

# **Scientific Articles related with the EAAF & Partners**

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**East Asian – Australasian Flyway  
Partnership Secretariat**

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# SHOREBIRDS

**Sripanomyom et al. 2011. Traditional salt-pans hold major concentrations of overwintering shorebirds in Southeast Asia. *Biological Conservation* 144: 526-537.**

*Comments of Science officer: Due to the rapid developments in coastal areas, migratory shorebirds rapidly and dramatically lost their high-tide roosts across Asian countries. Not only salt pans, but also coastal marshes and rice fields are good high-tide roosts which have been often used by the huge number of shorebirds; however, many of those sites have been recently converted to other types of habitats (particularly to shrimp farms) due to its relatively low economic profits. Along with the conservation of tidal flats, conservation of salt-pans and coastal marshes which support diverse flora and fauna is strongly recommended for shorebird conservation.*

**Abstract:** Shorebirds are declining worldwide due to loss and degradation of critical breeding and wintering habitats. Some human-modified habitats, particularly salt-pans which are used by shorebirds in many regions of the world, may help substitute for natural habitats lost for a wide range of species during migration. We studied the influence of landscape characteristics on species richness, abundance, and diversity of shorebirds at 20 sites covering most of the Inner Gulf of Thailand, a landscape with a long history of salt farming. Sites with salt-pans present held significantly higher species richness, abundance and diversity of shorebirds. Areas with larger proportions given over to aquaculture tended to have lower species richness, abundance and diversity. Generalized additive models indicated that landscapes with a larger proportion of tidal flats in conjunction with salt-pans were the best predictors of sites with higher species richness, abundance and diversity. Landscape configurations with higher richness, abundance and diversity of shorebirds also tended to be less fragmented and contained slightly larger patches. Shorebirds appeared to use ponds with exposed mud in salt-pans as both roosting sites and supplementary feeding grounds during high tide. Traditional salt-pans therefore proved to contribute significantly to maintenance of overwintering shorebird populations in this landscape and should be investigated elsewhere in Asian coastal zones. Collaboration between researchers, salt farmers and planning authorities as to how best to maintain salt-pans as potential shorebird roost sites such as in the Inner Gulf of Thailand is urgently needed in order to maintain habitat for shorebird populations in critical wintering and staging areas of this flyway.

**Wilson et al. 2011. Analyzing variability and the rate of decline of migratory shorebirds in Moreton Bay, Australia. Conservation Biology 25: 758–766.**

*Comments of Science officer: Moreton Bay, which was registered as a Flyway Network Site (EAAF013) in 1996, supports up to 40,000 shorebirds including 8 internationally important species. According to the state-space model, 7 species (White-winged Black Terns, Red Knots, Bar-tailed Godwits, Ruddy Turnstones, Greenshanks, Great Knots, and Whimbrels) significantly decreased in number while Red-necked Stints increased. The regression models also supported this result by indicating that 11 species were in decline. Considering its importance as major wintering site, the shorebird declines in abundance may represent the overall population decreases in the EAA Flyway.*

**Abstract:** Estimating the abundance of migratory species is difficult because sources of variability differ substantially among species and populations. Recently developed state-space models address this variability issue by directly modeling both environmental and measurement error, although their efficacy in detecting declines is relatively untested for empirical data. We applied state-space modeling, generalized least squares (with autoregression error structure), and standard linear regression to data on abundance of wetland birds (shorebirds and terns) at Moreton Bay in southeast Queensland, Australia. There are internationally significant numbers of 8 species of waterbirds in the bay, and it is a major terminus of the large East Asian-Australasian Flyway. In our analyses, we considered 22 migrant and 8 resident species. State-space models identified abundances of 7 species of migrants as significantly declining and abundance of one species as significantly increasing. Declines in migrant abundance over 15 years were 43–79%. Generalized least squares with an autoregressive error structure showed abundance changes in 11 species, and standard linear regression showed abundance changes in 15 species. The higher power of the regression models meant they detected more declines, but they also were associated with a higher rate of false detections. If the declines in Moreton Bay are consistent with trends from other sites across the flyway as a whole, then a large number of species are in significant decline.

**Barshep et al. 2011. The primary moult of Curlew Sandpipers *Calidris ferruginea* in North-western Australia shifts according to breeding success. *Ardea* 99: 43-51.**

*Comments of Science officer: As a main characteristic of birds, feathers carry many biological and ecological information or signals. Moulting, a significant process to renew feathers, is also linked with their life cycles and body conditions. This article shows that the moulting schedules of Curlew Sandpipers are closely related with their breeding biology and migratory schedules; early migrants change their feathers early. The results may indicate that shorebirds follow fine-tuned annual life cycles, and that some disturbances in a certain stage can alter next biological events of migratory shorebirds through carry-over effects.*

**Abstract:** The population moulting parameters, yearly onset of moulting and sex-specific schedule of moulting in relation to breeding success, and pattern of feather mass growth were examined in a population of Curlew Sandpipers *Calidris ferruginea* that migrate to northwest Australia. The mean start date of moulting was 18 September, and it lasted on average 129 days. No significant variation in duration of moulting was detected and feather mass was deposited at a constant rate. The yearly onset of moulting was positively correlated with the proportion of first year (juvenile) birds: the mean start date of moulting in good breeding years was 25 September, ten days later than mean start date of moulting in poor breeding years, being 15 September. Males generally started moulting five days earlier than females. The mean moulting start date of males was five days earlier in poor breeding years compared to good breeding years, while the moulting of females was 11 days earlier in poor breeding years compared to good breeding years. In Curlew Sandpipers the timing of post-breeding migration is advanced in bad breeding seasons, which explains the observed correlation between breeding success and the timing of moulting in non-breeding areas.

**Choi et al. 2011. Age structure and age-related differences in molt status and fuel deposition of Dunlins during the nonbreeding season at Chongming Dongtan in east China. Journal of Field Ornithology 82: 202–214.**

*Comments of Science officer: Based on trapping and measurement studies, the age-specific segregation and the different fueling and moulting strategies by age were confirmed in Dunlins at non-breeding grounds in the EAA Flyway. To understand their biology and life cycles, authors suggest that further comparative studies among populations using same/different flyways are required.*

**Abstract:** Although most shorebirds exhibit deferred migration and deferred breeding during their first summer, Dunlins (*Calidris alpina*) migrate to breeding areas and breed during their first summer. First-year and adult Dunlins should, therefore, have similar fueling and molt patterns if energetic and physiological constraints are responsible for deferred migration. From 2006 to 2008, we examined the age structure of Dunlins during the nonbreeding season at Chongming Dongtan, an estuarine wetland in the Yangtze River estuary in east China, and examined the effects of date, age, and molt status on fuel deposition during migration and during the winter. The Dunlin population at Chongming Dongtan was composed primarily of first-year birds. Most adults and first-year birds arrived together in late August. Regression analyses indicated that age, date, and molt status affected fuel deposition (as indicated by body mass) of Dunlins. Adults had significantly greater fuel deposits than first-year Dunlins near the end of northward migration (May: adults  $70.8 \pm 6.4$  g, first-year  $63.8 \pm 8.0$  g) and at the start of southward migration (September: adults  $50.2 \pm 6.1$  g, first-year  $47.2 \pm 4.9$  g). Adults also had significantly higher fuel deposition rates than first-year Dunlins during northward migration. Nonetheless, first-year Dunlins migrate and breed in their first summer. Thus, other factors, such as migration distance and body size, may be more important in determining if first-year shorebirds defer migration during their first spring and summer. During boreal spring and autumn, first-year Dunlins in active body molt had greater body mass than those that had not initiated body molt or those in suspended molt, and premigratory fuel deposits for northward migration were greatest after prealternate molt was completed. These results suggest that body molt requires additional fuel deposits and imposes a constraint on fuel deposition for migratory flights.

**Zhang et al. 2011. Diet of Great Knots (*Calidris tenuirostris*) during spring stopover at Chongming Dongtan, China. Chinese Birds 2: 27–32.**

*Comments of Science officer: This dietary study conducted in a major stopover site of shorebirds in China indicates that small gastropods and bivalves, which are dominant benthic species there, are important food resources for migrating Great Knots; this result means that Great Knots are opportunistic foragers during their spring stopover at Chongming Dongtan. Further studies (i.e. including consumption rates of polychaetes which are abundant but hardly-detectable from fecal analysis) will benefit our knowledge on the refueling biology of shorebirds.*

**Abstract:** Variable and unpredictable food resources at stopover sites bring severe challenges to migrating shorebirds. Opportunistic foraging strategies, referring to shorebirds consuming prey in proportion to their availability, allow shorebirds to replenish fuel and nutrient reserves efficiently for continuing their migration. Chongming Dongtan, located in the Yangtze River estuary of eastern China, is the first major stopover site of shorebirds on the Chinese mainland during their northward migration. We investigated the diet of Great Knots (*Calidris tenuirostris*) at Chongming Dongtan during the spring stopovers of 2009 and 2010 through benthos sampling and dropping analysis. The benthos samples were categorized into gastropods, bivalves, polychaetes, crustaceans and insect larvae. Dropping analysis indicated that gastropods and bivalves constituted more than 70% of the diet of the Great Knot, with *Assiminea violacea* and *Corbicula fluminea* being the most frequently consumed. Chi-square tests indicated that for each prey category, there was no significant difference between the frequency of its occurrence in the benthos samples and dropping samples during the early stopover periods of 2009 and 2010 and during the late stopover periods of 2010. Although there was a statistically significant difference between the frequency of occurrence of prey in the total macrobenthos and in the droppings of the Great Knots during the late stopover period in 2009, the more abundant prey were more frequently consumed by the Great Knots. This suggests that Great Knots adopted an opportunistic foraging strategy during their stopover at Chongming Dongtan.

**Mulcahy et al. 2011. Coelomic implantation of satellite transmitters in the Bar-tailed Godwit (*Limosa lapponica*) and the Bristle-thighed Curlew (*Numenius tahitiensis*) using propofol, bupivacaine, and lidocaine. Journal of Zoo and Wildlife Medicine 42: 54–64.**

*Comments of Science officer: This is a technical veterinary report on the implantation of tracking devices. Authors indicated that implanted devices may benefit the long-distance migrants by reducing aerodynamic drags and atypical behaviors caused by external equipments; it will also minimize the chance of potential loss of expensive devices. However, considering heavy weights of implanted devices (exceeding 5% of body mass) and long lifespans of shorebirds (i.e. bar-tailed godwits: >33 years in BTO database and >26 years in ABBBS database), implanted tracking devices will have long-lasting detrimental effects on the shorebirds. The use of small and light-weight 'external' tracking devices recently developed (i.e. 5g-satellite tracking PTTs, 1g-geolocators) is more recommended for the welfare of target birds as well as for successful studies.*

**Abstract:** Intravenous propofol was used as a general anesthetic with a 2:1 (mg:mg) adjunctive mixture of lidocaine and bupivacaine as local anesthetics infiltrated into the surgical sites for implantation of satellite transmitters into the right abdominal air sac of 39 female and 4 male bar-tailed godwits (*Limosa lapponica baueri* and *Limosa lapponica menzbeiri*) and 11 female and 12 male bristle-thighed curlews (*Numenius tahitiensis*). The birds were captured on nesting grounds in Alaska, USA, and on overwintering areas in New Zealand and Australia from 2005 through 2008. As it was developed, the mass of the transmitter used changed yearly from a low of 22.4±0.2 g to a high of 27.1±0.2 g and weighed 25.1±0.2 g in the final year. The mean load ratios ranged from 5.2% to 7.7% for godwits and from 5.7% to 7.5% for curlews and exceeded 5% for all years, locations, and genders of both species. The maximum load ratio was 8.3% for a female bar-tailed godwit implanted in Australia in 2008. Three godwits and no curlews died during surgery. Most birds were hyperthermic upon induction but improved during surgery. Two godwits (one in New Zealand and one in Australia) could not stand upon release, likely due to capture myopathy. These birds failed to respond to treatment and were euthanized. The implanted transmitters were used to follow godwits through their southern and northern migrations, and curlews were followed on their southern migration.

# ANATIDAE

**Sugimoto and Matsuda. 2011. Collision risk of White-fronted Geese with wind turbines. Ornithological Science 10: 61-71.**

*Comments of Science officer: Collision with man-made structures (i.e. windows, buildings, towers, power lines, aircrafts, wind turbines, etc) becomes a significant threat to birds. Although wind farms are believed as sources of 'green energy', it produces significant noises, vibrations, and their subsequent side-effects over vast areas and also increases direct mortality of large birds such as raptors, swans, and geese. This study suggests that, however, well-planned wind farms with systematic risk assessment and adapted risk management schemes may have less detrimental effects on birds than ever concerned.*

**Abstract:** Recently, to help curb anthropogenic climate change and fossil fuel depletion, there has been a rapid increase in the number of wind farms being built worldwide. However, the construction of wind farms in the foraging areas of raptors or along the routes of migratory birds raises concerns about avian collisions and habitat loss. Here, we present an additional situation in which avian collisions may present a problem. That is, when wind farms are built between roosting and foraging areas of over wintering migratory birds, the bird flocks are forced to pass through the farm each morning and evening. Indeed, at the Awara Wind Farm in Fukui Prefecture, Japan, approximately three thousand White-fronted Geese *Anser albifrons frontalis* inhabit the site where the installation of 10 wind turbines has recently been completed. The collision risk posed by these turbines may affect the goose population. However, few studies have examined the effects of wind farms on the flight patterns of geese, making it difficult for stakeholders to achieve a consensus. The purpose of this study was to evaluate the collision risk for geese in the planning phase of the Awara Wind Farm. A collision model based on goose avoidance behavior was developed to predict collision mortality, and an applied potential biological removal (PBR) analysis was used to determine the maximum allowable collision mortality (ACM) whilst maintaining a sustainable goose population. The estimated annual collision mortality was 0-2 geese, whereas the allowable collision mortality was 75 geese per year, suggesting that the collision risk is sufficiently small for the population to persist. We also include a discussion of adaptive management plans for regulating wind turbine operations when the actual collision mortality exceeds the socially acceptable level.

**Cui et al. 2011. Movement patterns of Bar-headed Geese *Anser indicus* during breeding and post-breeding periods at Qinghai Lake, China. *Journal of Ornithology* 152: 83-92.**

*Comments of Science officer: This article describes the local movement of Bar-headed Geese during breeding and post-breeding season. Given the few number of poultry farms near Qinghai Lake, authors suggests that many viruses may be carried by migratory populations, and the chance of virus exchange among populations seems to be high.*

**Abstract:** The highly pathogenic avian influenza (HPAI) H5N1 outbreak at Qinghai Lake, China, in 2005 caused the death of over 6,000 migratory birds, half of which were Bar-headed Geese *Anser indicus*. Understanding the movements of this species may inform monitoring of outbreak risks for HPAI viruses; thus, we investigated the movement patterns of 29 Bar-headed Geese at Qinghai Lake, China during 2007 and 2008 by using high resolution GPS satellite telemetry. We described the movements and distribution of marked Bar-headed Geese during the prenesting, nesting, and moulting periods. Of 21 Bar-headed Geese with complete transmission records, 3 moved to other areas during the nesting period: 2 to Jianghe wetland (50 km northwest of Qinghai Lake) and 1 to Cuolongka Lake (220 km northwest of Qinghai Lake) during the nesting period. We identified nesting attempts of 7 of the marked geese at Qinghai Lake. Four completed successful nesting attempts according to our rules of judgment for the breeding status, and 2 geese lost broods soon after hatching (hereafter referred to as unsuccessful breeders). Of 18 geese present at Qinghai Lake during the nesting period, 9 (6 non-breeders, 2 successful breeders and 1 unsuccessful breeder) remained at Qinghai Lake during the moulting period; and 9 (5 non-breeders, 4 unsuccessful breeders) left Qinghai Lake for moulting. Kuhai Lake, Donggeicuona Lake, Alake Lake, Zhaling-Eling Lake area and Huangheyuan wetland area were used as moulting sites. Geese that moulted at Qinghai Lake, Cuolongka Lake, Kuhai Lake, Donggeicuona Lake and Alake Lake also moved to Zhaling-Eling Lake area or Huangheyuan wetland area and stayed there for several days prior to autumn migration. Mean home range and core area estimates did not differ significantly by sex, year and between breeders and nonbreeders.

**Zhang et al. 2011. Migration Routes and Stop-over Sites Determined with Satellite Tracking of Bar-headed Geese *Anser indicus* Breeding at Qinghai Lake, China. Waterbirds 34: 112-116.**

*Comments of Science officer: This study describes the migration of the Bar-headed Goose which bred in Qinghai Lake. They identified new wintering and major stopover sites in China, Tibet and India. Please refer and compare the results of Prosser et al. (2011) introduced in the Avian Influenza section of this report.*

**Abstract:** Effective conservation and management of Bar-headed Geese (*Anser indicus*) require data to determine migration routes and identify key sites for protection. Ten Bar-headed Geese were banded with satellite transmitters at Qinghai Lake in western China in July 2006 and 2007 to determine their migration routes. Of the tagged geese, eight left Qinghai Lake and began autumn migration. Of these eight, four completed their autumn migration, lasting 50 to 90 days, using one of two migration routes to their wintering grounds near Caohai Lake in Guizhou Province, Yarlung Zangbo valley in Tibet, and Kohima in India. The tagged geese each stopped at three to four sites and traveled 1,270 to 1,470 km from their breeding to wintering grounds. Wetlands at Muli Marsh, Zhaling, Eling and Galalacuo Lakes in Qinghai Province, Nagqu and Damxung in Tibet, and Ruoergai Marsh in Gansu and Sichuan Provinces were used as major stopover sites.

**Zhang et al. 2011. Changing distribution and abundance of Swan Goose *Anser cygnoides* in the Yangtze River floodplain: the likely loss of a very important wintering site. *Bird Conservation International* 21: 36-48.**

*Comments of Science officer: Yangtze floodplain is the most important wintering ground for the threatened Swan Goose. This article reports how habitat changes by human activities (particularly increased aquaculture and dam constructions) caused the decline of main food resources (submerged *Vallisneria* plant) which was resulted in the distributional change and the decreased number of wintering Swan Geese in the main wintering site.*

**Abstract:** Virtually the entire population of the globally ‘Vulnerable’ Swan Goose *Anser cygnoides* winters in the Yangtze floodplain. Historically, the species was widely distributed throughout the floodplain but now approximately 95% of the population is confined to three closely-situated wetlands in Anhui and Jiangxi Provinces. Recent counts indicate that at one of these sites, Shengjin Lake (in Anhui), a decline of about 10,000–20,000 birds, to about 1,000 currently, has taken place during the last five years. The likely cause of the decline in Swan Goose abundance at Shengjin Lake is the recent decrease in submerged vegetation, particularly tuber-producing *Vallisneria* which is the species’s main food; this decrease has been linked with the introduction of intensive aquaculture in the main areas used by Swan Geese within the lake. Earlier range contractions in the Yangtze floodplain may also be linked to reductions in submerged vegetation cover at other sites, where intensive aquaculture has also been implicated. Changes in lake hydrology following construction of the Three Gorges Dam may also have adversely affected submerged vegetation productivity. Key information needs for the effective implementation of conservation measures for Swan Goose include an understanding of (1) the fitness consequences of Swan Geese being forced to switch to different foods; (2) how aquaculture can be managed to minimise impacts on submerged vegetation; (3) the impact of changing lake hydrology on key Swan Goose food plants; and (4) the optimal management of wetlands to ensure that adequate food is both produced during the summer period and is available throughout the winter.

**Cao et al. 2011. A systematic scheme for monitoring waterbird populations at Shengjin Lake, China: methodology and preliminary results. Chinese Birds 2: 1-17.**

*Comments of Science officer: As shown in the previous article on Swan Geese (Zhang et al. 2011), Yangtze floodplain is important wintering grounds for diverse migratory waterbirds in the EAA Flyway. This article describes the monitoring scheme (i.e. site information, waterbirds, threats and disturbances, and data analysis), major findings, and suggestions for future monitoring in this region.*

**Abstract:** Changes in the areas and quality of wetland habitat makes it imperative to monitor trends in the number of wintering waterbirds and their distribution in the Yangtze River floodplain, the most important waterbird region in eastern China, so that effective science-based action can be taken to ensure the survival and future recovery of the waterbirds of the region. However, obtaining accurate data on the number of waterbirds and distribution, which can be confidently compared across years and sites, is complicated by a number of factors which can affect count quality. It is essential to employ a survey methodology which maximizes count accuracy and precision and minimizes the bias inherent in counting waterbirds; failure to achieve these goals will lead to incorrect results and analytical problems. Recently we developed a systematic waterbird survey methodology which was tested, with promising results, in the winters of 2008/2009 and 2009/2010 at Shengjin Lake, an important wetland in the Yangtze River floodplain. The methodology involves dividing the lake into discrete survey areas, each containing a number of sub-areas, with clear boundaries, which were surveyed separately. Data, which included information on counts, distributions, the environment and disturbance, were collected in a standardized manner to maximize precision and minimize bias. We use the results from the surveys of the first two winters to provide examples of how the data can be employed to provide detailed information on the number of waterbirds, their distributions and habitat usage. Finally, we discuss the importance of wider application of the methodology throughout the Yangtze River floodplain to underpin a much needed floodplain-wide waterbird monitoring program.

Newth et al. 2011. Incidence of embedded shotgun pellets in Bewick's swans *Cygnus columbianus bewickii* and whooper swans *Cygnus cygnus* wintering in the UK. *Biological Conservation* 144: 1630–1637.

*Comments of Science officer: This study shows the European case about the lead poisoning in Swans, but this information can still give important lessons to the Asian/Pacific countries though the countries have different cultures and legislations from European ones. This article dealt with lead pellets from illegal hunting only, but lead sinkers used by anglers and fishermen can also cause severe problems of lead poisoning in many waterbirds as well as swans. Given the higher legislation in European flyways, the lead poisoning of migratory waterbirds in the EAA Flyway may be much worse.*

**Abstract:** The migratory whooper swans (*Cygnus cygnus*) and Bewick's swans (*Cygnus columbianus bewickii*) have been protected by national and international legislation throughout their migratory ranges since the mid 20th century, yet illegal shooting of both species still occurs. X-rays taken of wild caught swans at several sites in the UK were inspected to determine: (1) the incidence of embedded pellets in live birds, (2) inter-specific differences in the level of illegal shooting, and (3) trends in the prevalence of shot-in pellets between the 1970s and the 2000s. A significantly higher proportion of Bewick's swans (31.2%) contained shot-in pellets than whooper swans (13.6%). The likelihood of a bird having been shot increased with its age for both species. The proportion of Bewick's swans with embedded shot was higher during the 1970s and 1980s than in the 1990s and 2000s but the incidence remains high, with 22.7% of Bewick's swans X-rayed in the 21st century containing shot. The prevalence of whooper swans with embedded shot did not change significantly over time (14.9% with pellets in the 1980s compared with 13.2% with pellets in the 2000s). As the swans follow different migration routes, the results not only have implications for consistent and effective implementation of legislation, but show that illegal shooting must be addressed at both national and international levels.

# EGRETS

**Fang et al. 2011. Nestling diet of the vulnerable Chinese Egret on offshore islands in southern China. *Waterbirds* 34: 247-252.**

*Comments of Science officer: The Chinese Egret or Swinhoe's Egret is an endangered egret species inhabit coastal areas with small global populations (2,600-3,400 birds), and is locally distributed in Eastern Asia only. Threat analysis and conservation actions are still limited due to the lack of information on its biology and migration. This paper gives basic information on the feeding biology of the egret, though the size of diets is questionable (probably 4-6cm, not 4-6mm). For more information on the breeding biology of this species, please refer the recent PhD thesis of Dr. Hwang B. Y. (2011) entitled 'The study of breeding ecology and population genetics in the endangered species, Chinese Egret (*Egretta eulophotes*)' in Kyunghee University, Korea.*

**Abstract:** Nestling diets of the vulnerable Chinese Egret (*Egretta eulophotes*) were analyzed at two breeding colonies on islands off Fujian, Southern China, in 2007 and 2008. Fish and shrimps were the main prey, comprising 87.5% and 35.4% by frequency of occurrence in regurgitations, respectively. Prey in the 4-6 mm size class occurred most commonly (80.4% of regurgitations). Compared with nestling diets of the Little Egret (*Egretta garzetta*) from other island heronries, nestlings of the Chinese Egret depended on prey that only occurred in coastal wetlands, whereas nestlings of the Little Egret consumed prey found in all aquatic habitats, including freshwater marshes; however, both species preyed on fish and shrimps and took prey of a similar size. The results suggest that coastal wetlands near the heronries need to be considered in habitat conservation for Chinese Egret.

# SEABIRDS

**Rayner et al. 2011. Migration and diving activity in three non-breeding flesh-footed shearwaters *Puffinus carneipes*. Journal of Avian Biology 42: 266-270.**

*Comments of Science officer: This is a preliminary study on the migration of the medium sized Flesh-footed Shearwaters; three breeding adults were tracked for one year by data loggers (geolocators) with temperature and pressure sensors. Individual-level information on migration, movements and foraging behaviours were first collected based on the records from the three birds which successfully returned from the wintering ranges in NW Pacific Ocean to the breeding site in New Zealand.*

**Abstract:** The flesh-footed shearwater *Puffinus carneipes* is a medium-sized shearwater and transequatorial migrant within the Pacific Ocean. We used archival data loggers to study the non-breeding migration and diving behaviour of three flesh-footed shearwaters following breeding in New Zealand. In early April, the birds migrated to the western North Pacific Ocean in  $23 \pm 2$  days, occupying core distributions within the Kuroshio/Oyashio transition system for  $91 \pm 17$  days. Subsequent movements were made into the Sea of Okhotsk prior to return migrations to New Zealand in mid September ( $19 \pm 1$  days). Diving depths during migration ( $2.5 \pm 2.4$  m), and in the western North Pacific ( $2.4 \pm 2.6$  m) were shallower than during the onset of breeding ( $4.8 \pm 8.7$  m). Non-breeding flesh-footed shearwaters occupy a region of high fisheries activity and the impact of these fisheries on adult survival in this declining species warrant further study.

**Uhlmann and Jeschke. 2011. Comparing factors associated with total and dead sooty shearwater bycatch in New Zealand trawl fisheries. *Biological Conservation* 144: 1859–1865.**

*Comments of Science officer: Bycatch or incidental catch is one of the major causes of seabird mortality, and long-line or trawling fisheries in the Pacific areas have caused significant problems in the conservation of albatrosses and shearwaters. Though there are many limiting variables and factors, this study, based on the long-term data collected trawling operations, identified several important factors increasing bycatch rates; this information may be useful for future design of a new mitigation strategy.*

**Abstract:** Incidental capture of seabirds is a conservation concern because such periodic ‘bycatch’ may cause population declines. Not all birds die upon capture, but distinctions between total and dead captures are rarely done. Thus, it is currently unclear whether using total captures is an adequate simplification, for example when studying factors associated with bycatch. We investigated this question by analysing total and dead procellariiform seabird captures of 663 trawling operations between 1996 and 2008 in the Exclusive Economic Zone of New Zealand. As potential factors associated with bycatch, we considered eleven technical and seven environmental characteristics recorded by onboard observers during commercial trawling. A total of 1,231 procellariids were recovered as bycatch, with sooty shearwaters (*Puffinus griseus*) comprising 98% of the bycatch sample. Our analyses indicated that specific technical (headline height) and environmental factors (month, daylight, sea state, area code) influenced both total and dead captures of sooty shearwaters, with similar results for both response variables. Using total captures may thus be an adequate simplification in the interpretation of sooty shearwater captures in New Zealand trawl fisheries, and practices that mitigate the overall capture of birds will be most effective.

# AVIAN INFLUENZA

**Li et al. 2011. New avian influenza virus (H5N1) in Wild Birds, Qinghai, China. Emerging Infectious Diseases 17: 265-267.**

**Hu et al. 2011. Clade 2.3.2 avian influenza virus (H5N1), Qinghai Lake Region, China, 2009–2010. Emerging Infectious Diseases 17: 560-562.**

*Comments of Science officer: The Qinghai Lake Region is one of key breeding and stopover sites for migratory waterbirds in the EAA flyway. According to the recent studies on outbreaks of HPAI in this region as well as other Asian countries indicates that the HPAI virus is rapidly evolving from the clade 2.2 to clade 2.3.2 in most parts of Asia. Although we don't clearly understand the epidemiology of the virus in natural populations, the chance of HPAI virus spread by migratory waterbirds between separated habitats is likely increasing based on phylogenetic evidences. However, inadequate use of vaccines and free-ranging domestic fowls (which contact wild birds), which may cause the rapid change of HPAI virus, should be controlled to minimize the risk of outbreaks both in domestic and wild birds.*

**Abstract (Li et al. 2011):** In 2005, a highly pathogenic avian influenza virus (H5N1) (QH09) was isolated from dead wild birds (3 species) in Qinghai, China, during May–June 2009. Phylogenetic and antigenic analyses showed that QH09 was clearly distinguishable from classical clade 2.2 viruses and belonged to clade 2.3.2.

**Summary of the article [No original abstract] (Hu et al. 2011):** In 2005, a large population of wild migratory birds was infected with highly pathogenic avian influenza (HPAI) virus (H5N1) in the Qinghai Lake region of western People's Republic of China, resulting in the death of ≈10,000 birds. On the basis of phylogenetic analysis of the hemagglutinin (HA) gene, the virus was classified as clade 2.2 according to the World Health Organization guidelines. Subsequently, viruses from this clade were found in Mongolia, Russia, Europe, and Africa along the migratory flyways of birds. However, phylogenetic analysis of HA sequences and an additional HA gene sequence from the 2009 Qinghai Lake subtype H5N1 virus isolate from a great crested grebe (GenBank accession no. CY063318) showed that HA genes from all 12 viruses clustered as clade 2.3.2; none clustered with clade 2.2 viruses. Qinghai 2009 and 2010

virus isolates are closely related to those isolated in Mongolia and Uvs Nuur Lake in Russia in 2009. Therefore, viruses isolated in Mongolia and Russia and our isolates were likely transmitted between the 2 lake regions by bird migration. Moreover, HA sequences are closely related to viruses isolated from wild birds in Hong Kong and Japan during 2007–2008, which are the most recent isolates of clade 2.3.2 viruses before isolation of 2009 Qinghai Lake viruses. These results indicate that viruses in the Qinghai Lake region may be transmitted by wild birds along the migratory flyway in eastern Asia. However, there is no evidence that avian influenza virus (H5N1) is transmitted from eastern Asian (inner China or across the Himalayas) to the Qinghai Lake region. Our results show that in 2009 HPAI virus (H5N1) began infecting birds along the migratory route near Qinghai Lake and changed from clade 2.2 viruses to clade 2.3 viruses. Further investigations need to be conducted to clarify relationships among birds, animals, and influenza viruses near Qinghai Lake.

**Hoye et al. 2011. Reconstructing an annual cycle of interaction: natural infection and antibody dynamics to avian influenza along a migratory flyway. *Oikos* 120: 748–755.**

*Comments of Science officer: This study is not for HPAIV (high pathogenic avian influenza virus such as H5N1) but for all influenza A viruses, and is based on the study of pink-footed geese using the East Atlantic flyway in Europe. However, its finding may be applicable to the species in the EAA Flyway as well. According to the results, the highly-localized transmission period occurs particularly in winter indicating that the timing and location of infection may be highly localized. The authors also showed that LPAIV (low pathogenic avian influenza virus) is prevailed in natural ecosystems, and that the dynamics of infection may differ among host species due to complex ecological interactions between hosts, host-habitat interactions, and host-pathogen interactions. However, it is true that our knowledge on the ecology and epidemiology of avian influenza in the context of flyway is still limited, though there has been great improvement for last decades.*

**Abstract:** Migratory animals may play an important role in connecting disparate ecosystems, including the introduction of various pathogens. The incidence of these pathogens may vary over time and space, such that events along the entire migratory flyway are likely to be important in the interaction between pathogens and their migratory hosts. On this premise, the annual cycle of a naturally occurring host–pathogen system was reconstructed by examining infection with and antibodies to avian influenza virus along the flyway of a long-distance Arctic migrant, the Svalbard-breeding pink-footed goose *Anser brachyrhynchus*. A highly-localized transmission period was identified in winter, in contrast to the north – south decline expected from dabbling ducks, indicating the dynamics of infection may differ among host species. In spring, 63% (95% CI: 57.1, 68.9) of adults had detectable antibodies to the nucleoprotein of avian influenza virus, compared to just 15% (95% CI: 8.7, 23.4) of juveniles, suggesting inter-annual antibody maintenance. Nevertheless, adult seroprevalence declined by approximately 30% from spring to late summer, indicating significant seroreversion in the population. Integrating these findings in an epidemiological model, detectable antibodies to nucleoprotein were estimated to persist for just 343 days (95% CI: 221, 607); considerably shorter than for other wildlife diseases in long-lived bird species. The investigation of wildlife diseases in migratory populations is an inherently complex task, yet, by integrating disease incidence and seroprevalence along a migratory flyway, our findings suggest that the ecological interactions and life history of the host, as well as the life-history of the pathogen, can influence the dynamics of infection and host immune response.

Prosser et al. 2011. Wild bird migration across the Qinghai-Tibetan Plateau: a transmission route for highly pathogenic H5N1. PLoS ONE 6: e17622.

*Comments of Science officer: This study shows the evidence that migratory movement of Bar-headed Geese could occur before the virus impaired a bird's ability to migrate. However, given the common stopover habits of migratory waterbirds, authors suggest that a relay effect is the most likely way of transmission; H5N1 virus may be transported among individuals in stopover sites where large number of birds congregates and then be forwarded to newly infected birds along the migratory pathway. The results clearly indicate the role of wild birds in long distance spread of the HPAI virus; however, this result does not mean that wild birds are an original source of HPAI virus. Furthermore, as author also indicated, this is a unique case in the Central Flyway, but not in EAA Flyway where no concrete evidence was found in.*

**Abstract:**

**[Background]** Qinghai Lake in central China has been at the center of debate on whether wild birds play a role in circulation of highly pathogenic avian influenza virus H5N1. In 2005, an unprecedented epizootic at Qinghai Lake killed more than 6000 migratory birds including over 3000 bar-headed geese (*Anser indicus*). H5N1 subsequently spread to Europe and Africa, and in following years has re-emerged in wild birds along the Central Asia flyway several times.

**[Methodology/Principal Findings]** To better understand the potential involvement of wild birds in the spread of H5N1, we studied the movements of bar-headed geese marked with GPS satellite transmitters at Qinghai Lake in relation to virus outbreaks and disease risk factors. We discovered a previously undocumented migratory pathway between Qinghai Lake and the Lhasa Valley of Tibet where 93% of the 29 marked geese overwintered. From 2003–2009, sixteen outbreaks in poultry or wild birds were confirmed on the Qinghai-Tibet Plateau, and the majority were located within the migratory pathway of the geese. Spatial and temporal concordance between goose movements and three potential H5N1 virus sources (poultry farms, a captive bar-headed goose facility, and H5N1 outbreak locations) indicated ample opportunities existed for virus spillover and infection of migratory geese on the wintering grounds. Their potential as a vector of H5N1 was supported by rapid migration movements of some geese and genetic relatedness of H5N1 virus isolated from geese in Tibet and Qinghai Lake.

**[Conclusions/Significance]** This is the first study to compare phylogenetics of the virus with spatial ecology of its host, and the combined results suggest that wild birds play a role in the spread of H5N1 in this region. However, the strength of the evidence would be improved with additional sequences from both poultry and wild birds on the Qinghai-Tibet Plateau where H5N1 has a clear stronghold.

**Keawcharoen et al. 2011. Wild birds and increased transmission of highly pathogenic avian influenza (H5N1) among poultry, Thailand. Emerging Infectious Diseases 17: 1016-1022.**

*Comments of Science officer: This publication notes the prevalence of H5N1 virus in wild birds in Thailand. Most cases of HPAI infection were found in resident and scavenging wild birds which were associated with poultry flocks. The authors stressed on associated outbreaks between domestic and wild birds, and suggested that the transmission efficiency among poultry flocks was 1.7× higher in regions with infected wild birds in the given or preceding month. However, this paper could not determine which one (poultry or wild) is the origin of outbreaks, and the higher transmission efficiency may be caused by common environmental factors like the humidity and temperature which increase the persistence of viruses in environments. Also, this article also noted that too few infected wild birds were available for a reliable analysis; it rather indicates the low prevalence of HPAI in wild population.*

**Abstract:** Since the outbreaks of highly pathogenic avian influenza (HPAI) subtype H5N1 virus, wild birds have been suspected of transmitting this virus to poultry. On January 23, 2004, the Ministry of Public Health in Thailand informed the World Health Organization of an avian influenza A (H5N1) outbreak. To determine the epidemiology of this viral infection and its relation to poultry outbreaks in Thailand from 2004 through 2007, we investigated how wild birds play a role in transmission. A total of 24,712 swab samples were collected from migratory and resident wild birds. Reverse transcription PCR showed a 0.7% HPAI (H5N1) prevalence. The highest prevalence was observed during January–February 2004 and March–June 2004, predominantly in central Thailand, which harbors most of the country’s poultry flocks. Analysis of the relationship between poultry and wild bird outbreaks was done by using a nonhomogeneous birth and death statistical model. Transmission efficiency among poultry flocks was 1.7× higher in regions with infected wild birds in the given or preceding month. The joint presence of wild birds and poultry is associated with increased spread among poultry flocks.

**Li et al. 2010. Global Occurrence and Spread of Highly Pathogenic Avian Influenza Virus of the Subtype H5N1. Avian Diseases 55: 21–28.**

*Comments of Science officer: Authors analyzed general spreading patterns of HPAI virus in a large scale using common environmental variables, and concluded that the Human Footprint Index (the degree of human activities) was the most important contributing factor of the global occurrence and spread of the virus. As other studies have indicated, some habitats (particularly major wetlands in mild and humid climatic zones) possibly act as hot spots of virus spillover; this suggests that the identification of these major sites may be important to control of the spread of HPAI virus. Interestingly, this study found that high mountains or plateaus, which are common ecological barriers of bird migration, did not affect the spread speed and direction.*

**Abstract:** Highly pathogenic avian influenza viruses of the subtype H5N1 (HPAIV-H5N1) have circulated continuously in Asia, Europe, and Africa since 2003. Investigations on the environmental preference and global spread processes of the virus are needed. We compiled 16 environmental variables to assess their correlation with HPAIV-H5N1 occurrences by using a niche-based model called Maxent. We found the virus had the strongest positive association with the human footprint index, as well as the presence of certain types of wetlands and mild temperature (10–30 C). Outbreaks of HPAIV-H5N1 in poultry or wild birds were also more frequent in certain major habitat types (e.g., tropical and subtropical moist broadleaf forests, temperate broadleaf and mixed forests, and flooded grasslands and savannas) and ecoregions. We conducted trend surface analysis to generate the travelling wave of the virus' global spread from 2003 to 2009, which indicated that high mountains or plateaus did not affect the spread speed and direction.

**Ruenphet et al. 2011. Surveillance and characterization of Newcastle Disease Viruses isolated from Northern Pintail (*Anas acuta*) in Japan during 2006–09. Avian Diseases 55: 230–235.**

*Comments of Science officer: In this study, diverse nonvirulent Newcastle disease viruses, avian paramyxoviruses as well as avian influenza viruses were detected from fecal samples of Northern Pintails which are strong migrants in the Northern Hemisphere. This result confirms that wild birds including Northern Pintails can be act as common reservoirs and carriers of several viral diseases. To prevent economic damages in poultry farms the preventing measure to control contacts between waterfowls and domestic birds is required, and the quality of natural habitats should be maintained high to secure the health of other wild birds. The efforts for monitoring and disease surveillance must be also continued.*

**Abstract:** A total of 38 Newcastle disease virus (NDV) isolates were obtained from 6060 fecal samples from northern pintail (*Anas acuta*) ducks collected in the Tohoku district in Japan during 2006–09. One isolate from each sampling location and date was selected for a total of 38 isolates, then 15 of these were characterized for their pathogenicity by mean death time of minimum lethal dose (MDT/MLD) using chicken embryos and by plaque formation on chicken embryo fibroblasts. Furthermore, nine isolates were randomly selected from these 15 isolates, and the fusion protein genes were sequenced to characterize amino acid sequences around the cleavage site. All 15 were confirmed to be nonvirulent by MDT/MLD test, and nine isolates were also confirmed as nonvirulent by the cleavage site of the fusion protein <sup>112</sup>G/E-K/R-Q-G/E-R\*L<sup>117</sup> that was specific for nonvirulent NDVs. The characteristics of nine isolates identified by phylogenic analysis of the fusion protein gene indicated that the isolates belong to genotype I or II. In addition, we also isolated 68 avian influenza viruses and 28 other hemagglutinating viruses. Our data indicate that northern pintails are subclinically infected by, perpetuate, and distribute NDV along with different subtypes of avian influenza viruses and other hemagglutinating viruses during their migrations across vast areas over the Northern Hemisphere to Japan.

# CONSERVATION

**Grumbine and Xu. 2011. Creating a ‘Conservation with Chinese Characteristics’. *Biological Conservation* 144: 1347–1355.**

*Comments of Science officer: In China and in many Asian countries, apart from economic situations, main perspectives and philosophy on nature and environments are significantly different from those of so-called ‘western’ countries. Therefore, for the successful and effective cooperation with China and Asian countries to conserve migratory waterbirds and their habitats, understanding their historical, social, and economical conditions is essential. This article reviews the characteristics of China related with many environmental issues including conservation and management.*

**Abstract:** As China becomes increasingly influential in international affairs, it is important to understand the unique characteristics of Chinese environmental values and policy processes. This is especially true given the rate and scale of China’s environmental impacts on natural ecosystems from local to international levels. Currently, however, Chinese conservation values, policies and practices are not well-integrated. We identify four systemic barriers to conservation in China that contribute to this poor integration: weak rule of law; unclear land tenure; top down government authority; and disconnects between scientific research and management implementation. To advance China toward an environmentally secure future, we suggest that combining traditional Chinese environmental values with contemporary science and international conservation practices will help to create a ‘Conservation with Chinese Characteristics’. We do not believe that traditional values should replace modern science and management. Rather, we suggest that, given the cultural and political conditions in China today, using traditional values to frame contemporary environmental science and ecosystem-based management may create stronger societal support for conservation implementation.

**Ko et al. 2011. A conflict of greens: green development versus habitat preservation - the case of Incheon, South Korea. Environment: Science and Policy for Sustainable Development 53: 3-17.**

*Comments of Science officer: This article explains the definition, characteristics, major projects, and conflicts linked with the on-going 'Green Growth Policies' which overwhelms the Korean societies. Authors criticize that the Green Growth Policies of Korean governments are close to the 'Segmented Green Growth policies' focusing on economic developments based on large construction projects (which may threat important habitats), rather than to the Systematic Green Growth Policy. Based on their review as environmental planners, authors note some suggestions to achieve true Green Growth in Korea.*

**Summary of the article [No original abstract]:** Boosting the economy in green ways is a goal for many nations, but not all agree on what “green” means; the efforts of South Korea include a range of policies under the framework of green growth, from a national stimulus plan to local city initiatives. The perennial debate between economic development and natural preservation has now shifted toward a more subtle conflict between “systematic green” and “segmented green.” If South Korea is willing to pursue “systematic” green growth instead of “segmented” green growth, it may need to reassess the costs of the current plans for tidal power plants and tidal flat reclamation, reevaluate whether those plans are still economically feasible, and balance the goals of a sustainable local, national, and global society in the long run. Formal procedures to assess the environmental impacts of future proposed projects must take on a broader systematic outlook. Green growth and habitat preservation are not always mutually exclusive and it is possible to plan for green growth. Growth can fit into a framework of systematic greening using local, natural, and cultural assets to boost the local economy. However, in a “systematic green” society, it is a matter of ethics, not merely economics, when human activity threatens the existence of species and their habitats. Such plans would require careful consideration of each specific site. Planning and support from the central government must reflect and respect the latest scientific research as well as the firsthand experience of local residents. Creating and enacting plans that truly live up to their “green” claims will be a contentious but stimulating challenge to scientists, planners, policymakers, and everyday citizens alike, in this century and beyond.