Technical Session XIX (Saturday, November 5, 3:15 pm)

EARLY PLIOCENE (5MA) SHARK—CETACEAN INTERACTION AT LANGEBAANWEG, WEST COAST, SOUTH AFRICA

GOVENDER, Romala, University of Cape Town, Cape Town, South Africa; CHINSAMY-TURAN, Anusuya, University of Cape Town, Cape Town, South Africa

Numerous Early Pliocene fossils have been recovered from 'E' Quarry at Langebaanweg on the West Coast of South Africa. This river channel deposit would have been located close to the river mouth during the Early Pliocene, and is unique in that it preserves both terrestrial and marine animals. The terrestrial component of the deposit has been extensively studied and has provided a reconstruction of the palaeoecology of this area during the Early Pliocene. Although the marine taxa from the deposit have been known since the 1960s, until recently, they have been relatively under studied.

Phocid seals as well as mysticete and odontocete cetaceans represent the marine mammals at 'E' Quarry. The fragmentary remains of the cetaceans consist of cranial (cranium & mandible) and postcranial elements. Previous studies of the taphonomic agents involved in the Langebaanweg deposit failed to account for some of the damage evident on the cetacean remains. Damage on the cetacean bones consists of numerous superficial and penetrating scrapes, grooves and ridges on the bones. A comparative analysis with other studies in the literature suggested that this damage resulted from shark feeding activity. The shark responsible for most of the bites is the white shark, *Carcharodon sp.,* the remains of which have also been recovered from LBW. This is the first documented case of prehistoric shark and cetacean interaction off the South Africa's West Coast.

Technical Session XIX (Saturday, November 5, 2:15 pm)

NEW FOSSIL WHALES FROM ANGOLA

GRAF, John, Southern Methodist University, Dallas, TX, USA; JACOBS, Louis, Southern Methodist University, Dallas, TX, USA; POLCYN, Michael, Southern Methodist University, Dallas, TX, USA; MATEUS, Octávio, CICEGe, Faculdade de Ciências e Tecnologia, Lisbon, Portugal; SCHULP, Anne, Natuurhistorisch Museum Maastricht, NL-6211 KJ Maastricht, Netherlands

Ongoing field work in Angola, under auspices of Projecto PaleoAngola, has yielded fossil cetaceans from deposits of Miocene age, providing new insights into the early diversification of cetaceans along the western African coast. Here two new taxa of mysticete whales are described. PA 165 comprises a partial articulated skull, an unfused cervical vertebra, and a partial thoracic vertebra. The skull includes the nasals, proximal premaxillae and maxillae, the supraoccipital shield, left squamosal, exoccipital, periotic, and frontal. Portions of both dentaries are present. PA 166 comprises a partial articulated skull including the region posterior to and including the nasals. The proximal portions of the maxillae and premaxillae are present. Both specimens were recovered from what appears to be the Luanda Formation, a calcareous sandstone of late Miocene age. Phylogenetic analysis indicates these fossils represent two new taxa nested with *Caperea marginata*, the pygmy right whale, in the Neobalaenidae, a family currently restricted to one species inhabiting cold temperature Southern Hemisphere waters. Five characters unite the new Angolan taxa with *Caperea,* including the line joining the anterior points of the orbital processes of the frontals positioned anterior to the posterior extremity of the nasals, the posterior edge of the ascending process of the maxilla situated anterior to the orbit, the posterior edge of the nasal positioned just anterior to the anterior edge of the supraorbital process of the frontal, and the anterior point of the supraoccipital being in a transverse line with the anterior edge of the supraorbital process of the frontal. Three characters distinguish the Angolan taxa from *Caperea*, including the base of the rostrum being narrow, the zygomatic process of the maxilla underlying the supraorbital process of the frontal, and the lateral edges of the maxilla being parallel. Neobalaenidae is a sister group to Eschrichtiidae and Balaenopteridae. These new taxa are the only known fossil representatives of the family, they triple its known diversity, and they extend its range into the Miocene phase of the Benguela Large Marine Ecosystem.

Romer Prize/Technical Session 5 (Thursday, November 3, 11:15 am)

TIME AVERAGING AND AMS RADIOCARBON DATING OF LATE QUATERNARY VERTEBRATE ASSEMBLAGES: IMPLICATIONS FOR HIGH-RESOLUTION ANALYSES

GRAHAM, Russell, Pennsylvania State University, University Park, PA, USA; STAFFORD, Thomas, Stafford Research, Inc., Lafayette, CO, USA; SEMKEN, JR., Holmes, University of Iowa, Iowa City, IA, USA; LUNDELIUS, JR., Ernest, University of Texas at Austin, Austin, TX, USA

Advances in AMS physics and organic geochemistry have revolutionized our ability to establish absolute chronologies on vertebrate fossils for the late Quaternary. Highly purified collagen, which provides extremely accurate ages, can be extracted from single bones and teeth as small as 50 mg (individual rodent teeth). Combined with measurement precisions of ±15 to ±25 years for ages < 20,000 yr, the direct AMS 14C technique enables fossil deposits to be chronologically dissected at the level of individual specimens.

Analysis of hundreds of AMS 14C dates on individual taxa from a variety of sites and depositional environments indicates that most sites, and even excavation levels (analysis units) as small as 10 cm, can be time averaged by several thousand years at a minimum, even with the greatest care in excavation and processing of sediments. Time averaging of this magnitude has important implications for fine-scale paleoenvironmental resolution of faunas, especially when compared to high-resolution (decadal to centennial) climate records like those derived from speleothems, ice cores, or marine cores. To this end, we propose saturation dating of indicative taxa and plotting dates of individual specimens against high-resolution climate records rather than analysis of complete faunas or faunules. These types of analyses are critical for faunas that contain non-analog species pairs, those that have allopatric distributions today. Obviously, for faunas beyond 14C dating (~ 50 ka), high-resolution temporal analyses of individual taxa cannot be done.

Poster Session I (Wednesday, November 2)

DECIPHERING THE PERIODICITY OF GROWTH INCREMENTS IN THE TUSKS OF LATE TRIASSIC DICYNODONTS (THERAPSIDA: ANOMODONTIA)

GREEN, Jeremy, Kent State University at Tuscarawas, New Philadelphia, OH, USA

Dicynodonts were a diverse clade of non-mammalian therapsids that thrived amidst the ever-changing environments of the Permian and Triassic periods. Many dicynodonts had a pair of enlarged, caniniform teeth (tusks) that were ever-growing without replacement or remodeling. Thus, tusks may record a more complete growth history than skeletal elements that are subject to primary tissue turnover (e.g., bone). As such, growth records derived from tusks may enhance our understanding of life history and adaptation in Permo-Triassic dicynodonts. However, periodicity of growth increments in tusk dentine must be established before growth patterns can be analyzed. This study tests the hypothesis that increments in dicynodont tusks correspond to lines of von Ebner, which are daily growth lines in the dentine of living vertebrates. Partial longitudinal sections were taken from two isolated dicynodont (sp. indet.) tusks [North Carolina Museum of Natural Sciences (NCSM) specimens 19585 and 21735] from the Pekin Formation in North Carolina (Deep River Basin, Upper Triassic). Thin-sections were prepared using standard histological techniques and were analyzed at 100X magnification. Thickness of growth increments was measured from digital images using Axiovision software. Dentine growth lines in dicynodont tusks were visible as alternating dark and light bands oriented perpendicular to odontoblastic tubules. Increments with a mean thickness of 18.79 µm were identified in NCSM 19585, which is consistent with the thickness of daily dentine lines in living vertebrates. This result supports the hypothesis herein and is promising because it provides a measure of relative growth rate in dicynodonts. However, poor preservation in NCSM 21735 precluded accurate measurement of incremental thickness, so estimating the periodicity of growth lines in this specimen was not possible. This preliminary data suggests that well-preserved dicynodont tusks should record daily incremental features. If growth lines of a consistent periodicity can be confirmed in a whole tusk, it should be possible to construct a profile of increment thickness across the entire specimen to reconstruct growth history.

Poster Session III (Friday, November 4)

A NEW, PRIMITIVE SPECIES OF THE FLAT-HEADED PECCARY *PLATYGONUS* FROM THE LATE HEMPHILLIAN (LATEST MIOCENE) OF KANSAS, NEBRASKA, AND TEXAS

GRENADER, Jessica, Occidental College, Los Angeles, CA, USA; PROTHERO, Donald, Occidental College, Los Angeles, CA, USA

In the Frick Collection of the American Museum of Natural History are specimens of new species of the Miocene-Pleistocene flat-headed peccary, *Platygonus*. It occurs in the latest Hemphillian East *Pliohippus* Draw locality (the latest Hemphillian ZX Bar local fauna), Sioux County, Nebraska, as well as the latest Hemphillian Edson Quarry, Sherman County, Kansas, and the late Hemphillian Coffee Ranch local fauna, Hemphill County, Texas. It can be diagnosed from other species of *Platygonus* by a maxillopalatine labyrinth which has a relatively small posterior atrial aperture, a distally-rounded wing-like zygomatic process; its cheek teeth are bunodont to subzygodont; the talon and talonid cusps are retained on the premolars of most individuals, and the mandibular symphysis lacks a median keel-like structure. In these characters, it is the earliest and the most primitive species of *Platygonus* known. It is more primitive than the typical Blancan species, *Platygonus pearcei* from Hagerman in Idaho, or any of the many named species from the Pleistocene.

Poster Session I (Wednesday, November 2)

TOOTH INITIATION FOLLOWS AN ALTERNATE ONTOGENETIC CLOCK IN PROMETAMORPHIC PIPID TADPOLES

GRIECO, Theresa, Department of Integrative Biology and Museum of Paleontology, University of California Berkeley, Berkeley, CA, USA

Tadpoles in the fossil record provide a window into the ontogeny of anuran species and particular insight into how earlier life history demands can impact adult morphologies. Thyroid hormone (TH) triggers the development of some adult structures leading up to and during metamorphosis, and this process can be directly influenced by environmental cues. The Nieuwkoop and Faber (NF) normal table is the standard for comparing development in *Xenopus laevis* and other pipid tadpoles, including fossils. Prometamorphic NF stages are defined by hindlimb morphology, with suites of characters which may or may not develop in concert with the hindlimb, which is quite TH-responsive. Documenting ossification sequences has supplemented the NF system, but a clear sequence for comparison remains elusive, both within and between taxa. To examine the possibility of mosaic development within pipid tadpoles, I constructed a developmental series of *Silurana (Xenopus) tropicalis* tadpoles for NF stages 55-58. The dentition was assessed due to its quantifiable, well-described, and long-lasting development. Position and morphology of developing teeth were triangulated in the first generation of adult teeth using histological sections taken from 3 per-