = 14 N = color I = 11;
SU  T = 81 C = 14 N = color I = 11;
SU  T = 82 C = 14 N = color I = 11;
SU  T = 84 C = 14 N = color I = 11;

SU  T = 79 C = 15 N = color I = 11;
SU  T = 80 C = 15 N = color I = 11;
SU  T = 81 C = 15 N = color I = 11;
SU  T = 82 C = 15 N = color I = 11;
SU  T = 84 C = 15 N = color I = 11;

SU  T = 79 C = 16 N = color I = 11;
SU  T = 80 C = 16 N = color I = 11;
SU  T = 81 C = 16 N = color I = 11;
SU  T = 82 C = 16 N = color I = 11;
SU  T = 84 C = 16 N = color I = 11;

SU  T = 79 C = 17 N = color I = 11;
SU  T = 80 C = 17 N = color I = 11;
SU  T = 81 C = 17 N = color I = 11;
SU  T = 82 C = 17 N = color I = 11;
SU  T = 84 C = 17 N = color I = 11;

SU  T = 79 C = 18 N = color I = 11;
SU  T = 80 C = 18 N = color I = 11;
SU  T = 81 C = 18 N = color I = 11;
SU  T = 82 C = 18 N = color I = 11;
SU  T = 84 C = 18 N = color I = 11;

SU  T = 79 C = 19 N = color I = 11;
SU  T = 80 C = 19 N = color I = 11;
SU  T = 81 C = 19 N = color I = 11;
SU  T = 82 C = 19 N = color I = 11;
SU  T = 84 C = 19 N = color I = 11;

SU  T = 79 C = 20 N = color I = 11;
SU  T = 80 C = 20 N = color I = 11;
SU  T = 81 C = 20 N = color I = 11;
SU  T = 82 C = 20 N = color I = 11;
SU  T = 84 C = 20 N = color I = 11;

SU  T = 79 C = 21 N = color I = 11;
SU  T = 80 C = 21 N = color I = 11;
SU  T = 81 C = 21 N = color I = 11;
SU  T = 82 C = 21 N = color I = 11;
SU  T = 84 C = 21 N = color I = 11;

SU  T = 78 C = 22 N = color I = 11;
SU  T = 79 C = 22 N = color I = 11;
SU  T = 80 C = 22 N = color I = 11;
SU  T = 81 C = 22 N = color I = 11;
SU  T = 82 C = 22 N = color I = 11;
```

```
SU  T = 84 C = 22 N = color I = 11;

SU  T = 79 C = 23 N = color I = 11;
SU  T = 80 C = 23 N = color I = 11;
SU  T = 81 C = 23 N = color I = 11;
SU  T = 82 C = 23 N = color I = 11;
SU  T = 84 C = 23 N = color I = 11;

SU  T = 79 C = 24 N = color I = 11;
SU  T = 80 C = 24 N = color I = 11;
SU  T = 81 C = 24 N = color I = 11;
SU  T = 82 C = 24 N = color I = 11;
SU  T = 84 C = 24 N = color I = 11;

SU  T = 79 C = 25 N = color I = 11;
SU  T = 80 C = 25 N = color I = 11;
SU  T = 81 C = 25 N = color I = 11;
SU  T = 82 C = 25 N = color I = 11;
SU  T = 84 C = 25 N = color I = 11;

SU  T = 79 C = 26 N = color I = 11;
SU  T = 80 C = 26 N = color I = 11;
SU  T = 81 C = 26 N = color I = 11;
SU  T = 82 C = 26 N = color I = 11;
SU  T = 84 C = 26 N = color I = 11;

SU  T = 79 C = 27 N = color I = 11;
SU  T = 80 C = 27 N = color I = 11;
SU  T = 81 C = 27 N = color I = 11;
SU  T = 82 C = 27 N = color I = 11;
SU  T = 84 C = 27 N = color I = 11;

SU  T = 79 C = 28 N = color I = 11;
SU  T = 80 C = 28 N = color I = 11;
SU  T = 81 C = 28 N = color I = 11;
SU  T = 82 C = 28 N = color I = 11;
SU  T = 84 C = 28 N = color I = 11;

SU  T = 79 C = 29 N = color I = 11;
SU  T = 80 C = 29 N = color I = 11;
SU  T = 81 C = 29 N = color I = 11;
SU  T = 82 C = 29 N = color I = 11;
SU  T = 84 C = 29 N = color I = 11;

SU  T = 79 C = 30 N = color I = 11;
SU  T = 80 C = 30 N = color I = 11;
SU  T = 81 C = 30 N = color I = 11;
SU  T = 82 C = 30 N = color I = 11;
SU  T = 84 C = 30 N = color I = 11;

SU  T = 79 C = 31 N = color I = 11;
SU  T = 80 C = 31 N = color I = 11;
SU  T = 81 C = 31 N = color I = 11;
SU  T = 82 C = 31 N = color I = 11;
SU  T = 84 C = 31 N = color I = 11;

SU  T = 79 C = 32 N = color I = 11;
SU  T = 80 C = 32 N = color I = 11;
SU  T = 81 C = 32 N = color I = 11;
SU  T = 82 C = 32 N = color I = 11;
```

```
SU  T = 84 C = 32 N = color I = 11;

SU  T = 47 C = 33 N = color I = 11;
SU  T = 79 C = 33 N = color I = 11;
SU  T = 80 C = 33 N = color I = 11;
SU  T = 81 C = 33 N = color I = 11;
SU  T = 82 C = 33 N = color I = 11;
SU  T = 84 C = 33 N = color I = 11;

SU  T = 79 C = 34 N = color I = 11;
SU  T = 80 C = 34 N = color I = 11;
SU  T = 81 C = 34 N = color I = 11;
SU  T = 82 C = 34 N = color I = 11;
SU  T = 84 C = 34 N = color I = 11;

SU  T = 79 C = 35 N = color I = 11;
SU  T = 80 C = 35 N = color I = 11;
SU  T = 81 C = 35 N = color I = 11;
SU  T = 82 C = 35 N = color I = 11;
SU  T = 84 C = 35 N = color I = 11;

SU  T = 79 C = 36 N = color I = 11;
SU  T = 80 C = 36 N = color I = 11;
SU  T = 81 C = 36 N = color I = 11;
SU  T = 82 C = 36 N = color I = 11;
SU  T = 84 C = 36 N = color I = 11;

SU  T = 79 C = 37 N = color I = 11;
SU  T = 80 C = 37 N = color I = 11;
SU  T = 81 C = 37 N = color I = 11;
SU  T = 82 C = 37 N = color I = 11;
SU  T = 84 C = 37 N = color I = 11;

SU  T = 79 C = 38 N = color I = 11;
SU  T = 80 C = 38 N = color I = 11;
SU  T = 81 C = 38 N = color I = 11;
SU  T = 82 C = 38 N = color I = 11;
SU  T = 84 C = 38 N = color I = 11;

SU  T = 79 C = 39 N = color I = 11;
SU  T = 80 C = 39 N = color I = 11;
SU  T = 81 C = 39 N = color I = 11;
SU  T = 82 C = 39 N = color I = 11;
SU  T = 84 C = 39 N = color I = 11;

SU  T = 79 C = 40 N = color I = 11;
SU  T = 80 C = 40 N = color I = 11;
SU  T = 81 C = 40 N = color I = 11;
SU  T = 82 C = 40 N = color I = 11;
SU  T = 84 C = 40 N = color I = 11;

SU  T = 79 C = 41 N = color I = 11;
SU  T = 80 C = 41 N = color I = 11;
SU  T = 81 C = 41 N = color I = 11;
SU  T = 82 C = 41 N = color I = 11;
SU  T = 84 C = 41 N = color I = 11;

SU  T = 79 C = 42 N = color I = 11;
SU  T = 80 C = 42 N = color I = 11;
SU  T = 81 C = 42 N = color I = 11;
```

```
SU  T = 82 C = 42 N = color I = 11;
SU  T = 84 C = 42 N = color I = 11;

SU  T = 79 C = 43 N = color I = 11;
SU  T = 80 C = 43 N = color I = 11;
SU  T = 81 C = 43 N = color I = 11;
SU  T = 82 C = 43 N = color I = 11;
SU  T = 84 C = 43 N = color I = 11;

SU  T = 79 C = 44 N = color I = 11;
SU  T = 80 C = 44 N = color I = 11;
SU  T = 81 C = 44 N = color I = 11;
SU  T = 82 C = 44 N = color I = 11;
SU  T = 84 C = 44 N = color I = 11;

SU  T = 79 C = 45 N = color I = 11;
SU  T = 80 C = 45 N = color I = 11;
SU  T = 81 C = 45 N = color I = 11;
SU  T = 82 C = 45 N = color I = 11;
SU  T = 83 C = 45 N = color I = 11;
SU  T = 84 C = 45 N = color I = 11;

SU  T = 79 C = 46 N = color I = 11;
SU  T = 80 C = 46 N = color I = 11;
SU  T = 81 C = 46 N = color I = 11;
SU  T = 82 C = 46 N = color I = 11;
SU  T = 83 C = 46 N = color I = 11;
SU  T = 84 C = 46 N = color I = 11;

SU  T = 79 C = 47 N = color I = 11;
SU  T = 80 C = 47 N = color I = 11;
SU  T = 81 C = 47 N = color I = 11;
SU  T = 82 C = 47 N = color I = 11;
SU  T = 83 C = 47 N = color I = 11;
SU  T = 84 C = 47 N = color I = 11;

SU  T = 79 C = 48 N = color I = 11;
SU  T = 80 C = 48 N = color I = 11;
SU  T = 81 C = 48 N = color I = 11;
SU  T = 82 C = 48 N = color I = 11;
SU  T = 84 C = 48 N = color I = 11;

SU  T = 79 C = 49 N = color I = 11;
SU  T = 80 C = 49 N = color I = 11;
SU  T = 81 C = 49 N = color I = 11;
SU  T = 82 C = 49 N = color I = 11;
SU  T = 84 C = 49 N = color I = 11;

SU  T = 79 C = 50 N = color I = 11;
SU  T = 80 C = 50 N = color I = 11;
SU  T = 81 C = 50 N = color I = 11;
SU  T = 82 C = 50 N = color I = 11;
SU  T = 84 C = 50 N = color I = 11;

SU  T = 79 C = 51 N = color I = 11;
SU  T = 80 C = 51 N = color I = 11;
SU  T = 81 C = 51 N = color I = 11;
SU  T = 82 C = 51 N = color I = 11;
SU  T = 84 C = 51 N = color I = 11;
```

```
SU  T = 79 C = 52 N = color I = 11;
SU  T = 80 C = 52 N = color I = 11;
SU  T = 81 C = 52 N = color I = 11;
SU  T = 82 C = 52 N = color I = 11;
SU  T = 84 C = 52 N = color I = 11;

SU  T = 79 C = 53 N = color I = 11;
SU  T = 80 C = 53 N = color I = 11;
SU  T = 81 C = 53 N = color I = 11;
SU  T = 82 C = 53 N = color I = 11;
SU  T = 84 C = 53 N = color I = 11;

SU  T = 79 C = 54 N = color I = 11;
SU  T = 80 C = 54 N = color I = 11;
SU  T = 81 C = 54 N = color I = 11;
SU  T = 82 C = 54 N = color I = 11;
SU  T = 84 C = 54 N = color I = 11;

SU  T = 79 C = 55 N = color I = 11;
SU  T = 80 C = 55 N = color I = 11;
SU  T = 81 C = 55 N = color I = 11;
SU  T = 82 C = 55 N = color I = 11;
SU  T = 84 C = 55 N = color I = 11;

SU  T = 79 C = 56 N = color I = 11;
SU  T = 80 C = 56 N = color I = 11;
SU  T = 81 C = 56 N = color I = 11;
SU  T = 82 C = 56 N = color I = 11;
SU  T = 84 C = 56 N = color I = 11;

SU  T = 79 C = 57 N = color I = 11;
SU  T = 80 C = 57 N = color I = 11;
SU  T = 81 C = 57 N = color I = 11;
SU  T = 82 C = 57 N = color I = 11;
SU  T = 84 C = 57 N = color I = 11;

SU  T = 79 C = 58 N = color I = 11;
SU  T = 80 C = 58 N = color I = 11;
SU  T = 81 C = 58 N = color I = 11;
SU  T = 82 C = 58 N = color I = 11;
SU  T = 84 C = 58 N = color I = 11;

SU  T = 79 C = 59 N = color I = 11;
SU  T = 80 C = 59 N = color I = 11;
SU  T = 81 C = 59 N = color I = 11;
SU  T = 82 C = 59 N = color I = 11;
SU  T = 84 C = 59 N = color I = 11;

SU  T = 79 C = 60 N = color I = 11;
SU  T = 80 C = 60 N = color I = 11;
SU  T = 81 C = 60 N = color I = 11;
SU  T = 82 C = 60 N = color I = 11;
SU  T = 84 C = 60 N = color I = 11;

SU  T = 79 C = 61 N = color I = 11;
SU  T = 80 C = 61 N = color I = 11;
SU  T = 81 C = 61 N = color I = 11;
SU  T = 82 C = 61 N = color I = 11;
SU  T = 84 C = 61 N = color I = 11;
```

```
SU  T = 79 C = 62 N = color I = 11;
SU  T = 80 C = 62 N = color I = 11;
SU  T = 81 C = 62 N = color I = 11;
SU  T = 82 C = 62 N = color I = 11;
SU  T = 84 C = 62 N = color I = 11;

SU  T = 79 C = 63 N = color I = 11;
SU  T = 80 C = 63 N = color I = 11;
SU  T = 81 C = 63 N = color I = 11;
SU  T = 82 C = 63 N = color I = 11;

SU  T = 79 C = 64 N = color I = 11;
SU  T = 80 C = 64 N = color I = 11;
SU  T = 81 C = 64 N = color I = 11;
SU  T = 82 C = 64 N = color I = 11;

SU  T = 79 C = 65 N = color I = 11;
SU  T = 80 C = 65 N = color I = 11;
SU  T = 81 C = 65 N = color I = 11;
SU  T = 82 C = 65 N = color I = 11;

SU  T = 79 C = 66 N = color I = 11;
SU  T = 80 C = 66 N = color I = 11;
SU  T = 81 C = 66 N = color I = 11;
SU  T = 82 C = 66 N = color I = 11;

SU  T = 79 C = 67 N = color I = 11;
SU  T = 80 C = 67 N = color I = 11;
SU  T = 81 C = 67 N = color I = 11;
SU  T = 82 C = 67 N = color I = 11;

SU  T = 79 C = 68 N = color I = 11;
SU  T = 80 C = 68 N = color I = 11;
SU  T = 81 C = 68 N = color I = 11;
SU  T = 82 C = 68 N = color I = 11;

SU  T = 79 C = 69 N = color I = 11;
SU  T = 80 C = 69 N = color I = 11;
SU  T = 81 C = 69 N = color I = 11;
SU  T = 82 C = 69 N = color I = 11;

SU  T = 79 C = 70 N = color I = 11;
SU  T = 80 C = 70 N = color I = 11;
SU  T = 81 C = 70 N = color I = 11;
SU  T = 82 C = 70 N = color I = 11;

SU  T = 79 C = 71 N = color I = 11;
SU  T = 80 C = 71 N = color I = 11;
SU  T = 81 C = 71 N = color I = 11;
SU  T = 82 C = 71 N = color I = 11;

SU  T = 79 C = 72 N = color I = 11;
SU  T = 80 C = 72 N = color I = 11;
SU  T = 81 C = 72 N = color I = 11;
SU  T = 82 C = 72 N = color I = 11;

SU  T = 79 C = 73 N = color I = 11;
SU  T = 80 C = 73 N = color I = 11;
SU  T = 81 C = 73 N = color I = 11;
SU  T = 82 C = 73 N = color I = 11;
```

```
SU  T = 79 C = 74 N = color I = 11;
SU  T = 80 C = 74 N = color I = 11;
SU  T = 81 C = 74 N = color I = 11;
SU  T = 82 C = 74 N = color I = 11;

SU  T = 79 C = 75 N = color I = 11;
SU  T = 80 C = 75 N = color I = 11;
SU  T = 81 C = 75 N = color I = 11;
SU  T = 82 C = 75 N = color I = 11;

SU  T = 79 C = 76 N = color I = 11;
SU  T = 80 C = 76 N = color I = 11;
SU  T = 81 C = 76 N = color I = 11;
SU  T = 82 C = 76 N = color I = 11;

SU  T = 79 C = 77 N = color I = 11;
SU  T = 80 C = 77 N = color I = 11;
SU  T = 81 C = 77 N = color I = 11;
SU  T = 82 C = 77 N = color I = 11;

SU  T = 79 C = 78 N = color I = 11;
SU  T = 80 C = 78 N = color I = 11;
SU  T = 81 C = 78 N = color I = 11;
SU  T = 82 C = 78 N = color I = 11;

SU  T = 79 C = 79 N = color I = 11;
SU  T = 80 C = 79 N = color I = 11;
SU  T = 81 C = 79 N = color I = 11;
SU  T = 82 C = 79 N = color I = 11;

SU  T = 79 C = 80 N = color I = 11;
SU  T = 80 C = 80 N = color I = 11;
SU  T = 81 C = 80 N = color I = 11;
SU  T = 82 C = 80 N = color I = 11;

SU  T = 79 C = 81 N = color I = 11;
SU  T = 80 C = 81 N = color I = 11;
SU  T = 81 C = 81 N = color I = 11;
SU  T = 82 C = 81 N = color I = 11;

SU  T = 79 C = 82 N = color I = 11;
SU  T = 80 C = 82 N = color I = 11;
SU  T = 81 C = 82 N = color I = 11;
SU  T = 82 C = 82 N = color I = 11;

SU  T = 79 C = 83 N = color I = 11;
SU  T = 80 C = 83 N = color I = 11;
SU  T = 81 C = 83 N = color I = 11;
SU  T = 82 C = 83 N = color I = 11;

SU  T = 79 C = 84 N = color I = 11;
SU  T = 80 C = 84 N = color I = 11;
SU  T = 81 C = 84 N = color I = 11;
SU  T = 82 C = 84 N = color I = 11;

SU  T = 79 C = 85 N = color I = 11;
SU  T = 80 C = 85 N = color I = 11;
SU  T = 81 C = 85 N = color I = 11;
SU  T = 82 C = 85 N = color I = 11;
```

```
SU  T = 79 C = 86 N = color I = 11;
SU  T = 80 C = 86 N = color I = 11;
SU  T = 81 C = 86 N = color I = 11;
SU  T = 82 C = 86 N = color I = 11;

SU  T = 79 C = 87 N = color I = 11;
SU  T = 80 C = 87 N = color I = 11;
SU  T = 81 C = 87 N = color I = 11;
SU  T = 82 C = 87 N = color I = 11;

SU  T = 79 C = 88 N = color I = 11;
SU  T = 80 C = 88 N = color I = 11;
SU  T = 81 C = 88 N = color I = 11;
SU  T = 82 C = 88 N = color I = 11;

SU  T = 79 C = 89 N = color I = 11;
SU  T = 80 C = 89 N = color I = 11;
SU  T = 81 C = 89 N = color I = 11;
SU  T = 82 C = 89 N = color I = 11;

SU  T = 79 C = 90 N = color I = 11;
SU  T = 80 C = 90 N = color I = 11;
SU  T = 81 C = 90 N = color I = 11;
SU  T = 82 C = 90 N = color I = 11;

SU  T = 79 C = 91 N = color I = 11;
SU  T = 80 C = 91 N = color I = 11;
SU  T = 81 C = 91 N = color I = 11;
SU  T = 82 C = 91 N = color I = 11;

SU  T = 79 C = 92 N = color I = 11;
SU  T = 80 C = 92 N = color I = 11;
SU  T = 81 C = 92 N = color I = 11;
SU  T = 82 C = 92 N = color I = 11;

SU  T = 79 C = 93 N = color I = 11;
SU  T = 80 C = 93 N = color I = 11;
SU  T = 81 C = 93 N = color I = 11;
SU  T = 82 C = 93 N = color I = 11;

SU  T = 79 C = 94 N = color I = 11;
SU  T = 80 C = 94 N = color I = 11;
SU  T = 81 C = 94 N = color I = 11;
SU  T = 82 C = 94 N = color I = 11;

SU  T = 79 C = 95 N = color I = 11;
SU  T = 80 C = 95 N = color I = 11;
SU  T = 81 C = 95 N = color I = 11;
SU  T = 82 C = 95 N = color I = 11;

SU  T = 79 C = 96 N = color I = 11;
SU  T = 80 C = 96 N = color I = 11;
SU  T = 81 C = 96 N = color I = 11;
SU  T = 82 C = 96 N = color I = 11;

SU  T = 79 C = 97 N = color I = 11;
SU  T = 80 C = 97 N = color I = 11;
SU  T = 81 C = 97 N = color I = 11;
SU  T = 82 C = 97 N = color I = 11;
```

```
SU  T = 79 C = 98 N = color I = 11;
SU  T = 80 C = 98 N = color I = 11;
SU  T = 81 C = 98 N = color I = 11;
SU  T = 82 C = 98 N = color I = 11;

SU  T = 79 C = 99 N = color I = 11;
SU  T = 80 C = 99 N = color I = 11;
SU  T = 81 C = 99 N = color I = 11;
SU  T = 82 C = 99 N = color I = 11;

SU  T = 79 C = 100 N = color I = 11;
SU  T = 80 C = 100 N = color I = 11;
SU  T = 81 C = 100 N = color I = 11;
SU  T = 82 C = 100 N = color I = 11;

SU  T = 79 C = 101 N = color I = 11;
SU  T = 80 C = 101 N = color I = 11;
SU  T = 81 C = 101 N = color I = 11;
SU  T = 82 C = 101 N = color I = 11;

SU  T = 79 C = 102 N = color I = 11;
SU  T = 80 C = 102 N = color I = 11;
SU  T = 81 C = 102 N = color I = 11;
SU  T = 82 C = 102 N = color I = 11;

SU  T = 79 C = 103 N = color I = 11;
SU  T = 80 C = 103 N = color I = 11;
SU  T = 81 C = 103 N = color I = 11;
SU  T = 82 C = 103 N = color I = 11;

SU  T = 79 C = 104 N = color I = 11;
SU  T = 80 C = 104 N = color I = 11;
SU  T = 81 C = 104 N = color I = 11;
SU  T = 82 C = 104 N = color I = 11;

SU  T = 79 C = 105 N = color I = 11;
SU  T = 80 C = 105 N = color I = 11;
SU  T = 81 C = 105 N = color I = 11;
SU  T = 82 C = 105 N = color I = 11;

SU  T = 79 C = 106 N = color I = 11;
SU  T = 80 C = 106 N = color I = 11;
SU  T = 81 C = 106 N = color I = 11;
SU  T = 82 C = 106 N = color I = 11;

SU  T = 79 C = 107 N = color I = 11;
SU  T = 80 C = 107 N = color I = 11;
SU  T = 81 C = 107 N = color I = 11;
SU  T = 82 C = 107 N = color I = 11;

SU  T = 79 C = 108 N = color I = 11;
SU  T = 80 C = 108 N = color I = 11;
SU  T = 81 C = 108 N = color I = 11;
SU  T = 82 C = 108 N = color I = 11;

SU  T = 79 C = 109 N = color I = 11;
SU  T = 80 C = 109 N = color I = 11;
SU  T = 81 C = 109 N = color I = 11;
SU  T = 82 C = 109 N = color I = 11;
```

```
SU  T = 79 C = 110 N = color I = 11;
SU  T = 80 C = 110 N = color I = 11;
SU  T = 81 C = 110 N = color I = 11;
SU  T = 82 C = 110 N = color I = 11;

SU  T = 79 C = 111 N = color I = 11;
SU  T = 80 C = 111 N = color I = 11;
SU  T = 81 C = 111 N = color I = 11;
SU  T = 82 C = 111 N = color I = 11;
SU  T = 84 C = 111 N = color I = 11;

SU  T = 79 C = 112 N = color I = 11;
SU  T = 80 C = 112 N = color I = 11;
SU  T = 81 C = 112 N = color I = 11;
SU  T = 82 C = 112 N = color I = 11;
SU  T = 84 C = 112 N = color I = 11;

SU  T = 79 C = 113 N = color I = 11;
SU  T = 80 C = 113 N = color I = 11;
SU  T = 81 C = 113 N = color I = 11;
SU  T = 82 C = 113 N = color I = 11;
SU  T = 84 C = 113 N = color I = 11;

SU  T = 79 C = 114 N = color I = 11;
SU  T = 80 C = 114 N = color I = 11;
SU  T = 81 C = 114 N = color I = 11;
SU  T = 82 C = 114 N = color I = 11;
SU  T = 84 C = 114 N = color I = 11;

SU  T = 79 C = 115 N = color I = 11;
SU  T = 80 C = 115 N = color I = 11;
SU  T = 81 C = 115 N = color I = 11;
SU  T = 82 C = 115 N = color I = 11;
SU  T = 84 C = 115 N = color I = 11;

SU  T = 79 C = 116 N = color I = 11;
SU  T = 80 C = 116 N = color I = 11;
SU  T = 81 C = 116 N = color I = 11;
SU  T = 82 C = 116 N = color I = 11;
SU  T = 84 C = 116 N = color I = 11;

SU  T = 79 C = 117 N = color I = 11;
SU  T = 80 C = 117 N = color I = 11;
SU  T = 81 C = 117 N = color I = 11;
SU  T = 82 C = 117 N = color I = 11;
SU  T = 84 C = 117 N = color I = 11;

SU  T = 79 C = 118 N = color I = 11;
SU  T = 80 C = 118 N = color I = 11;
SU  T = 81 C = 118 N = color I = 11;
SU  T = 82 C = 118 N = color I = 11;
SU  T = 84 C = 118 N = color I = 11;

SU  T = 79 C = 119 N = color I = 11;
SU  T = 80 C = 119 N = color I = 11;
SU  T = 81 C = 119 N = color I = 11;
SU  T = 82 C = 119 N = color I = 11;
SU  T = 84 C = 119 N = color I = 11;
```

```
SU  T = 79 C = 120 N = color I = 11;
SU  T = 80 C = 120 N = color I = 11;
SU  T = 81 C = 120 N = color I = 11;
SU  T = 82 C = 120 N = color I = 11;
SU  T = 84 C = 120 N = color I = 11;

SU  T = 79 C = 121 N = color I = 11;
SU  T = 80 C = 121 N = color I = 11;
SU  T = 81 C = 121 N = color I = 11;
SU  T = 82 C = 121 N = color I = 11;
SU  T = 84 C = 121 N = color I = 11;

SU  T = 79 C = 122 N = color I = 11;
SU  T = 80 C = 122 N = color I = 11;
SU  T = 81 C = 122 N = color I = 11;
SU  T = 82 C = 122 N = color I = 11;
SU  T = 84 C = 122 N = color I = 11;

SU  T = 79 C = 123 N = color I = 11;
SU  T = 80 C = 123 N = color I = 11;
SU  T = 81 C = 123 N = color I = 11;
SU  T = 82 C = 123 N = color I = 11;
SU  T = 84 C = 123 N = color I = 11;

SU  T = 79 C = 124 N = color I = 11;
SU  T = 80 C = 124 N = color I = 11;
SU  T = 81 C = 124 N = color I = 11;
SU  T = 82 C = 124 N = color I = 11;
SU  T = 84 C = 124 N = color I = 11;

SU  T = 79 C = 125 N = color I = 11;
SU  T = 80 C = 125 N = color I = 11;
SU  T = 81 C = 125 N = color I = 11;
SU  T = 82 C = 125 N = color I = 11;
SU  T = 84 C = 125 N = color I = 11;

SU  T = 79 C = 126 N = color I = 11;
SU  T = 80 C = 126 N = color I = 11;
SU  T = 81 C = 126 N = color I = 11;
SU  T = 82 C = 126 N = color I = 11;
SU  T = 84 C = 126 N = color I = 11;

SU  T = 79 C = 127 N = color I = 11;
SU  T = 80 C = 127 N = color I = 11;
SU  T = 81 C = 127 N = color I = 11;
SU  T = 82 C = 127 N = color I = 11;
SU  T = 84 C = 127 N = color I = 11;

SU  T = 79 C = 128 N = color I = 11;
SU  T = 80 C = 128 N = color I = 11;
SU  T = 81 C = 128 N = color I = 11;
SU  T = 82 C = 128 N = color I = 11;
SU  T = 84 C = 128 N = color I = 11;

SU  T = 79 C = 129 N = color I = 11;
SU  T = 80 C = 129 N = color I = 11;
SU  T = 81 C = 129 N = color I = 11;
SU  T = 82 C = 129 N = color I = 11;
SU  T = 84 C = 129 N = color I = 11;
```

```
SU  T = 79 C = 130 N = color I = 11;
SU  T = 80 C = 130 N = color I = 11;
SU  T = 81 C = 130 N = color I = 11;
SU  T = 82 C = 130 N = color I = 11;
SU  T = 84 C = 130 N = color I = 11;

SU  T = 79 C = 131 N = color I = 11;
SU  T = 80 C = 131 N = color I = 11;
SU  T = 81 C = 131 N = color I = 11;
SU  T = 82 C = 131 N = color I = 11;
SU  T = 84 C = 131 N = color I = 11;

SU  T = 79 C = 132 N = color I = 11;
SU  T = 80 C = 132 N = color I = 11;
SU  T = 81 C = 132 N = color I = 11;
SU  T = 82 C = 132 N = color I = 11;
SU  T = 84 C = 132 N = color I = 11;

SU  T = 79 C = 133 N = color I = 11;
SU  T = 80 C = 133 N = color I = 11;
SU  T = 81 C = 133 N = color I = 11;
SU  T = 82 C = 133 N = color I = 11;
SU  T = 84 C = 133 N = color I = 11;

SU  T = 79 C = 134 N = color I = 11;
SU  T = 80 C = 134 N = color I = 11;
SU  T = 81 C = 134 N = color I = 11;
SU  T = 82 C = 134 N = color I = 11;
SU  T = 84 C = 134 N = color I = 11;

SU  T = 79 C = 135 N = color I = 11;
SU  T = 80 C = 135 N = color I = 11;
SU  T = 81 C = 135 N = color I = 11;
SU  T = 82 C = 135 N = color I = 11;
SU  T = 84 C = 135 N = color I = 11;

SU  T = 79 C = 136 N = color I = 11;
SU  T = 80 C = 136 N = color I = 11;
SU  T = 81 C = 136 N = color I = 11;
SU  T = 82 C = 136 N = color I = 11;
SU  T = 84 C = 136 N = color I = 11;

SU  T = 79 C = 137 N = color I = 11;
SU  T = 80 C = 137 N = color I = 11;
SU  T = 81 C = 137 N = color I = 11;
SU  T = 82 C = 137 N = color I = 11;
SU  T = 84 C = 137 N = color I = 11;

SU  T = 79 C = 138 N = color I = 11;
SU  T = 80 C = 138 N = color I = 11;
SU  T = 81 C = 138 N = color I = 11;
SU  T = 82 C = 138 N = color I = 11;
SU  T = 84 C = 138 N = color I = 11;

SU  T = 79 C = 139 N = color I = 11;
SU  T = 80 C = 139 N = color I = 11;
SU  T = 81 C = 139 N = color I = 11;
SU  T = 82 C = 139 N = color I = 11;
SU  T = 84 C = 139 N = color I = 11;
```

```
SU  T = 79 C = 140 N = color I = 11;
SU  T = 80 C = 140 N = color I = 11;
SU  T = 81 C = 140 N = color I = 11;
SU  T = 82 C = 140 N = color I = 11;
SU  T = 84 C = 140 N = color I = 11;
SU  T = 88 C = 140 N = color I = 1;

SU  T = 79 C = 141 N = color I = 11;
SU  T = 80 C = 141 N = color I = 11;
SU  T = 81 C = 141 N = color I = 11;
SU  T = 82 C = 141 N = color I = 11;
SU  T = 83 C = 141 N = color I = 11;
SU  T = 84 C = 141 N = color I = 11;
SU  T = 87 C = 141 N = color I = 11;
SU  T = 88 C = 141 N = color I = 11;

SU  T = 79 C = 142 N = color I = 11;
SU  T = 80 C = 142 N = color I = 11;
SU  T = 81 C = 142 N = color I = 11;
SU  T = 82 C = 142 N = color I = 11;
SU  T = 83 C = 142 N = color I = 11;
SU  T = 84 C = 142 N = color I = 11;
SU  T = 87 C = 142 N = color I = 11;
SU  T = 88 C = 142 N = color I = 11;

SU  T = 79 C = 143 N = color I = 11;
SU  T = 80 C = 143 N = color I = 11;
SU  T = 81 C = 143 N = color I = 11;
SU  T = 82 C = 143 N = color I = 11;
SU  T = 83 C = 143 N = color I = 11;
SU  T = 84 C = 143 N = color I = 11;
SU  T = 87 C = 143 N = color I = 11;
SU  T = 88 C = 143 N = color I = 11;

SU  T = 79 C = 144 N = color I = 11;
SU  T = 80 C = 144 N = color I = 11;
SU  T = 81 C = 144 N = color I = 11;
SU  T = 82 C = 144 N = color I = 11;
SU  T = 83 C = 144 N = color I = 11;
SU  T = 84 C = 144 N = color I = 11;
SU  T = 87 C = 144 N = color I = 11;
SU  T = 88 C = 144 N = color I = 11;

SU  T = 79 C = 145 N = color I = 11;
SU  T = 80 C = 145 N = color I = 11;
SU  T = 81 C = 145 N = color I = 11;
SU  T = 82 C = 145 N = color I = 11;
SU  T = 83 C = 145 N = color I = 11;
SU  T = 84 C = 145 N = color I = 11;
SU  T = 87 C = 145 N = color I = 11;
SU  T = 88 C = 145 N = color I = 11;

SU  T = 79 C = 146 N = color I = 11;
SU  T = 80 C = 146 N = color I = 11;
SU  T = 81 C = 146 N = color I = 11;
SU  T = 82 C = 146 N = color I = 11;
SU  T = 83 C = 146 N = color I = 11;
SU  T = 84 C = 146 N = color I = 11;
SU  T = 87 C = 146 N = color I = 11;
SU  T = 88 C = 146 N = color I = 11;
```

```
SU  T = 79 C = 147 N = color I = 11;
SU  T = 80 C = 147 N = color I = 11;
SU  T = 81 C = 147 N = color I = 11;
SU  T = 82 C = 147 N = color I = 11;
SU  T = 83 C = 147 N = color I = 11;
SU  T = 84 C = 147 N = color I = 11;
SU  T = 87 C = 147 N = color I = 11;
SU  T = 88 C = 147 N = color I = 11;

SU  T = 79 C = 148 N = color I = 11;
SU  T = 80 C = 148 N = color I = 11;
SU  T = 81 C = 148 N = color I = 11;
SU  T = 82 C = 148 N = color I = 11;
SU  T = 83 C = 148 N = color I = 11;
SU  T = 84 C = 148 N = color I = 11;
SU  T = 87 C = 148 N = color I = 11;
SU  T = 88 C = 148 N = color I = 11;

SU  T = 79 C = 149 N = color I = 11;
SU  T = 80 C = 149 N = color I = 11;
SU  T = 81 C = 149 N = color I = 11;
SU  T = 82 C = 149 N = color I = 11;
SU  T = 83 C = 149 N = color I = 11;
SU  T = 84 C = 149 N = color I = 11;
SU  T = 87 C = 149 N = color I = 11;
SU  T = 88 C = 149 N = color I = 11;

SU  T = 79 C = 150 N = color I = 11;
SU  T = 80 C = 150 N = color I = 11;
SU  T = 81 C = 150 N = color I = 11;
SU  T = 82 C = 150 N = color I = 11;
SU  T = 83 C = 150 N = color I = 11;
SU  T = 84 C = 150 N = color I = 11;
SU  T = 87 C = 150 N = color I = 11;
SU  T = 88 C = 150 N = color I = 11;

SU  T = 79 C = 151 N = color I = 11;
SU  T = 80 C = 151 N = color I = 11;
SU  T = 81 C = 151 N = color I = 11;
SU  T = 82 C = 151 N = color I = 11;
SU  T = 83 C = 151 N = color I = 11;
SU  T = 84 C = 151 N = color I = 11;
SU  T = 87 C = 151 N = color I = 11;
SU  T = 88 C = 151 N = color I = 11;

SU  T = 79 C = 152 N = color I = 11;
SU  T = 80 C = 152 N = color I = 11;
SU  T = 81 C = 152 N = color I = 11;
SU  T = 82 C = 152 N = color I = 11;
SU  T = 83 C = 152 N = color I = 11;
SU  T = 84 C = 152 N = color I = 11;
SU  T = 87 C = 152 N = color I = 11;
SU  T = 88 C = 152 N = color I = 11;

SU  T = 79 C = 153 N = color I = 11;
SU  T = 80 C = 153 N = color I = 11;
SU  T = 81 C = 153 N = color I = 11;
SU  T = 82 C = 153 N = color I = 11;
SU  T = 83 C = 153 N = color I = 11;
```

```
SU  T = 84 C = 153 N = color I = 11;
SU  T = 87 C = 153 N = color I = 11;
SU  T = 88 C = 153 N = color I = 11;

SU  T = 79 C = 154 N = color I = 11;
SU  T = 80 C = 154 N = color I = 11;
SU  T = 81 C = 154 N = color I = 11;
SU  T = 82 C = 154 N = color I = 11;
SU  T = 83 C = 154 N = color I = 11;
SU  T = 84 C = 154 N = color I = 11;
SU  T = 87 C = 154 N = color I = 11;
SU  T = 88 C = 154 N = color I = 11;

SU  T = 79 C = 155 N = color I = 11;
SU  T = 80 C = 155 N = color I = 11;
SU  T = 81 C = 155 N = color I = 11;
SU  T = 82 C = 155 N = color I = 11;
SU  T = 83 C = 155 N = color I = 11;
SU  T = 84 C = 155 N = color I = 11;
SU  T = 87 C = 155 N = color I = 11;
SU  T = 88 C = 155 N = color I = 11;

SU  T = 79 C = 156 N = color I = 11;
SU  T = 80 C = 156 N = color I = 11;
SU  T = 81 C = 156 N = color I = 11;
SU  T = 82 C = 156 N = color I = 11;
SU  T = 83 C = 156 N = color I = 11;
SU  T = 84 C = 156 N = color I = 11;
SU  T = 87 C = 156 N = color I = 11;
SU  T = 88 C = 156 N = color I = 11;

SU  T = 79 C = 157 N = color I = 11;
SU  T = 80 C = 157 N = color I = 11;
SU  T = 81 C = 157 N = color I = 11;
SU  T = 82 C = 157 N = color I = 11;
SU  T = 83 C = 157 N = color I = 11;
SU  T = 84 C = 157 N = color I = 11;
SU  T = 87 C = 157 N = color I = 11;
SU  T = 88 C = 157 N = color I = 11;

SU  T = 79 C = 158 N = color I = 11;
SU  T = 80 C = 158 N = color I = 11;
SU  T = 81 C = 158 N = color I = 11;
SU  T = 82 C = 158 N = color I = 11;
SU  T = 83 C = 158 N = color I = 11;
SU  T = 84 C = 158 N = color I = 11;
SU  T = 87 C = 158 N = color I = 11;
SU  T = 88 C = 158 N = color I = 11;

SU  T = 79 C = 159 N = color I = 11;
SU  T = 80 C = 159 N = color I = 11;
SU  T = 81 C = 159 N = color I = 11;
SU  T = 82 C = 159 N = color I = 11;
SU  T = 83 C = 159 N = color I = 11;
SU  T = 84 C = 159 N = color I = 11;
SU  T = 87 C = 159 N = color I = 11;
SU  T = 88 C = 159 N = color I = 11;

SU  T = 79 C = 160 N = color I = 11;
SU  T = 80 C = 160 N = color I = 11;
```

```
SU  T = 81 C = 160 N = color I = 11;
SU  T = 82 C = 160 N = color I = 11;
SU  T = 83 C = 160 N = color I = 11;
SU  T = 84 C = 160 N = color I = 11;
SU  T = 86 C = 160 N = color I = 11;
SU  T = 87 C = 160 N = color I = 11;
SU  T = 88 C = 160 N = color I = 11;

SU  T = 79 C = 161 N = color I = 11;
SU  T = 80 C = 161 N = color I = 11;
SU  T = 81 C = 161 N = color I = 11;
SU  T = 82 C = 161 N = color I = 11;
SU  T = 83 C = 161 N = color I = 11;
SU  T = 84 C = 161 N = color I = 11;
SU  T = 86 C = 161 N = color I = 11;
SU  T = 87 C = 161 N = color I = 11;
SU  T = 88 C = 161 N = color I = 11;

SU  T = 79 C = 162 N = color I = 11;
SU  T = 80 C = 162 N = color I = 11;
SU  T = 81 C = 162 N = color I = 11;
SU  T = 82 C = 162 N = color I = 11;
SU  T = 83 C = 162 N = color I = 11;
SU  T = 84 C = 162 N = color I = 11;
SU  T = 86 C = 162 N = color I = 11;
SU  T = 87 C = 162 N = color I = 11;
SU  T = 88 C = 162 N = color I = 11;

SU  T = 79 C = 163 N = color I = 11;
SU  T = 80 C = 163 N = color I = 11;
SU  T = 81 C = 163 N = color I = 11;
SU  T = 82 C = 163 N = color I = 11;
SU  T = 83 C = 163 N = color I = 11;
SU  T = 84 C = 163 N = color I = 11;
SU  T = 86 C = 163 N = color I = 11;
SU  T = 87 C = 163 N = color I = 11;
SU  T = 88 C = 163 N = color I = 11;

SU  T = 79 C = 164 N = color I = 11;
SU  T = 80 C = 164 N = color I = 11;
SU  T = 81 C = 164 N = color I = 11;
SU  T = 82 C = 164 N = color I = 11;
SU  T = 83 C = 164 N = color I = 11;
SU  T = 84 C = 164 N = color I = 11;
SU  T = 86 C = 164 N = color I = 11;
SU  T = 87 C = 164 N = color I = 11;
SU  T = 88 C = 164 N = color I = 11;

SU  T = 79 C = 165 N = color I = 11;
SU  T = 80 C = 165 N = color I = 11;
SU  T = 81 C = 165 N = color I = 11;
SU  T = 82 C = 165 N = color I = 11;
SU  T = 83 C = 165 N = color I = 11;
SU  T = 84 C = 165 N = color I = 11;
SU  T = 86 C = 165 N = color I = 11;
SU  T = 87 C = 165 N = color I = 11;
SU  T = 88 C = 165 N = color I = 11;

SU  T = 79 C = 166 N = color I = 11;
SU  T = 80 C = 166 N = color I = 11;
```

```
SU  T = 81 C = 166 N = color I = 11;
SU  T = 82 C = 166 N = color I = 11;
SU  T = 83 C = 166 N = color I = 11;
SU  T = 84 C = 166 N = color I = 11;
SU  T = 86 C = 166 N = color I = 11;
SU  T = 87 C = 166 N = color I = 11;
SU  T = 88 C = 166 N = color I = 11;

SU  T = 79 C = 167 N = color I = 11;
SU  T = 80 C = 167 N = color I = 11;
SU  T = 81 C = 167 N = color I = 11;
SU  T = 82 C = 167 N = color I = 11;
SU  T = 83 C = 167 N = color I = 11;
SU  T = 84 C = 167 N = color I = 11;
SU  T = 86 C = 167 N = color I = 11;
SU  T = 87 C = 167 N = color I = 11;
SU  T = 88 C = 167 N = color I = 11;

SU  T = 79 C = 168 N = color I = 11;
SU  T = 80 C = 168 N = color I = 11;
SU  T = 81 C = 168 N = color I = 11;
SU  T = 82 C = 168 N = color I = 11;
SU  T = 83 C = 168 N = color I = 11;
SU  T = 84 C = 168 N = color I = 11;
SU  T = 86 C = 168 N = color I = 11;
SU  T = 87 C = 168 N = color I = 11;
SU  T = 88 C = 168 N = color I = 11;

SU  T = 79 C = 169 N = color I = 11;
SU  T = 80 C = 169 N = color I = 11;
SU  T = 81 C = 169 N = color I = 11;
SU  T = 82 C = 169 N = color I = 11;
SU  T = 83 C = 169 N = color I = 11;
SU  T = 84 C = 169 N = color I = 11;
SU  T = 86 C = 169 N = color I = 11;
SU  T = 87 C = 169 N = color I = 11;
SU  T = 88 C = 169 N = color I = 11;

SU  T = 79 C = 170 N = color I = 11;
SU  T = 80 C = 170 N = color I = 11;
SU  T = 81 C = 170 N = color I = 11;
SU  T = 82 C = 170 N = color I = 11;
SU  T = 83 C = 170 N = color I = 11;
SU  T = 84 C = 170 N = color I = 11;
SU  T = 86 C = 170 N = color I = 11;
SU  T = 87 C = 170 N = color I = 11;
SU  T = 88 C = 170 N = color I = 11;

SU  T = 79 C = 171 N = color I = 11;
SU  T = 80 C = 171 N = color I = 11;
SU  T = 81 C = 171 N = color I = 11;
SU  T = 82 C = 171 N = color I = 11;
SU  T = 83 C = 171 N = color I = 11;
SU  T = 84 C = 171 N = color I = 11;
SU  T = 86 C = 171 N = color I = 11;
SU  T = 87 C = 171 N = color I = 11;
SU  T = 88 C = 171 N = color I = 11;

SU  T = 79 C = 172 N = color I = 11;
SU  T = 80 C = 172 N = color I = 11;
```

```
SU  T = 81 C = 172 N = color I = 11;
SU  T = 82 C = 172 N = color I = 11;
SU  T = 83 C = 172 N = color I = 11;
SU  T = 84 C = 172 N = color I = 11;
SU  T = 86 C = 172 N = color I = 11;
SU  T = 87 C = 172 N = color I = 11;
SU  T = 88 C = 172 N = color I = 11;

SU  T = 79 C = 173 N = color I = 11;
SU  T = 80 C = 173 N = color I = 11;
SU  T = 81 C = 173 N = color I = 11;
SU  T = 82 C = 173 N = color I = 11;
SU  T = 83 C = 173 N = color I = 11;
SU  T = 84 C = 173 N = color I = 11;
SU  T = 86 C = 173 N = color I = 11;
SU  T = 87 C = 173 N = color I = 11;
SU  T = 88 C = 173 N = color I = 11;

SU  T = 79 C = 174 N = color I = 11;
SU  T = 80 C = 174 N = color I = 11;
SU  T = 81 C = 174 N = color I = 11;
SU  T = 82 C = 174 N = color I = 11;
SU  T = 83 C = 174 N = color I = 11;
SU  T = 84 C = 174 N = color I = 11;
SU  T = 86 C = 174 N = color I = 11;
SU  T = 87 C = 174 N = color I = 11;
SU  T = 88 C = 174 N = color I = 11;

SU  T = 79 C = 175 N = color I = 11;
SU  T = 80 C = 175 N = color I = 11;
SU  T = 81 C = 175 N = color I = 11;
SU  T = 82 C = 175 N = color I = 11;
SU  T = 83 C = 175 N = color I = 11;
SU  T = 84 C = 175 N = color I = 11;
SU  T = 86 C = 175 N = color I = 11;
SU  T = 87 C = 175 N = color I = 11;
SU  T = 88 C = 175 N = color I = 11;

SU  T = 79 C = 176 N = color I = 11;
SU  T = 80 C = 176 N = color I = 11;
SU  T = 81 C = 176 N = color I = 11;
SU  T = 82 C = 176 N = color I = 11;
SU  T = 83 C = 176 N = color I = 11;
SU  T = 84 C = 176 N = color I = 11;
SU  T = 86 C = 176 N = color I = 11;
SU  T = 87 C = 176 N = color I = 11;
SU  T = 88 C = 176 N = color I = 11;

SU  T = 79 C = 177 N = color I = 11;
SU  T = 80 C = 177 N = color I = 11;
SU  T = 81 C = 177 N = color I = 11;
SU  T = 82 C = 177 N = color I = 11;
SU  T = 83 C = 177 N = color I = 11;
SU  T = 84 C = 177 N = color I = 11;
SU  T = 86 C = 177 N = color I = 11;
SU  T = 87 C = 177 N = color I = 11;
SU  T = 88 C = 177 N = color I = 11;

SU  T = 79 C = 178 N = color I = 11;
SU  T = 80 C = 178 N = color I = 11;
```

```
SU  T = 81 C = 178 N = color I = 11;
SU  T = 82 C = 178 N = color I = 11;
SU  T = 83 C = 178 N = color I = 11;
SU  T = 84 C = 178 N = color I = 11;
SU  T = 86 C = 178 N = color I = 11;
SU  T = 87 C = 178 N = color I = 11;
SU  T = 88 C = 178 N = color I = 11;

SU  T = 79 C = 179 N = color I = 11;
SU  T = 80 C = 179 N = color I = 11;
SU  T = 81 C = 179 N = color I = 11;
SU  T = 82 C = 179 N = color I = 11;
SU  T = 83 C = 179 N = color I = 11;
SU  T = 84 C = 179 N = color I = 11;
SU  T = 86 C = 179 N = color I = 11;
SU  T = 87 C = 179 N = color I = 11;
SU  T = 88 C = 179 N = color I = 11;

SU  T = 79 C = 180 N = color I = 11;
SU  T = 80 C = 180 N = color I = 11;
SU  T = 81 C = 180 N = color I = 11;
SU  T = 82 C = 180 N = color I = 11;
SU  T = 83 C = 180 N = color I = 11;
SU  T = 84 C = 180 N = color I = 11;
SU  T = 86 C = 180 N = color I = 11;
SU  T = 87 C = 180 N = color I = 11;
SU  T = 88 C = 180 N = color I = 11;

SU  T = 79 C = 181 N = color I = 11;
SU  T = 80 C = 181 N = color I = 11;
SU  T = 81 C = 181 N = color I = 11;
SU  T = 82 C = 181 N = color I = 11;
SU  T = 83 C = 181 N = color I = 11;
SU  T = 84 C = 181 N = color I = 11;
SU  T = 86 C = 181 N = color I = 11;
SU  T = 87 C = 181 N = color I = 11;
SU  T = 88 C = 181 N = color I = 11;

SU  T = 79 C = 182 N = color I = 11;
SU  T = 80 C = 182 N = color I = 11;
SU  T = 81 C = 182 N = color I = 11;
SU  T = 82 C = 182 N = color I = 11;
SU  T = 83 C = 182 N = color I = 11;
SU  T = 84 C = 182 N = color I = 11;
SU  T = 86 C = 182 N = color I = 11;
SU  T = 87 C = 182 N = color I = 11;
SU  T = 88 C = 182 N = color I = 11;

SU  T = 79 C = 183 N = color I = 11;
SU  T = 80 C = 183 N = color I = 11;
SU  T = 81 C = 183 N = color I = 11;
SU  T = 82 C = 183 N = color I = 11;
SU  T = 83 C = 183 N = color I = 11;
SU  T = 84 C = 183 N = color I = 11;
SU  T = 86 C = 183 N = color I = 11;
SU  T = 87 C = 183 N = color I = 11;
SU  T = 88 C = 183 N = color I = 11;

SU  T = 79 C = 184 N = color I = 11;
SU  T = 80 C = 184 N = color I = 11;
```

```
SU  T = 81 C = 184 N = color I = 11;
SU  T = 82 C = 184 N = color I = 11;
SU  T = 83 C = 184 N = color I = 11;
SU  T = 84 C = 184 N = color I = 11;
SU  T = 86 C = 184 N = color I = 11;
SU  T = 87 C = 184 N = color I = 11;
SU  T = 88 C = 184 N = color I = 11;

SU  T = 79 C = 185 N = color I = 11;
SU  T = 80 C = 185 N = color I = 11;
SU  T = 81 C = 185 N = color I = 11;
SU  T = 82 C = 185 N = color I = 11;
SU  T = 83 C = 185 N = color I = 11;
SU  T = 84 C = 185 N = color I = 11;
SU  T = 86 C = 185 N = color I = 11;
SU  T = 87 C = 185 N = color I = 11;
SU  T = 88 C = 185 N = color I = 11;

SU  T = 79 C = 186 N = color I = 11;
SU  T = 80 C = 186 N = color I = 11;
SU  T = 81 C = 186 N = color I = 11;
SU  T = 82 C = 186 N = color I = 11;
SU  T = 83 C = 186 N = color I = 11;
SU  T = 84 C = 186 N = color I = 11;
SU  T = 86 C = 186 N = color I = 11;
SU  T = 87 C = 186 N = color I = 11;
SU  T = 88 C = 186 N = color I = 11;

SU  T = 79 C = 187 N = color I = 11;
SU  T = 80 C = 187 N = color I = 11;
SU  T = 81 C = 187 N = color I = 11;
SU  T = 82 C = 187 N = color I = 11;
SU  T = 83 C = 187 N = color I = 11;
SU  T = 84 C = 187 N = color I = 11;
SU  T = 86 C = 187 N = color I = 11;
SU  T = 87 C = 187 N = color I = 11;
SU  T = 88 C = 187 N = color I = 11;

SU  T = 79 C = 188 N = color I = 11;
SU  T = 80 C = 188 N = color I = 11;
SU  T = 81 C = 188 N = color I = 11;
SU  T = 82 C = 188 N = color I = 11;
SU  T = 83 C = 188 N = color I = 11;
SU  T = 84 C = 188 N = color I = 11;
SU  T = 86 C = 188 N = color I = 11;
SU  T = 87 C = 188 N = color I = 11;
SU  T = 88 C = 188 N = color I = 11;

SU  T = 79 C = 189 N = color I = 11;
SU  T = 80 C = 189 N = color I = 11;
SU  T = 81 C = 189 N = color I = 11;
SU  T = 82 C = 189 N = color I = 11;
SU  T = 83 C = 189 N = color I = 11;
SU  T = 84 C = 189 N = color I = 11;
SU  T = 86 C = 189 N = color I = 11;
SU  T = 87 C = 189 N = color I = 11;
SU  T = 88 C = 189 N = color I = 11;

SU  T = 79 C = 190 N = color I = 11;
SU  T = 80 C = 190 N = color I = 11;
```

```
SU  T = 81 C = 190 N = color I = 11;
SU  T = 82 C = 190 N = color I = 11;
SU  T = 83 C = 190 N = color I = 11;
SU  T = 84 C = 190 N = color I = 11;
SU  T = 86 C = 190 N = color I = 11;
SU  T = 87 C = 190 N = color I = 11;
SU  T = 88 C = 190 N = color I = 11;

SU  T = 79 C = 191 N = color I = 11;
SU  T = 80 C = 191 N = color I = 11;
SU  T = 81 C = 191 N = color I = 11;
SU  T = 82 C = 191 N = color I = 11;
SU  T = 83 C = 191 N = color I = 11;
SU  T = 84 C = 191 N = color I = 11;
SU  T = 86 C = 191 N = color I = 11;
SU  T = 87 C = 191 N = color I = 11;
SU  T = 88 C = 191 N = color I = 11;

SU  T = 79 C = 192 N = color I = 11;
SU  T = 80 C = 192 N = color I = 11;
SU  T = 81 C = 192 N = color I = 11;
SU  T = 82 C = 192 N = color I = 11;
SU  T = 83 C = 192 N = color I = 11;
SU  T = 84 C = 192 N = color I = 11;
SU  T = 86 C = 192 N = color I = 11;
SU  T = 87 C = 192 N = color I = 11;
SU  T = 88 C = 192 N = color I = 11;

SU  T = 79 C = 193 N = color I = 11;
SU  T = 80 C = 193 N = color I = 11;
SU  T = 81 C = 193 N = color I = 11;
SU  T = 82 C = 193 N = color I = 11;
SU  T = 83 C = 193 N = color I = 11;
SU  T = 84 C = 193 N = color I = 11;
SU  T = 86 C = 193 N = color I = 11;
SU  T = 87 C = 193 N = color I = 11;
SU  T = 88 C = 193 N = color I = 11;

SU  T = 79 C = 194 N = color I = 11;
SU  T = 80 C = 194 N = color I = 11;
SU  T = 81 C = 194 N = color I = 11;
SU  T = 82 C = 194 N = color I = 11;
SU  T = 83 C = 194 N = color I = 11;
SU  T = 84 C = 194 N = color I = 11;
SU  T = 86 C = 194 N = color I = 11;
SU  T = 87 C = 194 N = color I = 11;
SU  T = 88 C = 194 N = color I = 11;

SU  T = 79 C = 195 N = color I = 11;
SU  T = 80 C = 195 N = color I = 11;
SU  T = 81 C = 195 N = color I = 11;
SU  T = 82 C = 195 N = color I = 11;
SU  T = 83 C = 195 N = color I = 11;
SU  T = 85 C = 195 N = color I = 11;
SU  T = 86 C = 195 N = color I = 11;
SU  T = 87 C = 195 N = color I = 11;
SU  T = 88 C = 195 N = color I = 11;

SU  T = 79 C = 196 N = color I = 11;
SU  T = 80 C = 196 N = color I = 11;
```

```
SU  T = 81 C = 196 N = color I = 11;
SU  T = 82 C = 196 N = color I = 11;
SU  T = 83 C = 196 N = color I = 11;
SU  T = 86 C = 196 N = color I = 11;
SU  T = 87 C = 196 N = color I = 11;
SU  T = 88 C = 196 N = color I = 11;

SU  T = 79 C = 197 N = color I = 11;
SU  T = 80 C = 197 N = color I = 11;
SU  T = 81 C = 197 N = color I = 11;
SU  T = 82 C = 197 N = color I = 11;
SU  T = 83 C = 197 N = color I = 11;
SU  T = 86 C = 197 N = color I = 11;
SU  T = 87 C = 197 N = color I = 11;
SU  T = 88 C = 197 N = color I = 11;

SU  T = 79 C = 198 N = color I = 11;
SU  T = 80 C = 198 N = color I = 11;
SU  T = 81 C = 198 N = color I = 11;
SU  T = 82 C = 198 N = color I = 11;
SU  T = 83 C = 198 N = color I = 11;
SU  T = 86 C = 198 N = color I = 11;
SU  T = 87 C = 198 N = color I = 11;
SU  T = 88 C = 198 N = color I = 11;

SU  T = 79 C = 199 N = color I = 11;
SU  T = 80 C = 199 N = color I = 11;
SU  T = 81 C = 199 N = color I = 11;
SU  T = 82 C = 199 N = color I = 11;
SU  T = 83 C = 199 N = color I = 11;
SU  T = 86 C = 199 N = color I = 11;
SU  T = 87 C = 199 N = color I = 11;
SU  T = 88 C = 199 N = color I = 11;

SU  T = 79 C = 200 N = color I = 11;
SU  T = 80 C = 200 N = color I = 11;
SU  T = 81 C = 200 N = color I = 11;
SU  T = 82 C = 200 N = color I = 11;
SU  T = 83 C = 200 N = color I = 11;
SU  T = 86 C = 200 N = color I = 11;
SU  T = 87 C = 200 N = color I = 11;
SU  T = 88 C = 200 N = color I = 11;

SU  T = 79 C = 201 N = color I = 11;
SU  T = 80 C = 201 N = color I = 11;
SU  T = 81 C = 201 N = color I = 11;
SU  T = 82 C = 201 N = color I = 11;
SU  T = 83 C = 201 N = color I = 11;
SU  T = 86 C = 201 N = color I = 11;
SU  T = 87 C = 201 N = color I = 11;
SU  T = 88 C = 201 N = color I = 11;

SU  T = 79 C = 202 N = color I = 11;
SU  T = 80 C = 202 N = color I = 11;
SU  T = 81 C = 202 N = color I = 11;
SU  T = 82 C = 202 N = color I = 11;
SU  T = 83 C = 202 N = color I = 11;
SU  T = 86 C = 202 N = color I = 11;
SU  T = 87 C = 202 N = color I = 11;
SU  T = 88 C = 202 N = color I = 11;
```

```
SU  T = 79 C = 203 N = color I = 11;
SU  T = 80 C = 203 N = color I = 11;
SU  T = 81 C = 203 N = color I = 11;
SU  T = 82 C = 203 N = color I = 11;
SU  T = 83 C = 203 N = color I = 11;
SU  T = 86 C = 203 N = color I = 11;
SU  T = 87 C = 203 N = color I = 11;
SU  T = 88 C = 203 N = color I = 11;

SU  T = 79 C = 204 N = color I = 11;
SU  T = 80 C = 204 N = color I = 11;
SU  T = 81 C = 204 N = color I = 11;
SU  T = 82 C = 204 N = color I = 11;
SU  T = 83 C = 204 N = color I = 11;
SU  T = 86 C = 204 N = color I = 11;
SU  T = 87 C = 204 N = color I = 11;
SU  T = 88 C = 204 N = color I = 11;

SU  T = 79 C = 205 N = color I = 11;
SU  T = 80 C = 205 N = color I = 11;
SU  T = 81 C = 205 N = color I = 11;
SU  T = 82 C = 205 N = color I = 11;
SU  T = 83 C = 205 N = color I = 11;
SU  T = 86 C = 205 N = color I = 11;
SU  T = 87 C = 205 N = color I = 11;
SU  T = 88 C = 205 N = color I = 11;

SU  T = 79 C = 206 N = color I = 11;
SU  T = 80 C = 206 N = color I = 11;
SU  T = 81 C = 206 N = color I = 11;
SU  T = 82 C = 206 N = color I = 11;
SU  T = 83 C = 206 N = color I = 11;
SU  T = 86 C = 206 N = color I = 11;
SU  T = 87 C = 206 N = color I = 11;
SU  T = 88 C = 206 N = color I = 11;

SU  T = 79 C = 207 N = color I = 11;
SU  T = 80 C = 207 N = color I = 11;
SU  T = 81 C = 207 N = color I = 11;
SU  T = 82 C = 207 N = color I = 11;
SU  T = 83 C = 207 N = color I = 11;
SU  T = 86 C = 207 N = color I = 11;
SU  T = 87 C = 207 N = color I = 11;
SU  T = 88 C = 207 N = color I = 11;

SU  T = 79 C = 208 N = color I = 11;
SU  T = 80 C = 208 N = color I = 11;
SU  T = 81 C = 208 N = color I = 11;
SU  T = 82 C = 208 N = color I = 11;
SU  T = 83 C = 208 N = color I = 11;
SU  T = 86 C = 208 N = color I = 11;
SU  T = 87 C = 208 N = color I = 11;
SU  T = 88 C = 208 N = color I = 11;

SU  T = 79 C = 209 N = color I = 11;
SU  T = 80 C = 209 N = color I = 11;
SU  T = 81 C = 209 N = color I = 11;
SU  T = 82 C = 209 N = color I = 11;
SU  T = 83 C = 209 N = color I = 11;
```

```
SU  T = 86 C = 209 N = color I = 11;
SU  T = 87 C = 209 N = color I = 11;
SU  T = 88 C = 209 N = color I = 11;

SU  T = 79 C = 210 N = color I = 11;
SU  T = 80 C = 210 N = color I = 11;
SU  T = 81 C = 210 N = color I = 11;
SU  T = 82 C = 210 N = color I = 11;
SU  T = 83 C = 210 N = color I = 11;
SU  T = 86 C = 210 N = color I = 11;
SU  T = 87 C = 210 N = color I = 11;
SU  T = 88 C = 210 N = color I = 11;

SU  T = 79 C = 211 N = color I = 11;
SU  T = 80 C = 211 N = color I = 11;
SU  T = 81 C = 211 N = color I = 11;
SU  T = 82 C = 211 N = color I = 11;
SU  T = 83 C = 211 N = color I = 11;
SU  T = 86 C = 211 N = color I = 11;
SU  T = 87 C = 211 N = color I = 11;
SU  T = 88 C = 211 N = color I = 11;

SU  T = 79 C = 212 N = color I = 11;
SU  T = 80 C = 212 N = color I = 11;
SU  T = 81 C = 212 N = color I = 11;
SU  T = 82 C = 212 N = color I = 11;
SU  T = 83 C = 212 N = color I = 11;
SU  T = 86 C = 212 N = color I = 11;
SU  T = 87 C = 212 N = color I = 11;
SU  T = 88 C = 212 N = color I = 11;

SU  T = 79 C = 213 N = color I = 11;
SU  T = 80 C = 213 N = color I = 11;
SU  T = 81 C = 213 N = color I = 11;
SU  T = 82 C = 213 N = color I = 11;
SU  T = 83 C = 213 N = color I = 11;
SU  T = 86 C = 213 N = color I = 11;
SU  T = 87 C = 213 N = color I = 11;
SU  T = 88 C = 213 N = color I = 11;

SU  T = 79 C = 214 N = color I = 11;
SU  T = 80 C = 214 N = color I = 11;
SU  T = 81 C = 214 N = color I = 11;
SU  T = 82 C = 214 N = color I = 11;
SU  T = 83 C = 214 N = color I = 11;
SU  T = 86 C = 214 N = color I = 11;
SU  T = 87 C = 214 N = color I = 11;
SU  T = 88 C = 214 N = color I = 11;

SU  T = 79 C = 215 N = color I = 11;
SU  T = 80 C = 215 N = color I = 11;
SU  T = 81 C = 215 N = color I = 11;
SU  T = 82 C = 215 N = color I = 11;
SU  T = 83 C = 215 N = color I = 11;
SU  T = 86 C = 215 N = color I = 11;
SU  T = 87 C = 215 N = color I = 11;
SU  T = 88 C = 215 N = color I = 11;

SU  T = 79 C = 216 N = color I = 11;
SU  T = 80 C = 216 N = color I = 11;
```

```
SU  T = 81 C = 216 N = color I = 11;
SU  T = 82 C = 216 N = color I = 11;
SU  T = 83 C = 216 N = color I = 11;
SU  T = 86 C = 216 N = color I = 11;
SU  T = 87 C = 216 N = color I = 11;
SU  T = 88 C = 216 N = color I = 11;

SU  T = 79 C = 217 N = color I = 11;
SU  T = 80 C = 217 N = color I = 11;
SU  T = 81 C = 217 N = color I = 11;
SU  T = 82 C = 217 N = color I = 11;
SU  T = 83 C = 217 N = color I = 11;
SU  T = 86 C = 217 N = color I = 11;
SU  T = 87 C = 217 N = color I = 11;
SU  T = 88 C = 217 N = color I = 11;

SU  T = 79 C = 218 N = color I = 11;
SU  T = 80 C = 218 N = color I = 11;
SU  T = 81 C = 218 N = color I = 11;
SU  T = 82 C = 218 N = color I = 11;
SU  T = 83 C = 218 N = color I = 11;
SU  T = 86 C = 218 N = color I = 11;
SU  T = 87 C = 218 N = color I = 11;
SU  T = 88 C = 218 N = color I = 11;

SU  T = 79 C = 219 N = color I = 11;
SU  T = 80 C = 219 N = color I = 11;
SU  T = 81 C = 219 N = color I = 11;
SU  T = 82 C = 219 N = color I = 11;
SU  T = 83 C = 219 N = color I = 11;
SU  T = 86 C = 219 N = color I = 11;
SU  T = 87 C = 219 N = color I = 11;
SU  T = 88 C = 219 N = color I = 11;

SU  T = 79 C = 220 N = color I = 11;
SU  T = 80 C = 220 N = color I = 11;
SU  T = 81 C = 220 N = color I = 11;
SU  T = 82 C = 220 N = color I = 11;
SU  T = 83 C = 220 N = color I = 11;
SU  T = 86 C = 220 N = color I = 11;
SU  T = 87 C = 220 N = color I = 11;
SU  T = 88 C = 220 N = color I = 11;

SU  T = 79 C = 221 N = color I = 11;
SU  T = 80 C = 221 N = color I = 11;
SU  T = 81 C = 221 N = color I = 11;
SU  T = 82 C = 221 N = color I = 11;
SU  T = 83 C = 221 N = color I = 11;
SU  T = 86 C = 221 N = color I = 11;
SU  T = 87 C = 221 N = color I = 11;
SU  T = 88 C = 221 N = color I = 11;

SU  T = 79 C = 222 N = color I = 11;
SU  T = 80 C = 222 N = color I = 11;
SU  T = 81 C = 222 N = color I = 11;
SU  T = 82 C = 222 N = color I = 11;
SU  T = 83 C = 222 N = color I = 11;
SU  T = 86 C = 222 N = color I = 11;
SU  T = 87 C = 222 N = color I = 11;
SU  T = 88 C = 222 N = color I = 11;
```

```
SU  T = 79 C = 223 N = color I = 11;
SU  T = 80 C = 223 N = color I = 11;
SU  T = 81 C = 223 N = color I = 11;
SU  T = 82 C = 223 N = color I = 11;
SU  T = 83 C = 223 N = color I = 11;
SU  T = 86 C = 223 N = color I = 11;
SU  T = 87 C = 223 N = color I = 11;
SU  T = 88 C = 223 N = color I = 11;

SU  T = 79 C = 224 N = color I = 11;
SU  T = 80 C = 224 N = color I = 11;
SU  T = 81 C = 224 N = color I = 11;
SU  T = 82 C = 224 N = color I = 11;
SU  T = 83 C = 224 N = color I = 11;
SU  T = 86 C = 224 N = color I = 11;
SU  T = 87 C = 224 N = color I = 11;
SU  T = 88 C = 224 N = color I = 11;

SU  T = 79 C = 225 N = color I = 11;
SU  T = 80 C = 225 N = color I = 11;
SU  T = 81 C = 225 N = color I = 11;
SU  T = 82 C = 225 N = color I = 11;
SU  T = 83 C = 225 N = color I = 11;
SU  T = 86 C = 225 N = color I = 11;
SU  T = 87 C = 225 N = color I = 11;
SU  T = 88 C = 225 N = color I = 11;

SU  T = 79 C = 226 N = color I = 11;
SU  T = 80 C = 226 N = color I = 11;
SU  T = 81 C = 226 N = color I = 11;
SU  T = 82 C = 226 N = color I = 11;
SU  T = 83 C = 226 N = color I = 11;
SU  T = 86 C = 226 N = color I = 11;
SU  T = 87 C = 226 N = color I = 11;
SU  T = 88 C = 226 N = color I = 11;

SU  T = 79 C = 227 N = color I = 11;
SU  T = 80 C = 227 N = color I = 11;
SU  T = 81 C = 227 N = color I = 11;
SU  T = 82 C = 227 N = color I = 11;
SU  T = 83 C = 227 N = color I = 11;
SU  T = 86 C = 227 N = color I = 11;
SU  T = 87 C = 227 N = color I = 11;
SU  T = 88 C = 227 N = color I = 11;

SU  T = 79 C = 228 N = color I = 11;
SU  T = 80 C = 228 N = color I = 11;
SU  T = 81 C = 228 N = color I = 11;
SU  T = 82 C = 228 N = color I = 11;
SU  T = 83 C = 228 N = color I = 11;
SU  T = 86 C = 228 N = color I = 11;
SU  T = 87 C = 228 N = color I = 11;
SU  T = 88 C = 228 N = color I = 11;

SU  T = 79 C = 229 N = color I = 11;
SU  T = 80 C = 229 N = color I = 11;
SU  T = 81 C = 229 N = color I = 11;
SU  T = 82 C = 229 N = color I = 11;
SU  T = 83 C = 229 N = color I = 11;
```

```
SU  T = 86 C = 229 N = color I = 11;
SU  T = 87 C = 229 N = color I = 11;
SU  T = 88 C = 229 N = color I = 11;

SU  T = 79 C = 230 N = color I = 11;
SU  T = 80 C = 230 N = color I = 11;
SU  T = 81 C = 230 N = color I = 11;
SU  T = 82 C = 230 N = color I = 11;
SU  T = 83 C = 230 N = color I = 11;
SU  T = 86 C = 230 N = color I = 11;
SU  T = 87 C = 230 N = color I = 11;
SU  T = 88 C = 230 N = color I = 11;

SU  T = 79 C = 231 N = color I = 11;
SU  T = 80 C = 231 N = color I = 11;
SU  T = 81 C = 231 N = color I = 11;
SU  T = 82 C = 231 N = color I = 11;
SU  T = 83 C = 231 N = color I = 11;
SU  T = 86 C = 231 N = color I = 11;
SU  T = 87 C = 231 N = color I = 11;
SU  T = 88 C = 231 N = color I = 11;

SU  T = 79 C = 232 N = color I = 11;
SU  T = 80 C = 232 N = color I = 11;
SU  T = 81 C = 232 N = color I = 11;
SU  T = 82 C = 232 N = color I = 11;
SU  T = 83 C = 232 N = color I = 11;
SU  T = 86 C = 232 N = color I = 11;
SU  T = 87 C = 232 N = color I = 11;
SU  T = 88 C = 232 N = color I = 11;

SU  T = 79 C = 233 N = color I = 11;
SU  T = 80 C = 233 N = color I = 11;
SU  T = 81 C = 233 N = color I = 11;
SU  T = 82 C = 233 N = color I = 11;
SU  T = 83 C = 233 N = color I = 11;
SU  T = 86 C = 233 N = color I = 11;
SU  T = 87 C = 233 N = color I = 11;
SU  T = 88 C = 233 N = color I = 11;

SU  T = 79 C = 234 N = color I = 11;
SU  T = 80 C = 234 N = color I = 11;
SU  T = 81 C = 234 N = color I = 11;
SU  T = 82 C = 234 N = color I = 11;
SU  T = 83 C = 234 N = color I = 11;
SU  T = 84 C = 234 N = color I = 11;
SU  T = 86 C = 234 N = color I = 11;
SU  T = 87 C = 234 N = color I = 11;
SU  T = 88 C = 234 N = color I = 11;

SU  T = 79 C = 235 N = color I = 11;
SU  T = 80 C = 235 N = color I = 11;
SU  T = 81 C = 235 N = color I = 11;
SU  T = 82 C = 235 N = color I = 11;
SU  T = 83 C = 235 N = color I = 11;
SU  T = 84 C = 235 N = color I = 11;
SU  T = 86 C = 235 N = color I = 11;
SU  T = 87 C = 235 N = color I = 11;
SU  T = 88 C = 235 N = color I = 11;
```

```
SU  T = 79 C = 236 N = color I = 11;
SU  T = 80 C = 236 N = color I = 11;
SU  T = 81 C = 236 N = color I = 11;
SU  T = 82 C = 236 N = color I = 11;
SU  T = 84 C = 236 N = color I = 11;
SU  T = 86 C = 236 N = color I = 11;
SU  T = 87 C = 236 N = color I = 11;
SU  T = 88 C = 236 N = color I = 11;

SU  T = 79 C = 237 N = color I = 11;
SU  T = 80 C = 237 N = color I = 11;
SU  T = 81 C = 237 N = color I = 11;
SU  T = 82 C = 237 N = color I = 11;
SU  T = 84 C = 237 N = color I = 11;
SU  T = 86 C = 237 N = color I = 11;
SU  T = 87 C = 237 N = color I = 11;
SU  T = 88 C = 237 N = color I = 11;

SU  T = 79 C = 238 N = color I = 11;
SU  T = 80 C = 238 N = color I = 11;
SU  T = 81 C = 238 N = color I = 11;
SU  T = 82 C = 238 N = color I = 11;
SU  T = 84 C = 238 N = color I = 11;
SU  T = 86 C = 238 N = color I = 11;
SU  T = 87 C = 238 N = color I = 11;
SU  T = 88 C = 238 N = color I = 11;

SU  T = 79 C = 239 N = color I = 11;
SU  T = 80 C = 239 N = color I = 11;
SU  T = 81 C = 239 N = color I = 11;
SU  T = 82 C = 239 N = color I = 11;
SU  T = 84 C = 239 N = color I = 11;
SU  T = 86 C = 239 N = color I = 11;
SU  T = 87 C = 239 N = color I = 11;
SU  T = 88 C = 239 N = color I = 11;

SU  T = 79 C = 240 N = color I = 11;
SU  T = 80 C = 240 N = color I = 11;
SU  T = 81 C = 240 N = color I = 11;
SU  T = 82 C = 240 N = color I = 11;
SU  T = 84 C = 240 N = color I = 11;
SU  T = 86 C = 240 N = color I = 11;
SU  T = 87 C = 240 N = color I = 11;
SU  T = 88 C = 240 N = color I = 11;

SU  T = 79 C = 241 N = color I = 11;
SU  T = 80 C = 241 N = color I = 11;
SU  T = 81 C = 241 N = color I = 11;
SU  T = 82 C = 241 N = color I = 11;
SU  T = 84 C = 241 N = color I = 11;
SU  T = 86 C = 241 N = color I = 11;
SU  T = 87 C = 241 N = color I = 11;
SU  T = 88 C = 241 N = color I = 11;

SU  T = 79 C = 242 N = color I = 11;
SU  T = 80 C = 242 N = color I = 11;
SU  T = 81 C = 242 N = color I = 11;
SU  T = 82 C = 242 N = color I = 11;
SU  T = 84 C = 242 N = color I = 11;
SU  T = 86 C = 242 N = color I = 11;
```

```
SU  T = 87 C = 242 N = color I = 11;
SU  T = 88 C = 242 N = color I = 11;

SU  T = 79 C = 243 N = color I = 11;
SU  T = 80 C = 243 N = color I = 11;
SU  T = 81 C = 243 N = color I = 11;
SU  T = 82 C = 243 N = color I = 11;
SU  T = 84 C = 243 N = color I = 11;
SU  T = 86 C = 243 N = color I = 11;
SU  T = 87 C = 243 N = color I = 11;
SU  T = 88 C = 243 N = color I = 11;

SU  T = 79 C = 244 N = color I = 11;
SU  T = 80 C = 244 N = color I = 11;
SU  T = 81 C = 244 N = color I = 11;
SU  T = 82 C = 244 N = color I = 11;
SU  T = 84 C = 244 N = color I = 11;
SU  T = 86 C = 244 N = color I = 11;
SU  T = 87 C = 244 N = color I = 11;
SU  T = 88 C = 244 N = color I = 11;

SU  T = 79 C = 245 N = color I = 11;
SU  T = 80 C = 245 N = color I = 11;
SU  T = 81 C = 245 N = color I = 11;
SU  T = 82 C = 245 N = color I = 11;
SU  T = 84 C = 245 N = color I = 11;
SU  T = 86 C = 245 N = color I = 11;
SU  T = 87 C = 245 N = color I = 11;
SU  T = 88 C = 245 N = color I = 11;

SU  T = 79 C = 246 N = color I = 11;
SU  T = 80 C = 246 N = color I = 11;
SU  T = 81 C = 246 N = color I = 11;
SU  T = 82 C = 246 N = color I = 11;
SU  T = 84 C = 246 N = color I = 11;
SU  T = 86 C = 246 N = color I = 11;
SU  T = 87 C = 246 N = color I = 11;
SU  T = 88 C = 246 N = color I = 11;

SU  T = 79 C = 247 N = color I = 11;
SU  T = 80 C = 247 N = color I = 11;
SU  T = 81 C = 247 N = color I = 11;
SU  T = 82 C = 247 N = color I = 11;
SU  T = 84 C = 247 N = color I = 11;
SU  T = 86 C = 247 N = color I = 11;
SU  T = 87 C = 247 N = color I = 11;
SU  T = 88 C = 247 N = color I = 11;

SU  T = 79 C = 248 N = color I = 11;
SU  T = 80 C = 248 N = color I = 11;
SU  T = 81 C = 248 N = color I = 11;
SU  T = 82 C = 248 N = color I = 11;
SU  T = 84 C = 248 N = color I = 11;
SU  T = 86 C = 248 N = color I = 11;
SU  T = 87 C = 248 N = color I = 11;
SU  T = 88 C = 248 N = color I = 11;

SU  T = 79 C = 249 N = color I = 11;
SU  T = 80 C = 249 N = color I = 11;
SU  T = 81 C = 249 N = color I = 11;
```

```
SU  T = 82 C = 249 N = color I = 11;
SU  T = 84 C = 249 N = color I = 11;
SU  T = 86 C = 249 N = color I = 11;
SU  T = 87 C = 249 N = color I = 11;
SU  T = 88 C = 249 N = color I = 11;

SU  T = 79 C = 250 N = color I = 11;
SU  T = 80 C = 250 N = color I = 11;
SU  T = 81 C = 250 N = color I = 11;
SU  T = 82 C = 250 N = color I = 11;
SU  T = 84 C = 250 N = color I = 11;
SU  T = 86 C = 250 N = color I = 11;
SU  T = 87 C = 250 N = color I = 11;
SU  T = 88 C = 250 N = color I = 11;

SU  T = 79 C = 251 N = color I = 11;
SU  T = 80 C = 251 N = color I = 11;
SU  T = 81 C = 251 N = color I = 11;
SU  T = 82 C = 251 N = color I = 11;
SU  T = 84 C = 251 N = color I = 11;
SU  T = 86 C = 251 N = color I = 11;
SU  T = 87 C = 251 N = color I = 11;
SU  T = 88 C = 251 N = color I = 11;

SU  T = 79 C = 252 N = color I = 11;
SU  T = 80 C = 252 N = color I = 11;
SU  T = 81 C = 252 N = color I = 11;
SU  T = 82 C = 252 N = color I = 11;
SU  T = 84 C = 252 N = color I = 11;
SU  T = 86 C = 252 N = color I = 11;
SU  T = 87 C = 252 N = color I = 11;
SU  T = 88 C = 252 N = color I = 11;

SU  T = 79 C = 253 N = color I = 11;
SU  T = 80 C = 253 N = color I = 11;
SU  T = 81 C = 253 N = color I = 11;
SU  T = 82 C = 253 N = color I = 11;
SU  T = 84 C = 253 N = color I = 11;
SU  T = 86 C = 253 N = color I = 11;
SU  T = 87 C = 253 N = color I = 11;
SU  T = 88 C = 253 N = color I = 11;

SU  T = 79 C = 254 N = color I = 11;
SU  T = 80 C = 254 N = color I = 11;
SU  T = 81 C = 254 N = color I = 11;
SU  T = 82 C = 254 N = color I = 11;
SU  T = 84 C = 254 N = color I = 11;
SU  T = 86 C = 254 N = color I = 11;
SU  T = 87 C = 254 N = color I = 11;
SU  T = 88 C = 254 N = color I = 11;

SU  T = 79 C = 255 N = color I = 11;
SU  T = 80 C = 255 N = color I = 11;
SU  T = 81 C = 255 N = color I = 11;
SU  T = 82 C = 255 N = color I = 11;
SU  T = 84 C = 255 N = color I = 11;
SU  T = 86 C = 255 N = color I = 11;
SU  T = 87 C = 255 N = color I = 11;
SU  T = 88 C = 255 N = color I = 11;
```

```
SU  T = 79 C = 256 N = color I = 11;
SU  T = 80 C = 256 N = color I = 11;
SU  T = 81 C = 256 N = color I = 11;
SU  T = 82 C = 256 N = color I = 11;
SU  T = 84 C = 256 N = color I = 11;
SU  T = 86 C = 256 N = color I = 11;
SU  T = 87 C = 256 N = color I = 11;
SU  T = 88 C = 256 N = color I = 11;

SU  T = 79 C = 257 N = color I = 11;
SU  T = 80 C = 257 N = color I = 11;
SU  T = 81 C = 257 N = color I = 11;
SU  T = 82 C = 257 N = color I = 11;
SU  T = 84 C = 257 N = color I = 11;
SU  T = 86 C = 257 N = color I = 11;
SU  T = 87 C = 257 N = color I = 11;
SU  T = 88 C = 257 N = color I = 11;

SU  T = 79 C = 258 N = color I = 11;
SU  T = 80 C = 258 N = color I = 11;
SU  T = 81 C = 258 N = color I = 11;
SU  T = 82 C = 258 N = color I = 11;
SU  T = 84 C = 258 N = color I = 11;
SU  T = 86 C = 258 N = color I = 11;
SU  T = 87 C = 258 N = color I = 11;
SU  T = 88 C = 258 N = color I = 11;

SU  T = 79 C = 259 N = color I = 11;
SU  T = 80 C = 259 N = color I = 11;
SU  T = 81 C = 259 N = color I = 11;
SU  T = 82 C = 259 N = color I = 11;
SU  T = 84 C = 259 N = color I = 11;
SU  T = 86 C = 259 N = color I = 11;
SU  T = 87 C = 259 N = color I = 11;
SU  T = 88 C = 259 N = color I = 11;

SU  T = 79 C = 260 N = color I = 11;
SU  T = 80 C = 260 N = color I = 11;
SU  T = 81 C = 260 N = color I = 11;
SU  T = 82 C = 260 N = color I = 11;
SU  T = 84 C = 260 N = color I = 11;
SU  T = 86 C = 260 N = color I = 11;
SU  T = 87 C = 260 N = color I = 11;
SU  T = 88 C = 260 N = color I = 11;

SU  T = 79 C = 261 N = color I = 11;
SU  T = 80 C = 261 N = color I = 11;
SU  T = 81 C = 261 N = color I = 11;
SU  T = 82 C = 261 N = color I = 11;
SU  T = 84 C = 261 N = color I = 11;
SU  T = 86 C = 261 N = color I = 11;
SU  T = 87 C = 261 N = color I = 11;
SU  T = 88 C = 261 N = color I = 11;

SU  T = 79 C = 262 N = color I = 11;
SU  T = 80 C = 262 N = color I = 11;
SU  T = 81 C = 262 N = color I = 11;
SU  T = 82 C = 262 N = color I = 11;
SU  T = 84 C = 262 N = color I = 11;
SU  T = 86 C = 262 N = color I = 11;
```

```
SU  T = 87 C = 262 N = color I = 11;
SU  T = 88 C = 262 N = color I = 11;

SU  T = 79 C = 263 N = color I = 11;
SU  T = 80 C = 263 N = color I = 11;
SU  T = 81 C = 263 N = color I = 11;
SU  T = 82 C = 263 N = color I = 11;
SU  T = 86 C = 263 N = color I = 11;
SU  T = 87 C = 263 N = color I = 11;
SU  T = 88 C = 263 N = color I = 11;

SU  T = 79 C = 264 N = color I = 11;
SU  T = 80 C = 264 N = color I = 11;
SU  T = 81 C = 264 N = color I = 11;
SU  T = 82 C = 264 N = color I = 11;
SU  T = 86 C = 264 N = color I = 11;
SU  T = 87 C = 264 N = color I = 11;
SU  T = 88 C = 264 N = color I = 11;

SU  T = 79 C = 265 N = color I = 11;
SU  T = 80 C = 265 N = color I = 11;
SU  T = 81 C = 265 N = color I = 11;
SU  T = 82 C = 265 N = color I = 11;
SU  T = 86 C = 265 N = color I = 11;
SU  T = 87 C = 265 N = color I = 11;
SU  T = 88 C = 265 N = color I = 11;

SU  T = 79 C = 266 N = color I = 11;
SU  T = 80 C = 266 N = color I = 11;
SU  T = 81 C = 266 N = color I = 11;
SU  T = 82 C = 266 N = color I = 11;
SU  T = 86 C = 266 N = color I = 11;
SU  T = 87 C = 266 N = color I = 11;
SU  T = 88 C = 266 N = color I = 11;

SU  T = 79 C = 267 N = color I = 11;
SU  T = 80 C = 267 N = color I = 11;
SU  T = 81 C = 267 N = color I = 11;
SU  T = 82 C = 267 N = color I = 11;
SU  T = 86 C = 267 N = color I = 11;
SU  T = 87 C = 267 N = color I = 11;
SU  T = 88 C = 267 N = color I = 11;

SU  T = 79 C = 268 N = color I = 11;
SU  T = 80 C = 268 N = color I = 11;
SU  T = 81 C = 268 N = color I = 11;
SU  T = 82 C = 268 N = color I = 11;
SU  T = 86 C = 268 N = color I = 11;
SU  T = 87 C = 268 N = color I = 11;
SU  T = 88 C = 268 N = color I = 11;

SU  T = 79 C = 269 N = color I = 11;
SU  T = 80 C = 269 N = color I = 11;
SU  T = 81 C = 269 N = color I = 11;
SU  T = 82 C = 269 N = color I = 11;
SU  T = 86 C = 269 N = color I = 11;
SU  T = 87 C = 269 N = color I = 11;
SU  T = 88 C = 269 N = color I = 11;

SU  T = 79 C = 270 N = color I = 11;
```

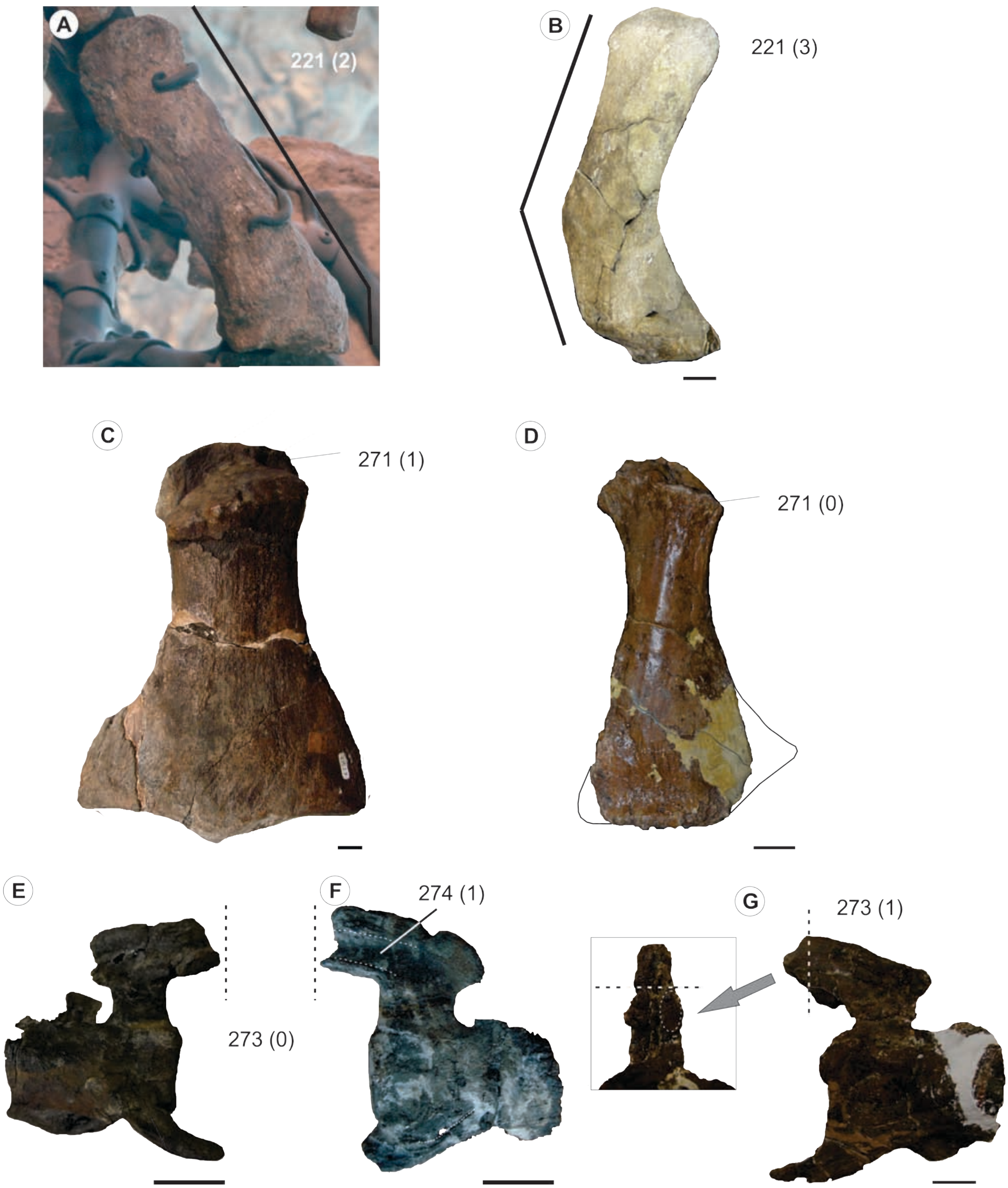
```
SU  T = 80 C = 270 N = color I = 11;
SU  T = 81 C = 270 N = color I = 11;
SU  T = 82 C = 270 N = color I = 11;
SU  T = 86 C = 270 N = color I = 11;
SU  T = 87 C = 270 N = color I = 11;
SU  T = 88 C = 270 N = color I = 11;

SU  C = 271 N = color I = 11;
SU  T = 1 C = 271 N = color I = 11;
SU  T = 2 C = 271 N = color I = 11;
SU  T = 3 C = 271 N = color I = 11;
SU  T = 4 C = 271 N = color I = 11;
SU  T = 5 C = 271 N = color I = 11;
SU  T = 6 C = 271 N = color I = 11;
SU  T = 7 C = 271 N = color I = 11;
SU  T = 8 C = 271 N = color I = 11;
SU  T = 9 C = 271 N = color I = 11;
SU  T = 10 C = 271 N = color I = 11;
SU  T = 11 C = 271 N = color I = 11;
SU  T = 12 C = 271 N = color I = 11;
SU  T = 13 C = 271 N = color I = 11;
SU  T = 14 C = 271 N = color I = 11;
SU  T = 15 C = 271 N = color I = 11;
SU  T = 16 C = 271 N = color I = 11;
SU  T = 17 C = 271 N = color I = 11;
SU  T = 18 C = 271 N = color I = 11;
SU  T = 19 C = 271 N = color I = 11;
SU  T = 20 C = 271 N = color I = 11;
SU  T = 21 C = 271 N = color I = 11;
SU  T = 22 C = 271 N = color I = 11;
SU  T = 23 C = 271 N = color I = 11;
SU  T = 24 C = 271 N = color I = 11;
SU  T = 25 C = 271 N = color I = 11;
SU  T = 26 C = 271 N = color I = 11;
SU  T = 27 C = 271 N = color I = 11;
SU  T = 28 C = 271 N = color I = 11;
SU  T = 29 C = 271 N = color I = 11;
SU  T = 30 C = 271 N = color I = 11;
SU  T = 31 C = 271 N = color I = 11;
SU  T = 32 C = 271 N = color I = 11;
SU  T = 33 C = 271 N = color I = 11;
SU  T = 34 C = 271 N = color I = 11;
SU  T = 35 C = 271 N = color I = 11;
SU  T = 36 C = 271 N = color I = 11;
SU  T = 37 C = 271 N = color I = 11;
SU  T = 38 C = 271 N = color I = 11;
SU  T = 39 C = 271 N = color I = 11;
SU  T = 40 C = 271 N = color I = 11;
SU  T = 41 C = 271 N = color I = 11;
SU  T = 42 C = 271 N = color I = 11;
SU  T = 43 C = 271 N = color I = 11;
SU  T = 44 C = 271 N = color I = 11;
SU  T = 45 C = 271 N = color I = 11;
SU  T = 46 C = 271 N = color I = 11;
SU  T = 47 C = 271 N = color I = 11;
SU  T = 48 C = 271 N = color I = 11;
SU  T = 49 C = 271 N = color I = 11;
SU  T = 50 C = 271 N = color I = 11;
SU  T = 51 C = 271 N = color I = 11;
SU  T = 52 C = 271 N = color I = 11;
```

```
SU  T = 53 C = 271 N = color I = 11;
SU  T = 54 C = 271 N = color I = 11;
SU  T = 55 C = 271 N = color I = 11;
SU  T = 56 C = 271 N = color I = 11;
SU  T = 57 C = 271 N = color I = 11;
SU  T = 58 C = 271 N = color I = 11;
SU  T = 59 C = 271 N = color I = 11;
SU  T = 60 C = 271 N = color I = 11;
SU  T = 61 C = 271 N = color I = 11;
SU  T = 62 C = 271 N = color I = 11;
SU  T = 63 C = 271 N = color I = 11;
SU  T = 64 C = 271 N = color I = 11;
SU  T = 65 C = 271 N = color I = 11;
SU  T = 66 C = 271 N = color I = 11;
SU  T = 67 C = 271 N = color I = 11;
SU  T = 68 C = 271 N = color I = 11;
SU  T = 69 C = 271 N = color I = 11;
SU  T = 70 C = 271 N = color I = 11;
SU  T = 71 C = 271 N = color I = 11;
SU  T = 72 C = 271 N = color I = 11;
SU  T = 73 C = 271 N = color I = 11;
SU  T = 74 C = 271 N = color I = 11;
SU  T = 75 C = 271 N = color I = 11;
SU  T = 76 C = 271 N = color I = 11;
SU  T = 77 C = 271 N = color I = 11;
SU  T = 78 C = 271 N = color I = 11;
SU  T = 79 C = 271 N = color I = 11;
SU  T = 80 C = 271 N = color I = 11;
SU  T = 81 C = 271 N = color I = 11;
SU  T = 82 C = 271 N = color I = 11;
SU  T = 83 C = 271 N = color I = 11;
SU  T = 84 C = 271 N = color I = 11;
SU  T = 85 C = 271 N = color I = 11;
SU  T = 86 C = 271 N = color I = 11;
SU  T = 87 C = 271 N = color I = 11;
SU  T = 88 C = 271 N = color I = 11;
SU  T = 89 C = 271 N = color I = 11;

SU  T = 1 C = 272 N = color I = 11;
SU  T = 2 C = 272 N = color I = 11;
SU  T = 3 C = 272 N = color I = 11;
SU  T = 4 C = 272 N = color I = 11;
SU  T = 5 C = 272 N = color I = 11;
SU  T = 6 C = 272 N = color I = 11;
SU  T = 7 C = 272 N = color I = 11;
SU  T = 8 C = 272 N = color I = 11;
SU  T = 9 C = 272 N = color I = 11;
SU  T = 10 C = 272 N = color I = 11;
SU  T = 11 C = 272 N = color I = 11;
SU  T = 12 C = 272 N = color I = 11;
SU  T = 13 C = 272 N = color I = 11;
SU  T = 14 C = 272 N = color I = 11;
SU  T = 16 C = 272 N = color I = 11;
SU  T = 17 C = 272 N = color I = 11;
SU  T = 18 C = 272 N = color I = 11;
SU  T = 59 C = 272 N = color I = 11;
SU  T = 62 C = 272 N = color I = 11;
SU  T = 69 C = 272 N = color I = 11;
SU  T = 77 C = 272 N = color I = 11;
SU  T = 83 C = 272 N = color I = 11;
```

```
	SU  T = 83 C = 273 N = color I = 11;

END;

BEGIN ASSUMPTIONS;
	TYPESET * UNTITLED   =  unord:  1 -  275;

END;

BEGIN MESQUITECHARMODELS;
	ProbModelSet * UNTITLED   =  'Mk1 (est.)':  1 -  271;
END;

Begin MESQUITE;
		MESQUITESCRIPTVERSION 2;
		TITLE AUTO;
		tell ProjectCoordinator;
		timeSaved 1441665947157;
		getEmployee #mesquite.minimal.ManageTaxa.ManageTaxa;
		tell It;
			setID 0 5346406094115664681;
		endTell;
		getEmployee #mesquite.charMatrices.ManageCharacters.ManageCharacters;
		tell It;
			setID 0 3919740700673883704;
			mqVersion 300;
			checksumv 0 3 4086242014 null  getNumChars 275 numChars 275
getNumTaxa 89 numTaxa 89   short true   bits 2305843009213694207   states 255
sumSquaresStatesOnly 105999.0 sumSquares -3.9660499758475536E20 longCompressibleToShort
false usingShortMatrix true   NumFiles 1 NumMatrices 1;
			mqVersion;
		endTell;
		getWindow;
		tell It;
			suppress;
			setResourcesState false false 144;
			setPopoutState 400;
			setExplanationSize 0;
			setAnnotationSize 0;
			setFontIncAnnot 0;
			setFontIncExp 0;
			setSize 1362 651;
			setLocation -8 0;
			setFont SanSerif;
			setFontSize 10;
			getToolPalette;
			tell It;
			endTell;
			desuppress;
		endTell;
		getEmployee
#mesquite.charMatrices.BasicDataWindowCoord.BasicDataWindowCoord;
		tell It;
			showDataWindow #3919740700673883704
#mesquite.charMatrices.BasicDataWindowMaker.BasicDataWindowMaker;
			tell It;
				getWindow;
				tell It;
					getTable;
```

```
					tell It;
						columnWidth 4 17;
						columnWidth 5 23;
						columnWidth 48 21;
						columnWidth 49 24;
						columnWidth 271 31;
						columnWidth 272 29;
					endTell;
					setExplanationSize 30;
					setAnnotationSize 20;
					setFontIncAnnot 0;
					setFontIncExp 0;
					setSize 1218 579;
					setLocation -8 0;
					setFont SanSerif;
					setFontSize 10;
					getToolPalette;
					tell It;
						setTool
mesquite.charMatrices.QuickKeySelector.QuickKeySelector.quickKeySelector;
					endTell;
					setActive;
					setTool
mesquite.charMatrices.QuickKeySelector.QuickKeySelector.quickKeySelector;
					colorCells
#mesquite.charMatrices.NoColor.NoColor;
					colorRowNames
#mesquite.charMatrices.TaxonGroupColor.TaxonGroupColor;
					colorColumnNames
#mesquite.charMatrices.CharGroupColor.CharGroupColor;
					colorText  #mesquite.charMatrices.NoColor.NoColor;
					setBackground White;
					toggleShowNames on;
					toggleShowTaxonNames on;
					toggleTight off;
					toggleThinRows off;
					toggleShowChanges on;
					toggleSeparateLines off;
					toggleShowStates on;
					toggleAutoWCharNames on;
					toggleAutoTaxonNames off;
					toggleShowDefaultCharNames off;
					toggleConstrainCW on;
					toggleBirdsEye off;
					toggleShowPaleGrid off;
					toggleShowPaleCellColors off;
					toggleShowPaleExcluded off;
					togglePaleInapplicable on;
					toggleShowBoldCellText off;
					toggleAllowAutosize on;
					toggleColorsPanel off;
					toggleDiagonal on;
					setDiagonalHeight 80;
					toggleLinkedScrolling on;
					toggleScrollLinkedTables off;
				endTell;
				showWindow;
				getWindow;
				tell It;
					forceAutosize;
```

```
				endTell;
				getEmployee
#mesquite.charMatrices.ColorByState.ColorByState;
				tell It;
					setStateLimit 9;
					toggleUniformMaximum on;
				endTell;
				getEmployee #mesquite.charMatrices.ColorCells.ColorCells;
				tell It;
					setColor Red;
					removeColor off;
				endTell;
				getEmployee
#mesquite.categ.StateNamesStrip.StateNamesStrip;
				tell It;
					showStrip off;
				endTell;
				getEmployee #mesquite.charMatrices.AnnotPanel.AnnotPanel;
				tell It;
					togglePanel off;
				endTell;
				getEmployee
#mesquite.charMatrices.CharReferenceStrip.CharReferenceStrip;
				tell It;
					showStrip off;
				endTell;
				getEmployee
#mesquite.charMatrices.QuickKeySelector.QuickKeySelector;
				tell It;
					autotabOff;
				endTell;
				getEmployee
#mesquite.charMatrices.SelSummaryStrip.SelSummaryStrip;
				tell It;
					showStrip off;
				endTell;
				getEmployee
#mesquite.categ.SmallStateNamesEditor.SmallStateNamesEditor;
				tell It;
					panelOpen true;
				endTell;
			endTell;
		endTell;
		endTell;
end;
```


A
221 (2)
B
221 (3)
C
271 (1)
D
271 (0)
E
273 (0)
F
274 (1)
G
273 (1)