CHAPTER 6

WHITEBAIT FISHERIES – A CASE STUDY OF MAORI INTERESTS IN RIVER FAUNA

6.1 Knowledge, Technology, Harvests

Hapu use their knowledge of fish behaviour and their technology of trapping devices to garner a harvest from wild fish. This chapter treats Maori knowledge, technology, and harvests as a single intellectual property.[1]

Whitebait shoals are composed of the transparent juveniles of five species of galaxias.[2] Today, inanga make up the whole catch in many rivers, but in harvests taken by Maori before colonial land clearances, koaro and kokopu probably were more abundant.[3]

Maori state that before colonial settlement the shoals of whitebait migrating up the Buller River 'covered the face of the water for miles in length'.[4] Pakeha settlers observed the abundance, but brought a new attitude to the resource.[5] In 1899, Clarke reported: 'The extent of the shoals . . . at times was incredible, often I have seen the surface of the chinamen's gardens . . . for several acres each in extent covered some inches in depth with these fry used as topdressing manure'.[6] In 1944, whitebait harvested for commercial canning was 'dumped by the drayload'.[7] In

1. I am following a United Nations preliminary report of 1992 which included physical resources indigenous to the territory of an indigenous people, in intellectual property (Malcom McNeill, 'Intellectual Property Law Reform and the Marginalisation of Maori', MA thesis, University of Auckland, 1995, p 53, citing UN/ E/CN.4/Sub.2, 1992, 30:2). An annotated bibliography of Maori fisheries has been compiled by McDowall (R M McDowall, *A Bibliography of Maori Fisheries in New Zealand Fresh Waters*, Christchurch, NIWA Freshwater, 1993).
2. They are the inanga, *Galaxias maculatus*; koaro, *Galaxias brevipinnis*; banded kokopu, *Galaxias fasciatus*; giant kokupu, *Galaxias argenteus*; and shortjawed kokopu, *Galaxias postvectis*. Present order of abundance in the whitebait shoals is commonly inanga, banded kokopu, koaro, giant kokopu, shortjawed kokopu. In South Westland giant kokopu are the last to migrate inland from the sea, appearing at river mouths in early November (R M McDowall, *Conservation and Management of the Whitebait Fishery*, Wellington, New Zealand Department of Conservation, Science and Research series, no 38, 1991, pp 2, 7). The source throughout is R M McDowall, *The New Zealand Whitebait Book*, Wellington, Reed, 1984.
3. McDowall, *The Whitebait Book*, p 11. Koaro and kokopu generally do not survive where streams have become exposed through forest clearance. The draining and clearance of swampland has further reduced the habitat of kokopu. Most inanga die after their first spawning, whereas kokopu and koaro live for a number of years, and it is possible that the annual cycle of the inanga, producing a rapid replenishment of its population, contributes to its having withstood habitat destruction for some time longer.
4. G G M Mitchell, *Maori Place Names in Buller County*, Wellington, Reed, 1948
5. Maori ethos is, 'We do not fish to kill fish, we fish for food'.
6. F E Clarke, 'Notes on New Zealand Galaxidae', in *Transactions and Proceedings of the New Zealand Institute*, vol 31, 1899, pp 78–91

1955 the recorded whitebait catch peaked at 322 tonnes, and thereafter to 1996 annual returns have declined. The catch in 1990 was 50 to 100 tonnes.[8]

Early nineteenth-century records indicate that inanga were trapped on two migrations: in spring as they migrated in from the sea forming a component of the whitebait shoals, and in autumn as the ripe adults returned downstream to spawn. Maori recognised the greater nutritional value of trapping the adult fish when they are rich with roe: 'In the old days they would not catch the whitebait coming up the Hokio, preferring to wait and take them when full grown they ran to sea to spawn. A few netfalls might be scooped up for a chief's delectation, but no more.'[9]

Migrations of inanga downstream into coastal estuaries to spawn, coincide with the spring tides on new and full moon, during late summer to early winter. Maori had a command of these migration patterns. A nineteenth century passage records prediction of a downstream migration, when the inanga are rich with roe:

> It was in connection with the running to sea of the inanga . . . that the Maoris had full scope for the remarkable fish-lore which they possessed. Certain amongst them, old men, could tell to a day when this annual run would commence . . . they would talk . . . about a study of the stars, the season experienced, and the phase of the moon, but would say nothing definite . . . The fact was the more remarkable in that the limited time occupied in the 'run', put guess-work out of the question. Three days it occupied – never more. Early one morning a few inangas would be noticed in the Hokio. These were the advance guard – the 'Mataaika' or 'leaders of the fish'. For a couple of hours that morning these would run at intervals, a few at a time. In the evening a few more, and then throughout the night the creek would be empty. But early one morning they would come down, a shimmering shoal . . . The third day brought a few stragglers and the run was over.[10]

This knowledge is an intellectual property. Without Maori knowledge of life cycles and seasons of migration, Pakeha could not correlate their observations of the upokororo (grayling, *Prototroctes oxyrhynchus*). In 1982 the upokororo was described by a fisheries scientist as a 'mysterious fish about whose habits little or nothing is known, found in one part of a stream today and disappearing no one knows where tomorrow'.[11] In 1901 it had a 'habit of disappearing and reappearing in a ghostly fashion'.[12] When it became extinct during the 1920s, fisheries scientists had still not unravelled the patterns of its migrations.

Whitebait fishing was a basic economic enterprise for many hapu. At 1840 inanga (*Galaxias maculatus*) in the Waikato River were the basis of possibly the largest whitebait fishery in the North Island, and before land clearances modified

7. McDowall, *The Whitebait Book*, p 106
8. R M McDowall, *New Zealand Freshwater Fishes: A Natural History and Guide*, Auckland, Heinemann Reed and MAF Publishing, p 435
9. E N D O'Donnell, *Te Hekenga: Early Days in Horowhenua*, Palmerston North, Bennett, not dated
10. O'Donnell, *Te Hekenga*
11. W H Spackman, *Trout in New Zealand: Where To Go and How To Catch Them*, Wellington, Government Printer, 1892
12. A J Rutherfurd, 'Notes on Salmonidae and Their New Home in the South Pacific', in *Transactions and Proceedings of the New Zealand Institute*, vol 33, 1901, pp 240–249

the Waikato catchment, this river sustained possibly the most important whitebait fishery in New Zealand.[13] The West Coast rivers, Waikato, Hutt, Manawatu, Waimakariri, and Mataura Rivers supported prolific whitebait fisheries.[14] In 1872 Hector recorded that whitebait 'form the food of the Maoris for many months of the year'.[15] In 1988, most fulltime whitebait fishermen on the Waikato were Maori,[16] and the Arahura River (Hokitika) was more or less exclusively a Maori fishery.

At 1840 New Zealand lakes 'teemed' with koaro whitebait. Whitney described the whole village at Waitahanui feasting on storm-cast koaro for days at a time.[17] Grace recorded that Ngati Tuwharetoa were nicknamed derisively 'kai panare' because the abundance of their resource allowed them to collect koaro stranded on the beach instead of skilfully trapping them.[18] Until the 1920s, when introduced trout had destroyed the fishery, koaro was especially important as an economic resource to Maori who lived around the central North Island lakes (Taupo, Rotoaira, Rotorua, Rotoiti, Okataina, Tarawera, Rotopounamu, Waikaremoana). Here whitebait were trapped in very large numbers. Observers described lake-locked koaro as a principal food of the Taupo Maori, and of the Arawa tribe.[19]

Koaro also populated South Island lakes: Coleridge, Sumner, Ohau, Hawea, Wanaka, Wakatipu, Te Anau, Manapouri, and others, with a population of very large-sized fish at Lake Chalice.[20]

Koaro were captured with baskets (kupenga), traps (pouraka), weirs, and seine nets. Huge seine nets were observed, as long as 100 metres by 2 metres deep.[21] In 1847, Angas described a technique of fastening a net between two canoes, while shoals of fish were driven into the net using a pole 6 metres long with a tuft at the end.[22] He illustrated another technique, the use of long-handled scoop nets from a canoe.[23]

Maori industry included techniques of preservation and storage. 'If [the whitebait] were not to be used immediately they were put on racks above the fire and dried and then packed away for use in the winter . . . the fish were packed into kits and would remain edible for some months'.[24] Hector observed in 1872 that

13. McDowall, *Natural History and Guide*, p 433
14. McDowall, *The Whitebait Book*, p 119
15. J Hector, 'Notes on the Edible Fishes', in *Fishes of New Zealand*, Wellington, Hughes, 1872, pp 97–133
16. A G Stancliff, J A T Boubee, and C P Mitchell, 'The Whitebait Fishery of the Waikato River', New Zealand Ministry of Agriculture and Fisheries, Freshwater Fisheries Report, no 95, 1988
17. C A Whitney, 'Minnows and Inanga', in *New Zealand Fishing and Shooting Gazette*, vol 14, no 5, 1941, p 10
18. J Te Heuheu Grace, *Tuwharetoa: The History of the Maori People of the Taupo District*, Wellington, Reed, 1959; McDowall, *Natural History*, pp 415–416
19. Gilbert Mair, letter, 25 October 1919, *Rotorua Chronicle*; H J Fletcher, 'Lake Taupo and Its Trout', in *New Zealand Journal of Science and Technology*, vol 2, no 6, 1919, pp 367–370; Elsdon Best, 'Fishing Methods and Devices of the Maori', *Dominion Museum Bulletin*, no 12, 1929; J S Armstrong, 'Notes on the Biology of Lake Taupo', in *Transactions and Proceedings of Royal Society of New Zealand*, vol 65, no 1, 1935, pp 88–94; W J Phillipps, *The Fishes of New Zealand*, New Plymouth, Avery
20. McDowall, *Natural History*, pp 105–107
21. Phillipps, *Fishes of New Zealand*
22. G F Angas, *Savage Life and Scenes in Australia and New Zealand*, London, Smith and Elder, 1847
23. G F Angas, *The New Zealanders Illustrated*, London, McLean
24. Best, *Fishing Methods and Devices of the Maori*

harvests of whitebait 'yield an ample supply both for daily use and to preserve for other seasons'.[25] In 1932, Foxton hapu advised Sir Apirana Ngata: 'We would like to point out that our staple food during the winter months consists of the fish dried'.[26]

Whitebait were a commercial resource, being sold and traded: 'the Grey River was very rich in whitebait in 1867. There was no difficulty getting bucketsful in a very short time. Maori gathered it and sold it very cheaply'.[27] Mair reported that from around 1860 to 1919 he had seen Ngati Pikaou netting koaro in the Ohau channel, sun-drying them, storing them for winter use, and bartering them profitably with West Coast tribes.[28] During the 1930s the Maori King Movement placed a tax on sales of whitebait from the Waikato River to fund its activities.[29]

The whitebait fishery is an intellectual property of Maori. The fishery was established by Maori, and Maori techniques of trapping whitebait were copied by Pakeha settlers: 'Well before the modern [whitebait] fishery developed the Maoris had identified whitebait as a palatable food and had devised methods for catching them. The Europeans in large measure adapted the Maori methods before developing new ways of fishing.' According to McDowall:[30]

> An early method in use in West Coast rivers was the so-called 'trench'. This was derived from a Maori method and . . . consisted of a groyne across the river channel formed either from river gravel or by setting a line of sacks filled with gravel. At intervals a gap was left and a set net was placed in the opening. The net was built of supplejack and had a D-shaped opening . . . The fish swimming upstream, unable to move up past the groyne, made for the flow of water through the gap where the net was placed.[31]

Twentieth-century trap nets designed by the Nolan brothers in the 1940s, and the 'Southland Sock' introduced to the Haast by the Russ brothers in the 1970s,[32] were possibly based on a new design of 'fyke' net introduced by the Dutch,[33] and are not developments of Maori hinaki as such. However, their employment in the whitebait fishery is an outcome of the technical knowledge-base developed by Maori.

A second whitebaiting technique adapted from Maori was the use of man-made side channels, which diverted whitebait out of the mainstream into holding ponds where they could be dip-netted.[34]

The whitebait fishery has now lost much of its reverence and festival. In the nineteenth-century practice of some hapu:

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25. Hector, pp 97–133
26. McDowall, *The Whitebait Book*, p 93, citing Marine Department files
27. C J Pfaff, *The Digger's Story*, Wellington, Wright and Carman, 1914; McDowall, *The Whitebait Book*, p 98
28. *Rotorua Chronicle*, 25 October 1919
29. Michael King, *Te Puea. A Biography*, Auckland, Hodder and Stoughton, 1973
30. McDowall, *The Whitebait Book*, p 139
31. McDowall, *The Whitebait Book*, pp 139, 140
32. McDowall, *The Whitebait Book*, pp 143, 145
33. McDowall, *Natural History*, p 426
34. McDowall, *The Whitebait Book*, p 140

> when the first catch . . . was made some were set aside as offerings to the Gods and the rest were consumed in a ceremony feast. The cooking was done in five different ovens for five different eaters: one for the priest, one for the chiefs, one for the women, one for the fishermen and another for the bulk of the people.[35]

Priority in the development of whitebait fisheries by Maori has not been admitted in some statements by fisheries scientists: '[whitebait research] began in New Zealand in the 1860s with the first efforts to determine the whitebait's identity . . . The first reported observations of [inanga] spawning go back to at least the 1890s . . . the indigenous fauna is . . . little known outside a small group of specialists and enthusiasts'.[36]

6.2 MAORI AND KOARO VERSUS TROUT

The saga of 'Maori and koaro versus trout' began with the introduction of brown trout in 1867, followed by a vigorous stocking policy which has colonised New Zealand waterways with seven predatory salmonids. Acclimatisation societies, provincial councils, Internal Affairs (Tourist and Publicity Department), Marine Department, Ministry of Agriculture and Fisheries, and currently the fish and game councils, have all participated in this venture. 'There can be little doubt that the presence of large numbers of fast moving and highly predatory brown and rainbow trout has affected the native fish species of New Zealand's lakes and rivers, particularly whitebait.'[37]

Following the introduction of brown trout, Hutton voiced concern in 1873 that native fish are not predatory and would be unprepared for competition from trout for territory and food resources: conditions for native fish 'will soon no longer exist in our rivers';[38] but the stocking of New Zealand lakes with brown trout continued. During the 1870s, quinnat salmon and brook char were introduced, and during the 1880s rainbow trout.

In the South Island, reports of the disappearance of upokororo (grayling) from the Inangahua and Buller Rivers were circulated during the 1880s.[39] In 1892, W H Spackman commented that trout 'seemed too much' for the upokororo.[40] In

35. D H Graham, *A Treasury of New Zealand Fishes*, Wellington, Reed, 1954
36. McDowall, *Natural History*, pp 65, 120, 461. Fisheries scientists did not themselves observe whitebait spawning until the 1920s. A E Hefford reported: 'For spawning the shoal approached the very margin of the river at the time of high water. The minute eggs are deposited among rushes, grass, clover, or other vegetation which afford concealment for the spawning fishes and cover for the eggs which adhere in small clusters or groups on the ground about the bases of the stems of rushes or grasses. Spawning did not take place till the highest of the spring tides had passed . . . The spawn is thus assured complete protection from any aquatic enemy' (McDowall, *The Whitebait Book*, p 67).
37. McDowall, *The Whitebait Book*, p 174
38. F W Hutton, 'On the Geographical Relations of the New Zealand Fauna', in *Transactions and Proceedings of the New Zealand Institute*, vol 5, pp 227–256
39. *Otago Daily Times*, 23 March 1910
40. W H Spackman, *Trout in New Zealand: Where To Go and How To Catch Them*, Wellington, Government Printer

1897, Rotorua hapu starting making public their disquiet at the loss of their koaro fishery in the Central Plateau lakes, and petitioned the Rotorua Town Board, objecting to the further release of trout in their lakes;[41] they held koaro in much higher regard than trout.[42] Acclimatisation societies continued to release salmonid fish; Thomson estimates that by 1916, 50 million brown trout had been released into New Zealand streams.[43] During the 1920s the Minister of Internal Affairs had a vision of trout sold commercially as a cheap fish for the people, but he too was opposed by the acclimatisation societies.[44]

Around 1913, the Government acted on advice that trout had exhausted their food supply of native koaro; from 1913 to 1920 an estimated 100,000 to 240,000 trout from the Rotorua–Taupo lakes were netted then sold or buried.[45] In 1920 an entomologist on contract to the New Zealand Government reported that trout had caused very serious declines in aquatic insects in the Rotorua–Taupo lakes.[46] With the depletion of both koaro and aquatic insects the Tourist Department sought another way of sustaining the trout fishery.

The saga of 'koaro and Maori versus smelt' began in 1906, when the Tourist Department extracted native common smelt from the Waikato River and released them into Lakes Rotorua and Rotoiti.[47] Releases of smelt into lakes continued: Lake Rotonui-a-ha; Lake Taupo (1920s, 1934), Lakes Okataina and Tarawera (1931), Lakes Tarawera, Rotoma, Okataina, Rotehu, Rerewhakaaitu, Ngapouri, Okaro (1932), Lake Waikaremoana (1949), Lakes Parkinson, Ngatoa, Putere, Heaton, Williams. These introductions were undertaken by acclimatisation societies, authorised by fisheries inspectors, and by 1955 Stokell was commenting, 'It is little short of tragic that authority in such matters should be vested in uninformed bodies'.[48] The releases continued, and from 1959 to 1964 smelt were introduced into South Island lakes with koaro fisheries.[49] In 1980 Dinamani and Hickman commented: 'The ignorance and lack of action in the past is not entirely the fault of government agencies; it is also the fault of the system by which amateur bodies are given [statutory] responsibility for managing a natural resource'.[50]

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41. P J Burstall, 'Trout Fishery: A History Of Management', in D J Forsyth and C Howard-Williams, *Lake Taupo – Ecology of a New Zealand Lake*, New Zealand Department of Scientific and Industrial Research, Information Series no 158, 1983
42. Te Rangi Hiroa (P Buck), 'Maori Food Supplies of Lake Rotorua', in *Transactions and Proceedings of the New Zealand Institute*, vol 53, pp 433–451
43. G M Thomson, *The Naturalisation of Animals and Plants in New Zealand*, Cambridge University Press, 1922
44. McDowall, *Gamekeepers for the Nation*, p 139
45. Burstall, *Trout Fishery*, p 123
46. R J Tillyard, 'Report on the Neuropteroid Insects of the Hot Springs Region, New Zealand, in Relation to the Problems of Trout Food', in *Proceedings of the Linnaean Society of New South Wales*, vol 45, pp 205–213
47. McDowall, *Natural History*, p 70
48. G Stockell, *Fresh Water Fishes of New Zealand*, Christchurch, Simpson and Williams, 1955
49. McDowall, *Natural History*, pp 70–71
50. P Dinamani and R W Hickman, *Proceedings of the Aquaculture Conference*, Fisheries Research Division, Occasional Publication no 27, Wellington, New Zealand Ministry of Agriculture and Fisheries, 1980, p 45

Common smelt withstand trout predation, possibly because, whereas koaro live for several years, common smelt are shortlived and spawn only once, rapidly replacing their population. McDowall commented:

> When trout were first introduced into our lakes, they teemed with . . . huge shoals of land-locked koaro whitebait . . . once so abundant in some lakes that the Maoris used to catch it by the 'hundredweight' . . . It was not until the 1920s and 1930s when smelt . . . were introduced that trout size and condition recovered again . . . Although there are huge numbers of smelt in these North Island lakes, the populations of koaro haven't recovered. Most anglers don't even know there is a lake whitebait. Possibly the failure of the koaro populations to recover in lakes like Taupo is because the smelt populations have occupied the habitat that originally belonged to the koaro whitebait.[51]

During the 1980s and 1990s, with extensive declines in whitebait catches in the Waikato River and elsewhere, common smelt have been harvested and sold on the market as 'second-class whitebait'.[52] Contemporary Maori have a second-class product to replace their koaro fisheries.

6.3 STATUTES

In 1894, the first Whitebait Fisheries Regulations were introduced. They made weir and trench trapping techniques used by Maori illegal: 'No scrim or whitebait net shall be used as a set net or be set or placed in openings made in the banks of rivers or streams or in dams constructed therein.'[53]

In 1896, further regulations affecting whitebait harvesting were introduced, and applied to Maori and Pakeha alike. A limited harvesting season was imposed. A prohibition was placed on frightening fish towards the net, a concept developed by Maori and adopted with technological innovation by Pakeha. The net size was restricted. Commercial exploitation of whitebait was permitted.[54]

In 1922, hapu at Arahura claimed rights under the Treaty to trap and sell whitebait from a river of their rohe, the Arahura (Brunner). In 1930, Taranaki hapu claimed rights under the Treaty to practise their fisheries unhindered by statutory restrictions; they also made representation in regard to Pakeha exploitation of the fishery and the diminishing runs. In 1932, Ratana Maori made representation to the Crown claiming their right under the Treaty to practise their fisheries, and hapu at Foxton wrote to Sir Apirana Ngata. In 1922, in 1932, and again in 1955, Maori representations were rejected; the Crown reasserting that Maori do not have special rights in the whitebait fishery. The Marine Department also adopted the position

51. McDowall, *The Whitebait Book*, p 175
52. McDowall, *Natural History*, pp 433, 434
53. McDowall, *The Whitebait Book*, pp 129, 140
54. McDowall, *The Whitebait Book*, p 129

that 'there could be no question of possession of a fishery in tidal waters on the part of anyone [Maori or Pakeha] since tidal waters belong to the Crown'.[55]

In 1869, it was recorded in Greymouth that whitebait were sold commercially by Pakeha for sixpence a pint,[56] and during the 1870s Chinese gold diggers in the South Island trapped, dried, marketed, and exported whitebait.[57] In 1891, Irvine and Stevenson began commercial canning of whitebait at Hokitika; they closed their Waikato cannery in 1957.[58]

6.4 Loss Of Abundance

Since 1930, when fisheries scientists belatedly became apprised that inanga did not spawn in stream gravels but on the banks of estuaries,[59] there has been gradual awareness that trout and smelt are part of a complex of factors cumulatively bringing about decline in the whitebait fishery. Also, indigenous fish have lost their habitat to the pasture lands and pine forests of a market economy introduced by colonial settlers. In 1991, McDowall reported on the management of the whitebait fishery for the Department of Conservation:

> It is said that for many parts of New Zealand there has been a long-term decline in the amount of whitebait entering rivers, and this is unarguable . . . Huge areas of habitat suitable for their feeding, growth and reproduction have been lost, especially lowland, forested streams and wetlands . . . There can be no doubt that a major contributor to declines in abundance of whitebait in virtually all rivers has been habitat deterioration. This has resulted from deforestation, wetland drainage, sedimentation, channelisation, pollution, impoundment, water abstraction . . . With the amount of historical change that has occurred to the habitats of the various whitebait species, the whole question of . . . habitat characteristics must be a matter of profound and primary concern.[60]

The statutes do not protect Maori interests in the whitebait fishery. Further, the statutes treat Maori interests as expendable to game fishing based on introduced salmonids. Under Whitebait Fishing Regulations gazetted in 1932, Wanaka hapu were prohibited from catching 'Matukituki whitebait' (koaro, *Galaxias brevipinnis*), because it was an important food for trout in Lake Wanaka.[61] When the Whitebait Fishing Regulations were rewritten in 1981, this regulation remained in force.

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55. McDowall, *The Whitebait Book*, pp 93–94
56. *West Coast Times,* 25 August 1869; McDowall, *The Whitebait Book*, p 102
57. *West Coast Times*, 14 December 1875; McDowall, *The Whitebait Book*, p 100
58. McDowall, *The Whitebait Book*, pp 103, 109
59. A E Hefford, 'Whitebait Investigation', in *Annual Report on Fisheries*, New Zealand Marine Department, 1932, pp 13–15
60. McDowall, *Conservation and Management*, pp 4–9
61. McDowall, *Natural History*, p 112

Meanwhile, the statutes had protected trout, from 1867 with closed seasons (Propagation of Salmon and Trout Act), and from 1892 with angling licences (Fish Protection Ammendment Act). Current legislation requires water quality in streams to be fit for trout; trout, however, are midstream feeders. No legislation requires stream margins to be forested to achieve the qualities needed to restore the abundance of native fish populations. Further, up to 1996 the legislation has restricted Maori in the traditional practice of their whitebait fisheries, while allowing everyone to enter the fishery as commercial operators.

In summary, in 1840 river hapu reaped a sustaining and surplus harvest from their whitebait fisheries. The harvest was preserved, stored, traded, and sold commercially. Observations by Angus, Hector, Captain Gilbert Mair, and others alerted the Crown to the importance of whitebait in the survival of many hapu.

As the statutes allowed a greater number of people to enter the fishery, in order for Maori harvests to be sustained an increasingly greater area of breeding grounds required protection, particularly estuary margins and swamplands; safe passage for schools migrating up streams into adult habitats required legislation. Advice on these measures was available to the Crown, from 1840 from river hapu, and from the 1930s from fisheries scientists.

The Crown, however, did not act to protect Maori interests: breeding grounds were not protected and extended but instead were reduced by agricultural clearances and settlement along margins; the fishery did not remain under the control of river hapu but became instead commercialised and over-exploited; upstream passage was often blocked by culverts and dams, while feeding grounds were destroyed by pine forestry practices and by dredging and straightening of drains in the interests of increasing agricultural production; Maori were allowed no input into the writing of statutes and regulations pertaining to the fishery; Maori traditional trapping techniques were made unlawful while elaborate jetties and huge nets of European concept were allowed (see figure 6); Maori technology was pre-empted (see figure 5) while river hapu received no allocation of research and development funding to advance their technology and knowledge; a subtle body of Maori knowledge of the fishery was variously ignored, pre-empted, discredited, and allowed to become fragmented while fisheries scientists to 1996 still had not developed an adequate understanding of the fishery.[62]

(1) *Inanga life cycle*

In autumn, adult inanga, *Galaxias maculatus*, migrate downstream to spawn on spring tides amongst sedges on estuary banks. The larvae hatch when the spawning grounds are flooded by the next spring tide, and are swept out to sea, where they spend the winter in the warm ocean, feeding on its rich sources of zooplankton. In spring, the whitebait migrate into river mouths and progress upstream, where they spend the summer feeding on aquatic insects and reaching maturity.[63]

62. See for example, R M McDowall, G A Eldon, M L Bonnet, J R E Sykes, 'Critical habitats for the conservation of shortjawed kokopu, *Galaxias postvectis',* Clarke, Wellington, Department of Conservation, Conservation Sciences Publication 5, 1996

(2) *The whitebait catch*

The whitebait catch is made up of the transparent juveniles of five species of *Galaxias*. Koaro are the first to run after floods; fat-bodied, slimy, milky (enter snow-fed, milky rivers). Inanga are currently the most common in the whitebait catch. Banded kokopu are the smallest whitebait; pale amber. Giant kokopu are rare; paler amber. Shortjawed kokopu are the rarest; indistinguishable from koaro. Each of the whitebait develops a distinct adult appearance.[64]

A inanga, *Galaxias maculatus*
B banded kokopu, *Galaxias fasciatus*, 'golden bait'
C koaro, *Galaxias brevipinnis*, 'run bait, jelly bait, elephant ears',
D giant kokopu, *Galaxias argenteus*
E shortjawed kokopu, *Galaxias postvectis*

63. C P Mitchell and G A Eldon, *How to Locate and Protect Whitebait Spawning Grounds*, [1991], p 9
64. McDowall, *The New Zealand Whitebait Book*, 1984, pp 11–14, 53

(3) ***Whitebait adults***

(4) *Derivation of the whitebait fishery from Maori technology*

5.1. The 'trench' technique of trapping whitebait, used by colonists (McDowall, *The New Zealand Whitebait Book*, p 139)

5.2. An inanga weir, constructed by Maori (Best, *Fishing Methods and Devices of the Maori*, p 204)

5.3. Weir with hoop nets, technique used by colonists (R M McDowall, *The New Zealand Whitebait Book*, 1984, p 140)

5.4. Weir with hoop net, constructed by Maori (E Best, *Fishing Methods and Devices of the Maori*, 1929, p 214)

5.5. Diversion channel, technique used by colonists (R M McDowall, *The New Zealand Whitebait Book*, 1984, p 140)

5.6. Diversion channel, constructed by Maori on the Wanganui River for trapping common smelt (R M McDowall, *The New Zealand Whitebait Book*, 1984, p 89)

5.7. Diversion channel, constructed by Maori (E Best, *Fishing Methods and Devices of the Maori*, 1929, p 206)

5.8. Diversion channel, constructed by Maori (E Best, *Fishing Methods and Devices of the Maori*, 1929, p 215)

In 1996 the whitebait fishery was commercial and selling was unlicensed. Whitebait fetched $50–$60 per kilo and were described as 'liquid gold'. Stands were bought and sold privately, owned privately, and licensed to the Crown. The technology of the fishery included access to rivers by jet boat and aircraft; walkways 23 metres long; pulleys for raising large box traps; and screens directing fish into the mouths of the traps (*NZ Herald*, 16 November 1996, p G10).