

Concerns Regarding South32/Worsley Alumina's failure to:

- a) adequately identify the limitations of their Black Cockatoo Nest Tree Survey Methodology; and
- b) improve their methodology to reduce potential impacts to already threatened Black Cockatoo species.

As part of their recent conditional project approval (MS1237), South32/Worsley have been permitted (under condition B13-1(1)(e)) to clear 24 known Black Cockatoo Nesting Trees. However, their methodology for identifying these trees has significant limitations and despite these issues being raised:

- a) during the PER/Appeals process¹;
- b) directly with South32/Worsley Alumina personnel (during a meeting with Claire Reid & Stuart Simmonds on the 17th Feb 2025); and
- c) via email with the Worsley Community personnel²;

South32/Worsley Alumina have shown little concern for improving their methodology to reduce potential impacts to already threatened Black Cockatoo species (only to reduce impacts on their project). Their current methodology will potentially result in numerous trees being mis-identified and the consequent loss of more than 24 Black Cockatoo Nesting Trees.

¹https://www.epa.wa.gov.au/sites/default/files/Proponent_response_to_submissions/South32%20Worsley%20Alumina%20Pty%20Ltd%20Response%20to%20Submissions_V3%20March%202024.pdf

Worsley Mine Expansion Response to Submission Document (Page 303 of 720) Submission No. TF-132 *"Much of the data collected on hollow-bearing trees appears to be based on ground-based surveys despite Whitford finding that ground-based surveys were largely inadequate for assessing hollow bearing trees"*

The proponent's response was that *"Worsley Alumina disagrees with the comments provided; the methodology utilised by Phoenix in the Black Cockatoo Breeding Habitat Assessment study (see Appendix G3 of the ERD) is a recognised form of assessment conducted by environment specialists"*

² Email query to worsleycommunity@south32.net 14/11/2024: *Does South32 acknowledge the limitations of their methodology regarding PHT surveys?*

Response received on 3/12/2024: *Worsley acknowledges that ecological knowledge is always evolving, and updated guidelines may provide new light on survey methodologies. However, this should not undermine the validity of past efforts that were designed to meet the highest standards of the time.*

As stated in the guideline, "Although this guideline is developed based on the most current scientific information available at the time of writing, a referral will be assessed by the department based on the most up-to-date scientific information available at the time of referral, which may build on the information reflected in this guideline" as the Revised Proposal has been referred to the state and commonwealth, it can be assumed the most up-to-date information is being used to review and inform the formal decision on whether to approve the proposal.

Survey Methodology (as taken from South32)

South32/Worsley Alumina's Pre-clearance Surveys and Methodology are outlined in the Conservation Significant Fauna Management Plan (Version 3; https://www.south32.net/docs/default-source/operations/worsley/approvals/management-plans/conservation-significant-fauna-management-plan.pdf?sfvrsn=2c185b6d_1; Pg 33 of 86)

It should be noted the surveys use Dr Mike Bamford's Tree Ranking System (Rank 5-1; see Appendix 1). Dr Bamford also includes a discussion of some of the limitations of this survey methodology (not included in any of South32's documentation).

6.5.5.1 Initial Pre-Clearance Surveys

Pre-clearance surveys are conducted prior to any native vegetation disturbance. The 10 Year Mine Plan includes planned operational disturbance activities and is used to identify areas requiring pre-clearance surveys. The following are identified during pre-clearance surveys

- Potential Breeding Trees (PBTs) including those with suitable hollow/s (Rank 3) or with evidence of use (Rank 1 or Rank 2);
- Potential and confirmed habitat features for other conservation significant fauna species (hollow logs, denning activity etc.);
- Physical signs of presence of conservation significant fauna species; and
- High potential habitat for more cryptic conservation significant fauna species.

Pre-clearance surveys include the following process for inspection:

- Areas of proposed clearing are walked to identify PBTs and other fauna habitat of significance (e.g. hollow logs, thickets etc.)
- All trees of suitable size are reviewed and PBTs are recorded as Rank 1-3 in accordance with Appendix C³ and GPS coordinates captured for all Rank 1-3 trees, as well as GPS coordinates for all other relevant habitat structures observed (noting rank 4 & 5 trees are not GPS recorded).
- PBTs Ranked 2-3 are inspected with a pole camera (or other method e.g. drone) where possible, to verify use or appropriateness of the hollow to support black cockatoo breeding. If the hollow is found to be unsuitable for breeding (e.g. shallow) the PBT will be re-classified to a Rank 4. Noting that PBTs assessed as Rank 1 are already confirmed to support Black Cockatoo breeding.

6.5.5.1 Follow up Pre-Clearance Surveys

- monitoring of all suitable PBTs (Rank 1-3) using the Tap and Flush survey method to determine occupancy
- destructive searches of potential and confirmed habitat features for conservation significant fauna species. This includes tapping and inspecting previously identified

³ Included as Appendix A in this document

habitat features to flush out any occupants. Where possible entries should be blocked or features repositioned so as to discourage return.

To summarise, the Pre-clearance Survey Methodology for Black Cockatoo contains three main steps:

- 1) Initial surveys to rank trees (all ground-based);
- 2) Rank 1-3 trees i.e. those considered most likely to contain Cockatoo nesting hollows, are recorded, but not Rank 4-5 trees;
- 3) Rank 2-3 trees are inspected with a pole-camera or drone and re-classified to a Rank 4 if hollows are considered unsuitable;

Of concern is that whilst the basic dataset after step 2 will potentially contain all four types of data listed below, step 3 above will only recognise and remove False-Positive data (i.e. trees that look like they may contain suitable hollows, but are dismissed on further investigation), not False-Negative data (i.e. trees with hollows that are not visible from the ground). Whilst this will be beneficial to South32/Worsley Alumina's project i.e. fewer trees they have to avoid, it will potentially result in numerous nesting trees with difficult to observe hollows being cleared.

Data Type	Example
True-Positive	Tree that contains cockatoo nesting hollow/s, identified as a tree that contains cockatoo nesting hollow/s
True-Negative	Tree that does not contain cockatoo nesting hollow/s, identified as a tree that does not contain cockatoo nesting hollow/s
False-Positive	Tree that does not contain cockatoo nesting hollow/s but identified as a tree that does contain a cockatoo nesting hollow/s
False-Negative	Tree that does contain cockatoo nesting hollow/s but identified as a tree that does not contain a cockatoo nesting hollow.

Limitations of ground-based surveys – recognition by researchers

The issue of ground-based surveys on tree-hollow identification has been well recognised by numerous researchers. The tree ranking methodology used by South32 is based on Mike Bamford's Ranking System. - the list below includes numerous Australian studies and some of the results/discussion from their research:

- Whitford, KR (2002) Hollows in jarrah (*Eucalyptus marginata*) and marri (*Corymbia calophylla*) trees. I) Hollow sizes, tree attributes and ages. Forest Ecology and Management. 160:201-214.
 - Abstract "Counts of hollows made from ground level are inaccurate as estimates of the actual number of hollows in trees."
 - "3.6. Hollows seen from the ground"

The number of hollows seen from the ground was not well correlated with the total number of hollows in the trees ($r = 0.57$, $n = 211$ trees).” (pg 208)

○ *“4.5. Counting hollows from the ground*

Estimating the number of hollows in trees or forest stands by counting visible hollows is a technique that has been used by several researchers (Smith and Lindenmayer, 1988; Taylor and Haseler, 1993; McComb et al., 1994; Soderquist, 1999; Rhind, 1996). Al Mike Bamford though in my study the ground based estimate of number of hollows was significantly correlated with the actual number of hollows ($p < 0.001$), the correlation coefficient was low ($r = 0.57$, $n = 211$ trees), and in the jarrah forest the estimates produced by this technique were of little practical use.

Why are hollows difficult to see from the ground? Hollows that are vertically oriented with openings at the top cannot be seen from the ground, and hollow entries can be hidden by clumps of leaves, or difficult to see because of shading within the canopy. When entries to hollows are visible, they do not indicate the depth of the hollow because minimum entry dimension is poorly correlated with hollow depth. Additionally, a substantial proportion of hollow entries that are dark and appear to open into a hollow, are blind entries that have been blackened by fire and go nowhere. The difficulty of reliably identifying hollows from the ground emphasises the value of tree and crown attributes as indicators of the hollow bearing potential of the tree, and the utility of these attributes for selecting and managing trees retained for hollow dependent species.” (pg 211)

- Whitford, KR and Williams, MR (2002) Hollows in jarrah (*Eucalyptus marginata*) and marri (*Corymbia calophylla*) trees II. Selecting trees to retain for hollow dependent fauna. *Forest Ecology and Management*. 160:215-232.
 - “The number of hollows seen from the ground was weakly correlated with the number of usable hollows in the trees ($r = 0.42$, $n = 211$ trees)” (pg 219)
- Harper, MJ, McCarthy, MA, van der Ree, R & Fox, JC 2004, ‘Overcoming bias in ground-based surveys of hollow-bearing trees using double-sampling’, *Forest Ecology and Management*, vol. 190, no. 2–3, pp. 291–300
 - Abstract: “Hollow-bearing trees are an important ecological resource for many forest-dwelling species throughout the world. Assessments of the abundance and characteristics of tree hollows usually involve ground-based surveys. These are likely to be biased because of the distance over which the assessments are made. We demonstrate the use of double-sampling theory to correct this bias in order to provide the most efficient estimate of hollow abundance. A sample of 40 *Eucalyptus leucoxylon* (yellow gum) trees located at Yarra Bend Park, Melbourne, were climbed and assessed for hollows through close-up inspection. The results were compared to ground-based surveys conducted by individuals with varying levels of experience in assessing tree hollows. Strong correlations ($r = 0.57 - 0.83$) were found

between climbing and ground surveys and amongst ground surveys. Those ground surveyors who took more time with their surveys generally identified a higher proportion of hollows (Spearman's $r^2 = 0.72$), although all ground surveys underestimated hollow frequency. The proportion of hollows identified by each observer (range 0.09–0.44) remained approximately constant across all tree diameter size classes, indicating systematic underestimation of hollow frequency. The relative efficiency of ground surveys in comparison to climbing surveys is dependent on the time taken for each survey method and the strength of the relationship between them. Although climbing surveys provided the standard for hollow detection, in all cases, the quicker ground surveys were found to increase the efficiency of hollow assessments. Therefore, it was determined that efficient surveys of hollow occurrence could be undertaken by inexperienced surveyors with periodic climbing surveys to measure and correct for bias."

"The accuracy of ground-based surveys of tree hollows has been analysed through comparison of initial ground surveys of standing trees with surveys after the tree has been felled (e.g. Mackowski, 1984; Gibbons, 1999; Whitford, 2001; Whitford and Williams, 2002). Such analyses indicated that counting hollows from the ground might be inaccurate. However, such destructive sampling of trees may be impractical or counter-productive in ecologically sensitive areas. The reliability of this technique is also reduced if hollows are destroyed or created through mechanical damage as the tree is felled or if hollows that survive the fall are obscured once on the ground" (pg 292)

- Rayner, L, Ellis, M & Taylor, JE 2011, 'Double sampling to assess the accuracy of ground-based surveys of tree hollows in eucalypt woodlands', *Austral Ecology*, vol. 36, no. 3, pp. 252–260.
 - "Direction of survey error
Ground survey errors are due to hollows going undetected or other tree features being misidentified as hollows (Koch 2008)". (Pg 258)
 - "**Hollow location**
The accuracy of ground surveys may vary with hollow location with the number of hollows occurring higher in trees and in branches being underestimated relative to hollows elsewhere (Blakely *et al.* 2008; Koch 2008). Frequency of branch hollows was not underestimated relative to trunk hollows for this study although the power of this test was low. However, there was a larger absolute error associated with estimates of branch hollow frequency, which may be due to a difficulty in seeing upward-facing hollows (Blakely *et al.* 2008), typically smaller entrance size and greater visual obstruction amid foliage." (pg 258)

- Stojanovic, D, Webb, M, Roshier, D, Saunders, D & Heinsohn, R 2012, 'Ground-based survey methods both overestimate and underestimate the abundance of suitable tree-cavities for the endangered Swift Parrot', *Emu*, vol. 112, no. 4, pp. 350–356
 - Abstract. "Most cavity-dependent species select tree-cavities with a narrow range of characteristics so that only a small subset of available cavities may be suitable for any species. Most surveys for tree-cavities are done from the ground using binoculars to reduce effort, but this technique is prone to error. These errors are likely to contribute to the loss of the cavity resource when used to inform conservation efforts for cavity-dependent species... We conclude that the most effective way to gain detailed information about the characteristics and abundance of tree-cavities is to climb a representative sample of trees to calibrate ground-based methods for a specific ecosystem."

Limitations of ground-based surveys – recognition by South32/Worsley Alumina

Within South32/Worsley Alumina's PER documentation, despite there being ~43 reports (one in the PER Referral, ERD, 11 in the ERD and 31 in the RTS documentation) that discuss Black Cockatoos, Potential Habitat Trees (PHT) and surveys for hollow-bearing trees as potential Black Cockatoo nesting trees, only four of the Biostat reports discuss the limitations of ground-based hollow surveys:

- Biostat (2017). Mining Extension Areas Associated with the Worsley Alumina Production Increase to 5.1Mtpa – Level 1 Fauna Assessment. RTS, Appendix J11.

*"Assessment of PHT, the number of hollows and the size of hollows is difficult from the ground and generally under-estimates the number of PHT and the number of hollows in trees (Harper et al. 2004; Rayner, Ellis & Taylor 2011; Stojanovic et al. 2012; Whitford 2001). The survey did not specifically concentrate on PHT suitable for Black-Cockatoo, as these trees tend to support a greater number of species (including the endangered Chuditch, *Dasyurus geoffroii*). However, the survey was carried out in October-November 2016 to include the peak breeding period of the breeding season for the Black Cockatoo species. To provide further information, landscape descriptions were recorded for all transect sites."* (Page 12)

- Biostat (2019). Worsley Alumina Mine Expansion (WME) Desktop Fauna Assessment. EPA Referral, Appendix B.

"The standard PHT survey is designed to determine the quality of potential habitat for hollow nesting species, especially threatened or listed species such as black-cockatoo. However, it is known that observers assessing hollows from the ground tend to underestimate the number of hollows, diameter and quality hollows (Harper et al. 2004; Rayner, Ellis & Taylor 2011)." (Page 34)

- Biostat (2021a). Worsley Mine Expansion Primary Assessment Area (PAA) Desktop Fauna Assessment. ERD, Appendix G1

“Data was recorded on the species of trees, number of stems, number and size of observable hollows, and the location of the hollow in the tree structure (see table below). Assessment of PHT, the number of hollows and the size of hollows is difficult from the ground and generally under-estimates the number of PHT and the number of hollows in trees (Harper et al. 2004; Rayner, Ellis & Taylor 2011; Stojanovic et al. 2012; Whitford 2001).” (Pg 195)

- Biostat (2021b). Targeted Surveys: Newmont Boddington Gold Mine and Worsley Refinery Lease Area. (included as a technical appendix to Biostat, 2021a in ERD, Appendix G1).

The identification of potential habitat to support nesting is generally achieved through the search for suitable habitat trees which meet criteria for Diameter at Breast Height (DBH) and the presence of hollows (Department of Environment and Energy 2017; Department of Sustainability, Environment, Water, Populations and Communities 2012). The search for suitable nesting hollows from ground-based surveys is both time and personnel intensive. It is also complicated by a high error rates in the identification of hollows from ground level, with mis-identifications of up to 90% (Harper et al. 2004; Rayner, Ellis & Taylor 2011). (Pg 15-16)

SUMMARY

My questions to South32 are:

- Will South32 formally recognise the limitations of their survey methodology?
- Will South32 work to improve the methodology, reducing the number of false-negatives within the dataset and thereby reducing impacts on threatened Black Cockatoos. If so, how?

The papers included in the section titled *Limitations of ground-based surveys – recognition by researchers* provide a good basis for methodologies that may be useful in assessing the efficacy of ground-based tree hollow surveys.

Appendix 1. Approach to the valuation of nesting habitat for black-cockatoos (revised 9th April 2025)

Aim of the assessment is to identify the current value of a site for nesting by black-cockatoos. It is thus limited to trees which have a structure that is potentially suitable to contain a hollow that can be used by the birds. Before even looking to see if a tree might have a potentially suitable hollow, there are several factors that need to be considered.

- Size of tree. Studies have found that actual nest trees (ie trees with active nests in them and thus with suitable hollows) have a DBH (at 1.3m) >500mm (most tree species including Marri, Jarrah, Karri and Tuart), but that a few tree species form suitable hollows when the DBH is >300mm (Wandoo (*Eucalyptus wandoo*, *E. accedens* and *E. capillosa*) and Salmon Gum). It should be noted that this DBH criterion is only a guide. We have seen a Jarrah with a DBH of ca. 450mm but with black-cockatoo chew marks around the entrance to a hollow. In reality, the tree species is not important; what is important is the presence of a hollow that is suitable for black-cockatoos. In theory, a she-oak could form a suitable hollow, as could non-native eucalypts (although non-native eucalypts in the SW of Western Australia are mostly too young to have formed large hollows). The tree can be alive or dead.
- Structure of tree. A tree with a large DBH also has to have stems of sufficient diameter, and at sufficient height, to contain a hollow attractive to black-cockatoos. Trees with a large DBH that branch close to the ground will not provide suitable hollows. The birds appear to favour high hollows, but this can be contextual. For example, in the Wheatbelt, there may be no suitable hollows >10m, whereas in the tall forests of the South-West, there may be suitable hollows >20m. Where there are suitable hollows at great height, low hollows are very unlikely to be used, but especially in the Wheatbelt where hollows of suitable size are a limited resource, very low hollows may be used. At a Wheatbelt site, J. Wadey (pers. comm.) has reported CBC using a hollow with an entrance at 2m. Such a hollow would almost certainly not be used in the tall forests, where a minimum suitable hollow height of 8m is suggested by studies. When assessing the suitability of a tree, its structure needs to be considered in the context of the surrounding nesting resource.
- Angle of nest-chamber. Black-cockatoos favour a vertical or near-vertical nest-chamber, but the entrance can either be at the top (a chimney), in the side or access may be gained through a horizontal spout. BUT.....nests have been recorded where the nest chamber is close to horizontal.
- Size of nest-chamber. Black-cockatoos favour a wide and deep hollow. Depths of several metres have been reported, and the minimum depth, in an area with very few available hollows, is about 500mm. As with hollow height, hollow depth may be contextual with short hollows used in the Wheatbelt but not in the tall forests. Hollow internal diameter can be <300mm but is generally greater than this. Therefore, the trunk in which a possible hollow may be located needs to be at least 300mm in external diameter, and probably substantially more than this.
- Size of entrance. Black-cockatoos favour wide entrances; for example a chimney hollow may have the same internal diameter from the entrance to the nest-chamber. Active nests have, however, been recorded with an entrance of as little as ca. 100mm. Turpin and Cherriman (2013) report on an active nest (one chick successfully fledged) with an entrance about 100mm wide and 500mm long, entering a chamber 480mm in diameter and 1050mm in depth. It was in a Karri and 15m above ground level.

The above factors are considered in a system for ranking trees (see Table 1). It should be stressed that this is a system based usually upon ground inspection, with follow-up use of a pole camera and/or drone possible later, which can allow for reassessment. For example, a tree given a Rank 3 from the ground could be reassessed to any rank, but such trees are most often downgraded to Rank 4 (occasionally upgraded to Rank 2 when chew marks can be seen only with a pole camera).

It should be further stressed that ANY level of inspection leaves some uncertainty. For example, if a hollow cannot be seen or is not suspected based upon the initial assessment, a follow-up with camera/drone will not take place. Such a tree would be assigned a Rank 5 and would not be considered for reassessment. As there can be thousands of trees, inspecting them all is not practical. Furthermore, a concealed hollow may not be seen even with a pole camera or drone. Similarly, a camera and even a drone can only do so much, as not all hollows can be accessed with such devices. The assessment presented here provides a valuation of a site for cockatoo nesting; it is not a total nest tree survey. As it is a site valuation, it is important not to over-emphasise the assessed value of individual trees.

Note that Rank 3 trees are the most problematic and are also of great interest to regulators. They are the most subject to context; for example a low hollow of suitable size might be a Rank 3 in the Wheatbelt, but not in tall forests. Likewise, a hollow with an entrance diameter of 150mm (wide enough for the birds) but in a trunk of only 200mm diameter (too narrow for a nest chamber of adequate diameter) would not give a tree a rank 3 in the southern forests, but might in the Wheatbelt. It is important to provide comments on Rank 3 trees, and clear notes on Rank 1 and 2 trees.

Finally, the assessment of a tree (ie the rank given to a tree) can change for two reasons:

- Reassessment. It is good practice to reassess Rank 3 trees as this rank gives the appearance of a tree being of high nesting value. But it might not be. Rank 3 should be considered a precautionary assessment, effectively 'this tree looks like there could be a good nesting hollow due to its structure but we can't tell from the ground, so we will assume there is a good hollow up there'. If what appears to be a good hollow can be viewed more closely, such as with a pole camera, and turns out to be a broken off trunk with solid wood and no hollow, then the tree would be reassigned as Rank 4. It has more potential than a Rank 5 but close examination reveals it is not a Rank 3.
- Change in Rank. This can happen in a number of ways. We have several monitoring projects where trees have changed in their rank. For example, we have had a branch containing a formerly active nest fall from a tree, so the tree was downgraded from Rank 1 to Rank 4 (it had no other suitable hollows), and a nearby Rank 3 tree became a Rank 2; possibly the birds breeding in the Rank 1 tree had moved to the Rank 3 tree. We also have several cases of where a Rank 1 tree in one year was a Rank 2 tree in the following year. Nesting hollows may not be used every year. To represent these sorts of changes in monitoring, we use notations such as 'Rank 2(1)' to represent a tree that was a Rank 2 at the time of the most recent assessment, but was formerly a Rank 1.

Table 1. BCE ranking system for the assessment of potential nest trees for Black-Cockatoos (revised 9/04/2025).

As per DCCEEW (2024a, 2024b, 2024c) guidance, a potential nest-tree is any tree with a diameter at breast height >500 mm (or >300 mm for *Eucalyptus accedens*, *E. salmonophloia*, *E. wandoo* and *E. capillosa*). Note that black-cockatoos favour vertical hollows for the nest chamber, but the hollow entrance may be vertical (a chimney hollow), have a side entrance or have a horizontal spout entrance. The tree may be dead or alive.

Ranks	Description of tree and hollows/activity
1	Activity at hollow observed; adult (or immature) bird seen entering or emerging from hollow. Can also be used for a known nest tree active in the previous 12 months (although this should be noted in the description). Note that activity at a hollow does not absolutely mean that breeding is occurring unless a young bird in hollow is observed.
2	Hollow of suitable size visible with chew marks around entrance. Record if chew-marks are recent or old.
3	Potentially suitable hollow visible but no chew marks present at entrance; or potentially suitable hollow suspected to be present - as suggested by structure of tree, such as large, vertical trunk broken off at a height of >8m; but note that hollow height is contextual. Carnaby's Black-Cockatoo will nest in hollows <5m so in a Wheatbelt breeding site a lower criterion may be more appropriate. Note that Rank 3 trees are the most likely to be reassessed with a pole camera and/or drone, and can be either downgraded or upgraded. The Rank 3 assessment should be considered precautionary as it is a tree that has or appears likely to have a suitable nesting hollow.
4	Tree with large hollows or broken branches that might contain large hollows, but hollows or potential hollows are not vertical or near-vertical; thus a tree with or likely to have hollows of sufficient size but not to have hollows of the angle preferred by Black-Cockatoos. Also, a tree with hollows that might be large enough for a black-cockatoo, but in a trunk or branch of insufficient diameter to contain a hollow of preferred size. Trees with low but otherwise suitable hollows can also be assigned a rank or 4, depending on the context (eg south-west forest or Wheatbelt).
5	Tree lacking large hollows or broken branches that might have large hollows; a tree with more or less intact branches and a spreading crown.

NB1. Black-cockatoos favour vertical hollows for the nest chamber, but the hollow entrance may be vertical (a chimney hollow), have a side entrance or have a horizontal spout entrance.

NB2. Chew marks are not always present (or at least visible) around a hollow used by black-cockatoos.

References

- DCCEEW (2024a) *Calyptorhynchus banksii naso* in Species Profile and Threats Database. [online]. Available from: <http://www.environment.gov.au/sprat>.
- DCCEEW (2024b) *Zanda baudinii* in Species Profile and Threats Database. [online]. Available from: <http://www.environment.gov.au/sprat>.
- DCCEEW (2024c) *Zanda latirostris* in Species Profile and Threats Database. [online]. Available from: <http://www.environment.gov.au/sprat>.
- Turpin, J. and Cherriman, S. (2013). Nesting records of Carnaby's [Black-] Cockatoo from the Porongorup Range, South-West Western Australia. *West. Aust. Nat.* 29 (1): 1-7.

