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COMMUNICATION

DISTRIBUTION OF *NANHAIPOTAMON HONGKONGENSE* (SHEN, 1940) (CRUSTACEA: BRACHYURA: POTAMIDAE), A FRESHWATER CRAB ENDEMIC TO HONG KONG

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Distribution of *Nanhaipotamon hongkongense* (Shen, 1940) (Crustacea: Brachyura: Potamidae), a freshwater crab endemic to Hong Kong

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OPEN ACCESS

Abstract: *Nanhaipotamon hongkongense* (Shen, 1940) is a tropical freshwater crab currently considered endemic to Hong Kong. The species is more widely distributed in Hong Kong than previously published photographic records from Guangdong Province require further survey and corroboration; these would be the first records of this species outside of Hong Kong. *Nanhaipotamon hongkongense* prefers terrestrial environs in close proximity to clean watercourses shaded by secondary woodland, and records from this study indicate it is also found at lower elevations than previously published. The habitats of this semi-aquatic species are under threat due to development. It is hoped that understanding of the species' distribution will aid in its conservation and encourage further study of this species and its habitat uses.

Keywords: Crabs, Crustacea, endemic, freshwater, habitat loss, Hong Kong, tropical.

Chinese abstract: 香港南海溪蟹是一種目前被認為是香港特有的熱帶淡水蟹。本文研究發現香港南海溪蟹在香港的分佈較以往認知的更為廣泛。另外，曾有報告稱於廣東省發現本種棲息，惟仍須進一步調查及確認。如有關報導屬實，將成為本種於香港境外的首筆確實紀錄。香港南海溪蟹偏好次生林地中的清澈溪流附近的陸地生境，本研究亦發現香港南海溪蟹棲息地的海拔高度下限似乎較過去所知的低。香港南海溪蟹的棲息地正面臨各種發展的威脅。本文希望增加對本種分佈的了解，可以幫助及促進本種的保育工作，及促進更多有關本種及其生境使用的研究。

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Author Details: David J. Stanton, Michael. R. Leven and Tommy C.H. Hui are all professional ecologists at AEC Ltd. based in Hong Kong. They conduct surveys for a wide range of faunal groups and input into a range of large scale Environmental Impact Assessments and Strategic Planning studies in Hong Kong and Asia.

Author Contribution: DJS, MRL and TCHH all participated in the design of the study, acquisition of data, analysis and interpretation of data, and drafting of the manuscript. All read and approved the final manuscript. All the authors have contributed equally to this paper.

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INTRODUCTION

Only known from Hong Kong, *Nanhaipotamon hongkongense* (Shen, 1940) is a tropical freshwater crab (Image 1). This species is found mostly in secondary forest; it is very terrestrial and rarely occurs in water, instead inhabiting the dry areas beyond the banks of streams, though smaller crabs and juveniles appear to stay closer to pools or patches of wet ground (Ng & Dudgeon 1992; Cumberlidge 2008a). They excavate burrows during dry periods; following rainfall the adult crabs move out of their burrows, even during daylight (Ng & Dudgeon 1992; Cumberlidge 2008a).

The species is listed under the Least Concern category of the IUCN Red List because there are no known long-term threats (Cumberlidge 2008a). It was last collected in 1991 and its extent of occurrence is probably less than 20,000km² (Cumberlidge 2008a). Its published range under Cumberlidge (2008a) is limited to three locations, Tai Po Kau Forest Reserve and Nai Chung stream in New Territories and near Victoria Peak on Hong Kong Island, though the range map shows the distribution extending outside of Hong Kong into neighbouring Guangdong, northwards up the Pearl River estuary and eastwards along the coast, though no supporting evidence or rationale for this suggested wider range is provided.

IUCN stated that major threats to this species are habitat loss and pollution and that no conservation measures are known to be in place for this species, and incorrectly, that it is not found in a protected area (Cumberlidge 2008a). According to a local conservation assessment, the species is listed as being of Potential Global Concern (Fellowes et al. 2002).

While some Chinese freshwater crabs have been quite well studied, most species are either known only from the type locality or from just a few localities. In these situations, further collections are necessary to ascertain their actual distributions (Cumberlidge et al. 2010). Therefore, we have made field observations in Hong Kong in order to provide additional information on the distribution of *N. hongkongense*.

MATERIALS AND METHODS

Study Area

The present study area, Hong Kong Special Administration Region (SAR), People's Republic of China (PRC) (22.15000000–22.61666667^{0}N & 113.8333333–114.5000000^{0}E) is situated on the southern China coast to the east of the Pearl River (Zhujiang) estuary (Fig. 1). Hong Kong occupies an area of 1,100km^2 and is made up of a section of the Chinese Mainland (Kowloon and the New Territories, 793km^2) and islands, of which Hong Kong and Lantau are the largest (78km^2 and 147km^2, respectively). The topography of Hong Kong is generally rugged with little flat land; much of the flatter areas (c. 60km^2) are a result of land reclamation (Dudgeon & Corlett 2004). The Shenzhen River to the north largely separates Hong Kong from the Shenzhen Special Economic Zone of the PRC.

The climate of Hong Kong is distinctly monsoonal and despite its subtropical nature has well-defined seasons associated with the East Asian monsoons (Carey et al. 2001). During winter, the continental high-pressure region over Siberia and Mongolia result in north or northeasterly winds that bring cool, dry air to Hong Kong (Dudgeon & Corlett 2004).

Literature review

Literature was reviewed to examine the known distribution of *N. hongkongense.* Full details of this review and sources can be seen in Appendices 1 and 2. Hong Kong SAR has a robust Environmental Impact Assessment (EIA) process and numerous developments requiring EIA studies have taken place in lowland Hong Kong; potentially affecting streams where this crab occurs. Such EIA studies invariably require surveys of the streams that may be affected. Accordingly, desktop studies of EIA reports were made from the documents available at the Environmental Protection Department website (http://www.epd.gov.hk/eia/) in order to comprehensively review the available ecological findings from these studies. Additional data were obtained from unpublished studies and the authors' own unpublished results of previous survey findings and from observations submitted on the online initiative iNaturalist (http://www.inaturalist.org), an online citizen science network that collates and presents observations of wildlife.

Observations

A review of 126 EIA reports, published between 2002 and 2017, was undertaken and these are listed in Appendix 1. The findings of the present review, combined with additional data obtained from unpublished studies, have revealed that *N. hongkongense* is known from at least 34 locations at 24 sites in Hong Kong (Appendix 1, Fig. 1). The type locality is The Peak on Hong Kong Island (Shen 1940).

Nanhaipotamon hongkongense has been found mostly in or near fast-flowing watercourses, within semi-mature secondary woodland with limited anthropogenic

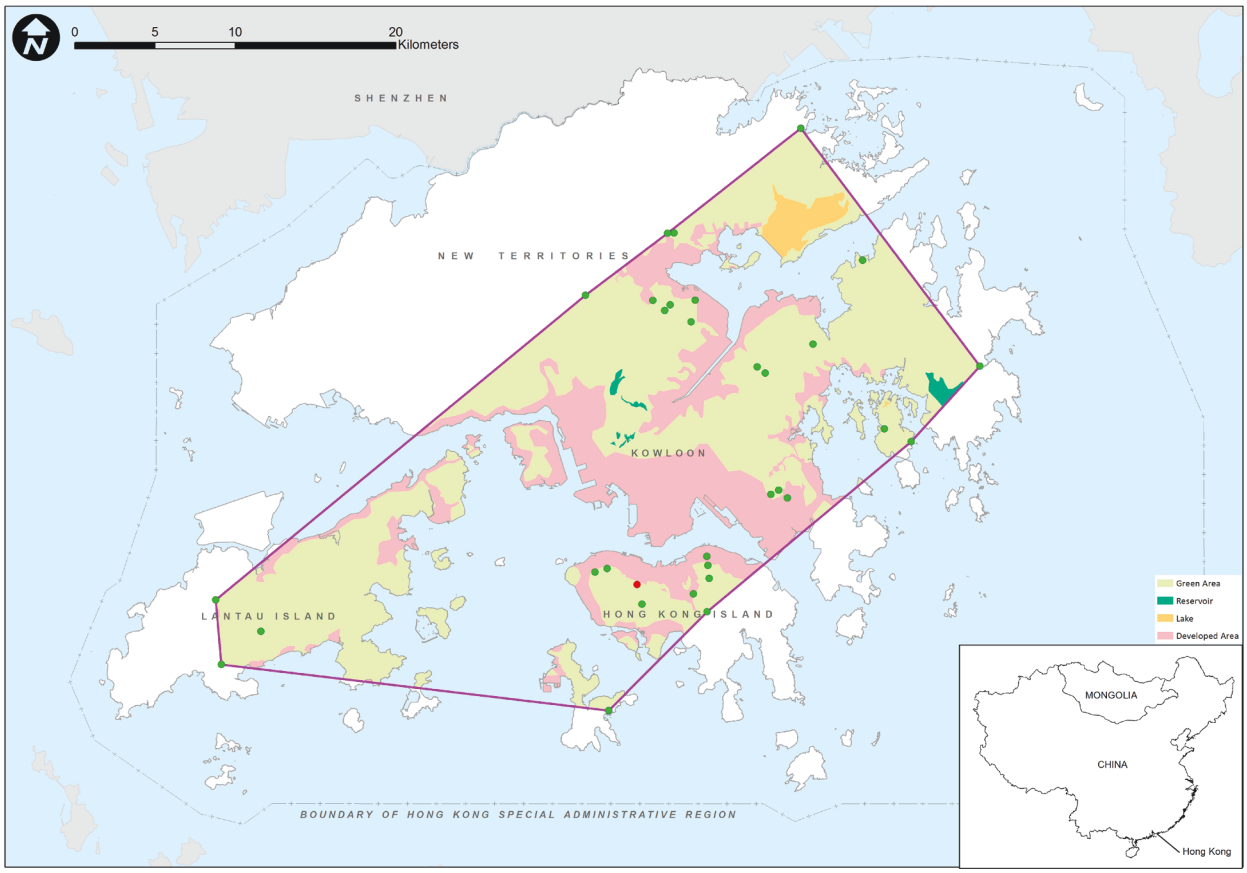

Figure 1. Map of Hong Kong Special Administrative Region, People's Republic of China. Green circles indicate the current distribution of *N. hongkongense*; red circle denotes the type locality (approximately).

Image 1. *Nanhaipotamon hongkongense* (Shen 1940) in its natural habitat: (a) observed in stream margin, Hong Kong; (b) climbing on tree bark in Tai Po Kau Forest Reserve, Hong Kong

influences, and with altitudinal range from 17–514 m. Examples of typical habitats where the crab has been observed are shown in Image 2. Field observations by the authors are that it is generally recorded singularly; in captivity, as this species is aggressive, specimens, particularly conspecifics, cannot be kept together (Ng & Dudgeon 1992). It has, however, been recorded in the same watercourses as *Cryptopotamon anacoluthon,* another endemic freshwater crab (Ng & Dudgeon 1992).

Anecdotal evidence supports the published

statement that the crab is largely terrestrial with records from residential areas and school buildings, well away from any streams (Alex McMillan in lit. 08.ix.2016). The species was also observed climbing on a tree in Tai Po Kau Forest Reserve, at a height of over a metre from the ground (pers. obs.). Furthermore, it is understood that it may "occur wherever there are reasonably clean streams under almost completely closed canopy. They don't seem to care if the stream has polystyrene and plastic bags as long as the water is flowing well, so is clean" (Paul Crow in lit. 13.ix.2016).

Outside of Hong Kong, there are records of this species and its congener, *N. aculatum*, from neighbouring Shenzhen over the past 10 years, though further details of habitat type and actual locations are apparently unpublished thus far. A record of land crabs (to date of unknown species) from the Dapeng Peninsula of Guangdong (Jonathan Martinez in lit. 15.xi.2017) is to be further investigated. These crabs were recorded from good quality lowland *fung shui* woodland behind a village on a hillside. Whilst this site in Dapeng is only 18km from the closest Hong Kong record, they are separated by the extensive seawaters of Mirs Bay.

DISCUSSION

Distribution and habitat requirements of *N. hongkongense*

Cumberlidge (2008a) stated that *N. hongkongense* occurred in three locations in Hong Kong, at elevations from 50–100 m; however, from the present review, it is clear that the species is more widespread than previously thought, i.e., with 34 identified locations and approximately 400km^2 area of occupancy in Hong Kong. In addition, the records from Shenzhen confirm that this species occurs beyond Hong Kong, albeit the extent of its range in southern China remains uncertain. Cumberlidge (2008a) suggested that the population of *N. hongkongense* is not severely fragmented, though the habitat mosaics in which *N. hongkongense* occurs are often fragmented by developed areas (Stanton & Leven 2016; Stanton et al. 2017) and do not share downstream confluences or natural habitat linkages, a result of urbanisation. Many watercourses have been piped or channelised in their lower sections and suitable secondary woodlands lack connectivity, thus potentially inhibiting the movement of crabs. Hence, it is likely that within this area of occupancy there are now a number of more or less isolated sub-populations.

Mitigation and Conservation

According to IUCN, no conservation measures are known to be in place for *N. hongkongense*, and the species is not found in a protected area (Cumberlidge 2008a). One of the sites listed by Cumberlidge (2008a), Tai Po Kau Reserve, however, was in fact protected at that time, as it is today as is the type locality, which falls within Aberdeen Country Park. Given its habitat requirements, many of the sites occur within upland hillstreams within secondary wooded habitats, which are largely situated within Country Parks or Protected Areas (e.g., Tai Po Kau, Fung Yuen). Those sites zoned 'Green Belt' under local planning guidelines are under pressure for housing developments (Stanton et al. 2017). It should be noted that the species does also occur at lower elevations, particularly on the islands of Kau Sai Chau and Lamma (see Appendix 2, Fig. 1).

Currently, there is no mechanism in place to protect the ecology of entire rivers and their catchments in Hong Kong (Dudgeon & Chan 1996; Cheung et al. 2010), and there is an urgent need for protection of the remaining rivers in their natural state (Hong Kong Birdwatching Society 2013); a similar situation is occurring in much of the rest of Asia (Cumberlidge et al. 2009, 2010).

When mitigation is prescribed through the EIA process in Hong Kong, it is usually in the form of watercourse preservation and the inclusion of riparian buffers and/or translocation exercises. Currently, there are no stringent guidelines for implementation of habitat management, riparian buffer zones or conducting species translocation (Stanton & Leven 2016; Lau et al. 2017); though based on detailed studies of the semi-aquatic Hong Kong Newt *Paramesotriton hongkongensis* in Hong Kong, Lau et al. (2017) proposed fixed-width buffer zones of 113m away from stream margins to protect the terrestrial habitat for this species. But projects for reducing habitat loss and fragmentation by watercourse restoration, recreation or enhancement and faunal conservation programs are being started or are in progress (e.g., Cumberlidge et al. 2009, 2010; Hong Kong Birdwatching Society 2015) in Hong Kong and elsewhere in the south China region. Furthermore, with the implementation of actions in the Hong Kong Biodiversity Strategy and Action Plan 2016–2021, there is scope for several specific actions that address habitat management and enhancement of watercourses and country parks and potentially help to improve our knowledge of this, and other, endemic freshwater species. This could also benefit its little known congener, *Nanhaipotamon aculatum*, which is only known from a few localities in the Northwestern New Territories in Hong Kong (H.K. Chan in lit. xi.2016)

and also in Shenzhen. It is listed as Data Deficient in view of the absence of further information on its extent of occurrence, ecological requirements, population size, population trends, and long-term threats (Cumberlidge 2008b).

The restricted range of many crab species from China, together with the ongoing human-induced loss of habitat in many parts of the region are a cause for concern, and it is considered that conservation activities should be aimed primarily at preserving the integrity of sites and habitats while closely monitoring key populations at the same time (Cumberlidge et al. 2010).

Many of the sites in Hong Kong are isolated, fragmented by a combination of developed areas (where downstream sections have been lost) and physical topography, and have few ecological linkages suitable for a predominantly aquatic species to exploit. Protection of known sites is therefore important, so that these can ensure the continued survival of the species, and suitable habitat management would also be beneficial either by providing increased habitat area or by providing corridors to link populations.

IUCN Red List Status

The present study is not intended to constitute a review of the IUCN listing of *N. hongkongense* Nevertheless, we suggest that the IUCN Red List status of *N. hongkongense* should be revisited in the light of our findings. While it is most unlikely that the population size and the extent of occurrence or area of occupancy meet the IUCN criteria for the listing of *N. hongkongense* as 'Vulnerable' , the species is still known only from Hong Kong and probably with a relatively small, fragmented and declining population largely restricted to upland areas.

The mapped range of *N. hongkongense* shown by IUCN extends considerably beyond Hong Kong into Guangdong Province, though as noted above no justification for this wider range is provided by Cumberlidge (2008a). Since much of the purported range comprises the intensely developed urban centres of Shenzhen and Dongguan it is considered most unlikely that it is present throughout this area. However, there are patches of potentially suitable habitat, highlighted by the photographic evidence from Shenzhen and it would be prudent to search for *N. hongkongense* in such areas to better determine the extent of species' occurrence.

Cumberlidge et al. (2010) stated that the existing IUCN Red List status can be updated by gathering current data on the distribution, natural history, population trends, threats, and endemism of China's highly diverse freshwater crabs. Once the IUCN Red List is updated, the conservation strategies can be developed for these understudied, diverse and potentially threatened fauna. It is hoped that the information gathered during the present study will help to feed into this process.

CONCLUSIONS

Nanhaipotamon hongkongense is widely distributed within Hong Kong; recorded throughout the New Territories, Hong Kong, Lamma and Lantau Islands. So far, there are no fully documented observations outside of Hong Kong and photographic records from Guangdong Province require further survey and corroboration. Generally, *N. hongkongense* prefers terrestrial environs in close proximity to clean watercourses shaded by secondary woodland. The species, however, has also been recorded in lower elevations from several locations, notably on the islands of Lamma and the Sai Kung Area (including the island of Kau Sai Chau). Watercourses and woodland in which this species occurs are largely natural with limited anthropogenic impacts such as channelisation or modification, but as the requirement of land increases for development, such areas will be under threat.

REFERENCES

AECOM (2016). *Sha Tin Cavern Sewage Treatment Works.* Environmental Impact Assessment Report to Hong Kong S.A.R. Government.

Black, B. & Veatch Hong Kong Limited (2015). *Desalination Plant at Tseung Kwan O.* Environmental Impact Assessment Report to Hong Kong S.A.R. Government.

Black, B. & Veatch Hong Kong Ltd. (2005). *Proposed Extension of Public Golf Course at Kau Sai Chau Island, Sai Kung*. Environmental Impact Assessment Report to Hong Kong S.A.R. Government.

Carey, G.J., M.L. Chalmers, D.A. Diskin, P.R. Kennerley, M.R. Leven, R.W. Lewthwaite, D.S. Melville, M. Turnbull & L. Young (2001). *The Avifauna of Hong Kong*. Hong Kong Bird Watching Society, Hong Kong.

Cheung, L.K., H. Lui & C. So (2010). *Rivers Reviving - Sham Pui River*. Green Power, Hong Kong.

Cumberlidge, N. (2008a). *Nanhaipotamon hongkongense*. The IUCN Red List of Threatened Species 2008: e.T134597A3983968. http://doi.org/10.2305/IUCN.UK.2008.RLTS.T134597A3983968.en Downloaded on 20 May 2017.

Cumberlidge, N. (2008b). *Nanhaipotamon aculatum*. The IUCN Red List of Threatened Species 2008: e.T134934A4038514. http://doi.org/10.2305/IUCN.UK.2008.RLTS.T134934A4038514.en Downloaded on 05 January 2017.

Cumberlidge, N., P.K.L. Ng, D.C.J. Yeo, C. Magalhães, M.R. Campos, F. Alvarez, T. Naruse, S.R. Daniels, L.J., Esser, F.Y.K. Attipoe, F.L. Clotilde-Ba, W. Darwall, A. Mcivor, B. Collen & M. Ram (2009). Freshwater crabs and the biodiversity crisis: importance, threats,

Appendix 1. List of Environmental Impact Assessment reports reviewed during the present study. All reports can be viewed online at http://www.epd.gov.hk/eia/index.html)

Application no.	Environmental Impact Assessment Report
EIA-002/1998	Tsuen Wan Bay Further Reclamation, Area 35, Tsuen Wan Engineering, Planning and Environmental Investigation
EIA-013/1999	Tang Lung Chau Dangerous Goods Anchorage
EIA-014/1999	Main Drainage Channels and Poldered Village Protection Schemes for San Tin, NWNT EIA Study
EIA-017/1999	Essential Public Infrastructure Works associated with West Rail Stations in Yuen Long Tin Shui Wai and Tuen Mun Centre
EIA-020/1999	Route 16 Investigation Assignment from West Kowloon to Sha Tin
EIA-021/1999	Feasibility Study on the Alternative Alignment for the Western Coast Road, Tseung Kwan O
EIA-022/1999	Sha Tin Sewage Treatment Works, Stage III Extension - Environmental Impact Assessment Study
EIA-023/1999	Tseung Kwan O Development - Contract F: Grade Separated Interchange T1/P1/P2
EIA-026/1999	Essential Public Infrastructure Works with West Rail Stations (the Eastern Access Road)
EIA-027/1999	East Rail Extensions - Tai Wai to Ma On Shan
EIA-028/1999	Hebe Haven Yacht Club Development - Phase 2 Environmental Impact Assessment Study
EIA-029/1999	132 kV Overhead Pole Line & Underground Cable from the Existing Po Lam Substation to the Existing Tui Min Hoi Substation - Circuit No.2
EIA-030/1999	Tin Shui Wai Phase 4 Rail Extension
EIA-031/1999	Light Rail Transit (LRT) Extension in Tin Shui Wai Reserve Zone and Grade Separation of the LRT with Pui To Road and Tsing Lung Road in Tuen Mun
EIA-033/1999	Route 10 North Lantau to Yuen Long Highway Investigation and Preliminary Design (Southern Section
EIA-039/2000	Shenzhen River Regulation Project Stage III - Environmental Impact Assessment
EIA-040/2000	Northshore Lantau Development Feasibility Study - Environmental Impact Assessment
EIA-041/2000	Construction of an International Theme Park in Penny's Bay of North Lantau together with its Essential Associated Infrastructures - Environmental Impact Assessment
EIA-043/2000	Agreement No. CE 73/98 Investigation Assignment for Widening of Tolo Highway/Fanling Highway between Island House Interchange and Fanling
EIA-061/2001	Tseung Kwan O Roads D1, D8 and D10
EIA-063/2001	Replacement of Cremators at Fu Shan Crematorium
EIA-066/2001	The Decommissioning of Underground Fuel Tanks at Tsuen Wan No.1 Pumping Station
EIA-067/2001	Widening of Yuen Long Highway between Lam Tei and Shap Pat Heung Interchange
EIA-068/2001	Planning and Engineering Feasibility Study for Sham Tseng Development
EIA-071/2001	Sheung Shui to Lok Ma Chau Spur Line
EIA-074/2002	Yuen Long and Kam Tin Sewerage and Sewage Disposal Stage 1 Packages 1A-1T and 1B-1T - Kam Tin Trunk Sewerage Phase I and II
EIA-075/2002	Tung Chung road
EIA-076/2002	Fill Bank at Tseung Kwan O Area 137
EIA-078/2002	Deep Bay Link
EIA-079/2002	Ngong Ping Sewage Treatment Works and Sewerage. EIA report submitted to EPD.
EIA-082/2002	Shenzhen Western Corridor
EIA-083/2002	Feasibility Study for Housing Development at Whitehead & Lee On in Ma On Shan
EIA-086/2002	Upgrading and expansion of San Wai Sewage Treatment Works and expansion of Ha Tsuen Pumping Station
EIA-087/2002	Cement Silos Addition Work in Tai Po Cement Depot
EIA-089/2003	The Proposed Submarine Gas Pipelines from Cheng Tou Jiao Liquefied Natural Gas Receiving Terminal, Shenzhen to Tai Po Gas Production Plant, Hong Kong
EIA-090/2003	Tung Chung - Ngong Ping Cable Car Project
EIA-091/2003	Outlying Islands Sewerage Stage 1, Phase II Package J - Sok Kwu Wan Sewage Collection, Treatment & Disposal Facilities
EIA-093/2004	Improvements to San Tin Interchange
EIA-094/2004	Yuen Long and Kam Tin Sewerage and Sewage Disposal Stage 2
EIA-096/2004	Peng Chau Sewage Treatment Works Upgrade
EIA-097/2004	Tai Po Sewage Treatment Works Stage V
EIA-099/2004	Renewable Energy by a Wind Turbine System on Lamma Island

Application no.	Environmental Impact Assessment Report
EIA-100/2004	Siu Ho Wan Water Treatment Works Extension
EIA-101/2004	Drainage Improvements in Sai Kung
EIA-103/2004	Trunk Road T4 in Sha Tin
EIA-106/2005	New Contaminated Mud Marine Disposal Facility at Airport East / East Sha Chau Area
EIA-107/2005	Peng Chau Helipad
EIA-110/2005	Drainage Improvements in Southern Lantau
EIA-111/2005	Further Development of Tseung Kwan O Feasibility Study
EIA-112/2005	Proposed Extension of Public Golf Course at Kau Sai Chau Island, Sai Kung
EIA-114/2005	Helipad at Yung Shue Wan, Lamma Island
EIA-118/2005	Main Arena of the 2008 Olympic Equestrian Event
EIA-119/2005	Lamma Power Station Units L4 & L5 Flue Gas Desulphurization Plant Retrofit Project
EIA-122/2006	Yuen Long, Kam Tin, Ngau Tam Mei & Tin Shui Wai Drainage Improvement Stage 1, Phase 2B - Kam Tin Secondary Drainage Channel KT13
EIA-124/2006	A Commercial Scale Wind Turbine Pilot Demonstration at Hei Ling Chau
EIA-125/2006	Liquefied Natural Gas (LNG) Receiving Terminal and Associated Facilities
EIA-126/2006	Relocation of Yiu Lian Floating Dock No. 3
EIA-128/2007	Drainage Improvement in Northern New Territories - Package C
EIA-130/2007	Drainage Improvement in Sha Tin and Tai Po
EIA-133/2007	North East New Territories (NENT) Landfill Extension
EIA-143/2007	South East New Territories (SENT) Landfill Extension
EIA-144/2008	Proposed Comprehensive Development at Wo Shang Wai, Yuen Long
EIA-146/2008	Provision of Cremators at Wo Hop Shek Crematorium
EIA-148/2008	Harbour Area Treatment Scheme (HATS) Stage 2A
EIA-149/2008	Proposed Development at Fung Lok Wai, Yuen Long at Lot 1457 R.P. in D.D.123
EIA-156/2008	Development of a Biodiesel Plant at Tseung Kwan O Industrial Estate
EIA-159/2008	Construction of Cycle Tracks and the associated Supporting Facilities from Sha Po Tsuen to Shek Sheung River
EIA-160/2008	Improvement to Pok Oi Interchange
EIA-161/2008	Construction of a Secondary Boundary Fence and new sections of Primary Boundary Fence and Boundary Patrol Road
EIA-161/2008	Construction of a Secondary Boundary Fence and new sections of Primary Boundary Fence and Boundary Patrol Road
EIA-162/2008	Inter-reservoirs Transfer Scheme (IRTS) - Water Tunnel between Kowloon Bywash Reservoir and Lower Shing Mun Reservoir
EIA-163/2008	Hang Hau Tsuen Channel at Lau Fau Shan
EIA-164/2009	Upgrading of Remaining Sections of Kam Tin Road and Lam Kam Road
EIA-167/2009	Hong Kong Offshore Wind Farm in Southeastern Waters
EIA-169/2009	Hong Kong Section of Guangzhou - Shenzhen - Hong Kong Express Rail Link
EIA-170/2009	Provision of a Poultry Slaughtering Centre in Sheung Shui
EIA-172/2009	Hong Kong - Zhuhai - Macao Bridge Hong Kong Link Road
EIA-173/2009	Hong Kong - Zhuhai - Macao Bridge Hong Kong Boundary Crossing Facilities
EIA-174/2009	Tuen Mun - Chek Lap Kok Link
EIA-177/2009	Development of a 100MW Offshore Wind Farm in Hong Kong
EIA-178/2009	Black Point Gas Supply Project
EIA-180/2010	Improvement of Fresh Water Supply to Cheung Chau
EIA-186/2010	Integration of Siu Ho Wan and Silver Mine Bay Water Treatment Works
EIA-188/2010	Phase III Redevelopment of The Hong Kong Federation of Youth Groups Jockey Club Sai Kung Outdoor Training Camp
EIA-189/2010	Regulation of Shenzhen River Stage IV
EIA-190/2010	Liantang /Heung Yuen Wai Boundary Control Point and Associated Works
EIA-193/2011	Development of the Integrated Waste Management Facilities Phase 1

Application no.	Environmental Impact Assessment Report
EIA-199/2011	Shatin to Central Link - Hung Hom to Admiralty Section
EIA-200/2011	Shatin to Central Link - Tai Wai to Hung Hom Section
EIA-201/2011	Engineering Investigation and Environmental Studies for Integrated Waste Management Facilities Phase 1 – Feasibility Study
EIA-203/2012	Pilot Project for Public - Private Partnership Conservation Scheme, Sha Lo Tung Valley, Tai Po
EIA-206/2012	Drainage Improvement Works at Ngong Ping
EIA-209/2013	Cross Bay Link, Tseung Kwan O
EIA-210/2013	Tseung Kwan O – Lam Tin Tunnel and Associated Works
EIA-212/2013	Development of Lok Ma Chau Loop
EIA-213/2013	North East New Territories New Development Areas
EIA-218/2013	Development of Organic Waste Treatment Facilities, Phase 2
EIA-219/2013	Outlying Island Sewerage Stage 2 - Upgrading of Cheung Chau Sewage Collection, Treatment and Disposal Facilities
EIA-222/2014	Development of Anderson Road Quarry
EIA-224/2014	In-situ Reprovisioning of Sha Tin Water Treatment Works - South Works
EIA-225/2014	Decommissioning of West Portion of the Middle Ash Lagoon at Tsang Tsui, Tuen Mun
EIA-226/2014	Alternative Ground Decontamination Works of the Proposed Kennedy Town Comprehensive Development Area Site
EIA-227/2015	Comprehensive Development and Wetland Protection near Yau Mei San Tsuen
EIA-228/2015	Flyover from Kwai Tsing Interchange Upramp to Kwai Chung Road
EIA-229/2015	Desalination Plant at Tseung Kwan O
EIA-230/2015	Chai Wan Government Complex and vehicle Depot
EIA-232/2015	Operation of the Existing Tai Lam Explosives Magazine at Tai Shu Ha, Yuen Long for Liantang/Heung Yuen Wai Boundary Control Point Project
EIA-233/2015	Tung Chung New Town Extension
EIA-234/2015	Development of Anderson Road Quarry Site – Rock Cavern Developments
EIA-235/2015	Development of Anderson Road Quarry Site – Road Improvement Works
EIA-236/2016	Site Formation and associated Infrastructural Works for Development of Columbarium, Crematorium and Related Facilities at Sandy Ridge Cemetery
EIA-237/2016	Additional Gas-fired Generation Units Project
EIA-238/2016	New Wang Tong River Bridge
EIA-239/2016	Police Facilities in Kong Nga Po
EIA-240/2016	Sha Tin Cavern Sewage Treatment Works
EIA-241/2016	Elevated Pedestrian Corridor in Yuen Long Town Connecting with Long Ping Station
EIA-242/2016	Proposed Low-rise and Low-density Residential Development at Various Lots and their Adjoining Government Land in D.D. 104, East of Kam Pok Road, Mai Po, Yuen Long. N.T.
EIA-243/2016	Outlying Islands Sewerage Stage 2 - Upgrading of Tai O Sewage Collection, Treatment and Disposal Facilities
EIA-244/2016	Port Shelter Sewerage, Stage3 - Sewerage Works at Po Toi O
EIA-245/2016	Expansion of Sha Tau Kok Sewage Treatment Work
EIA-246/2016	Outlying Islands Sewerage Stage 2 - South Lantau Sewerage Works
EIA-247/2016	Kai Tak Multi-purpose Sports Complex
EIA-248/2016	Hung Shui Kiu New Development Area
EIA-249/2016	A Rooftop Helipad at the Proposed New Block of Queen Mary Hospital
EIA-250/2017	Mui Wo Lai Chi Yuen Cemetery Extension
EIA-251/2017	Improvement Dredging for Lamma Power Station Navigation Channel

Appendix 2. Locations of *Nanhaipotamon hongkongense* obtained from literature and authors' observations

Site	Latitude (N)[1]	Longitude (E)[1]	Altitude (m)	Number of Locations	Conservation Area	Source/Additional notes
New Territories						
Tai Po Kau	22.427419	114.180772	157	-	Special Area	Authors' unpubl. data Cumberlidge 2008a
Pun Shan Chau, Tai Po	22.430789	114.170392	112	1	No	Alex McMillian in litt. 08.ix.2016
Cheung Shue Tan Hang, Tai Po	22.430967	114.195400	80	1	No	Alex McMillian in litt. 08.ix.2016
Kau Sai Chau	22.351361	114.310281	17-22	2	No	Binnie Black & Veatch Hong Kong Ltd. 2005
Wong Chuk Yuen, Sai Kung	22.404883	114.266278	207	1	Country Park	Ally van de Pol in litt. 08.ix.2016
Ma Yau Tong	22.320833	114.241344	95-200	3	No	Ove Arup and Partners Ltd. 2014 Black & Veatch Hong Kong Limited 2015
Mui Tsz Lam, Sha Tin	22.389489	114.236989	97-161	2	Partly	AECOM 2016 Authors' unpubl. data
Nai Chung	-	-	-	1	-	Cumberlidge 2008a
Lai Chi Wo	22.526928	114.258575	36	1	(Special Area)	Y.K. So pers. comm.
Fung Yuen	22.468611	114.178333	34-47	2	Priority Site	Authors' unpubl. data
Sai Kung Country Park	22.391539	114.367000	50	1	Country Park	iNaturalist.com
Lai Chi Chong	22.453553	114.296267	40	1	Country Park	iNaturalist.com
Ng Tung Chai	22.434475	114.129294	220	1	No	iNaturalist.com
Northwest New Territories – Undisclosed Site (not mapped)	-	-	20	1	No	Unpublished Source
Lamma Island						
Yung Shue Ha	22.200508	114.141778	20	1	No	iNaturalist.com
Lantau Island						
Nei Lak Shan	22.262428	113.906231	480	1	Country Park	Mott Connell Limited 2003
Lai Chi Yuen	22.255308	113.997922	60	1	Country Park	AECOM 2017
South Lantau Country Park	22.227775	113.909992	108	1	Yes	Authors' unpubl. data
Hong Kong Island						
The Peak	22.277758	114.146039	514	-	No	Shen 1940/Cumberlidge 2008a
Aberdeen Country Park	22.260706	114.163936	137	1	Yes	Authors' unpubl. data
Lung Fu Shan	22.278858	114.137919	203-251	2	Yes	Maunsell/AECOM 2007 P. Bailey in litt 07.ix.2016
Tai Tam Country Park	22.258519	114.202739	244	1	Yes	Authors' unpubl. data
Braemar Hill	22.281114	114.202669	186-290	4	No	Authors' unpubl. data
Jardine's Lookout	22.266758	114.194389	175-192	2	Country Park & SSSI	Authors' unpubl. data

[1] – Latitudes, longitudes and altitudes may be approximate for some sites as exact locations could not always be sourced from literature. Where left blank, location could not be determined.
[2] SSSI – Site of Scientific Interest

status, and conservation challenges. *Biological Conservation* 142(8): 1665–1673.

Cumberlidge, N., P.K.L. Ng, D.C.J. Yeo, T. Naruse, K.S. Meyer & L.J. Esser (2010). Diversity, endemism, and conservation of the freshwater crabs of China (Brachyura: Potamidae and Gecarcinucidae). *Integrative Zoology* 6: 45–55.

Dudgeon, D. & E.W.C. Chan (1996). *Ecological Study of Freshwater Wetland Habitats in Hong Kong*. Report to Agriculture & Fisheries Department, Hong Kong Government.

Dudgeon, D. & R. Corlett (2004). *The Ecology and Biodiversity of Hong Kong*. Friends of the Country Parks, Hong Kong.

Fellowes, J.R, M.W.N. Lau, D. Dudgeon, G.T. Reels, G.W.I. Ades, G.J. Carey, B.P.L. Chan, R.C. Kendrick, K.S. Lee, M.R. Leven, K.D.P. Wilson & Y.T. Yu (2002). Wild animals to watch: Terrestrial and freshwater fauna of conservation concern in Hong Kong. *Memoirs Hong Kong Natural History Society* 25: 123–160.

Hong Kong Birdwatching Society (2013). *Hong Kong Headline Indicators for Biodiversity and Conservation - 2012 Report.* Hong Kong Birdwatching Society, Hong Kong.

Hong Kong Birdwatching Society (2015). *Hong Kong Headline Indicators for Biodiversity and Conservation - 2013 & 2014 Report*. Hong Kong Birdwatching Society, Hong Kong.

Lau, A., N.E. Karraker, P. Martelli & D. Dudgeon (2017). Delineation of core terrestrial habitat for conservation of a tropical salamander:

The Hong Kong Newt (*Paramesotriton hongkongensis*). *Biological Conservation* 209: 76–82. http://doi.org/10.1016/j.biocon.2017.02.017

Maunsell/AECOM (2007). *Landslide Preventive Works at Po Shan, Mid-levels - Natural Terrain Risk Mitigation Measures*. Environmental Impact Assessment Report to Hong Kong S.A.R. Government.

Mott Connell Limited (2003). *Tung Chung - Ngong Ping Cable Car Project.* Environmental Impact Assessment Report to Hong Kong S.A.R. Government.

Ng, P.K.L. & D. Dudgeon (1992). The Potamidae and Parathelphusidae (Crustacea : Decapoda : Brachyura) of Hong Kong. *Invertebrate Taxonomy* 6: 741–768.

Ove, A. & Partners Ltd. (2014). *Agreement No. CE 18/2012 (CE) Development of Anderson Road Quarry – Investigation*. Environmental Impact Assessment Report to Hong Kong S.A.R. Government.

Shen, C. J. (1940). Four new species of Brachyura from Chinese seas. *Journal of the Hong Kong Fisheries Research Station* 1: 255-62.

Stanton, D.J. & M.R. Leven (2016). Distribution, habitat utilisation and conservation status of the freshwater crab, *Somanniathelphusa zanklon* Ng & Dudgeon, 1992 (Crustacea: Brachyura: Gecarcinucidae) endemic to Hong Kong. *Journal of Threatened Taxa* 8(3): 8564–8574; http://doi.org/10.11609/jott.2070.8.3.8564-8574

Stanton, D.J., M.R Leven & T.C.H. Hui (2017). Distribution of *Cryptopotamon anacoluthon* (Kemp, 1918) (Crustacea: Brachyura: Potamidae), a freshwater crab endemic to Hong Kong. *Journal of Threatened Taxa* 9(2): 9786–9794; http://doi.org/10.11609/jott.3007.9.2.9786-9794

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