Supplementary

The Bathyergidae family

The African mole-rats of the family Bathyergidae (Rodentia) have some 22 described species from six genera, with a wide distribution (reviewed by Šumbera [1]) [2,3], and are endemic to sub-Sahara Africa. The social groups include three genera, *Heterocephalus*, a monotypic genus in the Horn of Africa [2,3], *Fukomys,* in savannah habitats in tropical Africa, and *Cryptomys,* limited to the subtropics and Mediterranean Southern African region [2,4]. The solitary species include three genera, namely *Bathyergus,* which occurs in the western and/or northern Cape of South Africa and *Georychus,* which occurs in forested and savannah regions across the coastal regions of Western Cape and Eastern Cape provinces in South Africa [4,5]. The last social species include another monotypic genus, *Heliophobius,* which occurs mainly in Eastern Africa [1].

Life history

Importantly, bathyergids are subterranean and/or fossorial, meaning they live and forage almost exclusively below ground [1,6-8]. Despite the benefits of microclimate stability and a lack of predation pressure that a subterranean environment provides, it also presents physiological challenges such as hypoxia, hypercapnia, high relative humidity, and little or no exposure to sunlight [1,6-12]. These animals pay a high energy cost to find food due to digging through soil [13,14]. Digging can also increase the risk of overheating, as high humidities in the burrow complicate heat dissipation [6,15,16], contributing to exercise-induced hyperthermia and possible oxidative damage [17]. The ecological conditions of an underground lifestyle, and adaptations to this niche, such as differences in respiration [7,8,18], may have resulted in the concurrent evolution of factors that may also mitigate oxidative damage [19,20].

Mole-rat social reproductive structure

Bathyergids also show a broad spectrum of sociality from solitary to social, the species exhibiting social or eusocial behaviour, a few dominant animals monopolise reproduction, with one breeding female and one to three larger males responsible for reproduction [21]. The remaining colony members (referred to as non-breeders). Social species typically show a reproductive division of labour, cooperative care of the young, and overlapping generations [22]. Sherman *et al.* [23] criteria include bimodality, resulting in a high reproductive skew among breeding females and/or males where the maximum lifetime reproductive success of breeders versus non-breeders (helpers) is far greater than that of female breeders versus helpers in cooperatively breeding vertebrate societies. In this definition by Sherman *et al.* [23], the proportion of non-breeding animals obtaining reproductive status during their lifetime can be used as a stricter measure of eusociality. As such, currently, only the Damaraland mole-rat, *F. damarensis* and the naked mole-rat *H. glaber* are considered eusocial due to a lack of empirical data pertaining to lifetime reproductive success for the Ansells mole-rat *F. anselli* and Giant mole-rat or Mechows mole-rat, *F. mechowii*as, they do not fit the stricter conditions for the claim of eusociality according to the definition of Sherman *et al.* [23].

Mole-rat reproductive suppression and lifting of suppression

In order to control the breeding of non-breeders, breeders of social mole-rat colonies utilise natural reproductive suppression mechanisms either through behavioural [24-26], physiological [27-32] and/or both processes [24]. Typically, behavioural suppression includes incest avoidance and dominance, with blocked breeding attempts, where hormones do not influence reproduction [24,26]. Physiological suppression, however, has come in several forms and is dependent on species, either through prolactin [27] or through mediating the gonadotropin-releasing hormone (GnRH) response [32,33]. Non-breeding colony members can disperse from their natal colonies during periods of high rainfall when the soil characteristics are optimal for excavation and digging [34-36], where dispersal can result in the relaxation or lifting of reproductive suppression [35,37-39]. Their reproductive system may likely be relevant to the differences observed in oxidative markers and ageing [4,40,41]. For

example, in the genus *Fukomys* and *Heterocephalus*, breeding animals live longer than their non-breeding counterparts [42-45].

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