BRIEF COMMUNICATIONS

Rediscovery of the world's leggiest animal

This ancient animal, found only in a tiny stretch of California, is close to being a true millipede.

The millipede species *Illacme plenipes* comes the closest to having its namesake's mythical 1,000 legs — individuals can bear up to 750 legs¹. Here we record the rediscovery of this extremely rare species, which has not been reported since its original description¹ some 80 years ago, at a tiny locality of 0.8 km² in San Benito County, California. Because of the rarity and narrow geographical range of this delicate species, its fragile habitat must be protected at all costs.

The arthropod class Diplopoda (millipedes) contains some 10,000 described species² and is one of the most ancient groups of terrestrial animals^{3–5}. Confident reconstructions of diplopod phylogeny and the taxon's placement within the broader context of arthropod evolution remain elusive, however, due in part to the group's antiquity, but also to the rarity of key taxa^{6,7} — some are known from just a single specimen. The millipede *I. plenipes* (Arthropoda: Myriapoda: Diplopoda: Siphonurhinidae) has not been sighted since 1926 (ref. 1).

Over the course of three separate collecting expeditions, we captured four male, three female and five juvenile specimens of *I. plenipes*. The female specimens were 32.38–33.20 mm long and comprised 170 or 171 segments with a total of 662–666 legs — slightly fewer than the record-holding specimen first described¹. Male specimens were smaller at 14.38–16.15 mm, with 84–105 segments and 318–402 legs.

Millipedes undergo anamorphosis, the addition of segments and legs during post-embryonic growth⁸. In siphonurhinid millipedes, this continues for an indeterminate length of time, possibly even after sexual maturity. This would result in continuous segment addition and elongation and would account for the length variation we observed in our adult specimens. The average body width for all specimens is a thread-like 0.57 mm.

The species' simple outward appearance (Fig. 1a) belies its ornate exoskeletal surface structure, which becomes evident through scanning electron microscopy (Fig. 1b–e). (For

Figure 1 | The millipede *Illacme plenipes*. **a**, Live female *I. plenipes* with 662 legs (captured by Rob Marek). **b,c**, Scanning electron micrographs of male *I. plenipes*: **b**, mid-section, dorsal aspect of segments (note dense setation and micro-sculpturation of intersegmental cuticle); **c**, mid-section, ventral aspect of segments showing paired appendages on each diplo-segment. **d**, Close-up view of ozopore, the opening to the repugnatorial gland, and surface structure of cuticular projection on posterior margin of segment. **e**, Male copulatory device (gonopods), which are modified legs (ninth and tenth pair); left anterior is shaded blue; right posterior is in yellow. Scale bars: **a**, 10 mm; **b**, **c**, 400 μ m; **d**, 50 μ m; **e**, 200 μ m.

more images and for the only live video ever recorded, to our knowledge, of *I. plenipes*, see supplementary information.) Each segment is equipped with numerous hairs (setae) and previously undocumented cuticular projections. Many of the setae on the dorsal segmental plates (tergites) seem to secrete a 'silk-like' substance whose function is unknown. The trailing edge of each tergite and the ozopore — a gland opening — have bizarre, almost gothic ornamentation.

The male copulatory device (Fig. 1e) is far more complicated than previously described⁹, comprising an anterior component that cups the posterior articles *in situ*. The distal article of the posterior gonopod, the sixth podomere, is bifurcate and each branch is armed with a serrated apex like a bird claw

(Fig. 1e, structure shaded yellow).

The rediscovery of this remarkable animal in a known biodiversity hotspot, the California Floristic Province^{10,11}, is noteworthy: other species of closely related¹² and equally rare siphonurhinid genera are endemic to centres of biodiversity in Indo-Burma, southern Africa, Sundaland and Wallacea. The family's enigmatic distribution further supports the unique status of these hotspots as repositories of exceptional diversity and provides evidence that the siphonurhinid radiation pre-dates the break-up of Pangaea more than 200 million years ago.

Our rediscovery of *I. plenipes* at a time when sophisticated microscopes are available has revealed the fine-scale structure of a creature whose morphology is surprisingly intricate. The Diplopoda are an intriguing class of organisms that await new discoveries.

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