

## CHAPTER 5

# FAUNA OF RIVER SYSTEMS

### 5.1 TREATY FISHERIES

To many Pakeha settlers the inland waterways were inscrutable. In 1861 Hursthouse described New Zealand rivers as ‘destitute of fish’.<sup>1</sup> In 1892 Spackman maintained that before the introduction of trout ‘every one of the thousand creeks and streams . . . were tenantless and profitless to the sportsman’.<sup>2</sup> In 1910 a fisheries inspector with the Marine Department declared there were ‘no fish of any value’ to the early colonists. It was this scientist who established quinnat salmon in New Zealand waters, a predatory fish which has displaced indigenous fauna.<sup>3</sup> In 1990 McDowall described freshwater fish as the ‘Cinderella’ of research,<sup>4</sup> and to date the life-cycle histories of most species remain a mystery to fisheries scientists.

To Maori, river systems were passageways for mile-long shoals of eels, lampreys, smelt, and inanga migrating in and out of the sea. At the signing of the Treaty in 1840 massive eel and lamprey weirs stood along the banks of rivers, at the outlets of lakes and swamps, at the conjunctions of side streams and seabound waterways. Stone weirs and side channels diverted grayling, koaro, and smelt. Traps and baskets held eels, lampreys, kokopu, koaro. Eels dried on racks, smelt and whitebait dried on rock pavements. Lake koaro were bartered to coastal tribes. The fisheries accorded to Maori in the Treaty were an economic industry.

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1. C Hursthouse, *The New Zealand Handbook. A Complete Guide to the Britain of the South*, London, Stanford, 1871. The chapters on fisheries follow the extensive search of sources by a fisheries scientist currently at NIWA, R M McDowall. The natural history source throughout this chapter is R M McDowall, *New Zealand Freshwater Fishes. A Natural History and Guide*, Auckland, Heinemann Reed and MAF Publishing, 1990.

In 1840, 27 indigenous fish spp inhabited estuaries, rivers, lakes, and swamps: 1 lamprey sp, 2 eel spp, 2 smelt spp, 13 galaxiids: 5 whitebait spp, 3 mudfish spp, 5 other galaxiids; 6 bully spp, 1 sandperch sp, 1 flounder sp. Another six spp of marine fish enter river estuaries: 1 kahawai sp, 2 mullet spp, 1 stargazer sp, 1 cockabully sp, 1 flounder sp. In 1990, 20 introduced species competed with the native fauna for food and habitat: 7 trout and salmon spp, 1 catfish sp, 7 carp and minnow spp, 4 live-bearer spp, 1 perch sp.

2. H H Spackman, *Trout in New Zealand. Where To Go and How to Catch Them*, Wellington, Government Printer, 1892

3. L F Ayson, ‘Introduction of American Fishes into New Zealand’, in *Bulletin of the Bureau of Fisheries*, vol 28, 1910, pp 969–975

4. McDowall, *Natural History*, p 7

### 5.2 PERCEPTIONS OF THE FAUNA

New Zealand freshwater fish are cryptic, that is, they are secretive and wary, they blend with their habitat and retreat into hiding. Patterns on koaro (mountain trout) replicate the ripples and reflections of light on the surface of forest streams. Banded kokopu move rapidly to cover when disturbed. Young piharau (lamprey) can quickly bury themselves in the mud. Papanoko (torrentfish) lie on the stream bed hidden under white water in the rapids where they feed.

Many native fish move to new habitats as they grow, and their appearance and lifestyle change apace.<sup>5</sup> Taiwharu (giant kokopu) come in from the sea as small, unpigmented whitebait. As they move into lowland swamps and creeks they become greenish-grey juveniles with vertical bands on their sides. Adults are nocturnal, lurking under overhanging banks and feeding at night; they are dark grey, spangled with gold spots and hieroglyphic markings that mirror moonlight.

Glass longfin eels enter estuaries and settle in the mud or sand. As they grow to a dull sandy brown they move further upstream, living amongst the gravels of rapids and feeding on insect larvae. As they get larger they become nocturnal, hiding beneath logs and overhanging banks, feeding on small fish, brown on the back and creamy-yellow on the belly.

Piharau who have lived as grey-brown juveniles in mud burrows, metamorphose before migrating down to the sea, changing to a brilliant silver and blue which will blend with their marine habitat. The freshwater fish are a fauna of dissemblance and changing appearances.

Sometimes the same fish has different forms in different parts of the country. Whitebait from the West Coast (South Island) are fatter and longer than elsewhere.<sup>6</sup> The common river galaxias is a plain olive-brown in the milky, snow-fed rivers of Canterbury, but strikingly banded in the clear streams of Central Otago.<sup>7</sup> Charles Douglas, exploring in the 1860s, observed that the koaro 'changes its colour according to the waters it frequents. In bog holes and dark bush creeks it is . . . black, . . . in the large rivers and clear streams exposed to sunlight, it is very light coloured and in a snow river, I have caught them within twenty chain of the mouth of a glacier, almost white'.<sup>8</sup>

Some freshwater fish change appearance instantly. Redfined bullies become darker when the light above the stream weakens and when the stream bed darkens. When the cockabully is frightened it pales and blends with its background; when aggressive it darkens and becomes conspicuous. Male bullies develop a black nuptial colouring during spawning. In addition, male and female bullies have different colouration. Fisheries scientists did not establish that there are six species of bullies until the 1940s and the present scientific names were not settled until 1975.<sup>9</sup>

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5. Fish species are polymorphic, different habitats leading to the development of markedly different ecotypes.

6. R M McDowall, *The New Zealand Whitebait Book*, Wellington, Reed, 1984, p 157

7. McDowall, *Natural History*, pp 114–115

8. McDowall, *The Whitebait Book*, p 96

9. McDowall, *Natural History*, pp 293, 297, 311, 321

From the 1860s on, New Zealand fisheries scientists determined species on the basis of morphology, and were often defeated. Nineteenth century scientists misidentified large, old smelt as a separate species from their younger stages.<sup>10</sup> Marine-hued lampreys undertaking a seaward migration are so distinct from mud-dwelling lampreys that ‘it was long thought there were two lampreys in New Zealand’.<sup>11</sup> Common smelt spawn at different times in different locations; in the 1940s Gerald Stockell, a fisheries inspector, treated smelt from different lakes as different species.<sup>12</sup> Within the whitebait catch, distinguishing the migrating juveniles from each other requires tuition from skilled observers, considerable experience, and attention to small, often highly subjective details; most Pakeha scientists still cannot make reliable distinctions between juveniles of koaro and shortjawed kokopu.<sup>13</sup> Altogether the five whitebait species – inanga, koaro, giant kokopu, shortjawed kokopu, banded kokopu – were given 20 scientific names.<sup>14</sup>

A morphological approach to classification has perplexed fisheries scientists, created confusion in naming, delayed attention being given to habitat protection, provided unreliable definitions for Maori names of freshwater fish, and sustained the Crown’s unsupportable conviction that it was displacing Maori names with finer distinctions.

### 5.3 LIFE-CYCLE CLASSIFICATION

Because most native fish spend part of their life cycle in the ocean, New Zealand rivers are pathways of fish migrating up and down stream.<sup>15</sup> Many migrations occur when there is a conjunction of lunar phase, river floods, spring tides, and black nights. The dark of the moon provides cover; floods and high tides enable fish to cross bars, to reach spawning grounds on river banks, to make a fast passage, and to escape detection in the swirl of water. Maori correlated the multiple identities of each species and stored this knowledge in a sequence of names, producing a complex knowledge of life cycles. As at 1840, Maori names of fish had been

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10. McDowall, *Natural History*, citing identifications made by Hector in 1871.

11. W Martin, *The Fauna of New Zealand*, Whitcombe and Tombs, [1929] p 171

12. McDowall, *Natural History*, p 69

13. R M McDowall, *Conservation and Management of the Whitebait Fishery*, Wellington, Department of Conservation, Science & Research series, no 38, 1991, p 3

14. McDowall, *Whitebait Book*, p 82

15. Seventeen native fish move to and from the sea during their life cycles (they are diadromous): lampreys, eels, smelts, the torrentfish, the black flounder, the extinct grayling, some galaxiids, and some bullies. Others survive in land-locked swamps and lakes: some bullies, some galaxiids, and the mudfishes. Some spend much of their lives travelling long distances upstream and downstream. What is known about papanoko (torrentfish, *Cheimarrichthys fosteri*) suggests these fish are highly migratory at all stages. During spring and autumn, juveniles make their way from the sea into river estuaries. Adult males remain in the lowest reaches of rivers and streams, about 2 kilometres from the sea. Females however penetrate further inland and inhabit higher elevations, 24–50 kilometres from the sea. From late spring to autumn mature adults move downstream to spawn. In winter they return upstream, while their larvae are presumably washed out to sea (McDowall, *Natural History*, pp 286–291).

stabilised, and local variations on a general theory of migration cycles formed a complex body of knowledge.

Maori are scientists of lunar periodicity.<sup>16</sup> During the spring, glass eels migrate into New Zealand rivers in countless thousands. In some rivers, greatest runs are reported during September, for a few days after each full and new moon.<sup>17</sup> In the Waikato River, upstream migrations of elvers are greatest a little after the new moon, when lunar illumination is at a minimum.

Migrations of elvers are mostly during the night; in some rivers migration commences after sunset, peaks between 9 and 11pm, and dwindles after midnight; when very large numbers are migrating some movement may continue, especially at dawn and dusk.<sup>18</sup>

Lamprey larvae migrate downstream and out to sea in spring (July–August); in the Waikato river migration occurs during the early hours of the night. After some years at sea mature lampreys migrate back into rivers during winter and spring. Migrations occur on the dark phase of the moon, at night, and are greatest when rivers are in flood.<sup>19</sup>

Upstream, beyond the reach of the salt tide, autumn shoals of inanga migrate down to estuaries to spawn. These migrations coincide with the full and new moons, and thereby with the high spring tides downstream, that will lift the fish onto estuary banks to spawn amongst grasses and rushes. Spawning occurs at full tide and after the highest of the spring tides, so that the eggs are not again covered by water until the next cycle of spring tides.<sup>20</sup>

Maori observations are ordered by a theory of the correspondences between lunar cycles and fish life-cycles. The level of salient perception is the location of each fish in its round-trip between sea and freshwater: Maori names mark those points where simultaneous changes in habitat, appearance, and habits bring about an identity crisis. Mudfish (currently identified as three *Neochanna* spp) remain all their lives in their patch of swamp, retreating into mud caves during drought; in Maori naming they remain waikaka, water-cunning, all their lives. Whitebait (*Galaxias maculata*) however, enter streams from the sea in spring as unpigmented juveniles named karawaka; adults live solitarily in the upper reaches and then migrate back downstream to spawn as inanga.<sup>21</sup> The early run of inanga migrating

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16. The theory of lunar periodicity is accepted by marine biologists as an outstanding contribution by Pacific fishermen to world knowledge (R E Johannes, *Words of the Lagoon: Fishing and Marine Lore in the Palau District of Micronesia*, Berkeley, University of California Press [1981]). In the tropical Pacific, correlations between lunar phases, tides, and shifts in the wind are less often disturbed by other factors and are more directly observable; comparative studies suggest Maori adapted a well-defined theory of lunar periodicity to New Zealand conditions.

17. 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 66

18. D J Jellyman and C M Ryan, 'Seasonal Migration of Elvers (*Anguilla* spp) into Lake Pounui, New Zealand, 1974–1978' in *New Zealand Journal of Marine and Freshwater Research*, vol 17, no 1, 1983, pp 1–15

19. I C Potter, R W Hilliard, F J Neira, 'The Biology of Australian Lampreys', in P De Dekker and W D Williams (eds), 'Limnology in Australia', *Monographiae Biologicae*, vol 64, 1986, pp 207–230

20. McDowall, *Natural History*, p 122

downstream to spawn in the autumn is pukoareare; the major migration is matuaiwi.<sup>22</sup>

#### 5.4 FISHING TECHNOLOGY

Maori interests in freshwater fish are interests in a harvesting resource. Maori trap fish at stages in the life cycle when they are nutritious, being rich with roe, and at stages in the lunar cycle when they are abundant, congregating to migrate.

Large shoals of fish, congregating to migrate, funnel through the narrow entrances of estuaries and river mouths. Fast-moving shoals of smelt migrate in as adults; shoals of glass eels, bullies, and whitebait migrate in as juveniles. Eels migrating downstream to spawn at sea are trapped as they congregate at lake outlets. Eels and lampreys migrating upstream are trapped as they pass through weirs or congregate at the base of falls. Migrating shoals often move along the banks where the current is less swift and this habit is exploited in the placement of weirs and diversion channels. The scientific and technological achievement of Maori fisheries is subtle: knowledge of fish movements is combined with human stealth to outwit the fish. The techniques of weirs, diversion channels, and traps leave the habitat undamaged and the uncaptured fish unfrightened.<sup>23</sup>

Young fish migrate into swamps and upstream forks, where they fan out into side streams. Here each fish establishes a solitary territory, often in places rarely traversed by humans: alpine reaches of streams, forested mountainsides, and peat swamps. Many adult fish are nocturnal, wily, and secretive, they retreat rapidly when disturbed, and are difficult to catch. Maori do some fishing for solitary fish in places where they abound, using a heritage of closely observed knowledge.

Lampreys and eels migrate up rivers during the night; koura usually hide during the day in crevices and shallow burrows and become active at night; kokopu also feed at night. Thus Maori trapping of freshwater fish is often nocturnal. W J Phillips described the collectivity of skills employed in outwitting kokopu:

Mostly they were caught by the women at night with basket-like nets made of supplejack known as kupenga . . . it being useless to try to catch the wily kokopu with them in daylight. They made torches of resinous mapora wood<sup>24</sup> . . . The women waded upstream, the fish come out of hiding at night to be in midstream and the fisherwoman moves carefully until close by and then quietly lowers her net and moves it close to the shoal. She then advances her left foot and gently touches the fish on the near side. The startled fish invariably darts off in the opposite direction and hence enters the net which is raised out of the water.<sup>25</sup>

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21. Matua-a-iwi; inanga, post spawners (Ngai Tahu) (R R Strickland, *Nga Tini a Tangaroa. A Maori-English, English-Maori Dictionary of Fish Names*, New Zealand Fisheries, Occasional Publication, no 5, Wellington, 1990).

22. E Best, *Fishing Methods and Devices of the Maori*, Wellington, Government Printer, 1929, pp 109-210

23. By contrast, Whitianga fishermen report that trawling for scallops damages the ground-living organisms on which fish feed, and leaves the ocean bed looking like a ploughed paddock.

24. Mapara, ngapara, kapara (*Podocarpus excelsum*, kahikatea)

The nocturnal habits of fish are exploited ingeniously. Bundles of fern are submerged and left to rest on lake and stream beds. Kokopu, koaro, piharau, or koura retreat into these 'safe houses' during the day, and are lifted out in the fern mat (whakarau). Engineering that appears elementary combines knowledge of fish habits with knowledge of physical forces: lampreys migrating upstream against the current encounter weirs (utu piharau, kanakana) with avenues of escape. Traps are placed downstream of the gaps, using the enhanced force of water flow to sweep the lampreys into the traps.<sup>26</sup> This is a hand-made, social group technology that employs subtle combinations of knowledge; and it does not plunder the resource, leaving an avenue of escape for the wiliest of the fauna.

At 1840 Maori harvested seasonal abundance, and had an inventory of names identifying the progress of each fish through its migratory cycle. Life cycle research has not been a Crown priority, even when ecological concerns became critical. In 1990 McDowall wrote of the papanoko: 'The location of the spawning site, spawning behaviour . . . are completely unknown . . . What happens after spawning is also unknown'.<sup>27</sup> Of the shortjawed kokopu: 'Because the shortjawed kokopu has not been encountered very frequently, there is still some doubt about where this species 'typically' lives . . . [it has] secretive habits . . . all the kokopu species were thoroughly confused by the earlier writers'.<sup>28</sup> In 1991 he wrote of the banded kokopu that 'virtually nothing' is known of spawning behaviour and choice of spawning sites, while 'absolutely nothing' is known about the life of banded kokopu at sea; 'even less' is known of the natural history of the giant kokopu; and 'little' is known about the koaro. The natural history of the shortjawed kokopu is 'virtually undescribed'.<sup>29</sup>

New Zealand's freshwater fish fauna was not understood by fisheries scientists until the 1940s, and it was not until the 1960s that scientific names for the inventory of 27 species had been stabilised. Thus, Maori knowledge has been recorded by researchers who could not adequately translate what they were told. McDowell noted that Elsdon Best and Te Rangi Hiroa wrote extensively about Maori capture and use of freshwater fish, but knew very little about the fish themselves.

McDowall attributes the neglect of Maori knowledge to there being no time overlap of knowledgeable scientists with knowledgeable Maori.<sup>30</sup> But in fact fisheries scientists do currently overlap with knowledgeable elders. Another explanation is offered.

The theoretical basis of Crown fisheries research is a theory of phylogenetic evolution. Here, the level of perceptual salience has been species distinctions. Possibly because determination of species (systematics) is the basis of conventional international science, and that is where fisheries scientists have secured their

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25. W J Phillips, *The Fishes of New Zealand*, New Plymouth, Avery, 1940

26. McDowall, *Natural History*, pp 409–410

27. McDowall, *Natural History*, p 291

28. McDowall, *Natural History*, pp 101–102

29. McDowall, *Conservation and Management of the Whitebait Fishery*, pp 16–18

30. McDowall, *The Whitebait Book*, p 84

professional reputation. No attempt has been made to find what theory underpins Maori naming where the level of perceptual salience is life cycle transformations.

Maori classification is neither evolutionary nor species specific, and biological scientists do not have adequate tools for investigating a knowledge base that is much more complex in its observations and organised by a different theory. Lacking appreciation, they have treated hapu knowledge of the fauna with scepticism, or ignored it. In 1990 McDowall wrote of the shortjawed kokopu, a species taken by Maori in the whitebait catch: ‘There is no evidence that the Maori were familiar with this fish’.<sup>31</sup>

Thus, in 1996, Maori knowledge had not been systematically investigated. Maori priorities had not set the agenda for freshwater fisheries research, and no institute of freshwater fisheries research had employed Maori to conduct research to develop their own knowledge base. ‘Who knows what it all means?’ McDowall asked in 1990. ‘There is now, seemingly, no way of finding out.’<sup>32</sup> However, Maori naming does have systematic meaning, and there are ways of finding out.<sup>33</sup>

## 5.5 RIVER-BASED KNOWLEDGE

Each New Zealand river has a unique character, a unique inventory of fish fauna, and a unique Maori fishing culture. Rivers which drain large areas of lowland swamp were formerly rich in fish: Manawatu, Waikato, Waihou. Rivers which drain the sandstone/papa landscapes from Hawke’s Bay to Cape Palliser are almost barren of fish. The Whangaehu is frequently contaminated by volcanic acids and has a sparse fish fauna. The five whitebait species enter different qualities of water: Giant kokopu inhabit coastal swamps close to the sea; banded kokopu enter brown, tannin-stained waters – Jackson Bay Stream has large numbers of banded kokopu. Koaro enter clear-flowing, rocky streams and penetrate far inland – the snow-fed Haast and Arawata Rivers have large numbers of koaro. Whitebait entering the warm, brown waters of the Waita River are nearly all inanga.<sup>34</sup>

Usually no more than five native fish species are found in one locality, and often there are only one or two species in a stream. As a consequence of all these factors, hapu interests in freshwater fish are different in each locality, and each hapu has its own property of knowledge, technology, and harvested resources.

In each river system, fish are moving up and down in accordance with their separate life cycles. In autumn, while inanga are migrating downstream to spawn on

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31. The shortjawed kokopu was named ‘banded trout’ by Westland colonists; it was described as a separate species in 1899, was not seen again by scientists until ca 1939, nor again until 1960 (McDowall, *Natural History*, pp 100–104). Since the 1860s biologists have regarded evolutionary theory as more accurate than other classifications, but each theory has a different objective: international biologists are reconstructing a history of descent with change (phylogenetic evolution) while Maori are correlating lunar and life cycles (lunar periodicity).

32. McDowall, *The Whitebait Book*, p 86

33. For example, combining archival research with the knowledge of contemporary elders, and comparing Maori records with related Austronesian languages.

34. McDowall, *The Whitebait Book*, pp 54, 55, 92, 119–28

estuarine sedges, smelts are migrating upstream to spawn on river sandbanks. Lampreys migrate in from the sea and upstream to spawn while eels migrate downstream and out to sea to spawn. Most inanga spawn and die in an annual cycle, while koaro and kokopu survive spawning and return upstream; banded kokopu live for possibly nine years.<sup>35</sup> In northern New Zealand eel fishing can go on virtually all year round but moving south, cold winter temperatures reduce eel activity and induce some hibernation.<sup>36</sup>

Thus, knowledge of fish movements is particular to each river system and to each hapu. Further, tribes have dialect differences, particularly in naming flora and fauna. Many circumstances have combined to produce a system of classification and naming amongst Maori which is complex and finely observed. Maori knowledge appears in Pakeha records as apparently disordered because no systematic account is taken of dialect differences, of the organising theory, and of the unique ecology of each river system.

### 5.6 MAORI NAMING OF THE FAUNA

Sometimes Maori names correspond with a scientifically defined species: papanoko is precisely the torrentfish, *Cheimarrichthys fosteri*. Sometimes Maori classification recognises wider groupings: toitoi has been recorded for *Gobiomorphus cotidianus*, common bully, *Gobiomorphus gobioides*, giant bully, and *Gobiomorphus huttoni*, redfinned bully;<sup>37</sup> possibly toitoi classes together all six native bullies. Juveniles may be classed together and distinguished at later stages: karawaka, in Ngati Whatua usage, are the juvenile fish of a number of galaxias species which migrate in together; as they move upstream and become adult they are distinguished by different individual names: inanga, koaro, kokopu. Some fish have both a common name and a reverential name: the torrentfish, commonly called papanoko, is named metaphorically te ika huna a Tane, the hidden fish of Tane.<sup>38</sup> Maori names are storehouses of natural history observation, with an organising theory that documents life cycle changes.

In 1990, Strickland published a dictionary of Maori names of freshwater fish, compiled from historical records. Some fish have a large number of names, but often the dialect origin, the local provenance, and the life-cycle stage are not recorded: *Galaxias brevipinnis* is named koaro at lakes of the central North Island Volcanic Plateau (Lake Taupo, Lake Rotoaira), and maehe at Lake Waikaremoana.

35. Some fish have multiple spawning seasons. Bluegilled bullies spawn some in spring, some in autumn. Common bullies in a Northland lake spawn some in February–March, some in July–August, some in November–December. The same species may spawn at different times in different locations: common smelt spawn in summer at Lake Ngapouri, but in winter at nearby Lake Okaro (McDowall, *Natural History*, pp 307, 313).

36. McDowall, *Natural History*, pp 16, 73, 427

37. Strickland, *Nga Tini a Tangaroa*

38. McDowall, *Natural History*, pp 286, 289. Papanoko, *Cheimarrichthys fosteri*, feed at the base of boulders where their fins act as depressors, so that the current flowing overhead anchors the fish on the bottom, where the velocity of the water is less fierce. Patterns on the body replicate breaking water.

Elsewhere, historical records have ascribed the names hiwihiwi (Ngai Tahu), kakawai, kowaro, maeha, miroiti, mohimohi (Te Arawa), ngohongoho (Te Arawa), pangare, raawai, raumahehe (Tuhoe), taiwharu, and tohitohi to this fish.<sup>39</sup> The dictionary is invaluable to researchers, but such a list of names does not convey the coherent body of knowledge with which Maori harvested a prolific resource in 1840.

As colonial naturalists renamed the freshwater fauna, and as fisheries scientists organised the names into phylogentic species, Maori names were displaced. By international rules for naming species,<sup>40</sup> a holotype must be formally described, and the description published and circulated. Under these rules, the oldest name takes precedence. Fisheries scientists did not give precedence to Maori names, as two examples will demonstrate.

At 1840 the torrentfish was named in different localities papanoko (Tuhoe), papangoko, papamoko, panoko, panokoreia, panonoko, panokonoko, mokomoko, papane, panepane, papauma, papaki, papakiuma, papapakiuma, parikoi, parikou, pariri, parihou, piripiri, powhatu, piripiri pohatu, and so on.<sup>41</sup> In 1874 the torrentfish was given a latin name, *Cheimarrichthys fosteri*. 'The specific name honours a Mrs Foster who first collected the fish from the Otira river'.<sup>42</sup> At 1840 the redfined bully was named titarakura, and so on.<sup>43</sup> In 1894 this bully was given a latin name, *Gobiomorphus huttoni*, honouring Sir Frederick W Hutton, director of the Canterbury Museum.<sup>44</sup>

After the 1960s, when scientific knowledge of the fauna had been more or less stabilised, the now fragmented Maori knowledge of a depleted fauna could have been re-empowered with research. In 1980 the Fisheries Research Division published *A Synoptic Check-list of the Freshwater Fishes of New Zealand*. The list was based on '15 years' intensive collecting by staff of the Fisheries Research Division and others'.<sup>45</sup> Maori names were omitted; no research allocation had been given to identification and systematisation of Maori names. Maori knowledge had been sidelined.

## 5.7 COMMISSION: LAWS AND ADMINISTRATIVE PROCESSES AFFECTING MAORI INTERESTS IN FLORA AND FAUNA

From 1846 the Crown encouraged introductions of new species with the 'Duties of Customs Ordinance, 1846' which removed duties on selected species. The Colonial

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39. McDowall, *Natural History*, p 415; Strickland, *Nga Tini a Tangaroa*. Common English names for koaro are mountain trout, climbing galaxias, and Matukituki whitebait.

40. The International Code of Zoological Nomenclature.

41. Strickland, *Nga Tini a Tangaroa*

42. McDowall, *Natural History*, p 289

43. Strickland, *Nga Tini a Tangaroa*

44. McDowall, *Natural History*, p 299

45. R M McDowall, *A Synoptic Check-list of the Freshwater Fishes of New Zealand*, Fisheries Research Division, 1980, p 5

Office in London was already familiar with the potential of introduced species to cause harm;<sup>46</sup> none the less, new introductions to New Zealand proceeded without research into their effects on the indigenous species which provided Maori with a self-sustaining economy.<sup>47</sup> An opinion published in 1872 stated, ‘The native species . . . are rapidly giving way . . . Not that the change is to be regretted, except from a zoological point of view’.<sup>48</sup>

From 1867 on, introduced game fish took precedence over indigenous fish in Crown management of waterways.<sup>49</sup> Trout were protected by closed seasons from 1867 and angling licences from 1892.<sup>50</sup> From 1896 Whitebait Regulations restricted harvesting of whitebait; otherwise indigenous freshwater fish were not protected by statute until 1983.<sup>51</sup> Through statutes, the Crown secured the colonisation of waterways with salmonid fish.

From 1840 to 1867 Pakeha settlers hunted indigenous birds and fish without statutory constraint. From 1867 to 1996 the Crown imposed closed seasons on the taking of scheduled indigenous game.<sup>52</sup> The schedules failed to protect many species in which Maori had economic and social interests, as the two examples demonstrate.

At 1840 hapu located around Central Plateau lakes maintained commercial and economic interests in koaro fisheries. From around 1880 on, acclimatisation societies and the Department of Internal Affairs stocked the Rotorua–Taupo lakes with brown and rainbow trout. In 1897, Rotorua Maori advised the Rotorua Town Board that trout had depleted their indigenous koaro fishery. As the koaro populations declined, the Rotorua–Taupo lakes were re-stocked with indigenous common smelt to support the trout fishery. During the 1930s smelt became

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46. ‘By the end of the seventeenth century the spread of goats in the wake of European expansion was creating ecological difficulties on a global scale.’ See, for example, reports by Governors Roberts, Byfield, and Brooke on St Helena during the eighteenth century (R H Grove, *Green Imperialism*, Cambridge University Press, 1995, p 108).

47. In 1873 Hutton warned that indigenous fish would have no defence against predatory introduced fish (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). In 1941 Stockell warned that fishery control was ‘blindfold’ (G Stockell, *Wild Life Control*, Wellington, Blundell). In 1990 McDowall conceded that there had been ‘only minimal explicit study of the relationship between indigenous and exotic fish faunas’ (McDowall, *Natural History*, p 461).

48. Cited in R M McDowall, *Gamekeepers for the Nation*, Christchurch, Canterbury University Press, 1994, p 36. In 1990 the impact of introduced fish on indigenous fish and their food resources remained still largely unknown and unresearched (McDowall, *Natural History*, p 461).

49. The Resource Management Act 1991 required water quality in streams to be adequate for trout; no provision has ever been made for water qualities required by indigenous fish.

50. The price of an angling licence was recorded around 1900 as 10s for a single river and 20s for a ‘roving’ licence, beyond the budget of many Maori families. McDowall notes that acclimatisation society records show they were selling angling licences from the 1860s, although the 1867 Salmon and Trout Act does not mention licences. Under the Animals Protection Act 1866 a licence to hunt game and native game cost £5 (five pounds), a price beyond the budget of most Maori families. Under the Animals Protection Act 1867 a person under the age of 15 who hunted game or native game without a licence could be whipped (McDowall, *Gamekeepers for the Nation*, pp 56, 65, 67).

51. Freshwater Fisheries Regulations, 1983

52. Closed season for native pigeon from 1896. Closed season for pigeon, pukeko, kaka from 1901. Closed season for whitebait from 1896.

established in place of the koaro, foreclosing on the possibility of the koaro fishery being recovered.<sup>53</sup> Thereafter, introduced salmonid fish dominated the Central Plateau lakes.

Eels are the fish most prized by Maori in their freshwater fisheries. At 1840 New Zealand waterways still retained stocks of very large longfin eels. From 1866 some indigenous fauna (hawks, shags, eels, and so on) were classed by statutory bodies as vermin. By 1900 acclimatisation societies were promoting public vermin extermination campaigns to eradicate eels from waterways occupied by trout. These campaigns continued until around 1977. Large eels were particularly targeted. Since 1975 commercial fisheries records have shown a continual decline in numbers and size of eel captures.<sup>54</sup>

### **5.7.1 The Fisheries Conservation Act 1884**

This Act did not recognise any Maori interests in the fauna. The Act prescribed regulations for the harvesting and selling of oysters, seals, and specified fish. These regulations could be altered by the Governor in Council. Hereafter the Crown, not Maori, exercised authority over the fauna.

This Act prohibited 'the casting of sawdust or any saw-mill refuse into any waters, river, or stream' (section 5(12)). This was amended in 1903 to allow the Governor to make regulations 'Preventing the pollution of streams in which trout or salmon exist'. Depositing mining tailings in streams was not held to be pollution under this Act (section 3 of the Fisheries Conservation Act Amendment 1903, No 5). The habitats of indigenous fish were given no protection from pollution by flax mills, saw mills, farm effluent, and toxins.

### **5.7.2 The Whitebait Fisheries Regulations 1894, 1896**

In 1887 commercial canning of whitebait began. From 1894 certain techniques of whitebait trapping favoured by Maori were outlawed: construction of weirs (groynes) across the current, and construction of diversion channels in stream banks. From 1896 a closed season was imposed.

### **5.7.3 The Fisheries Act 1908**

Under this Act the Governor-General could declare any species of fish protected, and could set apart bays where fish propagated, within or outside any harbour (section 10). Management of freshwater fisheries was accorded to acclimatisation societies, and in their absence to the Department of Internal Affairs. It is acknowledged that freshwater fish did not receive protection under their management.<sup>55</sup>

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53. McDowall, *Natural History*, p 113

54. McDowall, *Gamekeepers for the Nation*, p 124

55. Fisheries scientists at the National Institute of Water and Atmosphere, personal communication, 1996

The Act declared: ‘Every person . . . who wilfully destroys or causes to be destroyed any fresh fish fit for human consumption is liable to a fine . . .’ (section 54). None the less, acclimatisation societies continued to destroy and bury hundreds of thousands of eels in public campaigns.<sup>56</sup>

The Arawa Maori Council (from 1955 the Arawa Maori Trust Board) received entitlement to 20 angling licences at 5 shillings each. A holder was entitled to fish for trout within the Arawa Maori District, ‘for the use and consumption of himself and the members of his family, and for no other purpose whatsoever’ (section 2).

#### **5.7.4 The Wildlife Act 1953**

The Act declared ‘. . . all wildlife is hereby declared to be . . . absolutely protected throughout New Zealand’ (section 3, Part 1, Protection of Wildlife). It was an offence to hunt protected wildlife (section 63). Acclimatisation societies continued to notify their memberships of extermination campaigns against eels, and Government departments participated in some campaigns.<sup>57</sup> It is acknowledged that ‘wildlife’ in the 1953 Act did not include freshwater fish. Acclimatisation societies voluntarily ceased their extermination campaigns against eels around 1977.

#### **5.7.5 The Conservation Act 1987**

This was the earliest legislation requiring Maori values in flora and fauna to be recognised. The Department of Conservation was established, and took over responsibility for conservation of native freshwater fish and for managing freshwater fisheries.

#### **5.7.6 The Fisheries Act 1983**

Taking acclimatised fish without a licence was prohibited (section 68). Pollution of fresh waters, estuaries, and spawning grounds was unlawful (section 75). The Governor-General could require and authorise ‘the provision of devices and facilities to permit or control the passage of fish through or around any dam or other structure impeding the natural movement of fish upstream or downstream’ (section 90(f)).

Freshwater fisheries regulations included: eels, whitebait, and indigenous fish could be taken for human consumption. Sale of koura was unlawful (Part 10, section 71). Freshwater fish were protected: ‘No person shall in any water intentionally kill or destroy indigenous fish’ (Part 10, section 70), and ‘No person, having taken indigenous fish from any water, shall leave the fish upon the bank . . .’ (Part 10, section 70).

The regulations provided for the unhindered passage of freshwater fish along inland waterways (Part 6, Fish Passage).

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56. McDowall, *Gamekeepers for the Nation*, p 121

57. *Ibid*, p 120

The Fisheries Act 1983 gave acclimatisation societies responsibility for protection and management of freshwater fish. They were to be responsible for the conservation of all indigenous freshwater fish species and their habitats within their districts of administration (section 71).

Sections of this Act, relating to the societies' functions, were written by the acclimatisation societies themselves.<sup>58</sup>

The Act did not provide for mandatory protection of freshwater fish by the Societies and there is no record of the acclimatisation societies negotiating with forestry, pastoral, and agricultural organisations to protect the habitats of indigenous fish, nor with regional councils to redesign culverts and dams, revegetate marginal strips, nor re-engineer waterways in the interests of indigenous fauna. To 1996, in waterways nationwide, culverts, fords, weirs, and dams impede the migrations of fish, while eels removed from drains by draglines are left to die in the sun.

### 5.7.7 The Conservation Law Reform Act 1990

This Act provided immunity from prosecution for 'Any person who, having unintentionally taken any freshwater fish . . . immediately returns the fish with as little injury as possible, to the water' (Part VB Freshwater Fisheries, section 26ZG).

In this Act, management of the fauna was accorded to the Crown: 'In respect of any freshwater fish other than sports fish, the Director-General may, from time to time . . . determine a closed season . . .' (Part VB 26ZP Determination of closed seasons for fishing) and 'the Governor-General may . . . prescribe a total allowable catch in respect of any freshwater fish . . .' (Part VB 48A).

Landowners and land occupiers were permitted to fish without licence from waters which passed through their land (Part VB, section 26ZO). Where the Act dealt with rights of landowners and with taking sports fish without licence, Maori fishing rights were acknowledged with the clause 'Nothing in this Part of this Act shall affect any Maori fishing rights' (Part VB, section 26ZH).

Maori were prohibited from taking introduced sports fish without a licence (Part VB 26ZI), unless they were the occupiers of the land: 'Subject to this Act, any person who is the lawful occupier of any land may fish on such land or waters within that land without a licence . . .' (Part VB 26ZO).

Acclimatisation societies were replaced with fish and game councils.

### 5.7.8 The Resource Management Act 1991

This Act provided for 'The protection of significant habitats of indigenous fauna' and for 'The relationship of Maori and their culture and traditions with their ancestral lands, water, sites, waahi tapu, and other taonga (Part 2, section 6); for 'Kaitiakitanga', 'Intrinsic values of ecosystems', Maintenance . . . of the quality of

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58. McDowall, *Gamekeepers for the Nation*, p 59

the environment', and 'Any finite characteristics of natural and physical resources' (Part 2, section 7).

'The protection of the habitat of trout and salmon' was specifically required (Part 2, section 7). No indigenous fish received specific protection of its habitat, although the endangered status of some species had been noticed by the International Union for the Conservation of Nature in 1981.<sup>59</sup>

Regional councils were accorded 'control of the use of the land' for the purpose of 'The maintenance of the quantity of the water in water bodies', 'taking, use, damming, and diversion of water', 'Discharge of contaminants into and onto land, air, or water', and so on (Part 2, section 30). In 1996 thousands of kilometres of streambed were still unavailable to fish passage.

Since 1983 legislation has provided for the protection of indigenous fish and their habitats. In 1996 neither the fish and game councils nor the regional councils, both statutory bodies, had discharged their statutory responsibilities. Swamp drainage and the straightening of drains continued nationwide. Dragline operators left eels to die in the sun. Culverts and dams continued to block upstream migrations of fish; property owners continued to receive permits to draw off water; household and farm sewerage continued to be diverted into streams; stream banks remained unforested; spawning grounds remained unfenced. Some fisheries scientists have concluded that Maori interests in freshwater fisheries will not be realised through legislation. What is needed is a spirit of cooperative willingness to restore waterways.

Five statutory processes deprived Maori of their harvests from freshwater fisheries:

- (a) From around 1864 acclimatisation societies colonised waterways with introduced game fish. They were statutory bodies, supported by the statutes, with a prior interest in predatory game fish.
- (b) Native fish populations were weakened by predation and competition for territory and food supplies in many locations, or were eradicated. Longfin eels and shortfin eels were eradicated in vermin extermination campaigns throughout the country, in an attempt to secure the establishment of trout.
- (c) The Crown (from 1892) and later the acclimatisation societies (from 1951) pre-empted rights over the harvesting of New Zealand waterways (through sale of licences and prosecution). Up to 1996 the Crown has maintained that Maori do not have special rights in the whitebait fishery. The Crown pre-empted rights over management of harvests (through closed seasons and prosecution) and over management of waterways (through Water and Soil Conservation Act 1967, Water Pollution Act).
- (d) Maori practices (taking fish only for food; trapping at times of optimal food value; maintaining purity of waterways), based on long experience of the fauna, were not incorporated in the statutes or were not enforced.

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59. G R Williams and D R Given, *The Red Data Book of New Zealand*, Wellington, Nature Conservation Council, 1981; McDowall, *Natural History*, 1990, pp 94, 104, 151

- (e) Habitat protection (retention of swamplands, afforestation of stream verges, estuarine reservations, headwater reservations, fish passes at dams, fords, and culverts) was not mandatory or was not enforced.

Conservation statutes enacted from 1846 to 1996 document the Crown's protection of its own interests in introduced fauna.<sup>60</sup> They document processes by which Maori lost rangatiratanga over the indigenous flora and fauna. The waterways, and Maori knowledge of the river fauna, were colonised, just as the land had been.

## 5.8 THE LOSS SUSTAINED

The statutes displaced Maori interests in the indigenous fauna with interests in an introduced fauna.

Statutes removed indigenous freshwater fauna from the values accorded in Maori economy, and re-assigned them according to the interests of colonial settlers. So Maori lost their economic and social interests in the flora and fauna: hawks, shags, and eels became vermin.

Statutes removed indigenous fauna from the authority of local land-holding groups and gave discretionary powers to the Crown to declare the length of closed seasons, to schedule species as protected or unprotected. Iwi and hapu lost rangatiratanga over the fauna of their whenua.

Statutes protected the conditions for introduced fauna to thrive and did not provide for the needs of indigenous fauna. Predatory game fish displaced native fish from lakes and waterways. Spawning grounds of inanga and kokopu were and continue to be damaged by stock and logging. Maori lost their self-sustaining harvests.

The fragmentation of faunal resources in which Maori have economic interests, and the accompanying fragmentation of Maori knowledge, is highlighted by reports on thriving populations of introduced sports fish. These introductions were supported by Crown statutes, Government funding and research, and public participation. Brown trout, for example, were introduced in the 1860s and by the 1920s their acclimatisation was a 'phenomenal success . . . the most successful piece of acclimatisation work undertaken in this colony'. After rainbow trout were introduced in the 1880s, 'a policy of stocking rivers and lakes was pursued vigorously, with spectacular successes in the lakes of the central North Island . . . forms the basis for important and valuable recreational fisheries'. Tench were introduced in 1867. 'As a result of their growth to large size in New Zealand waters, tench are now a prized target of a significant group of course fishermen in the Auckland area'. Rudd were introduced around 1967 and by 1990 they were 'well established . . . widely present . . . very boring and not favoured as food'. Koi carp

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60. That is, the statutes give priority to trout; trout compete with indigenous fish for territory and food. Water conditions that are optimal for trout are not the conditions optimal for indigenous fish; trout will be found in mid-stream, exposed to light, where indigenous fish require forest cover and overhanging banks.

were released around 1980. Ten years later they are ‘an undesirable species for New Zealand . . . aggressive colonists of new habitats . . . growing rapidly in the Waikato’.<sup>61</sup>

During a millenium of Maori occupation, New Zealand river systems teemed with migrations of freshwater fish. Hapu living along the banks of rivers observed the fish in their local waters; overall, Maori have an interest in every one of the 27 species and their population variants. These interests are in the harvesting of a self-sustaining resource for subsistence (economic), trade (commercial), and social-ceremonial purposes. The resource (harvest, technology, and knowledge) comprises both whenua and taonga:

the methods of procuring fish were based upon careful observations of the generations of fishermen who studied the habits, food supplies and seasons of the various fish frequenting the waters that formed an important part of the tribal territory.<sup>62</sup>

Crown policy (through Marine Department, Ministry of Agriculture and Fisheries, Department of Conservation, NIWA, and the universities) has been to insist upon the exclusive use of an international system of classification, while ignoring the knowledge developed by indigenous New Zealanders during a long acquaintance with the biota. This policy has been a critical factor in the loss to New Zealand of the resource itself, for want of appreciation of the resource and for want of understanding of the ecological and habitat protection it needs.

The river fauna is now depleted and marginalised, surviving precariously in remnant forest swamps: ‘The general abundance and distributions of virtually all indigenous fishes in New Zealand’s fresh waters have declined since the European settlement of the country’.<sup>63</sup> It is not possible for fisheries scientists to construct a body of knowledge which can compare with the minutely detailed contributions of each hapu to the collective body of knowledge acquired by Maori from astute observations and wily interactions, made when New Zealand river systems coursed with migrating fish. Twenty species of introduced fish have now colonised the waterways and a new saga has begun.

World science has lost a complex and astutely observed body of knowledge of an ancient fauna. Maori have lost a resource of prolific abundance, and a body of knowledge and technology which at 1840 procured harvests sustaining their people in well-being and prosperity. By means of forest clearance, swamp drainage, pine forestry, and the introduction of predatory salmonid fish, this prosperity was lost to Maori in favour of a market economy in which most Maori have experienced marginalisation and impoverishment.

Up to 1996, Maori knowledge of river fauna has not received research and development funding which would enable Maori to develop the 1840 knowledge

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61. McDowall, *Natural History*, pp 186–188, 231–243

62. Te Rangi Hiroa (P Buck), ‘The Maori craft of netting’, in *Transactions and Proceedings of the New Zealand Institute*, vol 56, 1926, pp 597–646; McDowall, *The Whitebait Book*, p 84

63. McDowall, *Conservation and Management*, p 4

base in its own direction. A theory of lunar periodicity does not necessarily lead to a policy of 'preserving biogenetic diversity'. Nor does it necessarily lead to 'copyrighting intellectual property'. It does lead to protection of riparian zones and marginal strips; to guardianship of stream beds, stream environments, stream headwaters, and estuaries; to unhindered passage for migrating fish; to purity of water; and to good reasons for not mixing one water-system with another.<sup>64</sup>

### **5.9 COMMISSION: WHETHER MAORI WERE DEPRIVED OF INTERESTS BY SUCH POLICIES OR WHETHER THEIR INTERESTS WERE DIRECTLY OR INDIRECTLY SAFEGUARDED AND IF THERE WAS A LOSS OF INTERESTS WHETHER THAT LOSS WAS COMPENSATED**

As the statutes were passed, Maori lost rangatiratanga over the indigenous flora and fauna. Today the resource provides little sustenance.<sup>65</sup> With Animal Protection Acts, Conservation Acts, and Resource Management Acts the indigenous biota became a taonga of the Crown, a prohibited Gondwanaland remnant safe-kept on offshore refuges. On the mainland an introduced biota flourishes in its place.

#### **5.9.1 Wildlife schedules**

Decisions on the scheduling of wildlife in statutes were made in the interests of an introduced fauna. Native hawks, shags, and eels were excluded from protection in the interests of introduced game in the Animals Protection Act 1907; the Animals Protection and Game Act 1921; and the Wildlife Act 1953. In the Fisheries Act, 1983 the acclimatisation societies wrote the statutes that governed them.<sup>66</sup>

##### **(I) *The Animals Protection Act 1907***

The Animals Protection Act 1907 was 'An Act to consolidate and amend the Law for the Protection of Animals and for the Encouragement of acclimatisation societies'. Acclimatisation societies were accorded statutory powers to pursue their interests under sections 52–57. Maori interests in faunal management were not considered.

Acclimatisation societies and the Minister of Internal Affairs were accorded property rights in introduced fauna – section 55. Maori were not granted property rights in their technology, knowledge, and harvests.

The Governor (under sections 5, 20, 24, 25, 28, 50) and the Minister of Internal Affairs (under section 33) were accorded authority over scheduling, harvesting,

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64. In some species, fish migrating in from the sea possibly locate their ancestral streams by the smell of the water. Each stream is the territory of a limited number of species and when waters are mixed roe may be transferred, altering long-established balances.

65. 'The general abundance and distribution of virtually all indigenous fishes in New Zealand's fresh waters have declined since the European settlement of the country' (McDowall, *Conservation and Management*, Wellington, New Zealand Department of Conservation, 1991, p 4).

66. R M McDowall, *Gamekeepers for the Nation*, Christchurch, University of Canterbury Press, 1994, p 59

5.9.1(1) THE LAND WITH ALL WOODS AND WATERS

hunting, and selling of indigenous fauna. The Governor could regulate ‘the season during which godwits may be killed’ and ‘the taking of any imported game or native game within any domain or forest reserve’ (section 50(h, i)).

The Act contained six schedules:

- First Schedule: Imported Game [deer, pheasants, and so on].
- Second Schedule: [Specified indigenous fauna scheduled as ‘native game’, and subject to closed seasons, purchase of licences for hunting and selling, prohibitions on trapping, snaring, and netting techniques, and hunting in reserves: kereru, kuaka (godwit), wild duck, and so on – sections 19, 27].
- Fifth Schedule: Birds, Animals, and Reptiles to be protected [Specified indigenous fauna able to be protected, but meanwhile able to be hunted and sold: kaka, huia, kiwi, and so on – section 25].

INSERT FIGURE 1.1

**(2) *The Animals Protection and Game Act 1921***

The Animals Protection and Game Act 1921 contained four schedules:

- First schedule: Animals Absolutely Protected [tuatara, kereru, kaka, huia, and so on. Native shags, hawks, and all native fish were excluded].
- Second Schedule: Imported Game.
- Third schedule: [Specified indigenous fauna scheduled as ‘native game’ and subject to closed seasons, licence fees, fines for breach, bag limits, hunting areas, and prohibitions on the use of traps, nets, and snares: grey duck, godwit, and so on]. Introduced possums were protected (Part 3). No protection was given to native hawks, shags, and fish.

INSERT FIGURE 1.2

5.9.1(2)

THE LAND WITH ALL WOODS AND WATERS



5.9.1(2)

THE LAND WITH ALL WOODS AND WATERS



**(3) *The Wildlife Act 1953***

The Wildlife Act 1953 contained eight schedules:

- First Schedule: Wildlife Declared to be Game [fauna that could be hunted only with an acclimatisation society permit: all indigenous ducks, pukeko].
- Second Schedule: Partially Protected Wildlife [wildlife that could be shot under specified circumstances to protect introduced game: indigenous gulls, bush hawks].
- Third Schedule: Wildlife That May be Hunted or Killed Subject to Minister's Notification [wildlife hunted by certain hapu: ducks, pukeko, weka mutton birds, petrels; wildlife predatory of introduced fauna: little shag, pied shag].
- Fourth Schedule: Wildlife Not Protected, Except in Areas and During Periods Specified in Minister's Notification.
- Fifth Schedule: Wildlife Not Protected [harrier hawks, kea, black shags, skinks, geckos. Acclimatisation societies were free to treat these species as vermin and offer bounties.]
- Sixth Schedule: Animals Declared to be Noxious [pigs]

INSERT FIGURE 1.3



5.9.1(3)

THE LAND WITH ALL WOODS AND WATERS



