

## NOTES ON THE NATURAL HISTORY OF A TRAPDOOR SPIDER *ANCYLOTRYPA* SIMON (ARANEAE, CYRTAUCHENIIDAE) THAT CONSTRUCTS A SPHERICAL BURROW PLUG

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**ABSTRACT.** Burrows of an unidentified species of *Ancylotrypa* Simon from the floodplain of the Nyl River in Limpopo Province, South Africa are described. In addition to constructing a thin trapdoor, members of this species construct a hard, spherical plug or marble from soil particles held together with silk. Burrow structure, the plug and associated behavior are described for the first time.

**Keywords:** Marble spiders, burrows, spherical plug, trapdoor, *Ancylotrypa*

The genus *Ancylotrypa* Simon 1889 contains 48 species 32 of which occur in southern Africa (Dippenaar-Schoeman 2002). Members of this genus construct and occupy silk-lined burrows that vary from simple, single-tube structures to Y or U shaped configurations or burrows with multiple arms, not all of which necessarily reach the soil surface. Various forms of soft lids close the burrow entrances (e.g., Dippenaar-Schoeman 2002: p.43 fig. 26). Although burrows of several species of *Ancylotrypa* have previously been described, this is the first species to be shown to construct a spherical plug or “marble” which is used to close and possibly protect the burrow.

This study was conducted on the floodplain of the Nyl River (24°39'S: 28°42'E) in the Limpopo Province of South Africa at Nylsvley Nature Reserve from the summer of 1992–1993 through 2002–2003. The floodplain is usually inundated during the southern summer (November–March) but in years of poor rainfall the area remains entirely dry. When several years of exceptionally high rainfall occur it may remain inundated for more than one season (Barnes et al. in press).

In the late 1980s we observed colonies of trap door burrows in the sodic alluvial soils of the Nyl River floodplain. Small spheres made of tight packed sand resembling tiny marbles of various sizes were noted lying on the ground in the vicinity of the colonies but the connection between these marbles and the spiders that produce them was not made until 1992–1993 when burrows were examined in detail.

Burrows were excavated at different times of the year: during dry and wet seasons and in years of average, low and high rainfall. A colony would be located, the ground swept with a hard floor brush and a burrow chosen for excavation. Burrow lids

were gently scratched to ascertain which were occupied and it was found that if spiders were present, they would tug at the lids which, because they are soft, made them cave inwards. If the lids were scratched too hard, movement would cease and it was assumed the spider had retreated lower into its burrow. A hole was dug vertically about 60 mm distant from the chosen burrow lid to a depth of about 200 mm at what was hoped to be more or less parallel to the burrow and the hard soil between the initial hole and the burrow was removed. Once the main arm of a burrow was located even more careful digging was carried out to find the direction of the side arm until the whole burrow was located. The burrow was measured and only then would the burrow wall be breached below the junction of the arms and subsequently sectioned from the bottom towards the top. Burrow shape, the spider, any young or eggsacs, prey remains and the position of the spherical plug were noted. Some plugs were cut open to see how they were constructed.

All the burrows ( $n = 97$ ; Table 1) excavated were roughly Y-shaped with two short arms forming a V above the junction of the main burrow (Figs. 1 & 2). The angle of the burrow to the soil surface varied between about 50° and 60° and all burrows had lids (Table 2). The largest burrows were those of adult females, generally about 150 mm deep: one arm between 30 and 40 mm long from the junction to the surface of the soil, ending in a cuff and wafer-lid trapdoor, the other ending some 10 mm below the soil surface. The trapdoor was soft, folded and asymmetrical. Larger burrows had lids with a raised “cuff” (Leroy & Leroy 2000) of silk around the lid as well as the trapdoor and were found to contain adult female spiders. All the burrows excavated contained hard, spherical plugs or “marbles” formed of soil particles bound together by

Table 1.—Total number of burrows of *Ancylotrypa* sp. excavated over a ten year period from 1992–2002 including number of burrows containing young or eggsacs. Immature spiders were less than 8 mm in length. No adult males were found in burrows.

Month	Young present	Egg sacs present	No young or egg sacs present	Immature	Total
Jan.	3	2	—	2	7
Feb.	4	2	—	3	9
Mar.	4	2	—	4	10
April	3	1	—	5	9
May	3	2	1	4	10
June	1	2	—	4	7
July	1	2	2	2	7
Aug.	1	1	1	3	6
Sept.	2	1	1	2	6
Oct.	2	1	1	3	7
Nov.	2	1	2	4	8
Dec.	3	1	—	6	11
Total	29	18	8	42	97

fine, strong silk. The size of the marble corresponded closely to the burrow diameter. On cutting open the spherical marbles, all were found to contain only soil particles and no prey remains. Many marbles of different diameters were found on the surface of the soil and it seems that the spiders periodically construct new ones, probably as they grow and enlarge their burrows the spiders discard the old, smaller marbles (Fig. 3). During nocturnal observation, the spiders were found to be sit-and-wait predators. They do not leave their burrows to hunt but lurk below the trapdoor for prey to come close enough to be snatched and taken down into the burrow. On excavating the burrows, if the spider was undisturbed, the marble would be found at the top of the shorter, blind arm. Likewise, if during excavation, the spider retreated to the bottom of the burrow, the marble would still be at the top of the shorter arm. However, if the burrow wall was carefully breached for observation and if the trapdoor was then scratched, the spider would pull on the door presumably to test what the disturbance was. More vigorous scratching, which eventually broke the door, sent the spider scurrying from the open arm into the blind one, where it retrieved the marble (Fig. 4) and then positioned the marble below the door, hiding below it.

All the burrows excavated housed female or immature spiders and those of adult females also contained eggsacs or young at all times of year. No adult males were collected from burrows. Prey remains and exuvia were found to be stored above

the marble at the top of the blind arm while eggsacs were generally suspended from the burrow walls near the bottom of the burrow.

On checking geomorphological and flooding data it became apparent that the area the spiders inhabit does not become inundated when the river floods but because it is rather flat, will be covered in water from a few to several centimeters deep for varying lengths of time after even a single rain storm. Since the first observations in the southern summer of 1992–1993 we have had the opportunity to observe the effect of showers of varying intensity and duration and noted that sheets of water form and, because the soil is virtually impermeable, the humidity penetrates it very slowly indeed. In years of steady rainfall these sheets of water persist all summer, being replenished with each successive shower although if it does not rain regularly the shallower parts dry up after a few days.

The whole area where the spiders are found is interspersed with vegetated “islands” which are up to half a meter higher than the surrounding bare parts. During the summer months there is good grass cover and considerable termite activity. According to Ferrar 1982, 12 species of termites can be found on what he termed “turf vlei” (here called sodic, alluvial soils). Three species are dominant with *Macrotermes natalensis* being the most visible. It was expected that termites would be the main prey for this spider but a cursory examination of prey remains shows small Coleoptera and ants constitute the main prey along with the remains of a few termites and other small unidentifiable hymenopterans.

The population density of this species of *Ancylotrypa* in the study area is very high, especially on slightly raised and sloping ground. A square meter transect was marked out into 200 mm squares on one of these shallow slopes, the covering of loose soil swept from the top few millimeters and 170 burrow lids counted. While excavating burrows, still more were found which had not been apparent from the surface. At a rough estimate, in optimum areas, there could be around 200 burrows per square meter but these did not extend into areas with different soil textures.

There are “Y” shaped burrows constructed by other *Ancylotrypa* species but until this study, there are no records of marbles being constructed by spiders in this genus. The only other similar behavior seems to be that of a trapdoor spider in the family Nemesiidae, *Stanwellia nebulosa*, found in South Australia (Main 1976). This species uses a pebble or stone attached to a sock and stores in a side pocket about halfway down its burrow, counterbalanced to fall neatly so that when it feels threatened it can be pulled down to close off the bottom half of the burrow.

Because the burrows of this species of *Ancylo-*

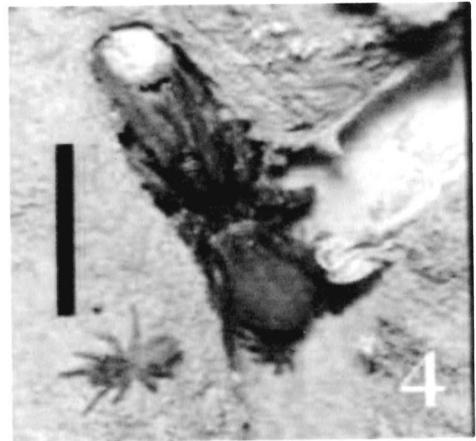
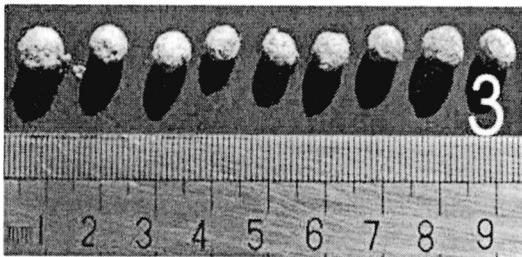
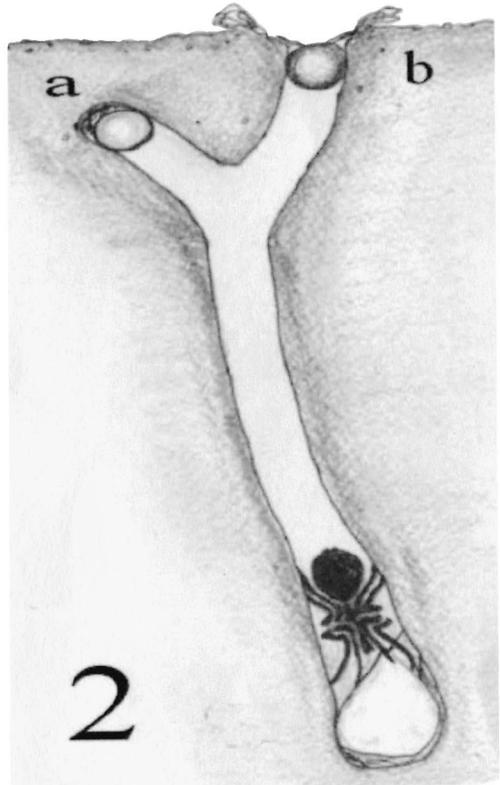
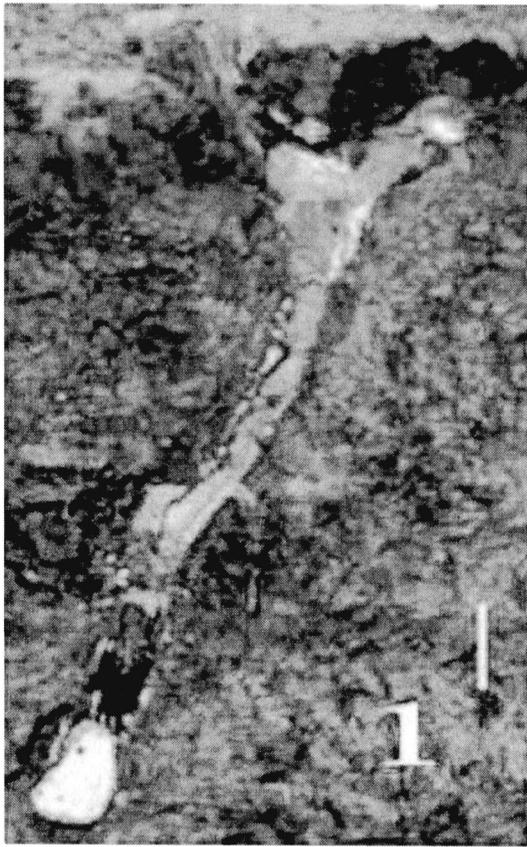


Figure 1.—Excavated burrow of adult female *Acylotrypa* showing marble stored at the top of the blind arm. The spider is just above an egg case which is attached to the wall at the bottom of the burrow. Scale bar = 10mm.

Figure 2.—Diagram of burrow showing the two positions of the marble: (a) stored at the top of the blind arm and (b) in position to plug and protect the burrow.

Figure 3.—Size of marbles shown next to a metric scale.

Figure 4.—Female spider collecting marble from the blind arm preparatory to plugging the open arm of the burrow. Note young still in material burrow, Scale bar = 10 mm.

Table 2.—Numbers and sizes of burrow lids of *Ancylotrypa* sp. measured in 1 square meter area.

Size of burrow lid (diameter in mm)	Number
<2	42
2–4	83
4–6	32
6–8	13

*trypa* are found on slightly sloping ground where water can drain away, it appears that the hypothesis that the marbles are used to stop water flooding the burrow is probably not the case. The conclusion is that the marbles are used by the spider to plug the burrow when the trap door is breached and we suggest a vernacular name of “marble spiders”.

It was not possible to identify the species on which this study is based because the genus *Ancylotrypa* is in need of taxonomic revision. It is tentatively identified as *Ancylotrypa brevivalpis* (Hewitt 1916) described as *Pelmatorycter brevivalpis* and originally placed in the family Ctenizidae by Hewitt based on material collected from Pretoria and from one other locality, Crocodile Bridge. Raven (1985) transferred the genus to the family Cyrtaucheniidae and the species to the genus *Ancylotrypa*. If it is *A. brevivalpis*, males have been collected in pit traps and recorded from Gauteng and the North West Provinces of South Africa (Dippenaar Schoeman 2002) which means that Nylsvley Provincial Nature Reserve (24°39'S:28°42'E) and the nearby Mosdene Private Nature Reserve (24°31'S:28°47'E) in Limpopo Province, South Africa will constitute new locality records. Voucher specimens are deposited in The National Collection of Arachnida, ARC-Plant Protection Research Institute, Pretoria, South Africa (PPRI).

#### ACKNOWLEDGMENTS

The authors thank The Friends of Nylsvley and the Nyl Floodplain for permission and encouragement to list and study the arachnofauna of the Nylsvley Nature Reserve and to Steve Langton for first pointing out the spiders and their burrow plugs. We are especially indebted to Dr. Gail Stratton of the University of Mississippi for final editing of the manuscript and Dr. Eugene Marais, Senior Curator Natural History of The National Museum of Namibia for helpful suggestions and initial editing.

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*Manuscript received 28 December 2004, revised 15 August 2005.*