The Fatal Shore —K'Gari's Trafficable Beach

Off-road vehicles (ORVs) are heavily impacting the life above and within the sand of K'Gari's ocean beach. Over the last decade researchers from the University of the Sunshine Coast have demonstrated in a series of studies the lethal damages caused by 4WDs to surf clams (wongs), ghost crabs, worms and shorebirds, in and on the beach and to foredune vegetation. Backgrounder 77 by John Sinclair (June 2016) summarizes the research findings on each of these forms of life from the unseen to the very visible that are fast vanishing.

University of the Sunshine Coast's Dr Thomas Schlacher has collaborated with various teams in an interesting series of studies showing the impact of 4WDs on the beaches. While FIDO believes that something needs to be done to stop the damage done in the interior of the island by eroding roads, a blind eye can't be turned to the impact of vehicles on K'Gari's beaches. This Backgrounder summarizes the findings of the various studies quoting extensively from the summaries and conclusions from six papers which taken together make a compelling case for reviewing the existing beach management.

Macrobenthic invertebrates (e.g., worms, clams, crustaceans, etc.) play a key role in the trophic architecture of sandy beaches, supporting higher-order consumers such as shorebirds and fishes and contribute to nutrient recycling on beaches. They generally occupy the sand matrix of the intertidal zone where most of the vehicle traffic is concentrated and are thus potentially vulnerable to impacts by ORVs via direct crushing of individuals. In 2008 a study, *("Impacts of Off-Road Vehicles (ORVs) on Macrobenthic Assemblages on Sandy Beaches")* contrasted two reference sites with no ORV traffic and two beaches with heavy ORV traffic (in excess of 250,000 vehicles per year) located in South-East Queensland. Macrobenthic assemblages on ORV-impacted beaches had significantly fewer species at substantially reduced densities, resulting in marked shifts in community composition and structure. These shifts were particularly strong on the middle and upper shore where vehicle traffic was concentrated. Strong effects of ORVs were detectable in all seasons, but increased towards the summer months as a result of heavier traffic volumes. The study provided clear evidence of the substantial impacts on sandy beach invertebrates.

Impact on Wongs: The 2008 paper *"Mortalities caused by off-road vehicles (ORVs) to a key member of sandy beach assemblages, the surf clam Donax deltoids"* experimentally quantified the link between beach traffic and lethal damages caused by vehicles to sandy shore invertebrates, using surf clams (aka Eugaries, pippies, Wongs) as the biological response variable. Although clams had some tolerance against vehicles at low traffic volumes (5 vehicle passes), more than half of them were killed at higher traffic volumes (75 passes) in situations where cars traversed soft sand and turned across the beach face. Overall, both traffic volume and driver behaviour (i.e. straight vs. turning vehicle tracks) determined the incidence of direct crushing of clams under vehicles. The data demonstrated that recreational use of ORVs was a source of mortality for beach invertebrates.

Ghost Crabs: Beaches are important habitats to invertebrates such as ghost crabs of the genus *Ocyopde,* which excavate extensive and elaborate burrows. Ghost crabs are sensitive to human pressures and changes in burrow architecture may thus be a consequence of disturbance by vehicles. This was tested during the spring and summer by comparing 305 burrow casts between beaches open and closed to vehicles in Eastern Australia. *("Impacts of Off-Road Vehicles (ORVs) on Burrow Architecture of Ghost Crabs (Genus Ocypode) on Sandy Beaches" 2010)* Traffic influenced burrow architecture: there were smaller crabs on vehicle-impacted beaches, and after the peak traffic period (Christmas and New Year holidays), these crabs had tunnelled deeper into the sediment on shores rutted by cars. Smaller crabs from vehicle-impacted beaches simplified the shapes of their burrows following heavy traffic disturbance.

Foredune vegetation: Dunes serve as campsites for large numbers of people (~90,000 p.a.) on the ocean-exposed shores of Fraser Island. Campsites are located in the established dunes and can only be accessed with 4WD vehicles along tracks cut directly from the beach through the foredunes. Of the 124 km of ocean exposed beaches, 122 km (98%) are open to vehicles driven on the beaches, and camping zones cover 28.7 km or 23% of the dunes. These tracks were quantified to show the extent of physical damage to foredunes and tested whether human-induced physical changes to foredunes translate into biological effects. A 2008 study (*"Physical damage to coastal dunes and ecological impacts caused by vehicle tracks associated with beach camping on sandy shores: a case study from Fraser Island, Australia"***)** found a total of 235 vehicle tracks are cut across the foredunes at an average density of eight tracks per km of beach. These tracks have effectively destroyed one-fifth (20.2%) of the dune front in camping zones, deeply incising the dune-beach interface. There is evidence of accelerated erosion and shoreline retreat centred around vehicle tracks, resulting in a "scalloping" of the shoreline. No dune vegetation remains in the tracks and the abundance of ghost crabs (*Ocypode spp*.) is significantly reduced compared with the abutting dunes. It appers that current levels of environmental change caused by dune camping may not be compatible with the sustainable use of coastal resources and conservation obligations for the island. Ultimately, coastal management needs to develop and implement strategies that reconcile demands for human recreation, including beach camping, with conservation of coastal dune ecosystems.

Aware of all of the implications of this research, FIDO has long advocated for more vehicle free beaches on Fraser Island with our top target being closing the beach from the Hook Point barge landing to Dilli Village where there is a road alternative.

Traffic heavily impacts K'Gari's shorebird numbers

While the impact of ORVs on critters living in the beach traffic zones passes largely unnoticed, birds are much more visible, particularly beach shorebirds because they are usually found in the open with nowhere to hide. USC studies confirm anecdotal reports by many Fraser Island veterans of the great decline in shorebird populations. While the decline of the more obvious birds such as Pied Oyster-catchers and Beach Stone-curlews has long been lamented, other birds are also being impacted by beach traffic. Three published papers by USC researchers dealt with the impacts of disturbance to shorebirds and how this influenced bird behaviour and their use of beaches. So far other causes of population decline including bird strikes by traffic and disturbance of foredune nesting areas have not been studied.

Sandy shorelines form irreplaceable critical habitats for bird breeding, foraging and roosting. Populations of many coastal birds are in decline, driven by expanding coastal cities that escalates beach use by humans and habitat loss. The nature of coastal development (ribbon vs nodes) is influential. Humans directly degrade sandy shore habitat quality by altering beach dimensions and stability, reducing structural diversity of vegetation on dunes, and decreasing food availability through harvesting and incidental crushing of fauna by vehicles. In addition, sea level rise is predicted to impact coastal birds substantially.

***Motorized traffic** is currently allowed to use 94% of the 201 km long sandy ocean shoreline of Fraser Island and Cooloola, one of Australia's premier coastal conservation areas. A mere 7 km of beach is free from cars, but most of the vehicle exclusion zones are used as bathing reserves and dog exercise areas. Current zoning offers virtually no protection to shorebirds and other wildlife. This appears paradoxical given the region is a declared National Park and is listed as 'World Heritage'. There are no limits on the number of vehicles allowed on beaches and the beaches are open to vehicles all year round, the only exception being temporary closures when cyclonic or other storm conditions present a safety risk.*

Disturbance influence on shorebird site selection: Because many animals perceive humans as predators, human disturbance can result in the decline of shorebird populations. The more disturbance, the more birds shy away from using such disturbed habitats. If critical habitats are frequently disturbed across large areas at high intensities, this can alter bird behavior and lead them to abandon use of such busy sites. Such is the case involving the use of beaches by shorebirds. A 2012 study (*"Humans alter habitat selection of birds on ocean-exposed sandy beaches"* 2012) by Meager, Schlacher and Nielsen tested whether habitat selection of birds that commonly use the surf–beach–dune interface is influenced by the rates of human activities. The research showed that human activities do affect beach sites selected by birds on beaches at both the local (25 ha) and landscape (250 ha) scales. They developed and tested strategies that have the potential to inform site selection for conservation and management measures for birds on sandy beaches. This would complement a range of spatial management measures that have already been used on sandy beaches, such as management of beach access points, vehicle permits and dog use.

Altering bird behaviour: Motorized traffic is the prime agent of disturbance to birds on these beaches, resulting in frequent and time-consuming escape behaviours. A 2012 study (*"Human recreation alters behaviour profiles of non-breeding birds on open-coast sandy shores")* by Schlacher, Nielsen and Weston detailed how the impacts of human usage of beaches potentially conflict with the conservation and management of wildlife, such as beach-dwelling birds, on sandy shorelines. Because responses by birds to environmental change, including disturbance by humans, often involve behaviours that carry fitness costs, researchers quantified behaviour profiles of birds in relation to human occurrence along 200 km of sandy shoreline in Eastern Australia, including the large conservation area of Fraser Island. The study found considerable disturbance to birds on these shores:
1) birds encountered motorized vehicles (cars, trucks, buses etc.) during 80% of focal bird observation bouts,
2) birds were flushed in over half (up to 86% in individual species) of all bouts, and
3) individuals spent, on average, one-third of their time on disturbance-related behaviours; this was particularly prevalent for Crested Terns (*Thalasseus bergii*) which were alert 42% of the time and spent 12% of their time escaping from human stimuli.

Beach closures have been shown to be highly effective in conserving birds on sandy shores and invertebrates in sections closed to vehicles are also substantially more diverse and abundant. Beach closures in the region are, however, embryonic and small.

Amelioration Measures: A 2013 study by Schlacher, Weston, Lynn and Connolly *("Setback Distances as a Conservation Tool in Wildlife- Human Interactions: Testing Their Efficacy for Birds Affected by Vehicles on Open-Coast Sandy Beaches"*) found that in some wilderness areas, vehicles disrupt shorebird behaviour and their use of the habitat. It noted (a) most drivers did not create sizeable buffers between their vehicles and birds; (b) bird disturbance was frequent; and (c) probability of flushing (escape) was most influenced by setback distance and vehicle type (buses flushed birds at higher rates than cars). Experiments demonstrated that substantial reductions in bird escape responses required buffers to be greater than 25 metres and vehicle speeds to be slower than 30 kph. The paper noted that paradoxically, the 'eco-friendly' tourist industry operating buses caused greater disturbance to birds, suggesting that organised tourism – notwithstanding its 'eco accreditation - does not necessarily engender better outcomes for wildlife.

Establishing buffers can reduce impacts on wildlife but because buffers rely on changes to current driver behaviour, they are less effective than vehicle-free zones (i.e. beach closures).