

SHORT COMMUNICATION

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Diet of the introduced Gough Moorhen *Gallinula comeri* on Tristan da Cunha

Den introducerade goughröhönans Gallinula comeri diet på Tristan da Cunha

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GOUGH MOORHENS *Gallinula comeri* were introduced to Tristan da Cunha in the 1950s, and are now numerous in lowland habitat, filling the ecological niche of the extinct Tristan Moorhen *G. nesiotis*. On their native Gough Island, moorhens have a varied diet, ranging from vegetation and fruits to scavenging and even predatory behaviour. Here, we examined the stomach contents of four birds on Tristan da Cunha to provide insight into their diet. Moorhens mostly ate vegetation, but we also recorded spiders (Arthropoda: Aranea), earthworms (Oligochaeta: Lumbricidae), remains of introduced rodents (*Mus musculus*), and anthropogenic debris. As on Gough Island, moorhens on Tristan have a generalist diet, and the impact of ecosystem restoration (and of the moorhens themselves) should be considered.

Keywords: predation | scavenging | generalism | endemic species | island | South Atlantic Ocean

Tristan da Cunha (37°7'S, 12°18'W) and its associated islands (Nightingale, Inaccessible, and Gough islands; Figure 1) are among the most remote in the world, and consequently have a high number of endemic species (Wace & Holdgate 1958, Holdgate 1965, Wace & Dickson 1965). Tristan is home to c. 250 residents, and is

nearly circular, covering 96 km² with the conical Queen Mary's Peak rising 2060 m. Of all the islands in the group, Tristan is geologically the most recent and only 0.2–0.5 million years old (Ryan 2007). Since human settlement in the early 19th century, an increasing number of introduced and invasive species have arrived on the

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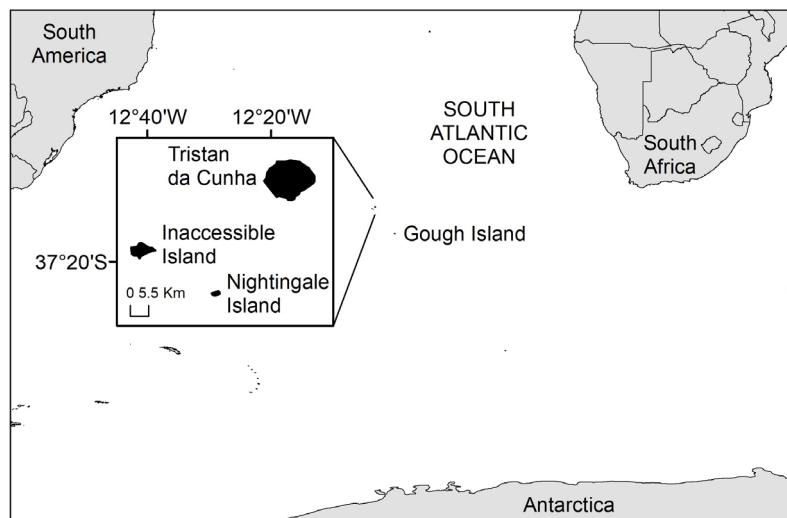


FIGURE 1. The location of Tristan da Cunha and Gough islands in the South Atlantic Ocean. The map is shown in Mercator projection.

– Tristan da Cunha och Gough är belägna mitt i Sydatlanten. Kartan visas i Mercators projektion.

islands, both intentionally and accidentally (Wace 1967, 1969, Wace & Holdgate 1976, Jones *et al.* 2003, Ryan 2007), where they have had devastating consequences (Angel & Cooper 2006, Ryan *et al.* 2006, Wanless *et al.* 2009, Caravaggi *et al.* 2019, Dilley *et al.* 2020).

In the South Atlantic Ocean, flightless moorhens *Gallinula* spp. were found on both Tristan da Cunha and Gough Island. On Tristan, the Tristan Moorhen *Gallinula nesiotis* went extinct in the late 19th century,

likely as a result of predation by introduced cats *Felis catus* (eradicated in the early 1970s) and human persecution (Sperling 1872, Richardson 1984, Bond *et al.* 2019). Only two specimens exist, both in the Natural History Museum, Tring (Knox & Walters 1994, Bond *et al.* 2019). On Gough, the Gough Moorhen *Gallinula comeri* persists, and 2,000–3,000 pairs are found throughout the island (Watkins & Furness 1986). In 1956, six Gough Moorhens were introduced to Tristan at Sandy Point on the east coast, and they are now present through

much of the island including the settlement plain (Richardson 1984). There was considerable debate about whether *G. nesiotis* had persisted or indeed whether *G. nesiotis* and *G. comeri* were the same species (Broekhuysen & Macnae 1949, Eber 1961). Molecular evidence now indicates that they are indeed separate taxa and that *G. nesiotis* is extinct (Groenenberg *et al.* 2008).

The ecology of the Gough Moorhen on Tristan, however, has received scant attention with the only de-

TABLE 1. The contents of the proventriculus and gizzard (ventriculus) of four Gough Moorhens *Gallinula comeri* from Tristan da Cunha.

– Körtelmagens (proventriculus) och muskelmagens (ventriculus) innehåll i fyra goughrörhönor *Gallinula comeri* på Tristan da Cunha.

Bird characteristics Fågelegenskaper			Abundance by estimated volume (%) Uppskattad mängd som del av total volym (%)					Notes Anmärkningar
Bird Fågel	Sex Kön	Age Ålder	Vegetation Vegitation	Spider Spindel	Earthworm Daggmask	House mouse Husmus	Anthropogenic debris Mänskligt avfall	
1	♀	Adult	100	0	0	0	Present	1 piece of metal foil garbage 1 bit metallfolie
2	♀	Adult	0	0	0	Present	0	6 vertebrate bones (3 rodent, 3 unidentified) 6 ben från ryggradsdjur (3 gnagare, 3 oidentifierade)
3	♂	Adult	95	5	Present	0	Present	2 small pieces of glass 2 små glasbitar
4	?	Juvenile	90	5	5	0	0	

tailed information on diet from Richardson (1984) who examined four stomachs in the early 1970s. On Gough Island, the moorhens are predatory scavengers, eating a variety of plants and invertebrates, seabird carrion and eggs, and even introduced house mice *Mus musculus* (Watkins & Furness 1986, Wanless & Wilson 2007). On Tristan, where there are significantly fewer seabirds and more introduced mammals and plants (Wace 1967, Wace & Holdgate 1976), Richardson (1984) found seeds, vegetation and gravel, but also eggshells and a cephalopod beak in 1973 and 1974. The specimens were deposited in the Natural History Museum, Tring (NHMUK 1984.7.1–4), but contain no further details of diet or stomach contents.

We examined the stomachs of four Gough Moorhens on Tristan da Cunha in the summer of 2014/2015.

Birds were killed accidentally during rodent trapping at Pigbite (n=2) and Big Point Road (n=2) at 270–350 m elevation. Birds were sexed either by dissection or using measurements (Parker *et al.* 2012). The complete proventriculus and gizzard were dissected out and flushed with tap water. The contents were examined under a 10–40× dissecting microscope, and prey identified to the nearest 5% by volume.

Of the four examined, the stomach of one was empty aside from six small bones, three of which were of house mouse tail vertebrae. The remaining three had consumed predominantly vegetation, likely one of the many endemic or introduced grasses on Tristan (Ryan 2007). Two had also smaller proportions of earthworms and spiders. Two birds had also consumed anthropogenic debris, including metal foil and glass (Table 1).

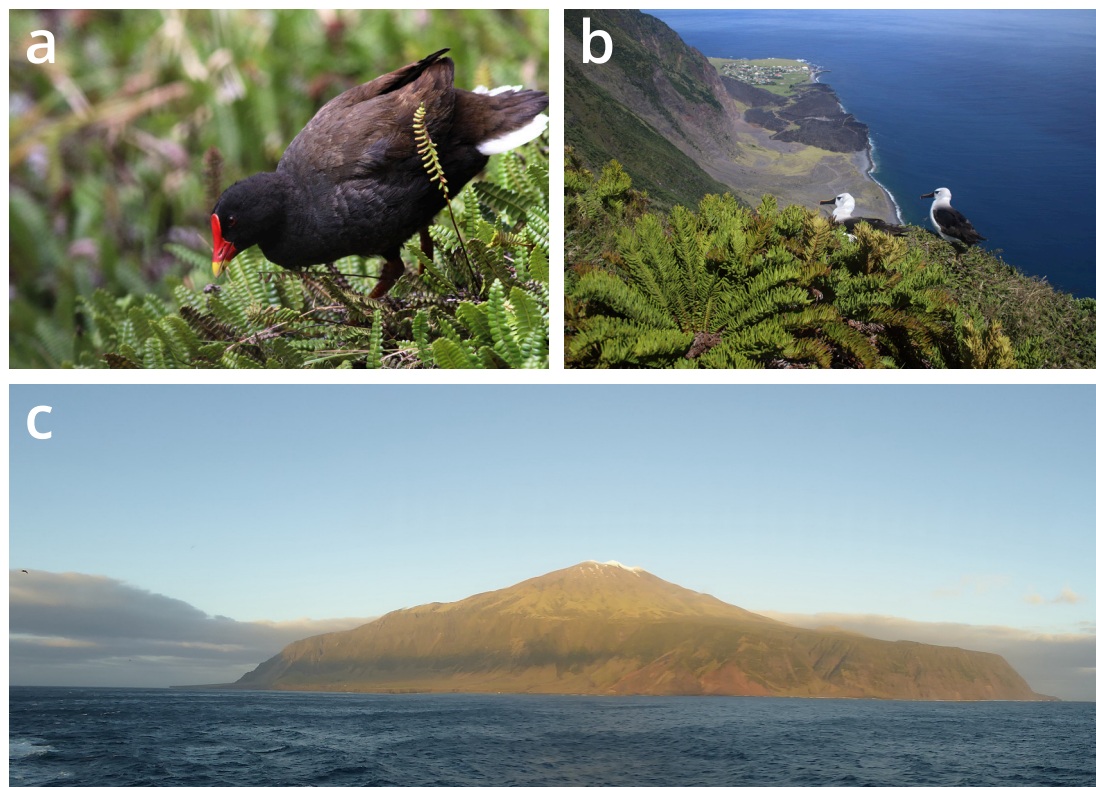


FIGURE 2. (a) Gough Moorhen *Gallinula comeri* on Tristan, foraging in *Blechnum penna-marina* (GTWM). (b) View from Pigbite looking northwest towards Edinburgh of the Seven Seas and the Settlement Plain, across a recent lava field. Moorhens occupy all these diverse habitats (GTWM). (c) Tristan as viewed from the sea, with Queen Mary's Peak (2,060 m) and the Settlement Plain on the left (ALB).

— (a) En goughrörhöna *Gallinula comeri* födosöker bland *Blechnum penna-marina* på Tristan da Cunha (GTWM). (b) Vy mot nordväst från Pigbite, över ett lavafält mot Edinburgh of the Seven Seas och Settlement Plain (GTWM). (c) Tristan sedd från havet, med Queen Mary's Peak tronande vid 2060 m höjd och Settlement Plain med bebyggelse till vänster (ALB).

There are six recorded species of earthworm (Oligochaeta: Lumbricidae) on Tristan da Cunha, all non-native and with a palearctic distribution (Reynolds & Hänel 2005). The arachnid fauna has not been thoroughly studied, but many islands in the Southern Ocean have endemic species or those associated with South America or the neotropics (Pugh 2004).

That moorhens scavenged or preyed on introduced rodents directly is not surprising, as they do the same on Gough Island where house mice are introduced; they also prey on seabird eggs and chicks (Watkins & Furness 1986, Wanless & Wilson 2007). Moorhens not only scavenge dead rodents, but also actively pursue and prey upon them (Wanless & Wilson 2007). If introduced rodents are ever eradicated from Tristan (Dawson *et al.* 2015, Holmes *et al.* 2019), and the moorhen population is to remain, a captive population will be required, as was recommended for Gough Island (Dagleish *et al.* 2017).

The occurrence of debris (glass and foil) in two of the stomachs is also expected. Waste on Tristan is managed by incineration at a site on the 1961 Volcano east of Edinburgh of the Seven Seas, and incomplete burning or escape from waste management streams is common. In the 1970s, one moorhen had ingested gravel (Richardson 1984), presumably as gastroliths to aid in digestion (Downs *et al.* 2019). This is the first occurrence of recorded debris ingested by terrestrial birds on Tristan da Cunha, where there is also a significant influx of plastics from international shipping (Ryan *et al.* 2019). Moorhens are widespread on Tristan, and though uncommon along the coast, can forage on beaches, and likely have territories of c. 5,000 m² (Watkins & Furness 1986).

Together, these results confirm that introduced Gough Moorhens on Tristan have similar diets to those on Gough, namely a generalist, but primarily herbivorous one with opportunistic scavenging and possibly direct predation of introduced rodents. Broader ecosystem restoration on Tristan must account for the potential impact on, and of, Gough Moorhens.

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Svensk sammanfattning

Ögruppen Tristan da Cunha – som utöver huvudön inkluderar Nightingale Island och Inaccessible Island – samt Gough Island är en av jordens mest isolerade platser, belägen i södra Atlanten mellan Afrika och Sydamerika (figur 1). Fågelfaunan har stort inslag av endemiska arter, vilken sedan koloniseringen av öarna under tidigt 1800-tal och efterföljande introduktion av invasiva arter och predatorer påverkats starkt negativt. På Tristan och Gough fanns ursprungligen flygoförmögna rörhöror, men på Tristan utrotades dessa under slutet av 1800-talet, troligen av en kombination av jakt och predation från katt. På grannön Gough fanns dock fåglarna kvar och idag är populationen runt 2000–3000 par. Mer sentida studier har visat att det rörde sig om två olika arter på de båda öarna: tristanrörhöna *Gallinula nesiotus* respektive goughrörhöna *G. comeri*. År 1956 flyttades sex goughrörhöror till huvudön Tristan och dessa har lyckats etablera en population (figur 2).

Goughrörhönans ekologi på Tristan är dåligt känd, men från Gough vet man att de kan ha en bred diet som inkluderar växtdelar, olika ryggradslösa djur, as från

sjöfågel, ägg och till och med möss (introducerade *Mus musculus*). Ön Tristan har färre häckande havsfåglar än Gough, och fler introducerade däggdjur och växter, vilket gör det troligt att födan skiljer sig mellan öarna. I samband med studier på invasiva gnagare på Tristan 2014–2015 fångades fyra goughrörhöror oavsiktligt, vilkas maginnehåll studerades.

Av de fyra undersökta fåglarna hade en fågel en relativt tom mage, som endast innehöll sex små benrester varav tre kunde härledas till svanskotor från möss. De tre andra fåglarna hade mestadels ätit vegetabilier, mest troligt ett av de endemiska eller introducerade grässlagen. Två av magarna innehöll en mindre andel dagmaskar och spindlar och två av fåglarna hade konsumerat skräp i form av aluminiumfolie och glas (tabell 1). Dieten antyder att goughrörhörona har en generalistisk, allätande strategi på Tristan och inte drar sig från att predera även större djur som möss, eller ägg. På Tristan drivs en kampanj för att utrota introducerade gnagare och det återstår att se hur detta påverkar fågelfaunan. Ett förslag som diskuterats är att bibehålla

en inhägnad population goughrörhönor som försäkring ifall den vilda påverkas ytterligare negativt.

Att fåglarna konsumerat skräp kan tyckas förvånande, men faktum är att sophantering mestadels har skett genom enkel förbränning på ön, från vilken skräp kan transporteras via vatten eller vind till andra delar av ön.



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