fragments, and which are unquestionably of meteoritic origin.

No unequivocal evidence for any origin is thus available, but it is considered most likely that the crater results from meteorite impact. A more thorough search may lead to the finding of meteoritic material at the Veevers Crater.

The crater is named after Associated Professor J. J. Veevers, now of Macquarie University, Ryde, N.S.W., in recognition of his contribution to reconnaissance geological mapping of the Canning Basin in the late 1950s while a member of BMR. The name has the approval of the Division of National Mapping, Canberra, and the Lands Department, Western Australia.

References

DENHAM, D. H., EVERINGHAM, I. B., & GREGSON, P. J., 1974—East Canning Basin Earthquake, March, 1970. *Journal of the Geological Society of Australia,* **21** (3), 353-358.

KENNEWELL, P. J., in press—Madley, W.A., 1:250 000 Geological Series. *Bureau of Mineral Resources, Australia—Explanatory Notes* **SG51-3.**

MILTON, D. J., 1968—Structural geology of the Henbury Meteorite Craters, Northern Territory, Australia. *United States Geological Survey Professional Paper* **599-C.**

VAN DE GRAAFF, W. J. E., 1974—Warri, W. A., 1:250 000 Geological Series. *Bureau of Mineral Resources, Australia—Explanatory Notes* **SG51-4.**

WEST AUSTRALIAN PETROLEUM PTY LTD., 1966—Kidson Number 1 Well Completion Report (*Unpublished Company Report*).

The occurrence of *Thylacinus* in Tertiary Rocks from Papua New Guinea

M. Plane

Collecting at the Pliocene Awe fauna type locality (Plane 1967) on the west bank of the Watut River, in the Morobe District of Papua New Guinea during 1962 and 1963 produced a number of fine mandibles and maxillae of *Protemnodon otibandus.* Although these were the highlights of the collecting in this quarry the bulk of the collections were isolated teeth of *P. otibandus, Kolopsoides cultridens* and lesser number of *Kolopsis rotundus.* Among the collection a half tooth passed unnoticed during the sorting and subsequent study of the fauna. This tooth has now, thanks to L. Marshall of the Department of Palaeontology, University of California, Berkley, been brought to my attention. It is the posterior half of a *Thylacinus* lower second promolar. The specimen documents the earliest record of this genus beyond the mainland of Australia.

The problem of dealing with a fragmentary premolar of the rather nondescript morphology such as possessed by larger marsupial carnivores is not as complex as would be imagined. The fragment clearly belongs in the size range of the living genera *Sarcophilus, Thylacinus* and the largest species of *Dasyurus.* It was accordingly compared with both neontological and palaeontological specimens of *Sarcophilus harisii, Thylacinus cynocephalus* and *Dasyrus maculatus* in the Palaeontology and Mammal Departments of the Australian Museum, Sydney.

A brief examination of the largest individuals of *Dasyurus maculatus* eliminated this genus from consideration on the basis of size and morphology.

The two upper and lower premolars of *Sarcophilus* are robust, conical and low crowned. They lack a distinctive posterior cingular shelf and are in close contact.

The three upper and lower thylacine premolars are well spaced and increase in size posteriorly. The development of a distinctive posterior cingular shelf also increases backwards, being almost unrecognizable on P^1_1, a little developed on P^2_2 and strong on P^3_3. The upper premolars have a well marked median crest but lack a well defined basin on the lingual side of the posterior cingular shelf and have a rather simple heel. The diastems between P^1, P^2 and P^3 are evenly spaced but P^3 is close to M^1, P_1, P_2 and P_3 are evenly spaced and P_3 is separated from M_1. The ridge from the apex of the tooth descends posteriorly in a curve to the labial side of the tooth, then swings back to the centre line at the posterior edge of the tooth. There is a marked lingual basin on the posterior cingular shelf—not deep but distinctive.

P^1_1, P^2_2 and P^3_3 all have a distinctive profile and the curve of the ridge from the top of the crown backwards to the posterior edge of the tooth enables differentiation between isolated premolars.

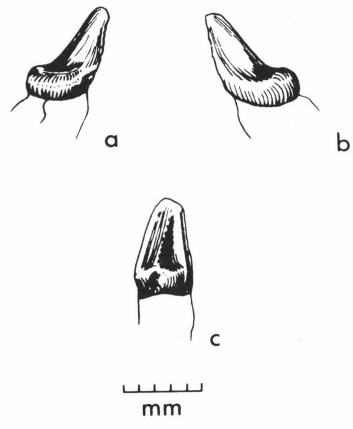

Fig. 1 *Thylacinus* **sp. x 2, UCMP 107737**
a. Lingual view b. labial view c. posterior view

The fossil fragment UCMP 107737/V6234 (Fig. 1) is the posterior half of a left P_2 complete with posterior root. The root, which is broken near its tip, is slightly tapered, broad and robust. A fine crest descends from the apex of the crown posterolabially and turns lingually to end on the posterior cingular shelf. This crest defines the labial edge of a slight but distinct lingual basin. The crown is 5.5 mm high from the base of the enamel between the roots to the apex. From the same point to the back of the tooth, at the base of the enamel, is 4.3 mm and the crown is 3.9 mm wide.

Both the morphology and the dimensions of the fossil fragment accord closely with a series of twenty five recent thylacine lower premolars which were measured and examined. Measurements were made on left P_2's from the

base of the enamel, between the roots, to the tip of the crown; from the base of the enamel, between the roots, to the posterior edge of the tooth at the base of the enamel; and across the width of the tooth at the broadest point. They averaged 5.5 mm, 5.4 mm, and 3.5 mm respectively. The fossil is the posterior half of a thylacine left P_2 of a species whose P_2 is very close to that of *Thylacinus cynocephalus*.

The occurrence of the thylacine in Papua New Guinea was first recorded by Van Deusen (1963). He reported a specimen recovered from an archaeological dig at Kiowa, 3 miles south east of Chuave in the Eastern Highlands, at an elevation of 1525 m. This mandible (AMNH 160284) was found in level nine of the dig; it was associated with fire ash which was dated using the C_{14} method at 9920 ± 200 years before 1950 (Bulmer 1964). A later paper (Bulmer 1974), again refers to the thylacine and assigns it an age of between 6 and 9 000 years before present.

Thylacines have again been found in New Guinea in 1975. M. Mountain of the Department of Anthropology, University of Papua New Guinea, working at a site previously called Niobe by J. P. White (1972), but which is now called Nombe and which is located 2 miles south of the Kiowa site, has found several specimens throughout the human occupation levels.

That thylacines should have roamed New Guinea during the late Tertiary is not surprising for although the animal is extinct, or almost so, in Tasmania, it certainly ranged widely over the Australian continent during the Pleistocene and is found, albeit as a somewhat rare item, in widely separated assemblages of fossil mammals. (Ride, 1964; Archer, 1974).

The similarities between animals found in Tertiary fossil mammal localities in central Australia and in later deposits or even among the living fauna of Papua New Guinea has been noted by several workers. Woodburne (1967) records, *Crocodylus porosus, Kolopsis torus* and *Dorcopsoides fossilus*, from a late Miocene site at Alcoota in central Australia, all of which have their nearest descendants in Pliocene and later faunas of Papua New Guinea. The meagre thylacine material from the Awe fauna, reported here does not allow a statement about possible relationships with *Thylacinus potens* from Alcoota, however it does add to the list of genera shared by the Alcoota and Awe faunas and once again underlines their similarities.

The text figure was drawn by R. W. Brown.

References

ARCHER, M., 1974—New information about the Quaternary distribution of the thylacine (Marsupialia, Thylacinidae) in Australia. *Journal of the Royal Society of Western Australia*, **57**, (2), 43-50.

BULMER, S., 1964—Radio Carbon dates from New Guinea. *Journal of the Polynesian Society* **73** (3), 327-8.

BULMER, S., 1974—Working paper in Anthropology & Archaeology. Linguistics and Maori Studies No. 30, Archaeology. *Unpublished Report, Department of Anthropology, University of Auckland.*

PLANE, M. D., 1967—Stratigraphy and vertebrate fauna of the Otibanda formation, Morobe district, New Guinea. *Bureau of Mineral Resources, Australia—Bulletin* **86**.

RIDE, W. D. L., 1964. A Review of Australian Fossil Marsupials. *Journal of the Royal Society of Western Australia*, **47**, 97-131.

VAN DEUSEN, H. M., 1963—First New Guinea record of *Thylacinus*. *Journal of Mammalogy*, **44** (2), 279-280.

WHITE, J. P., 1972—01 Tumbuna. *Terra Australis*, **2**, 1-176.

WOODBURNE, M. O., 1967—The Alcoota Fauna, Central Australia, an integrated Palaeontological and Geological study. *Bureau of Mineral Resources, Australia—Bulletin* **87**.

Reinterpretation of Isotopic Ages from The Halls Creek Mobile Zone, Northwestern Australia

R. W. Page

Data presented elsewhere in this issue (Page, Blake, & Mahon, 1976) provide some of the first ages from The Granites-Tanami Block. Unfortunately it did not prove possible to date or even adequately sample the weathered low grade metasediments and metavolcanics of the Tanami complex, clearly the oldest exposed component of the block. For this reason age data pertaining to the Halls Creek Group, the suggested correlative of the Tanami complex in the Kimberley region to the northwest (Page *et al.*, this volume, Fig. 1), are now reinterpreted in an attempt to arrive at a reasonable estimate of the age of these old rocks. In considering the available information on the geochronology of this part of Australia it is also pertinent to review the age of the Whitewater Volcanics, Castlereagh Hill Porphyry and Bow River Granite, which form a Lower Proterozoic comagmatic suite overlying and intruding the Halls Creek Group in the Halls Creek Mobile Zone.

The Age of the Halls Creek Group

This group is the basement throughout much of the east Kimberley region and crops out extensively in the Halls Creek Mobile Zone. It consists of tightly folded and complexly faulted low grade metasediments and metavolcanics, and was subdivided by Dow & Gemuts (1969) into four separate formations. The similarities in lithology, regional metamorphism and deformation between the Halls Creek Group and the Tanami complex suggest that these units are stratigraphically equivalent (Blake *et al.*, 1975).

Rb-Sr studies on the Halls Creek Group and later intrusions were undertaken by Bofinger (1967a), and subsequently some of these results have been quoted (Bofinger, 1967b; Compston & Arriens, 1968; Dow & Gemuts, 1969; Gellatly, 1971), leading to the now widely held belief that the Group may be older than 2700 m.y., i.e. Archaean in age. The data are examined here to assess the validity of this age.

Limited Rb-Sr data obtained from three formations in the Halls Creek Group by Bofinger (1967a) yield the following anomalous age pattern:

Ding Dong Downs Volcanics—one intrusive or extrusive acid volcanic sample has a model Rb-Sr age of 2050 m.y.