miles south of Kawakawa*, and to his surprise saw a pair of Welcome Swallows flying about in pursuit of insects. In April I took a hurried run to Auckland and on the way stopped at the big concrete bridge over the Waimeo stream, half expecting to find some evidence that Welcome Swallows had nested there. But though the situation was ideal, I was disappointed.

It appears that during the summer of 1958-1959 there was a fair sprinkling of Welcome Swallows in Northland. Breeding is known to have taken place in three localities and possibly in a fourth. One pair is known to have succeeded. Another pair was robbed of success when all seemed well and its young were already on the wing. The evidence indicates that but for human interference the Welcome Swallow would now be firmly established as a breeding bird in Northland. In Australia some populations of Welcome Swallows are resident and non-migatory; and the winter-climate of northern New Zealand should not prove too severe for this useful insect-catching bird, which could become a charming addition to our small list of breeding passerines.

*[Two Welcome Swallows were seen here again on 10/8/59 by Mr. A. Blackburn. They flew across the main road.—Ed.]

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# NESTING HABITATS ON THE SHOTOVER RIVERBED

*By M. F. SOPER*

A casual glance at a South Island riverbed rather gives the impression of "just a lot of shingle"; but it is surprising, when one starts to look at it through the eyes of a nesting bird, how many variations there are in surface, contour, texture and shelter. The Shotover River is typical of many South Island rivers in that it runs through alternate gorges and shingle flats, the final flat differing only in being smaller than most (3 miles by ½ mile). This river flat has the usual elements; large stones (2ft. across) through shingle and gravel to fine sand; areas covered with short, coarse grasses and lichens; patches of willows, of gorse and broom; but 90% of it is shingle and it is in these areas that the four common river-bed birds nest: Banded Dotterel, S.I. Pied Oystercatcher, Black-billed Gull and Black-fronted Tern. This expanse of shingle is not all of the same consistency. As a result of the "throw" of the river as it swings from one side of the river bed to the other the shingle tends to get sorted into areas of different sizes — banks of big stones, flat areas of sand, areas of round stones, areas of flat stones, areas of continual change and areas that stay much the same year after year. Each bird has its own niche in this variable shingly expanse.

When a Banded Dotterel makes its nest it first hollows out a hemispherical cup rather like half a tennis ball let into the ground. I have been lucky enough to find a nest at this stage, when it is a very neat and accurate piece of work. To do this the consistency of the river

beach must be just right — too sandy and the sides fall in; stones too big and the dotterel, a small bird, is unable to excavate with precision, if at all. Stones ¼in.-½in. average size are needed, preferably with a growth of stunted grass and lichen on the surface to bind the edges and aid camouflage. The eggs are then laid daily for three days, and as they are laid tiny stones are packed carefully round them, the nest being finished off after the laying of the third egg with a layer of lichen. At this stage the nest is about half filled with "filling." A week later the filling is flush with the surface of the ground, only a small part of the eggs is showing, and if one gets down and squints across the nest the eggs barely dimple above the surface. This then is the actual nest site and material — but the dotterel likes a reasonably large area of it. A square yard of such habitat in amongst large boulders will not be used The Banded Dotterel likes to be able to run about not too encumbered by large stones, and it likes to have an unobstructed view from its nest. It does not therefore nest in a bouldery area or in a spot too cluttered with drift and growth or near trees. On the other hand this flat open exposed area must also be sheltered. This sounds impossible but it is not. The dotterel is an expert at finding those places on the beach where, through the lie of the land, the wind is deflected just sufficiently high off the ground for them to sit in a howling north-wester with hardlly a feather fluffing up in the eddies. Dotterel pairs keep their distance from one another. Seventy-five yards seems to be about average. This may partly be due to the patchy nature of suitable beach. Finally their nests are rarely near the river. This I think is a direct result of their habitat demands. Dotterel beach can only be formed with time, in those areas of river-bed undisturbed by scouring and floods when stunted lichens can take root and grow.

The Oystercatcher uses far more of the beach than the Banded Dotterel does. It uses the areas undisturbed by the river (in which case they may use the identical site two or more years running) and also the changing shingle and sand-banks of the centre. Two factors seem to be invariable. They need sand and they nest in the lee of a piece of driftwood, rarely a large stone. They will use plain sand, or sandy gravel, or sand and tussock. They do not use typical dotterel country nor the type of beach the gulls use, but they will nest in the same type of habitat as terns, though rarely. The area they select is seldom flat like a dotterel's, it is usually more humpy. They keep clear of the willow trees. Their nests are more exposed than a dotterel's and more widely spaced — a good 200 yards as a minimum. Some nests are quite close to the river, but strategically placed and it takes a freak flood to catch them.

The Black-billed Gulls use the centre of the river-bed, the area of change. They choose a very definite type of shingle. They like to be able to walk about without watching their feet, so they will not use large round boulders — though they will use largish (12in. across) flat ones. They will not use sand. They will not use an area that is growing lichens or grass or other vegetation. They choose a flat area at least 100 yards x 50 yards, with no banks or humps, composed of flat stones 3in.-12in. across with a minimum of silt and round projecting stones, liberally scattered with driftwood and preferably on an island between two streams if they can get it. If the site is otherwise perfect but lacking

driftwood, they will not use it. They will tolerate willow trees and wind and they get caught by "freshes" of the river more often than any of the others. The nests, which are made of grass, drift and general rubbish, are grouped round the clumps of driftwood. The size of the piece of drift determines the number of nests, which are usually 1-2 feet apart in any given cluster. There will be odd lone nests on the bare stones. These are always in the centre of the colony. Stragglers outwards follow the driftwood. The Shotover colony has so far always been in two sections, usually separated by a small stream. The smaller lays one week later than the larger. These gulls have never yet used the same site two years running though they always congregate on last year's site at the beginning of each breeding season. Generally the site has become unsatisfactory because it has been swept clear of driftwood without the river depositing more. Occasionally the shingle bank has been scoured out to an entirely different gravel structure.

The Black-fronted Tern uses one habitat and one habitat only — large round stones set in silt and sand; sand, to make a scrape like the Oystercatcher; large round stones, probably for camouflage and shelter. They drop onto their nests and walk reluctantly so that unlike the gulls, dotterels and oystercatchers, beach is not needed. The fact that tern habitat is usually free of drift is I think accidental. Large round bouldery stones seem to be found only on the inside curve of a big sweep of the main river. These shingle banks usually have quite a hump and slope steeply to the water. The driftwood tends to get thrown outwards and deposited on the beach beyond the outside curve which is at a lower level and often forms good oystercatcher habitat. Although the Bleck-fronted Terns use the changing area of the river-bed and are close to the river, they do not get caught by rising water to the extent that the gulls do, as the bouldery shingle banks are by nature higher than the rest of the beach. Terns space their nests 10-20 yards apart or more, so that the colony straggles well down the beach. They associate with the gulls only by chance proximity of suitable beach.

These then are the main habitats on the Shotover river-bed. Stilts do use it — isolated pairs — close to water and in stony areas, with a pebble size larger than dotterel prefer but smaller than a gull's, and free of silt. But not enough stilts use it to form any conclusions. Stilts in this district are generally swamp nesting birds.

Whether these habitats hold good on other river-beds I do not know, but on the Shotover, over the last five years, they have remained remarkably constant. Variations occur of course — a blurring round the edges as it were — but no drastic variations from the norm have as yet been seen.