



## *Thesium ovatifolium* (Santalaceae), a new species with ovate leaves from KwaZulu-Natal, South Africa

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### Abstract

A new species from South Africa, *Thesium ovatifolium*, is described. A diagnosis, description and photographs are provided along with details of its distribution, habitat and conservation status. The new species forms part of *Thesium* sect. *Barbata*, which is characterized by the presence of a dense apical beard on the corolla lobes and post-staminal hairs connecting the anthers to the perianth. It is distinguished by its alate stems, large ovate leaves and bracts, with reticulate secondary venation, 3- to 4-flowered cymes on inflorescence apices, as well as the rosulate arrangement of leaves and bracts in young stems and inflorescences. *Thesium ovatifolium* is believed to be Endangered (EN), based on IUCN criteria.

**Keywords:** grassland, Thesiaceae, *Thesium goetzeanum* complex

### Introduction

*Thesium* Linnaeus (1753: 207) [Santalaceae (The Angiosperm Phylogeny Group 2016) or alternatively Thesiaceae (Nickrent *et al.* 2010)] species are hemi-parasitic herbs or subshrubs characterized by their sessile, linear or scale-like leaves and dry, nut-like fruits, which often form elaiosomes (De Candolle 1857, Hill 1925, Nickrent & García 2015). *Thesium* is globally distributed, with a centre of diversity in South Africa ( $\pm 170$  species) where it is listed as a high priority for taxonomic research (Germishuizen *et al.* 2006, Victor *et al.* 2015), because existing taxonomic treatments and identification keys are outdated. Since the last comprehensive taxonomic revision of South African *Thesium* species by Hill (1925), a further 40 new species have been described (e.g., Brown 1932, Brenan 1979, García *et al.* 2018). As part of a larger project to revise this taxonomically problematic genus (e.g., Visser *et al.* 2018), field work has revealed the presence of an, as yet, undescribed *Thesium* species.

In 2016 a *Thesium* specimen, collected by Mr Pieter Bester near Ngome, KwaZulu-Natal, South Africa, reached the authors, who believed the species to be new to science due to its unusually large ovate leaves. However, as *Thesium* species are known to exhibit phenotypic variation in several vegetative characters (Hill 1915), it was necessary to confirm that the leaf size and shape was not just extreme phenotypic variation of the superficially similar species *T. goetzeanum* Engler (1901: 306). A subsequent visit to the collection locality revealed a large population of more than a hundred plants, all with markedly large and ovate leaves. Upon further investigation of the collections at three major herbaria (NH, NU and PRE), two additional collections of the species were found (none were found in NU). The first collection, *B. Schrire 1093* (NH) from 1982, was from the same area the authors visited, and the second, *J.P.H. Acocks 13068* (PRE) collected in 1946, was located approximately 90 km to the southeast, near Hlabisa. Both field investigations and herbarium collections confirmed it to be a distinct species. The new species is described here as *Thesium ovatifolium* N.Lombard & M.M.le Roux.

## Materials and methods

Fresh material of *T. ovatifolium* was collected by the authors at the type locality (Ngome, KwaZulu-Natal, South Africa) in October 2018. Specimens of this collection (Visser & Lombard 346, 347, 348, 349) are listed below, and are housed in the National Herbarium (PRE) in Pretoria, South Africa. Duplicate specimens will be distributed to NH and NBG. Herbarium acronyms follow Thiers (2019).

The vegetative and reproductive characters of all six known collections of *T. ovatifolium* (housed in NH and PRE) were studied. Measurements were taken by hand using a ruler, except for floral measurements below 3 mm, which were taken using a Zeiss Discovery V8 Stereo microscope, with a Zeiss 60 N-C, 2/3", 0.63× camera attached and Zeiss ZEN lite software v. 2.0 (Carl Zeiss Microscopy GmbH).

The new species was compared to two superficially similar species, *T. goetzeanum* and *T. racemosum* Bernh. in Krauss (1844: 79). Character information for these two species were sourced from the most recent taxonomic treatments for each species, Visser *et al.* (2018) and Hill (1925) respectively. Insights into morphological variation were further improved by studying herbarium specimens in BNRH, J, K, NH and PRE, as well as through field studies.

All photographs were taken by the authors in the field, except for flower sections, which were photographed using the Zeiss Discovery microscope and associated camera described above. Photographs and figure plates were edited using Microsoft Publisher software v. 14.0.7181.5 (Microsoft Corporation).

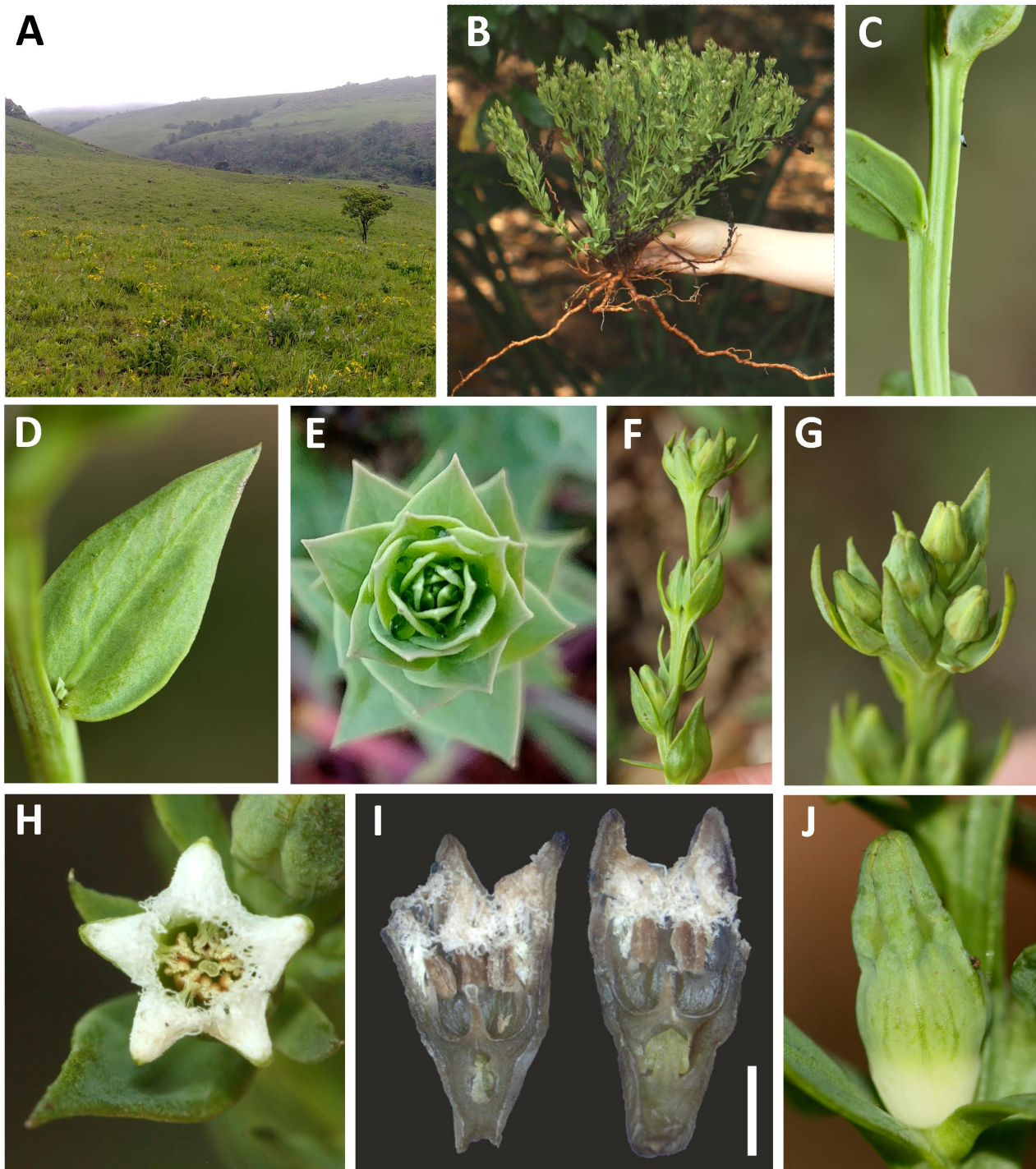
A preliminary conservation status is suggested, based on the guidelines provided by the International Union for Conservation of Nature (IUCN Standards and Petitions Subcommittee 2017).

**TABLE 1.** A comparison of the main diagnostic characters to distinguish between *Thesium ovatifolium* and two morphologically similar species, *T. goetzeanum* and *T. racemosum*.

|                                    | <i>T. ovatifolium</i>                | <i>T. goetzeanum</i>          | <i>T. racemosum</i>         |
|------------------------------------|--------------------------------------|-------------------------------|-----------------------------|
| <b>Stem shape</b>                  | Alate                                | Sulcate                       | Alate                       |
| <b>Leaf shape</b>                  | Lanceolate to ovate                  | Linear to narrowly obovate    | Linear to linear-lanceolate |
| <b>Leaf size (length × width)</b>  | (3.0–)11.0–21.0(–30.0) × 3.0–14.0 mm | 4.5–20.0 × 0.3–1.8 mm         | 6.0–10.0 × 0.6–1.5 mm       |
| <b>Leaf secondary venation</b>     | Reticulate                           | Absent                        | Absent                      |
| <b>Inflorescence apex</b>          | 3- to 4-flowered cymes               | 1-flowered (3-flowered cymes) | 1-flowered                  |
| <b>Bract shape</b>                 | Lanceolate to ovate                  | Linear-lanceolate             | Linear-lanceolate           |
| <b>Bract size (length × width)</b> | 6.4–16.2(–23.0) × 1.6–5.7(–9) mm     | 4.0–12.5 × 0.4–1.8 mm         | 3.0–4.6 × 0.6–0.9           |
| <b>Bract fusion to pedicel</b>     | Complete                             | Complete                      | Partial                     |
| <b>Corolla lobe apical beard</b>   | Present                              | Present                       | Absent                      |

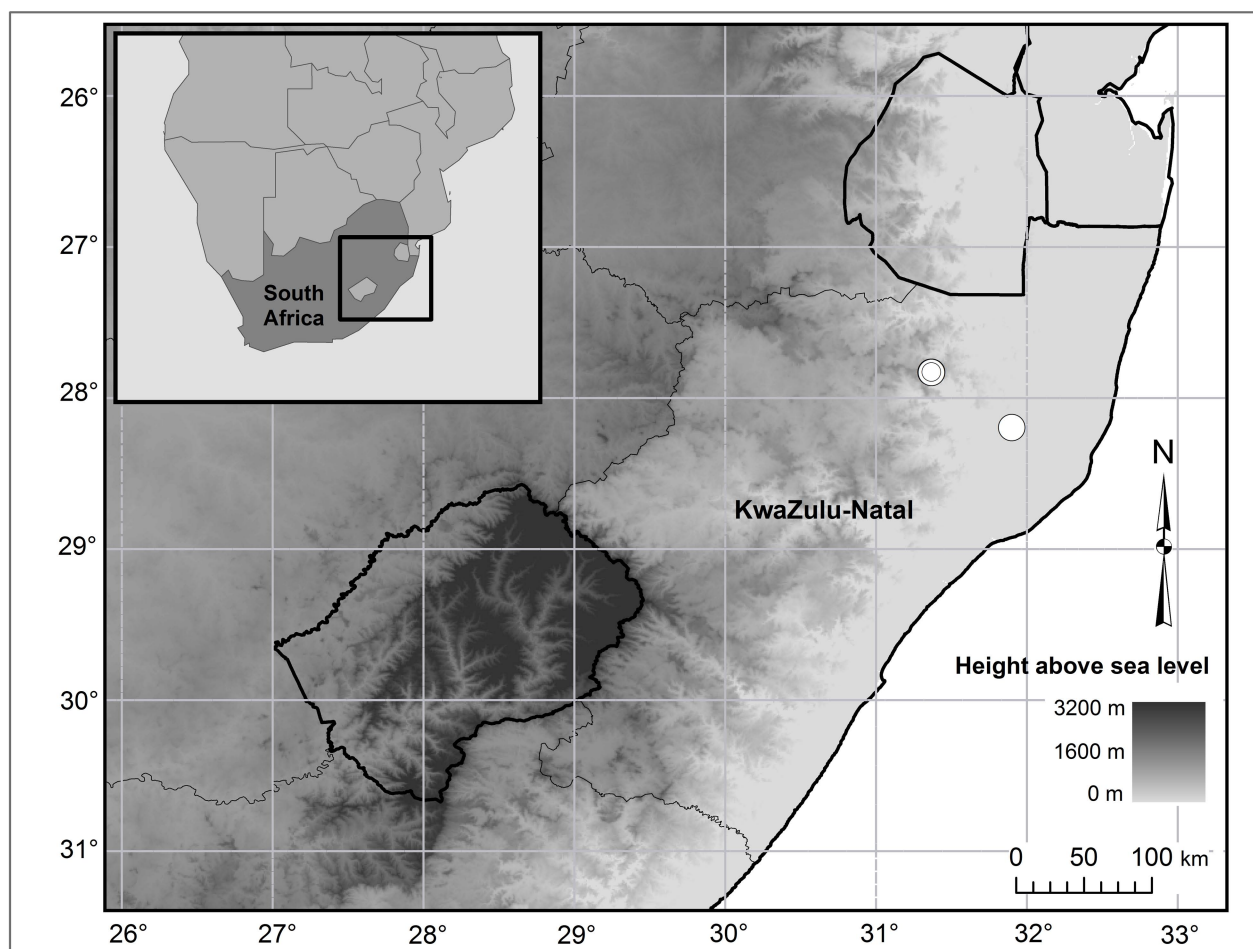
## Results and discussion

*Thesium ovatifolium* forms part of the recently revised *T. goetzeanum* species complex (Visser *et al.* 2018) in *Thesium* sect. *Barbata* Hill (1915: 10). Species in this complex are characterised by corolla lobes with a prominent apical beard, post-staminal hairs connecting the anthers to the perianth, non-sessile stigmas, determinate inflorescences, leafy (not rush-like) stems, glabrous stems and leaves, and leaf-like (not scale-like) leaves, bracts and bracteoles (Visser *et al.* 2018). *Thesium ovatifolium* is distinguished by its alate stems (longitudinal wing-like ridges present below the point of attachment of the leaves), large lanceolate to ovate leaves [(3.0–)11.0–21.0(–30.0) × 3.0–14.0 mm] and bracts [6.4–16.2(–23.0) × 1.6–5.7(–9) mm], with reticulate secondary venation, and 3- to 4-flowered cymes on its inflorescence apices, as well as the rosulate arrangement of leaves and bracts in young stems and inflorescences (see Table 1).



**FIGURE 1.** *Thesium ovatifolium*. A. Grassland habitat at the type locality near Ngome, KwaZulu-Natal, South Africa. B. Suffrutescent, virgate habit. C. Alate stem. D. Ovate leaf with a prominent midrib and reticulate secondary venation. E. Rosulate arrangement of leaves in a young stem. F. Determinate racemose inflorescence. G. 4-flowered cyme on an inflorescence apex. H. Apical beard on the corolla lobes of a fresh flower. I. Cross-section of a rehydrated flower. J. 10-ribbed fresh fruit with an elaiosome at the base. Scale bar in I = 1 mm. Photographs taken of the holotype, *Visser & Lombard 348*, by M.M. le Roux (B–D, F–H, J), R.J. Lombard (A, E) and N. Lombard (I).

Within the *Thesium goetzeanum* complex, *T. ovatifolium* is superficially most similar to *T. goetzeanum* in its suffrutescent and virgate habit, leafy stems, green coloration, determinate racemose inflorescences, and floral structure. *Thesium goetzeanum*, however, differs in its sulcate stems (longitudinal ribs present below the point of attachment of the leaves), smaller 1-nerved linear to narrowly obovate leaves ( $4.5\text{--}20.0 \times 0.3\text{--}1.8$  mm) and linear-lanceolate bracts ( $4.0\text{--}12.5 \times 0.4\text{--}1.8$  mm), 1-flowered (occasionally 3-flowered) inflorescence apices and the absence of a clear rosulate arrangement of leaves and bracts (see Table 1). Although, both *T. ovatifolium* and *T. goetzeanum* occur in the grasslands of KwaZulu-Natal, South Africa, their distribution ranges do not overlap.



**FIGURE 2.** The known geographical distribution of *Thesium ovatifolium* in the KwaZulu-Natal Province (larger map) of South Africa (insert, darker grey).

*Thesium ovatifolium* is also compared to *T. racemosum* (see Table 1), which has been recorded in Vryheid, KwaZulu-Natal, South Africa, close to the type locality of *T. ovatifolium*. Although *T. racemosum* falls within *Thesium* sect. *Imberbia* Hill (1915: 10) (characterised by glabrous, papillose or lacinulate corolla lobes), these two species might be confused due to their similar virgate habits, and alate leafy stems. *Thesium racemosum* is easily distinguished from *T. ovatifolium* by its smaller (6.0–10.0 × 1.5 mm), linear to linear-lanceolate leaves, and papillose corolla lobes, compared to the larger lanceolate to ovate leaves [(3.0–)11.0–21.0(–30.0) × 3.0–14.0 mm], and dense apical beard of *T. ovatifolium*.

## Taxonomic treatment

***Thesium ovatifolium*** N.Lombard & M.M.le Roux, *sp. nov.* (Fig. 1)

**Diagnosis:**—*Thesium ovatifolium* is superficially similar to *T. goetzeanum* and *T. racemosum*, but differs in its predominantly ovate leaves (linear to narrowly obovate in *T. goetzeanum*, and linear to linear-lanceolate in *T. racemosum*) and bracts (linear-lanceolate in *T. goetzeanum* and *T. racemosum*) with reticulate secondary venation (absent in *T. goetzeanum* and *T. racemosum*), 3- to 4-flowered cymes on inflorescence apices [1(3)-flowered in *T. goetzeanum*, and 1-flowered in *T. racemosum*], and the rosulate arrangement of leaves and bracts in young stems and inflorescences (absent in *T. goetzeanum* and *T. racemosum*). *Thesium ovatifolium* further differs from *T. goetzeanum* in its alate (not sulcate) stems, and from *T. racemosum* in its densely bearded (not papillose) corolla lobes.

**Type:**—SOUTH AFRICA. KwaZulu-Natal Province: Ngome area, about 60 km east of Vryheid on the R618, 1105 m, 14 October 2018, N. Visser & R.J. Lombard 348 (holotype, PRE; isotypes, NH, NBG).

Rhizomatous *suffrutex*, up to 0.3 m tall, vegetative scales present on rhizome and lower parts of aerial stems; stems 5 to 50, arising from rhizome, erect or suberect, virgate, branched in upper half, green, glabrous, alate due to decurrent bases of leaves and bracts. *Leaves* more or less spreading, lanceolate to ovate, (3.0–)11.0–21.0(–30.0) × 3.0–14.0 mm, glabrous, apex acute or pungent, midrib prominent on both surfaces, secondary veins faintly reticulate, margins entire. *Flowers* usually solitary in bract axils, sometimes with 2- to 3-flowered cymes, arranged in 6- to 13-flowered determinate racemose inflorescences, terminating in 3- to 4-flowered cymes; pedicels 0–3.0(–5.0) mm long. *Bracts* lanceolate to ovate, 6.4–16.2(–23.0) × 1.6–5.7(–9) mm, usually acuminate, margins entire, fused to full length of pedicel; bracteoles leaf-like, 4.0–9.7(–15.6) × 0.8–2.3(–3.2) mm. *Perianth* campanulate, 3.0–5.0 mm long, elongate receptacle often present, “glands” often visible on outside; corolla lobes narrowly triangular, 1.0–1.7 × 0.4–0.6(–0.9) mm, apex slightly cucullate, with dense apical beard. *Stamens* inserted at base of corolla lobes; filaments 0.3–0.6 mm long; anthers 0.4–0.9 mm long, attached to perianth with post-staminal hairs. *Style* 0.7–1.4 mm long, stigma ± opposite anthers. *Placental column* straight; ovules 3. *Fruit* elliptic, shortly stipitate (stipe ±0.5 mm long), 5.0–7.5 mm long including persistent perianth (3.0–5.0 mm long excluding perianth), 2.5–3.5 mm wide, 10-ribbed or occasionally 5-ribbed, smooth or with faint reticulate venation.

**Distribution and habitat:**—*Thesium ovatifolium* is endemic to the KwaZulu-Natal Province in South Africa, where it is known from only three localities between Hlobane, and Hlabisa to the south-east (Fig. 2). It is found in grasslands, as well as grassland patches in wooded areas, between 365 and 1178 m a.s.l. The large disparity between the high elevation mistbelt grassland vegetation [Northern Zululand Mistbelt Grasslands (Gs1); Mucina & Rutherford 2006] and the lower elevation wooded grassland vegetation [Northern Zululand Sourveld (SV122); Mucina & Rutherford 2006] in which this species has been found, is indicative of a widespread distribution.

**Phenology and ecology:**—*Thesium ovatifolium* seems to exhibit the typical phenology of South African grassland *Thesium* species, occurring in the summer rainfall region, flowering and fruiting between September and February. Elaiosomes are often present at the base of the fruits, suggesting myrmecochory as a possible seed dispersal strategy.

**Etymology:**—The specific epithet *ovatifolium* refers to the distinctive ovate leaves of this species.

**Conservation:**—*Thesium ovatifolium* has an extent of occurrence (EOO) of 103 km<sup>2</sup> and an area of occurrence (AOO) of 12 km<sup>2</sup>. It is known from only three localities, of which two are historical records (i.e. number of localities 1–3). While the population at the type locality near Ngome has been seen by the authors, the two historical localities (near Ngome and Hlabisa) have not been verified. Both localities in the Ngome area are subject to ongoing overgrazing. The locality near Hlabisa was incorporated into the Hluhluwe-iMfolozi Park in 1989, and while it is currently protected, there are signs of historical disturbances, such as overgrazing. The Ngome and Hlabisa localities are ±75 km apart, and while other populations of *T. ovatifolium* might be present in between these localities, the area is mostly transformed by rural developments. A preliminary conservation status of Endangered (EN) is therefore suggested under Criterion B1ab(iii) + 2ab(iii) (IUCN Standards and Petitions Subcommittee 2017).

**Additional specimens examined (paratypes):**—SOUTH AFRICA. KwaZulu-Natal: Hlabisa, ±2.7 km [±4.5 mi] south of Hlabisa, 13 October 1946, *J.P.H. Acocks 13068* (PRE [2 sheets]); Louwsburg, about 12 km along road to Vryheid from Ngome Forest Station turnoff, 17 October 1982, *B. Schrire 1093* (NH – image); Ngome area, about 60 km east of Vryheid on the R618, 14 October 2018, *N. Visser & R.J. Lombard 346* (PRE), *347* (PRE), *349* (PRE); Ngotshe District, 57 km east of Vryheid on the R618 between Vaalbank and Nongoma, Farm: Zaagkuil 14333, 15 October 2013, *S.P. Bester 11666* (PRE).

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