Chinese white dolphins in Hong Kong and the Pearl River Estuary: Ecology, behaviour, population processes and trend

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Synopsis

Indo-Pacific humpback dolphins (Sousa chinensis), locally in China/Taiwan known as Chinese white dolphins, inhabit shallow coastal waters of tropical and subtropical Indo-Pacific Ocean. The continuous survival of known remaining populations is a subject of conservation concern and there are few other populations that face the range and intensity of human-induced pressures comparable to those in the Pearl River Estuary (PRE). Our recent mark-recapture analyses of humpback dolphins in Hong Kong (HK) indicate that in the past two decades the population parameters have been severely misunderstood. Predictive demographic models estimate a continuous decline of the PRE dolphin population at -2.5% per annum, a rate at which the population is likely to drop below the demographic threshold within two generations and lose 74% of the current numbers within the lifespan of three generations. In PRE, the case of humpback dolphins represents a particularly explicit example of inadequate management where a complete revision of the fundamental approach to conservation management is urgently needed.

Fig. 1. Spatio-behavioural analyses show that only a very small proportion of the dolphins’ key habitats in Hong Kong and the PRE are given any forms of protection.

Fig. 2. Abundance fluctuations of the PRE humpback dolphins after 7 years, shown by (a) stochastic plots that illustrate variation in prediction and (b) deterministic plot of the projected percentage of population alive. If the current annual decline (2.5%) remains constant, 74% of the population will be lost in the lifespan of three generations (<60 years).

Fig. 3. Eastern reaches of the PRE are inhabited by at least seven closely interacting dolphin communities; with associations between individuals within each community significantly stronger than between communities (Two-tailed mantel test, t = 45.0675, p<1).

Fig. 4. Temporal models of movement and group dynamics indicate a fluid dolphin society with low geographic fidelity.

Fig. 5. Temporary emigration from HK waters is higher during Summer-Winter transition, while the opposite is true in Winter-Summer intervals, with high residence rate (1 - 0.036 = 0.964). This movement pattern corresponds with the seasonal prey availability which in HK peaks in summer, increasing seasonal habitat capacity and lowering foraging competition.

Total super-population size

(tot number of dolphins that used HK waters as part of their range during the study period)

Nw = 368 (349-387)

Seasonal super-population sizes

(super-population size in 6-month periods)

Winter: Nw = 222 (187-262)

Summer: Nw = 285 (257-317)

Short-term abundances

(number of dolphins in HK waters in 2-month periods)

Winter: Nw = 82 (44-152)

Summer: Nw = 152 (121-180)

Apparent survival rates

(considering true survival and emigration)

ϕwS = 0.905 (S.E. = 0.043)

ϕwW = 0.980 (S.E. = 0.038)

Table 2. Population parameter estimates (with 95% C.I.) in HK waters from a suite of POPAN open population and robust design models using MARK. The true survival rate approximates the Winter-Summer estimate when it is the least influenced by emigration (see Fig. 5).

Research Output

PhD Thesis

Chen SCY, HKU – Int. submission: 2017

Or CKM, HKU – Int. submission: 2016


Lin W, SYSU (2014)

Publications


MPAs in PRE for humpback dolphins

Area

PRE National Nature Reserve 460

Taishan Provincial Nature Reserve 108

Sha Chau - Lung Kwo Chau Marine Park 12

TOTAL 580 km²

Estimated Minimum Area of Critical Habitat (MACH)

1508 km² (range: 888 – 4518 km²)

Table 1. All current marine protected areas within the PRE fail to meet a minimum habitat requirement (MACH) that could facilitate the population’s long-term persistence.