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**Diet and Foraging Behaviour of Juvenile Rig  
(*Mustelus lenticulatus*) from New Zealand  
Harbours and Estuaries**

A thesis presented in partial fulfilment of the requirements for the degree  
of  
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in  
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# Abstract

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Smooth-hounds (Elasmobranchii, Triakidae) can form important commercial fisheries, and in New Zealand, rig (*Mustelus lenticulatus*) is marketed as “lemonfish”. Despite this, little is known of their biology. Rig are small sharks known for making annual inshore migrations to harbours and estuaries to give birth and mate. These areas act as nursery grounds for newborn rig, providing an important food source, protection from predators, or both. A large-scale survey of the diet of juvenile (<1 year old) rig was undertaken throughout New Zealand in February-March 2011, sampling guts of 130 rig at eight sites from the northern North Island to the southern South Island. Rig fed mainly on benthic crustaceans, especially stalk-eyed mud crabs (*Hemiplax hirtipes*) and snapping shrimp (*Alpheus richardsoni*). Other prey groups found in their diet include mantis shrimps, hermit crabs, squat lobsters, various caridean shrimps and polychaetes, while molluscs were rarely taken and fish were not found at all. Two recently introduced species were found in rig diets from northern sites: the Japanese mantis shrimp (*Oratosquilla oratoria*) from Kaipara Harbour and the greentail prawn (*Metapenaeus bennettiae*). While diets overlapped between all harbours and estuaries, significant differences were detected through pairwise Analyses of Similarity between sites. Differences in diet were associated with latitude and temperature, and related especially to the proportions of two mud crabs, *Hemiplax hirtipes* and *Hemigrapsus crenulatus*, the snapping shrimp *Alpheus richardsoni* and the prawn *Metapenaeus bennettiae*. We suggest that newborn rig remain in harbours and estuaries primarily to feed. In addition to analysing juvenile rig diet, a behaviour study was performed to analyse the effects of sediment type on captive juvenile rig foraging effort and success. Six young of the year rig caught from Porirua Harbour were transferred to the NIWA, Greta Point, Wellington facility. No significant differences were observed in the time spent foraging or the number of strikes occurring on sand or mud. However, a significant increase in the time spent foraging and a significant decrease in the time spent resting was observed with the presence of crabs. Further research is required to determine the effects of sedimentation on juvenile rig behaviour.

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