

REPORT

THE SMOOTH-COATED OTTER *Lutrogale perspicillata* (MAMMALIA: MUSTELIDAE) IN SINGAPORE: ESTABLISHMENT AND EXPANSION IN NATURAL AND SEMI- URBAN ENVIRONMENTS

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ABSTRACT – The smooth-coated otter *Lutrogale perspicillata* reappeared in Singapore in the mid-1990s after an apparent absence of three decades. No assessment of their status has been reported since. We compiled 370 sighting records from the literature and verified online reports and submissions between 1998 and 2014. The records revealed increasing numbers of individuals since the 1990's with breeding populations in the western and eastern Johor Straits on the north shore, and in South of Singapore. About half the records were from three localities: Sungei Buloh Wetland Reserve (16%), Pulau Ubin (14%) and Serangoon Reservoir (14%). In areas of frequent reports of otter presence, camera trapping and sign surveys were conducted to determine the status (transient, infrequent, newly resident, established resident). Thirteen spraint sites and three den sites were identified at four localities, two of which were along rivers dammed to form freshwater reservoirs. The smooth-coated otter is using partially disturbed environments along the Singapore coastline, and in increasingly human-disturbed sites. As the interface with humans continue to increase, the importance of habitat preservation and public communication is highlighted.

KEYWORDS – Conservation, *Lutrogale perspicillata*, status, Singapore, Smooth-coated otter

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INTRODUCTION

Otters have been used as a symbol for promoting the conservation of wetlands, because of their widespread public appeal, worldwide distribution and indication of healthy aquatic habitats (Foster-Turley, 1991; Kruuk, 2006). As human populations continue to grow, wetlands become increasingly polluted or are lost to development (Moser et al., 1996; Prigent et al., 2012). As a result, otters have become increasingly

vulnerable throughout their original range (de Silva et al., 2015; Wright et al., 2015). Of the diversity of natural habitats suitable for otters in South-east Asia (Foster-Turley, 1992), mangrove forests and estuaries are available to otters in Singapore. However, less than 1% of original mangrove cover remains in Singapore (Yee et al., 2010) owing to decades of intensive coastal development and activity (Hilton and Manning, 1995).

Four species of otters occur in Asia (Foster-Turley, 1992; Sivasothi and Nor, 1994), of which two have been known to occur in Singapore, namely the smooth-coated otter *Lutrogale perspicillata* and the small-clawed otter *Aonyx cinereus* (Sivasothi and Nor, 1994). Prior to the 1960's, *A. cinereus* appeared to be the common otter species compared to *L. perspicillata* of which few records were available (Sivasothi, 1995). No verified records of either species are available in the 1970s and 1980s; although this not an indication of absence. In the early to mid-1990s, sightings of individual *L. perspicillata* re-emerged (Lim, 1990; Sivasothi, 1995). In 1998, a pair of smooth-coated otters re-established themselves at the Sungei Buloh Wetland Reserve and raised pups (Sivasothi, 1999; Baker, 2000).

Since then, sightings of *L. perspicillata* have increased on blogs, photo sites and personal reports from the community of naturalists and photographers, especially since 2008. These records have suggested the establishment of more than one population. This is exciting news as *Lutrogale perspicillata* is listed internationally as 'Vulnerable' in the IUCN Red List of Threatened species (de Silva et al., 2015) and nationally as 'critically endangered' in the Singapore Red Data Book (Lim et al., 2008). In areas where they are extant, a grasp of their distribution is vital. With the use of collated records and field surveys, we: (1) summarise sighting records between 1998 and 2014 to describe the distribution and status of *L. perspicillata* in Singapore; and (2) determine the residency status of *L. perspicillata* in various sites in Singapore.

STUDY AREA

The Republic of Singapore (103°500'E, 1°200'N) is an island 719 km² in area, located off the southern tip of Peninsular Malaysia (Fig. 1). The Johor Straits is a sea channel of varying width of 500-1,000 m, separating Peninsular Malaysia and Singapore giving rise to sheltered coastlines. The Johor-Singapore causeway links the two countries and separates the straits into eastern and western halves. The eastern Straits of Johor contain two islands belonging to Singapore, Pulau Ubin (10.2 km²) and Pulau Tekong (24.4 km²). This area has suffered an impact by coastal development by both countries and high vessel traffic from the Malaysian port of Pasir Gudang, which began operations in the 1970s (Johor Port, 2012). Singapore's coastline is highly developed and reclaimed (Tan et al., 2010), and major river mouths are sealed to form reservoirs but short stretches of relatively intact habitats such as mangrove, beaches and estuaries are still present or recovering (Fig. 1).

METHODS

Verified otter sighting records were compiled and then plotted on a map to reveal the distribution of *L. perspicillata* in Singapore. The records were supplemented with data from sign foot surveys and camera trap surveys, which are among the methods suggested by the IUCN Otter Specialist Group Standard to monitor otter distribution (Reuther et al., 2000). Nine sites with a high incidence of sighting reports between 2010 and 2011 were selected for these surveys and included estuarine mangroves, estuarine reservoirs, mangrove, beaches, coastal park and ponds (Table 2).

Compilation and analysis of records: Records of otter sightings between 1996 and 2014 were compiled from the following sources: records from the Raffles Museum of Biodiversity Research, National University of Singapore (RMBR, now Lee Kong Chian Natural History Museum); the Vertebrate Study Group (VSG), Nature Society (Singapore); National Parks Board (NParks); submissions (both unsolicited and invited) by the naturalist community and the public through Mammal Sightings in Singapore (an online records submission form at <http://mammal.sivasothi.com>); Google searching for internet sources (online photography forums, YouTube and blogs) with photographic and/or video evidence; and soliciting records through a FaceBook page (<https://www.facebook.com/OtterWatch>). Records were verified before inclusion. The compiled records were grouped by year and location and plotted on Google Maps.

Sign Surveys: Sign surveys were conducted on foot between July 2011 and April 2012 at all locations where otters had been reported in 2011, to detect otter signs (spraint and footprints), spraint sites and den sites. Sites with a high incidence of sightings and signs of otters were selected as study sites - Sungei Buloh Wetland Reserve, Woodlands Waterfront, Coney Island, Sungei Tampines, Serangoon Reservoir, Punggol Reservoir and Pulau Ubin (Fig. 1). These were regularly surveyed for new otter signs to evaluate the status of otter presence there.

Defining Status. Based on the available data, otter occurrence in a survey site was classified into one of four categories: 1) transient, 2) infrequent, 3) newly resident, and 4) resident. The criteria for each category are listed in Table 1.

Table 1. Criteria for the classification of *L. perspicillata* presence at survey sites in Singapore as of December 2014

Category	No. of consecutive years of sighting records	Activity of spraint sites, July 2011 - April 2012	Presence of juveniles or subadults in past three years
Transient	Less than three	Inactive	No
Infrequent	Three	May not be active	No
Newly resident	Less than three	Active	Yes
Resident	More than three	Active	Yes

Camera Trapping: Ten Reconyx™ PC900 Hyperfire™ camera traps were opportunistically deployed in eight active sites to monitor otter activity and group structure between September 2011 and March 2012. Each trap was fixed to a tree or fence railing at a height between 0.5 and 1.5 m. Traps were set to be active 24 hours per day and triggered by an infra-red motion sensor with the following setup: high sensitivity, three pictures per trigger, one second picture interval, no quiet period delay, 3.1 MP resolution, balanced night mode.

RESULTS

A total of 370 verified records were collated from January 1998 to December 2014 (records are archived at <http://mammal.sivasothi.com>) and plotted on a map to describe *L. perspicillata* distribution in Singapore (Fig. 1). More than two-thirds of these records were submitted through the Mammal Sightings in Singapore online form since mid-2009 (258 records; 70%) while the rest were obtained from records maintained by the natural history community (RMBR, VSG, NParks) (46 records;

12%) and the rest were harvested from the public mainly from photos shared online, blogs and webpages (51 records; 14%).

Lutrogale perspicillata were first exclusively observed in mangrove, estuaries and along the coast mainly along the northern shores of Singapore along the western and eastern Straits of Johor. From 2008, however, the otters have been exploring the coastal reservoirs of Punggol and Serangoon and more recently (in 2014), a six-fold increase (2013: 11 records; 2014: 65) in occurrences in the south with some rare records of otters observed inland. Records are poor for coastal areas with restricted public access (mostly military areas).

Clusters of sightings are reflected at Sungei Buloh Wetland Reserve (81 records; 22%) and Pulau Ubin, (53 records; 14%), particularly Chek Jawa. From 2008 there have been numerous records from recently dammed Punggol and Serangoon Reservoirs (63 records; 17%), where barrage works ended in October 2010 and December 2009 respectively (Ng and Tan, 2013). Reports from inland and southern areas of Singapore were few and episodic (16 records; 4%) until 2014, when southern records comprised 48% of the records submission that year.

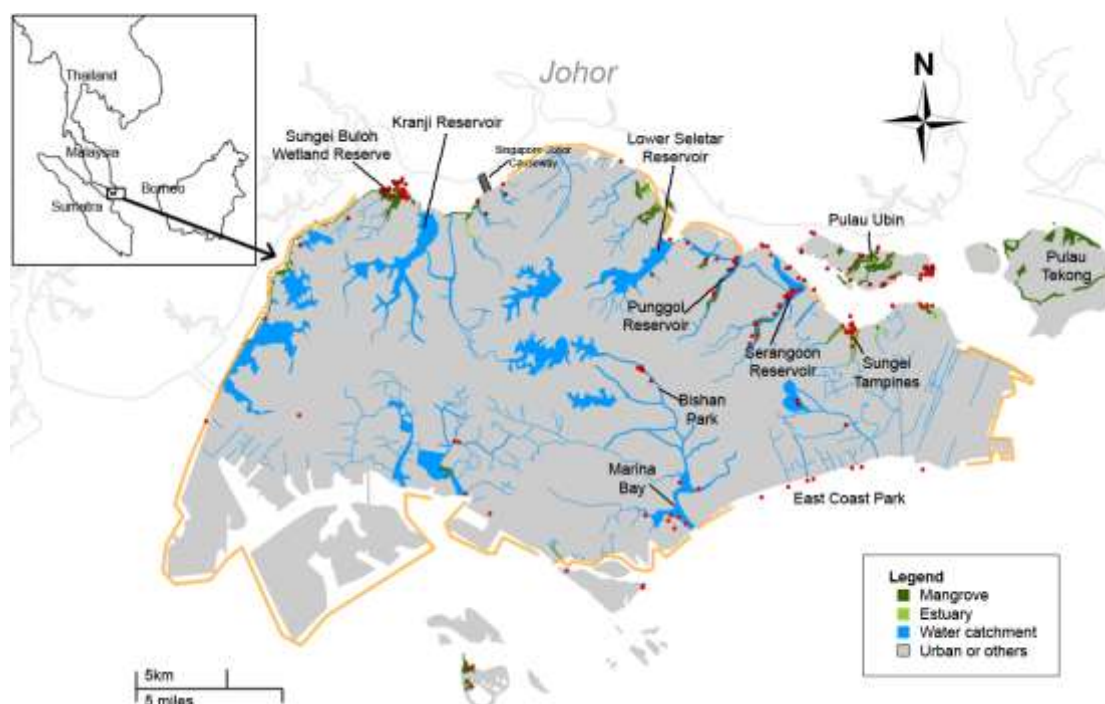


Figure 1. Map of the distribution of *Lutrogale perspicillata* (red dots) in Singapore based on verified otter sighting records from January 1998 to December 2014, overlaid onto a map of the current mangrove, estuary (Yee et al., 2010) and water catchment areas in Singapore. Orange lines indicate restricted areas for which mostly no records were available.

An increasing number of otter sightings have been recorded annually since the appearance of a pair of otters in 1998, except for the period 2004–2006 when there were few records. Sightings records peaked slightly in 2000–2003 and thereafter a much larger number of records were obtained between 2007 to 2014. The greatest number of otter sighting records obtained so far was in 2014 (Fig. 2).

The early sighting records obtained from 1998–2006 were mostly of the first resident population at Sungei Buloh Wetland Reserve in western Johor Straits (24 records; 80%). During this time, other records of *L. perspicillata* were mostly of a single individual or a pair of otters at Pulau Ubin in eastern Johor Straits. Otters had not yet been detected in southern Singapore.

From 2007 to 2014, otter records in western Johor Straits had increased in number but no longer constituted the majority of records (64 records; 17%). Reports of otters were now mostly originating from eastern Johor Straits (191 records; 52%) and a fifth of the records were from Pulau Ubin. For the first time since 1938 (Sivasothi and Nor, 1994), *L. perspicillata* was recorded in the southern islands in 2010 (Fig. 3).

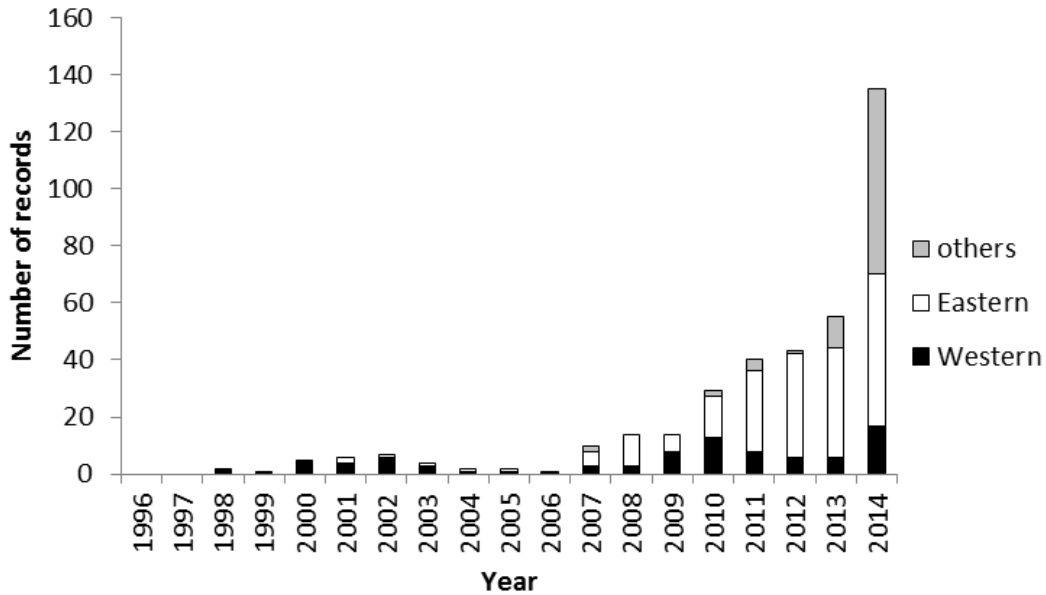


Figure 2. The annual number of verified *Lutrogale perspicillata* records, with an indication of their source from eastern and western Johor Straits, and other (southern and inland Singapore) areas.

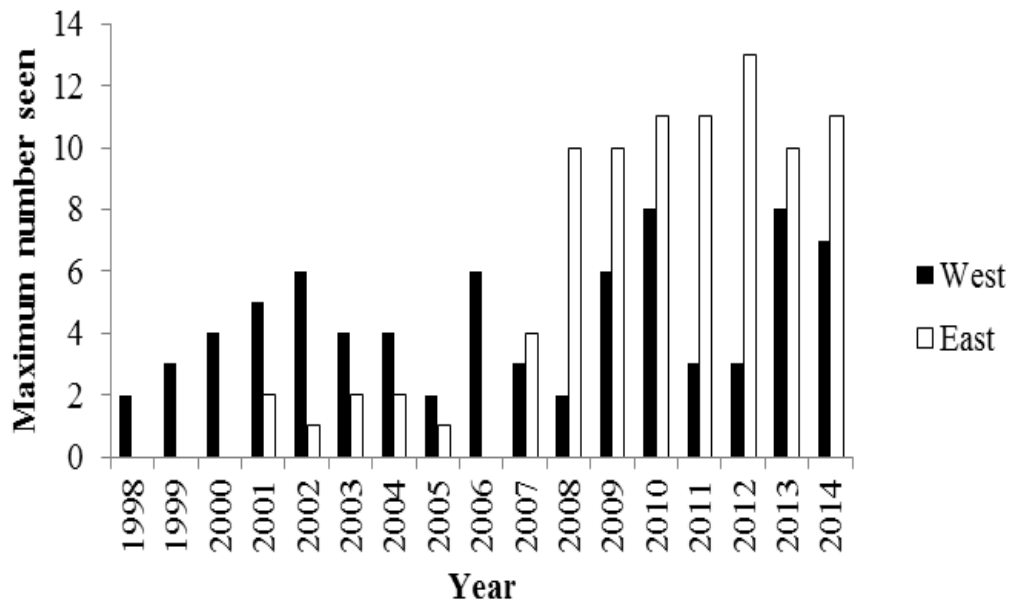


Figure 3. Maximum number of otters reported in Western and eastern Johor Straits annually.

In Singapore, records of groups of four or more otters were common (118 records) and have increased over time (see the appendix of records in <http://mammal.sivasothi.com>). Group sizes larger than seven individuals have been reported 25 times between 2008 and July 2014, almost entirely from eastern Johor Straits populations. The largest, a group of 13, was reported by officers of the Public Utilities Board at Punggol Reservoir in 2012.

Reports of pups and/or subadults of *L. perspicillata* were few but are a useful indication of residency (Table 2). Every year from 1999 to 2003, pups or subadults were reported at Sungei Buloh Wetland Reserve, and also in 2009 to 2014. In Pulau Ubin, subadults were reported in 2007–2008, 2010, 2012 and 2014. Pups and/or subadults were first reported at Punggol and Serangoon reservoirs in 2011 and 2012 respectively, and in Marina Bay in 2014.

Thirteen spraint sites and three dens were found in four study sites. Activity recorded by camera traps was high in two of six sites (more than 0.5 visits/trap night; Table 3). Otters were determined to be resident in Sungei Buloh Wetlands Reserve and Chek Jawa on Pulau Ubin, and newly resident in Punggol and Serangoon Reservoirs, and Marina Bay. Permanent otter presence was not detected in other sites despite reports of otter presence.

Table 2. Residency status of *Lutrogale perspicillata* at nine sites in Singapore, based on the activity of spraint and/or den sites between Jul 2011 – Apr 2012, presence of subadults and/or juveniles and the number of years otters have been detected in the area. BP: Brackish water pond; EM: Estuarine mangrove; ER: Estuarine reservoir; SB: Sandy Beach; UB: Urban.

No.	Site	Residency status	Spraint/den site activity in Jul 2011 – Apr 2012	No. of years juv/subadults present	No. of consecutive years with sightings
1	Sungei Buloh Wetland Reserve (EM)	Resident	Active	11 (1999-2003; 2009 - 2014)	17 (1998-2014)
2	Chek Jawa, Pulau Ubin (SB)	Resident	Active	1 (2007, 2008, 2010, 2012)	7 (2001; 2007-2013)
3	Punggol Reservoir, west bank (ER)	Resident	Active	2 (camera trap 2011, 2012, 2013, 2014)	4 (2008; 2010 - 2013)
4	Serangoon Reservoir, Lorong Halus (ER)	Resident	Active	3 (2012-2014)	3 (2008; 2011-2014)
5	Pulau Ubin – Various locations apart from Chek Jawa (BP, EM, SB)	Transient/absent	None detected	1 (2008, 2012, 2014)	7 (2001-2004; 2007-2014)
6	Sungei Tampines, Api-api (EM)	Infrequent	None detected	1 (2011, 2014)	4 (2008; 2010-2014)
7	Coney Island (SB)	Transient	Old	1 (2010)	1 (2010)
8	Woodlands Waterfront (UB)	Transient	None detected	1 (2011)	1 (2011)
9	Serangoon Reservoir, upstream (ER)	Transient	None detected	None observed	1 (2011)
10	East Coast Park (SB)	Transient	-	None observed	2 (2013, 2014)
11	Marina Bay (ER)	Newly resident	-	1 (2014)	1 (2014)
12	Bishan Park		-	None observed	1 (2014)

Table 3. Camera trap results of *Lutrogale perspicillata* activity and group numbers.

Site	Trap nights	No. of days with visits	No. of visits	No. of otters	Group structure
Sungei Buloh Wetland Reserve Visitor Centre Pond	66	32	40	2	Adult male & female
Chek Jawa, Pulau Ubin	73	50	122	2	Adult male & female
Punggol Reservoir (west bank, inlet)	71	17	27	2–9	Adults & subadults

Punggol Reservoir (west bank, breakwater)	44	7	8	4–9	Adults & subadults
Serangoon Reservoir (east bank, Tampines Expressway Bridge)	31	1	1	At least 4	Adults
Serangoon Reservoir (east bank, junction with Sg Blukar)	11	1	1	At least 2	Adults

DISCUSSION

Records submission peaks: It is unclear why there was a lack of records in the 2004–2007 period. Some familiarity with the otters could have led to a reduction in official records. Also, public encounters, are often unrecorded. The large increase in records (from 2007 to 2014) can be partly attributed to the growing trend of naturalist blogging (nine blog records between 2007 to 2013), greater online communication through social media (pers. obs.), and as a result, the growing awareness of the online submission form, Mammal Sightings. Annex C in The Singapore Blue Plan 2009 (2008) contains a list of blogs that feature marine content, reflecting a surge of new blogs from 2006. Photography forums and platforms have contributed records and sites such as ClubSNAP and Flickr sourced a further 14 records which were either posted publicly at these sites or derived after communication with the photographers. The bulk of recent records (2011: 38 of 40; 2012: 42 of 43; 2013: 49 of 55; 2014: 122 of 135) were from Mammal Sightings, which has seen an increase of submissions (from 2010: 3; 2009: 2) since its creation in 2009. This may have been attributed to the active promotion and solicitation of otter record submissions through a FaceBook page (www.facebook.com/OtterWatch) created by the first author in September 2011.

Three zones of residency: The rise in the number of records also implies that the population has continued to increase and spread island-wide after the first recorded colonisation event in the Sungei Buloh Wetland Reserve (Fig. 2). These numerous records have indicated an established presence throughout the coastlines of Singapore with evidence of residency. There appears to be three zones of residency in Singapore: the northwest, northeast and the south.

Of the groups recorded in the study, the pair of *L. perspicillata* in Sungei Buloh Wetland Reserve (northwest) appeared to be the longest established residents with a fixed home range encompassing the reserve. However, it is not clear if all records were due to the same individuals, as group size varied. The fluctuating group numbers may be an indication of dispersals, with the pair being the parental subpopulation of a metapopulation in southwestern Johor and southern Singapore.

Three study locations to the northeast (Serangoon Reservoir, Punggol Reservoir, and Pulau Ubin) were classified as areas newly resident to otters. This was concluded by the presence of active spraint sites, presence of juveniles/subadults and at least three consecutive years of records in each of these locations. The first signs of residence in the east were from records in Pulau Ubin that indicated an established group since (at least) 2007. Sightings of 1–10 individuals have been observed for seven consecutive years (Table 2) with one active den site known from the area (in Chek Jawa). A third and fourth group appear to be newly resident in Punggol and Serangoon Reservoirs since 2010 and 2011 respectively. However, as individuals and groups could not be identified, individuals in these three areas may not all be from separate groups.

Although recorded for consecutive years, the infrequency of records within a year in each of these eastern locations could be an effect of a larger home range that

encompassed more than one of these locations and parts of southern Johor (i.e. the estuarine mangroves of Sungei Kim-Kim and Sungei Johor in the east). This is likely given the proximity of the sites that are approximately 2 km from each other. A similar distance was reported in a radio-tracking study of the species in Indian freshwater rivers that found small-scale foraging in the environs of dens and extensive journeys between dens and foraging sites of up to 1.5 km (Hussain, 1993).

Transient otters numbering two to three individuals have been recently (2013–2014) recorded in the southern locations of East Coast Park, Marina Bay and Bishan Park. Although Marina Bay recorded a very recent presence (since January 2014), the birth of five pups in the location was recorded shortly after, indicating new residence. This began with the sighting of a pair earlier in the year (Feb 2014) and subsequent sightings of a lone male, until the appearance of the entire family group of two adults and five juveniles in June 2014. The short absence of the female likely indicated its confinement to a natal den for the birth and nursing of the pups until they were old enough to emerge.

New habitats, population growth and dispersal: There appears to be a move southwards from the Johor Straits that led to an increase in the number of locations *L. perspicillata* was present in, suggested by the shifts in the composition of record locality from 1998–2014, with the stream of records in previous locations persisting. Initial records (1998–2004) were exclusively in mangroves and estuaries (indicated by western Johor Straits records, mostly from Sungei Buloh Wetland Reserve), which were considered suitable otter habitats in Southeast Asia (Foster-Turley, 1992). This was followed by records in the newly dammed rivers (Serangoon and Punggol Reservoirs), largely modified sites where entire banks have been concretized and developed, with patches of wasteland vegetation. The species has been reported to inhabit reservoirs in India and Pakistan that were once natural estuaries or lakes (Anoop and Hussain, 2004; Khan et al., 2010). This may be a sign of pressure to adapt to these unoccupied, suboptimal habitats, evidenced by diets of almost exclusively non-native cichlids in the areas (Theng *et al.*, *in press*). Moreover, the recent emergence of southern and inland records (with a record peak in 2014) could be an indication of attempts to migrate and disperse from the Johor Straits populations, a possible result of the maturation of offspring from breeding groups (Table 3: subadults in eastern sites).

Origins and barriers to movement: It appears that populations of *L. perspicillata* on the western and eastern Johor Straits are separated by the Johor-Singapore Causeway (Fig. 1). Built all the way down to the seafloor, the causeway is a likely physical barrier to animal crossing. This obstruction is coupled with the highly urbanised surroundings could be a barrier hindering or preventing exchange between populations.

If the two populations on either side of the causeway are indeed isolated, it is possible they represent migrants from distinct populations residing in mangroves and rivers in southwestern and southeastern Johor. These possible source sites presently include mangrove areas of Pulau Kukup, Tanjung Piai and Sungei Pulai (RAMSAR sites) in southwest Johor and Sungei Johor and Kim-Kim, all of which have reported the presence of this species (Iskandar Malaysia, 2009).

Push and pull factors for establishment in Singapore: The eventual establishment of *L. perspicillata* suggests three possibilities: a pull factor in the recovering natural

environment receiving migrants from Malaysia, a push factor from development and loss of habitat in Malaysia, or a combination of both.

Coastal development in northern Singapore has significantly slowed (Tan *et al.*, 2010: 79) since a 40-year period (1953–1993) of intensive coastal development, resulting in significant mangrove loss (Hilton and Manning, 1995). This may have encouraged the migration of *L. perspicillata*, following the disturbances from land reclamation during the 1960s for farming, housing and industrial activity (Hilton and Manning, 1995), when the environs of pockets of natural waterways stabilised. This phenomenon was also reflected in the northeast, where the increased presence of groups of *L. perspicillata* (from 2008 onwards) in the Serangoon and Punggol Reservoir followed years of activity from fishing and farming villages, reclamation work and eventual dam construction, which was completed in 2009 (Cornelius, 2005).

Meanwhile, massive development plans of a similar scale have been underway in Southern Johor, threatening the continued existence of extensive mangrove patches (e.g., Iskandar Malaysia, 2011; Pengerang Integrated Petroleum Complex in southwest Johor). This may have caused a pressure for *L. perspicillata* to migrate southwards to escape habitat loss and disturbance. Thus it may no longer be just transient males dispersing to seek new territory, by relocating to Singapore, but family groups as well. This may have helped establish populations here.

Implications: The rising occurrence of *L. perspicillata* throughout Singapore was not a result of targeted efforts to encourage otter presence but one that was mostly natural dispersal. The population spread has seen the increase in the heterogeneity of habitat use throughout the years as the species continues to surprise us with the amount of modification and disturbance it is able to tolerate. Though *L. perspicillata* appeared to be fairly adaptable to severely degraded and disturbed habitats, actual use of spaces within these areas appeared more specific. What is often seen are individuals traversing expanses of unfavourable habitat to move between these spaces, evident by the transience in areas such as Woodlands Waterfront and East Coast Park (Table 2), sites with banks that are completely bare or vertically walled.

Habitat: The spaces that otters require in their home range are foraging sites and suitable spraint and den sites to defecate, groom and rest. Spraint and den sites are sites used with regularity and fidelity (Kruuk, 1995; Anoop and Hussain, 2004; Shenoy *et al.*, 2006) and tend to have preferred characteristics like elevated ground, presence of grooming substrate (e.g. sand), surrounding vegetation and a refuge from disturbance (Kruuk, 2006: 82). The latter is especially required when raising young (Kruuk, 2006: 90). Similarly, spraint and den sites were recorded on more vegetated, elevated but gently sloping banks that were less human disturbed, in the coastal reservoirs of this study (Theng, 2012). Bankside vegetation is known to serve as a refuge (Mason and Macdonald, 1986) and a screen from disturbance (*pers. obs.*). It usually has a positive correlation with otter presence in species such as *Lutra lutra* (Macdonald and Mason, 1983; Prenda and Granado-Lorencio, 1995; Ottino and Giller, 2000; Madsen and Prang, 2001), *Lontra canadensis* (Melquist and Hornocker, 1983), *Lontra provocax* (Medina-Vogel *et al.*, 2003), *Aonyx cinereus* (Prakash *et al.*, 2012), *Aonyx capensis* (Carugarti *et al.*, 1995) and *Hydrictis maculicollis* (Carugarti *et al.*, 1995). Thus rehabilitating bankside vegetation in heavily modified sites could improve habitat for the local population, evident in ‘otter haven’ projects in Europe, which have successfully enhanced *L. lutra* populations (Fox, 1999). In fact, a recent initiative of the government body in charge of water resources (Public Utilities Board) has introduced a similar concept of greening waterways in its Active, Beautiful, Clean

Waters programme, which has seen the engineering of otherwise concrete canals into ‘naturalised’ rivers in Bishan Park and Sungei Ulu Pandan (Public Utilities Board, 2010, 2014). This may have enriched the habitat for otters that may result in an increased presence in such areas in future.

Attitudes and actions: As otter presence continues to increase throughout the country, an increasing interface with humans is inevitable and this raises the probability of potential disturbance and conflict. Raising awareness and spreading a consistent message to encourage responsible behaviour when faced with wildlife such as otters is thus vital. Working with local government agencies and management to spread this message has been key in achieving this in Singapore. An example was set by collaboration with the management of Gardens by the Bay where a message of “Please do not approach but view from a distance” was adopted by staff and printed on pedestrian sign boards (Fig. 4). This has since been actively communicated by the lead government agency on biodiversity conservation in Singapore (National Parks Board), news media (Ee, 2014; Boh, 2015) and even echoed by our then-National Development Minister (Goy, 2014).



Figure 4. Signs have been erected in areas with otter presence to encourage appropriate behaviour when encountering otters. *Left:* Gardens by the Bay; *Right:* Coney Island, Serangoon Reservoir (Photo by: Jeffrey Teo).

Encouraging public involvement: Apart from encouraging good wildlife ethic, encouraging public involvement in the research and monitoring of the species has proven to be invaluable. The use of public records has been a critical element in understanding *L. perspicillata*'s distribution in Singapore. Of late, public involvement has been taken a step further with a constant engagement with enthusiastic members of the public who report otter sightings real-time through the use of smartphones and capture high-resolution media that provides a vital source of documentation for this species. This contribution has also enabled updated and effective feedback to various development projects and advice about public encounters for the ongoing

conservation management of otters in Singapore. Public involvement has proven to be big part of local otter research in highly connected Singapore and will continue to provide the information required for population monitoring, conservation management and future studies.

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RÉSUMÉ

LA LOUTRE D'ASIE (*Lutrogale perspicillata* (MAMMALIA: MUSTELIDAE) À SINGAPOUR : ÉTABLISSEMENT ET RECOLONISATION DANS UN ENVIRONNEMENT NATUREL ET SEMI URBAIN

La loutre d'Asie *Lutrogale perspicillata* est réapparue à Singapour dans le milieu des années 90 après une absence apparente de trois décennies.

Aucun établissement de leur statut n'avait été établi. Nous avons compilé 370 observations visuelles dans la littérature, et vérifié les données rapportées sur Internet entre 1998 et 2014. Les observations révèlent un nombre d'individus en augmentation depuis les années 1990 avec une population se reproduisant dans les détroits de Johor ouest et est sur les plages du nord et dans le sud de Singapour. Presque la moitié des observations proviennent de 3 sites : Sungei Buloh Wetland Reserve (16%), Pulau Ubin (14%) et Serangoon Reservoir (14%).

Dans les zones d'observations fréquentes de loutre, des pièges photos et des prospections à la recherche d'indices de présence ont été utilisés pour déterminer le statut (de passage, non fréquent, nouveau résident, résident établi). 13 places de marquage et 3 catiches ont été identifiées dans 4 sites, deux d'entre elles, le long de rivières possédant des barrages en vue de créer des réservoirs d'eau douce. La loutre d'Asie utilise un environnement partiellement dégradé le long des côtes de Singapour. Alors que l'interface avec les humains ne cesse de s'accroître, l'importance de la préservation de l'habitat et de la communication auprès du public est de plus en plus capitale.

RESUMEN

LA NUTRIA LISA *Lutrogale perspicillata* (MAMMALIA: MUSTELIDAE) EN SINGAPUR: ESTABLECIMIENTO Y EXPANSIÓN EN AMBIENTES NATURALES Y SEMI-URBANOS

La nutria lisa *Lutrogale perspicillata* reapareció en Singapur a mediados de los 90s, después de una aparente ausencia de tres décadas. Desde entonces no se ha reportado ninguna evaluación de su estatus. Hemos compilado 370 registros de avistaje de la bibliografía y de reportes online o enviados, verificados, entre 1998 y 2014. Los registros revelaron un creciente número de individuos desde los 90s, con poblaciones reproductivas en los Estrechos Johor occidentales y orientales sobre la costa norte, y en el sur de Singapur. Alrededor de la mitad de los registros fueron de tres localidades: Reserva del Humedal Sungei Buloh (16 %), Pulau Ubin (14 %) y el embalse Serangoon (14%). En áreas con reportes frecuentes de presencia de nutrias, condujimos relevamientos con cámaras-trampa y en base a signos, para determinar el estatus (transeúntes, infrecuentes, residentes recientes, residentes establecidos). Identificamos trece sitios con fecas y tres sitios con cuevas en cuatro localidades, dos de las cuales estaban a lo largo de ríos represados para formar embalses de agua dulce. La nutria lisa está usando ambientes parcialmente disturbados a lo largo de la costa de Singapur, y sitios con disturbio humano creciente. Como la interfase con los humanos continúa creciendo, destacamos la importancia de la preservación de hábitats y la comunicación pública.