Hydrictis maculicollis – Spotted-necked Otter

Regional Red List status (2016)	**Vulnerable C2a(i)***
National Red List status (2004)	Near Threatened
Reasons for change	Genuine change
Global Red List status (2015)	Near Threatened A3cde
TOPS listing (NEMBA) (2007)	Protected
CITES listing (1977)	Appendix II
Endemic	No

*Watch-list Data

This species was recently recorded as much as 1,200 km downstream from its known distribution in the arid Northern Cape, and the species may be more widespread along the Orange and Gariep rivers than previously thought.

Taxonomy

Hydrictis maculicollis (Lichtenstein 1835)

ANIMALIA - CHORDATA - MAMMALIA - CARNIVORA - MUSTELIDAE - *Hydrictis* - *maculicollis*

Synonyms: *Lutra maculicollis* (Lichtenstein 1835)

Common names: Spotted-necked Otter, Speckle-throated Otter, Spot-necked Otter (English), Klein Otter (Afrikaans), Lenyebi, leNyibi (Setswana), Ntsini (Swati), iNtini (Zulu)

Taxonomic status: Species

Taxonomic notes: While this species was included in the genus *Lutra* by, amongst others, Koepfli and Wayne (1998), recent molecular research places it in *Hydrictis* (Pocock 1921) (Koepfli et al. 2008; Sato et al. 2012), and has been included as such in d'Inzillo Carranza and Rowe-Rowe (2013). While five subspecies have been recognised from across the continent, of which *H. m. maculicollis* occurs within the assessment region (Skinner & Chimimba 2005), further research is needed to confirm the validity of these.

Assessment Rationale

The Spotted-necked Otter is widespread within the assessment region, and may either be expanding westwards along the Orange River, or subpopulations here may have been overlooked. However, it is restricted to areas of permanent fresh water offering good shoreline cover and an abundant prey base. Overall, the population may be declining as river habitat is lost to development and infestations of alien species in riparian areas, and riverside vegetation degradation from overgrazing. Habitat loss and degradation is exacerbated by human disturbance, including both direct and indirect persecution and/or hunting, reduction of denning sites and diminishment of the species' prey base which may be attributed to decreasing river quality from agricultural and industrial run-off.

This species is estimated to occur along an expanse of rivers totalling roughly 31,407 km. Using density estimates of 0.09–1 individual / km yields 2,855–31,407 individuals. However, 49.7% of the rivers within the extent of occurrence are modified, and thus we feel using a low-density estimate of 0.09 otter / km is more appropriate for the disturbed rivers. This yields an estimated 1,413 individuals for the disturbed rivers (15,704 km), and 15,704 individuals for the intact rivers, which yields an estimated total of 17,117 individuals, of which 9,414–10,954 are mature (assuming a 55–64% mature population structure). Groupings of interconnected rivers were chosen in each catchment area as individual subpopulations, which yielded 103 subpopulations. These river systems ranged from 10–968 km, meaning no subpopulation is estimated to exceed 1,000 mature individuals (using the upper density estimate of 1 otter / km).

Thus, considering the estimated mature population is likely to be at or just below 10,000 mature individuals, no subpopulation is estimated to contain more than 1,000 mature individuals, and there is an inferred continuing decline in both habitat and mature individuals, we list this species as Vulnerable C2a(i). We construe this as a genuine change based on a recent study that estimated a *c.* 42% decline over three generations at one locality. While we choose not to extrapolate this across the region, it is potentially indicative of more widespread continuing declines. We emphasise that far greater monitoring and survey studies (especially along the Orange River) are needed to make this assessment more accurate, particularly long-term monitoring of subpopulation trends, and that the availability of new information should prompt a re-assessment of this species, as it may be both more or less threatened than can currently be determined. River restoration and riverside rehabilitation are key interventions necessary for the prevention of future declines in population numbers.

Recommended citation: Ponsonby DW, Rowe-Rowe D, Power RJ, Somers MJ. 2016. A conservation assessment of *Hydrictis maculicollis*. In Child MF, Roxburgh L, Do Linh San E, Raimondo D, Davies-Mostert HT, editors. The Red List of Mammals of South Africa, Swaziland and Lesotho. South African National Biodiversity Institute and Endangered Wildlife Trust, South Africa.

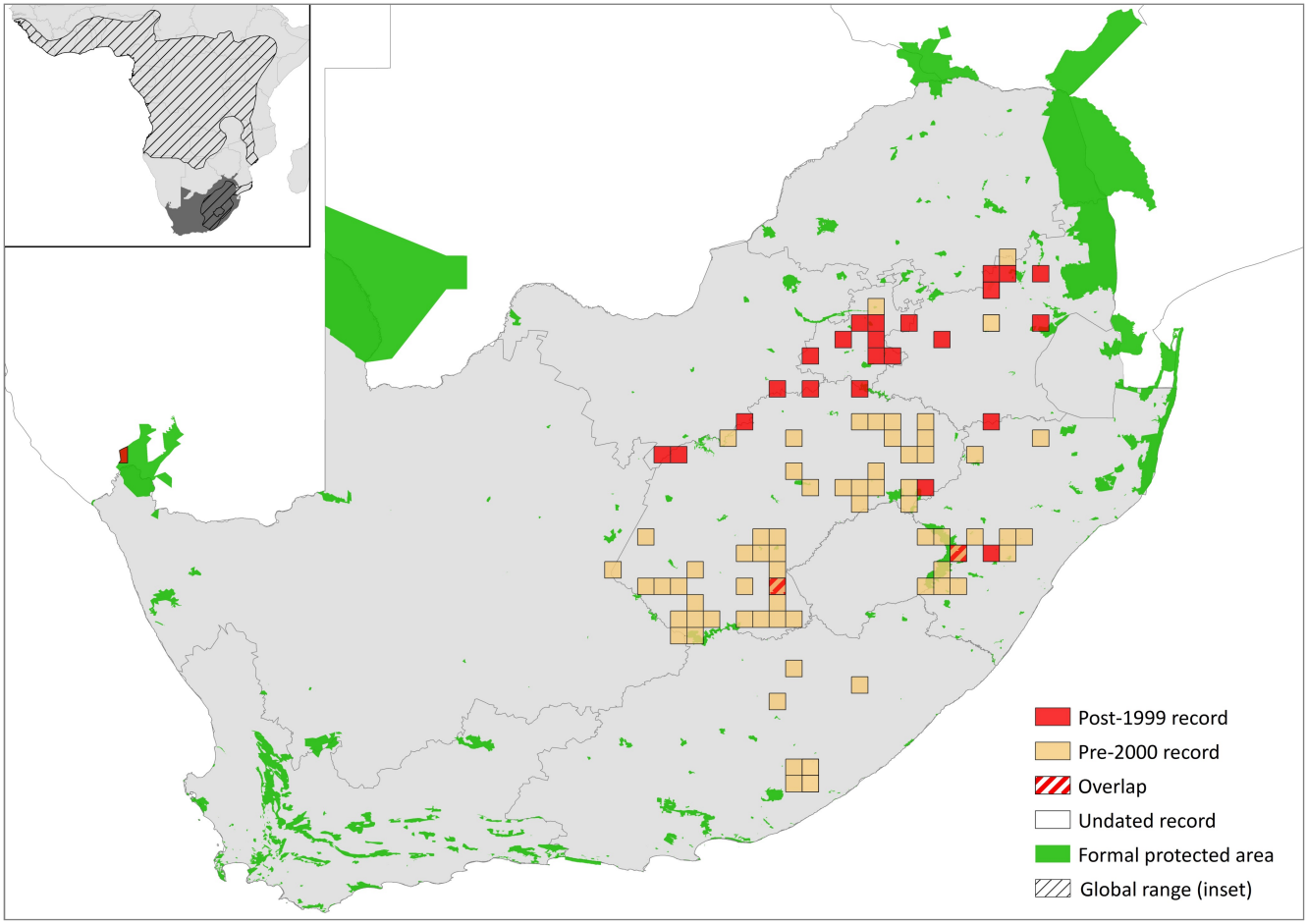

Figure 1. Distribution records for Spotted-necked Otter (*Hydrictis maculicollis*) within the assessment region

Table 1. Countries of occurrence within southern Africa

Country	Presence	Origin
Botswana	Extant	Native
Lesotho	Extinct	Native
Mozambique	Extant	Native
Namibia	Extant	Native
South Africa	Extant	Native
Swaziland	Absent	-
Zimbabwe	Extant	Native

Regional population effects: While we suspect that dispersal between Mozambique, South Africa and Swaziland is possible, it is unlikely to provide significant rescue effects seeing as the southern Mozambique population is disjunct from the rest of the African range (Reed-Smith et al. 2015). The species does not traverse large distances (Kruuk 2006), though further research on the dispersal capacities and rates of this species is needed.

Distribution

Spotted-necked Otters are found in lakes and larger rivers throughout much of Africa south of 10°N, and are believed to be extinct in Burundi, Ghana, Lesotho, and Togo (Reed-Smith et al. 2015). They have not been recorded from Swaziland (Monadjem 1998), though they do occur in dams and rivers to the west, on the Mpumalanga Highveld. Within southern Africa, they are confined to the Cunene River in Namibia and are widespread in the Caprivi Strip and Chobe swamps, extending into the Okavango Delta of Botswana (Skinner & Chimimba 2005). They are mostly absent from Zimbabwe but may occur in the Zambezi River above Victoria Falls (Rowe-Rowe 1997; Skinner & Chimimba 2005; Reed-Smith et al. 2015). They have a patchy distribution within Mozambique, occurring in the Zambezi delta and rivers in the south (Skinner & Chimimba 2005), extending into eastern South Africa (Rowe-Rowe & Somers 1998; d'Inzillo Carranza & Rowe-Rowe 2013).

Within the assessment region, they specifically occur in the well-watered eastern parts of the country, north of Bushman's River in the Eastern Cape (Stuart 1981; Somers & Purves 1996), east of the escarpment and including the highlands of KwaZulu-Natal (Rowe-Rowe 1992a), Free State (Lynch 1983), Gauteng, and Mpumalanga (Rowe-Rowe 1997, Figure 1), and the southern parts of the North West Province (Power 2014), and have recently been documented in the Northern Cape (Power & Slater-Jones 2010). Interestingly, they do also occur in the polluted Vaal River of the North West Province (from Parys to Christiana) and have been known to occur in tributaries in the southeastern part of this province and may occur at Barberspan, and Taung and Hartebeestpoort dams (Power 2014).

They occur throughout much of Limpopo Province (except the dry northern parts and along the Limpopo River) but have not been recorded from Kruger National Park (G. Zambatis pers. comm. 2016). The species has a marginal distribution in the southern parts of the Limpopo.

In KwaZulu-Natal Province they are confined to the montane regions in the western half of the province (Rowe-Rowe 1992a), especially in the headwaters of streams in the Ukahlamba Drakensberg Park (Perrin & Carugati 2006). Abundance in the latter region may have increased since the 1970s (Perrin & Carugati 2006; but see Kubheka et al. 2013). Since these streams are within the Tugela River basin, it is unclear whether there could be otter dispersal over the Drakensberg watershed into the Orange River headwaters, or whether dispersal via the Vaal River is a more likely candidate (Power & Slater-Jones 2010).

While Skinner and Chimimba (2005) report them occurring extensively within the Eastern Cape Province and coastal regions of the Western Cape Province, they have not recently been recorded in the Western Cape and have disappeared from many Eastern Cape rivers (Stuart 1985; Somers & Nel 1996). Similarly, a possible range contraction or local extinction may have occurred in the Tussen-die-Riviere Nature Reserve section of the Orange river in Free State Province where Lynch (1983) recorded this species close to the reserve, but they have not been recorded in more recent years (Watson 2006).

In the Northern Cape Province, while they have previously only been recorded from the Vaal River at Warrenton (Stuart 1981; Skinner & Chimimba 2005), Power and Slater-Jones (2010) recently reported a range expansion for the species along the Orange River where an individual was observed (and videographic evidence obtained) in a large pool in the Orange River at Senderling's drift in the Ais/Ais Richtersveld Transfrontier Park in 2008, which is 1,200 km downstream from the nearest known distribution area. Thus, further field surveys are needed to determine if they occur more extensively along the Orange River.

Although these otters have a large extent of occurrence, they are restricted to areas of permanent fresh water, offering good shoreline cover and an abundant prey base, which means the area of occupancy is substantially smaller and difficult to quantify (Reed-Smith et al. 2015). We estimated total viable habitat as 31,407 km (using the South African section of the range map from Reed-Smith et al. 2015, as Figure 1 is lacking data from many areas) by summing river condition classes from Unmodified to Moderately Modified from the National Freshwater Ecosystem Priority Area land cover data (Nel et al. 2011). This river length may be an underestimate as they may occur more extensively along the Orange River (Power & Slater-Jones 2010), but more surveys are needed to confirm this distribution. Similarly, using the Department of Water and Sanitation quaternary drainage land cover data (DWS 2010), groupings of connected rivers in each catchment area were construed as individual subpopulations. Isolated rivers were considered to be a single subpopulation and not grouped with rivers further than 5 km away as the Spotted-necked Otter does not traverse large distances of land and remains very close to bodies of water (Kruuk 2006). This means there are an estimated 103 subpopulations in the assessment region.

Population

Spotted-necked Otter abundance and density appear to be dependent on the availability of fish (Perrin & Carugati 2006) and suitable habitat cover, which includes dense shoreline vegetation or large boulders (Reed-Smith et al. 2015). They are thus uncommon where fish fauna is poor or reduced due to anthropogenic disturbance and where vegetation has been removed (Stuart 1985; Rowe-Rowe


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1990, 1995; d'Inzillo Carranza & Rowe-Rowe 2013). In an area that included a highland stream and man-made lakes in the Drakensberg of KwaZulu-Natal Province, Perrin et al. (2000) estimated 0.5–1 otter / km of river. More recently, at similar sites along the Mooi River, Perrin and Carugati (2006) estimated otter densities between 0.2 and 1.3 otter / km of river. Similarly, at Wolwespruit Nature Reserve, North West Province, maximal sighting frequency was 1 (group size 1–6) otter group / km of river (Power 2014). In less suitable habitat, Rowe-Rowe (1992b) estimated 0.09–0.17 otter / km of river. Friedmann and Daly (2004) estimated the total population as 1,600 by dividing 8,000 km of river by 5 (1 otter every 5 km). Here, using the river length calculated above (31,407 km) and density estimates of 0.09–1 otter / km river yields 2,855–31,407 individuals. Although further empirical data are needed to estimate mature population size for this species, van der Zee (1982) estimated the adult to juvenile ratio of Cape Clawless Otter (*Aonyx capensis*) as 55–64% (22 adults, 18 juveniles; and 16 adults, 9 juveniles respectively). Given the similar social organisation of Spotted-necked Otters (Skinner & Chimimba 2005), the adult to juvenile ratios can be expected to be similar. If we use this mature proportion, the total mature population size ranges from 1,570–20,100 individuals. However, 49.7% of the rivers are moderately modified (Class C), and thus we feel using the low-density estimate of 0.09 otter / km is more appropriate for the disturbed rivers. This yields an estimated 1,413 individuals for the disturbed rivers (15,704 km), and 15,703 individuals for the less disturbed rivers, which yields an estimated total of 17,117 individuals, or 9,414–10,953 mature individuals. Similarly, connected rivers construed to contain subpopulations (see above) range in length from 10 to 968 km, meaning that the maximum estimated subpopulation size is 631 mature individuals. By calculating average river length per subpopulation (179 km), we can estimate a range of otter numbers per subpopulation, which yielded an estimated 16–179 otters per subpopulation (9–80 mature individuals).

The population is inferred to be declining. A long-term study on the Mooi River in KwaZulu-Natal compared three survey periods (1972–1974, 1993–1994 and 2010) on a human-dense and modified stretch and a near-pristine, protected stretch (Kubheka et al. 2013). While the stretch that had been affected, by agricultural pollution from intensive dairy farming, and hunting pressure caused by high human density, exhibited a decline in both otter sightings and spraint (droppings) sites by 71–75% from the 1970s to 2010, the protected stretch exhibited the same otter densities between 1993 and 2010 (Kubheka et al. 2013), which suggests population stability and the positive effect of conservation. Similarly, sightings frequency along a 12 km protected section of the Vaal River, in the Wolwespruit Nature Reserve of the North West Province, were higher than any of the non-protected sections of the same river (Power 2014). The generation length of this species has been estimated as 7.5 years (Pacifici et al. 2013), which equates to a 22.5 year three-generation time period. Assuming a linear rate of decline, the data from Kubheka et al. (2013) equate to a 42% decline over three generations.

Current population trend: Declining, inferred from habitat degradation.

Continuing decline in mature individuals: Yes, inferred from direct and indirect persecution.

Number of mature individuals in population: 9,414–10,954

Number of mature individuals in largest subpopulation: 631

Number of subpopulations: 103, based on connected rivers within watersheds.

Severely fragmented: Unknown. Although rivers may be connected, this species does not traverse large distances over ground, and thus subpopulations may be fragmented.

Habitats and Ecology

Spotted-necked Otters are thought to inhabit freshwater habitats where water is not silt-laden, and is unpolluted, and rich in small fishes (Perrin & Carugati 2000a; d'Inzillo Carranza & Rowe-Rowe 2013). However, anecdotal observations suggest they can occur, and can be common, in relatively polluted rivers, such as the Braamfonteinspruit, Jukskei River and Blesbokspruit, Gauteng Province (Ponsonby, thesis, in prep.), and the Vaal River (Power 2014). More surveys are needed to determine at what threshold of water quality otter densities decline. The home range of these otters has been estimated at 5.9–27.4 km^2 and the mean length of river within home ranges was 14.8 km (Perrin et al. 2000). They occur in groups of usually up to five individuals, but are most frequently singular (Skinner & Chimimba 2005), and are predominantly diurnal (Perrin & d'Inzillo Carranza 2000a), and very aquatic in nature compared to the Cape Clawless Otter.

Adequate riparian vegetation, in the form of long grass, reeds, or bushes, is also essential to provide cover (Perrin & d'Inzillo Carranza 2000b), especially during periods of inactivity (Perrin & d'Inzillo Carranza 2000a). Unlike the Cape Clawless Otter, the Spotted-necked Otter does not occur in marine or estuarine waters (Rowe-Rowe & Somers 1998). However, it does co-exist with the Cape Clawless Otter along rivers (Somers & Purves 1996; Perrin & Carugati 2006; Power 2014), and while there is dietary overlap (Somers & Purves 1996; Rowe-Rowe & Somers 1998; Perrin & Carugati 2000a), it seems to be more of a fish specialist (Rowe-Rowe 1977; Perrin & Carugati 2000b). Interestingly, Spotted-necked Otters also display more dietary adaptation in different habitats than Cape Clawless Otters (Perrin & Carugati 2000b). The introduction of exotic trout into South African rivers has presumably benefitted the species (Rowe-Rowe 1992a; Perrin & Carugati 2000a; Perrin & d'Inzillo Carranza 2000b).

Ecosystem and cultural services: Although they do occasionally persist in poor quality river systems (Power 2014), otters are thought to be indicator species (Rowe-Rowe 1997). The presence of otters in a water body generally indicates a healthy, unpolluted habitat.

Use and Trade

Throughout Africa, otters are killed for food, for medicinal purposes and for their skins (Reed-Smith et al. 2015), but the extent to which this occurs in the assessment region needs further research. Live animals are also traded for international zoos and aquariums, but this is not expected to impact the population negatively. At least one South African province (North West) has reported no occurrences of harvest for trade or keeping.

Threats

The Spotted-necked Otter is inferred to be decreasing throughout its range, mainly as a result of the alteration or degradation of freshwater habitats and riparian vegetation, exacerbated by the loss of habitat as a consequence of increased agricultural activity (Rowe-Rowe 1990, 1992a, 1995, 1997) and increased disturbance to otters resulting from human settlement expansion (Kubheka et al. 2013). Thus habitat loss from both agricultural and human settlement expansion also increases the rate of habitat degradation and both direct and indirect persecution.

1. Agricultural expansion: crop and livestock agricultural practices have led to both bank and shoreline erosion, denuding of important vegetative cover used

Table 2. Use and trade summary for the Spotted-necked Otter (*Hydrictis maculicollis*)

Category	Applicable?	Rationale	Proportion of total harvest	Trend
Subsistence use	Yes	Killed for food, medicine or skins.	Unknown	Unknown
Commercial use	No	-	-	-
Harvest from wild population	No	-	-	-
Harvest from ranched population	No	-	-	-
Harvest from captive population	No	-	-	-

Table 3. Threats to the Spotted-necked Otter (*Hydrictis maculicollis*) ranked in order of severity with corresponding evidence (based on IUCN threat categories, with regional context)

Rank	Threat description	Evidence in the scientific literature	Data quality	Scale of study	Current trend
1	*2.1.3 Agro-industry Farming*: habitat loss and conversion from agricultural expansion up to shorelines of rivers.	Jewitt et al. 2015	Indirect	Regional	Increasing: 7.6% natural vegetation in KwaZulu-Natal Province lost from 2005–2011.
2	*2.3.2 Small-holder Grazing, Ranching or Farming*: removal of shoreline vegetation due to overgrazing. Current stress *1.2 Ecosystem Degradation*: shelter removal from overgrazing.	Medina-Vogel et al. 2003	Empirical	Regional	Possibly increasing with human settlement expansion.
3	*1.1 Housing & Urban Areas*: habitat loss from settlement sprawl along rivers. Current stresses *1.1 Ecosystem Conversion*, *1.2 Ecosystem Degradation* and *2.1 Species Mortality*: wetland conversion, increased pollution and increased hunting.	Kubheka et al. 2013 GeoTerraImage 2015 Jewitt et al. 2015	Empirical Indirect Indirect	Local National Regional	Threats increasing along with human settlement expansion.
4	*2.2.2 Agro-industry Plantations*: habitat loss from afforestation along rivers.	Jewitt et al. 2015	Indirect	Regional	Increasing
5	*9.3 Agricultural & Forestry Effluents*: soil erosion, sedimentation, pesticides and fertiliser pollution in rivers and wetlands.	Mason & Rowe-Rowe 1992 Nel et al. 2007	Empirical Indirect	Local National	Increasing with agricultural expansion.
6	*9.2 Industrial & Military Effluents*: pollution from industrial expansion along rivers and acid seepage from mining.	Nel et al. 2007	Indirect	National	Increasing
7	*9.1 Domestic & Urban Waste Water*: sewage and pollutants from human settlements decreasing water quality.	Nel et al. 2007 Kubheka et al. 2013	Indirect Empirical	National Local	Increasing with human settlement expansion.
8	*7.2 Dams & Water Management/Use*: increased abstraction of surface water for industrial, agricultural and domestic use.	Nel et al. 2007 Driver et al. 2012	Indirect Indirect	National National	Increasing with settlement expansion.
9	*5.1.3. Persecution/Control*: direct persecution for perceived competition for fish stocks.	-	Anecdotal	-	Possibly increasing with human settlement expansion.
10	*5.1 Hunting & Collecting Terrestrial Animals*: direct removal from the wild for bushmeat or traditional medicine.	-	Anecdotal	-	Possibly increasing with human settlement expansion
11	*5.1 Hunting & Collecting Terrestrial Animals*: indirect mortalities from entanglement in fish nets.	-	Anecdotal	-	Unknown
12	*8.1 Invasive Non-Native/Alien Species/Diseases*: Water Hyacinth (*Eichhornia crassipes)*. Current stress *1.2 Ecosystem Degradation*: habitat degradation.	-	Anecdotal	-	Possibly increasing with human settlement expansion.
13	*11.2 Droughts*: increased aridity and drought conditions caused by global climate change.	Erasmus et al. 2002	Simulation	National	Increasing

by the otters, increased human presence which is disruptive to otter denning, increased use of smaller mesh nets and poisoning to improve catches, and the change or depletion of the otters prey base (Kruuk & Goudswaard 1990; Reed-Smith et al. 2015). In KwaZulu-Natal Province, 7.6% of remaining natural vegetation was lost between 2005 and 2011, primarily due to agricultural expansion, afforestation and the built-up environment (Jewitt et al. 2015). Work on the effects of vegetation removal along rivers in South America have shown that their local species, *Lontra provocax*, will still frequent areas with moderate vegetation removal but only if human activity is not present as there is not enough cover to remain concealed from human detection (Medina-Vogel et al. 2003). While industrial-scale farming tends to convert entire ecosystems, small-scale farming will tend to degrade localised shoreline habitats.

2. Human settlement expansion: in tandem with agricultural expansion is the expansion of human settlements. Human disturbance increases both

habitat degradation from pollution and vegetation removal, but also direct mortality or population depression through persecution and disruption. Pollution from agricultural and residential effluents are inferred to be causing population decline. For example, bioaccumulation of organochlorines and other bio-contaminants has been recorded in Spotted-necked Otter scats (Mason & Rowe-Rowe 1992), and this could have negative repercussions for such populations. Acid mine drainage in some regions is likely to impact otters as well. Nationally, 84% of main river ecosystems in South Africa were identified as threatened: 54% Critically Endangered, 18% Endangered, and 12% Vulnerable (Nel et al. 2007; CSIR 2010). The species is said to be affected by water quality changes, though its abundance in some poor quality waters challenges this supposition (Power 2014). Another pressure caused by increasing human density is the abstraction of water from rivers and other alterations to the timing and quantity of flows, for example, as a result of dams or transfer schemes between catchments (Nel et al. 2007; Driver et al. 2012). Half of the river ecosystem types are threatened (25% Critically Endangered, 19% Endangered and 13% Vulnerable). The proportion of threatened river ecosystem types is higher among lowland rivers than among upper foothills and mountain streams, reflecting the fact that the intensive agriculture and urban areas are often found in lowlands, as well as the accumulation of impacts on rivers as they flow from source to sea. Only 14% of river ecosystem types are well protected and 50% are not protected at all (Driver et al. 2012). Introduction of alien fish species that out-compete the smaller indigenous fish was identified as a main threat to otters in Lake Victoria, East Africa (Kruuk & Goudswaard 1990). However, the introduction of trout may have benefited this species, so the net effect of alien fish introduction should be determined. However, the introduction of alien plant species, such as Water Hyacinth (*Eichhornia crassipes*), may cause habitat degradation (Reed-Smith et al. 2015).

3. Persecution: Expanding human settlements indirectly increase incidences of persecution. Otters are also killed for food or skins, or as a perceived threat to poultry, or as a competitor for fish (Rowe-Rowe 1990; Reed-Smith et al. 2015), and the latter is probably more applicable. Occasionally, they are accidentally caught and drowned in gill nets and fish traps (Stuart 1985; Rowe-Rowe 1990). The rate of otters becoming entangled in set and discarded fishing nets is impossible to determine. However, based on known entanglement of other species, it has likely increased over the occasional drowning reported previously (Reed-Smith et al. 2015). Hunting dogs on farmsteads and rural communities may also be causing direct mortality.

The above-mentioned threats act synergistically. For example, Kubheka et al. (2013) document a 75% decline in Spotted-necked Otters between 1993 and 2010 at a site downstream of a commercial dairy farm where human density is high; a similar protected site showed no decline in Spotted-necked Otter density between 1993 and 2010. Thus, while some areas may exhibit a continuing decline in mature individuals, this must be weighed against documented range expansions (along the Orange River at least; Power and Slater-Jones 2010) and the possible ability of the species to survive in polluted water (Power 2014).

Current habitat trend: Habitat has decreased in quality for this species, especially through increased river turbidity from agricultural and commercial effluents and

Table 4. Conservation interventions for the Spotted-necked Otter (*Hydrictis maculicollis*) ranked in order of effectiveness with corresponding evidence (based on IUCN action categories, with regional context)

Rank	Intervention description	Evidence in the scientific literature	Data quality	Scale of evidence	Demonstrated impact	Current conservation projects
1	*1.2 Resource & Habitat Protection*: reduce development along rivers and coastlines through conservancy formation and stewardship schemes.	-	Anecdotal	-	-	-
2	*2.1 Site/Area Management*: reduce overgrazing by stocking livestock/wildlife at ecological capacity.	-	Anecdotal	-	-	-
3	*5.4 Compliance & Enforcement*: enforcement of zoning regulations and penalties for pollution.	-	Anecdotal	-	-	-
4	*5.2 Policies & Regulations*: development of stricter regulations on water abstraction, and riverside development.	-	Anecdotal	-	-	-
5	*6.1 Linked Enterprises & Livelihood Alternatives*: the use of community projects to restore habitats.	-	Anecdotal	-	-	Working for Water Programme, Department of Environmental Affairs
6	*4.3 Awareness & Communication*: making the public aware of the importance of protecting water resources and the importance of this species in ecosystem health.	-	Anecdotal	-	-	-

unfettered development along riverbanks. This is especially prominent in the Northern Cape, North West and Eastern Cape, and one particular area of concern is the lower Vaal and Gariep (old Orange) Rivers confluence (Somers & Nel 1996; Nel et al. 2007). Interestingly, however, the species is still common in the Vaal River (Power 2014), which suggests this species can tolerate lower quality water than previously thought. Subpopulations are also thought to be declining in KwaZulu-Natal Province due to the serious effects of acidification from coal mining and bourgeoning human population growth (Rowe-Rowe 1992b; Jewitt et al. 2015). O'Keefe (1986) rated only 50% of highland rivers in KwaZulu-Natal as near-pristine. Recently, Driver et al. (2012) estimated that 57% of South Africa's rivers are threatened and are in poor condition either from water abstraction or pollution, which is congruent with O'Keefe (1986). Thus we infer that half of the total river length within the species' range is in poor condition. Similarly, recent remote sensing data reveal a continuing expansion in both urban and rural settlements, having increased from 0.8% to 38% across all provinces (GeoTerraImage 2015). Human modification of river habitats and deterioration of water quality from agriculture, mining and commercial development will thus likely cause greater deterioration of water quality in the future. Finally, the impact of climate change throughout Africa also has the potential to decrease suitable habitat for otters and to increase human/otter conflict for increasingly scarce resources such as water, land and fish (Erasmus et al. 2002; Hendrix & Glaser 2007).

Conservation

The Spotted-necked Otter is present in a number of protected areas across its range. For example, the protected Wolwespruit Nature Reserve in the North West harbours what appears to be the highest population density along the length of the Vaal (Power 2014). An extensive amount of work has been conducted on the Spotted-necked Otters occurring in the Kamberg section of the Ukahlamba-Drakensberg Park in KwaZulu-Natal (Perrin & d'Inzillo Carranza 2000a, 2000b; Kubheka et al. 2013). Other important protected areas where they persist are the following: Velorenvallei Nature Reserve (Mpumalanga), and the diminutive but important Marievale Bird Sanctuary (Gauteng). The main interventions revolve around riparian protection and enforcement of existing legislation, and indirectly by the controls on the number of fishermen permitted on reserves. Biodiversity stewardship opportunities of key sites should be sought. For example, stricter regulations and enforcement on development along riverbanks needs to be implemented. Monitoring and mitigation of pollution (chemical and physical) of rivers needs to be implemented or increased. Education and awareness campaigns that position this species as an indicator of river health, and thus prestige for the landowner, should be promoted and tested as a conservation intervention. Similarly, persecution should also be reduced through education and awareness campaigns, especially with the angling and trout farming industries, for instance otter-proof keep nets should be created. The use of extension services to restore riparian habitats, such as alignment with the Working for Water Programme, should continue to be used in key watersheds within the species' range.

Recommendations for land managers and practitioners:

- For all rivers, good land-use practices, such as keeping natural vegetation intact along river banks, can make a vital difference to their ecological integrity (Driver et al. 2012). Thus, rivers should be carefully managed to increase flow and reduce turbidity, and development on banks should be restricted.
- Conservation agencies should work with the agricultural sector and private landowners to restore and protect riverside habitats and catchments. For example, the Working for Water Programme.
- Importantly, for researchers and practitioners alike, a key step is to create a network with fellow field biologists working in ecosystems where otters are found, which would create synergy between conservation efforts (Reed-Smith et al. 2015). For example, creating an easy system to report otter sightings (i.e. Citizen Science mapping projects) would significantly contribute to knowledge of their current distribution and aid researchers in future assessments of status and population trends.

Research priorities:

- Subpopulation trends should be monitored. Developing effective long-term monitoring programmes for this species in different habitat types (for example, coastal, estuarine, riverine and urban, pristine) can be achieved through molecular techniques. Recently, partial DNA from spraint samples has been used to distinguish between *A. capensis* and *H. maculicollis* and could be incorporated into monitoring techniques of distribution, population size and structure over time (Madisha et al. 2015).
- Survey studies are needed to examine changes in area of occupancy nationally, but specifically in the Free State and Eastern Cape, as well as determining its occurrence along the Orange River.
- Research to determine whether this species is an effective ecological indicator of healthy river systems.

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- Genetic studies need to be carried out to determine whether this is a separate subspecies from the rest of Africa.
- Research in assessing the effectiveness of conducting public relations campaigns to decrease persecution rates.

Encouraged citizen actions:

- Avoid building properties on riverbanks (i.e. word of mouth message spreading).
- Citizens can assist the conservation of the species by reporting sightings on virtual museum platforms (for example, iSpot and MammalMAP), and therefore contribute to an understanding of the species distribution.
- Citizens can conduct simple otter surveys using a useful guide: "Otter surveys: a simple and quick method". This can be obtained from paula.vanberkel@gmail.com or from the Otter Specialist Group (Lesley.wright@stfc.ac.uk).
- In some urban areas near rivers and wetlands, citizens can become involved in the local WESSA affiliated Friends of the River groups, which help to ensure the conservation of these systems.
- Supervise hunting dogs in farmlands to prevent unnecessary non-selective otter deaths.

Data Sources and Quality

Table 5. Information and interpretation qualifiers for the Spotted-necked Otter (*Hydrictis maculicollis*) assessment

Data sources	Field study (literature, unpublished), indirect information (literature, expert knowledge)
Data quality (max)	Estimated
Data quality (min)	Suspected
Uncertainty resolution	Maximum / minimum values
Risk tolerance	Precautionary

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Details of the methods used to make this assessment can be found in *Mammal Red List 2016: Introduction and Methodology.*