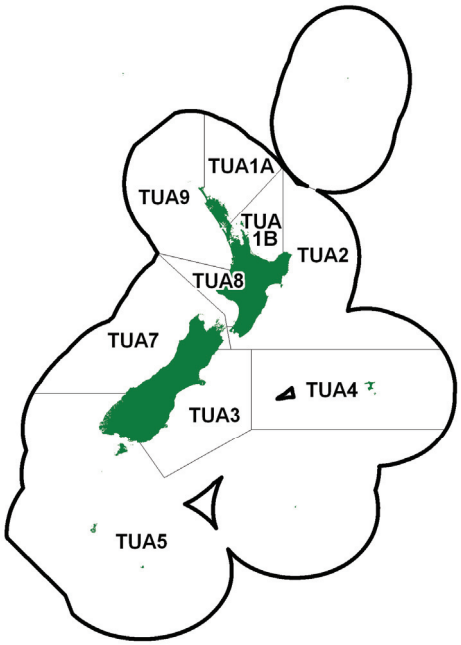
TUATUA (TUA)

(*Paphies subtriangulata*)
Tuatua



1. FISHERY SUMMARY

1.1 Commercial fisheries

Tuatua (*Paphies subtriangulata*) were introduced into the QMS on 1 October 2005. The fishing year runs from 1 October to 30 September, and commercial catches are measured in greenweight. QMA boundaries for tuatua were set the same as those established for FMAs, except for FMA 1 (the area between North Cape and Cape Runaway), which was divided into two QMAs, TUA 1A and TUA 1B, on either side of Te Arai Point (Pakiri Beach). The formerly specified historic commercial areas within TUA 1B (Papamoa domain to Maketu Beach, Bay of Plenty) and TUA 9 (i.e., Ninety Mile Beach, Hokianga Harbour to Maunganui Bluff, and specific areas between Maunganui Bluff to the North Head of the Kaipara Harbour) were revoked, and regulations were amended to remove the commercial daily catch limits for tuatua, which were no longer applicable. Commercial fishing was allowed to continue only in TUA 9 in the specified commercial area of the Kaipara Harbour entrance. A TACC of 43 t, which reflected the average of the reported landings taken from the Kaipara fishery between 1990–91 and 2003–04, was allocated to the TUA 9 stock in recognition that commercial tuatua fishing was constrained to the Kaipara Harbour entrance.

There is no minimum legal size (MLS) for tuatua, although fishers probably favour large individuals. Tuatua are available for harvest year-round, so there is no apparent seasonality in the fishery. Significant landings since 1989–90 have been reported from TUA 1 and TUA 9 only (Table 1), and there have been no reported landings from TUA 5, TUA 6, and TUA 8. Between 1989–90 and 1993–94, landings from TUA 1 averaged 85 t, but subsequently decreased substantially, and no further landings were reported from 2000–01. Landings from TUA 9 reached a peak of 192 t in 1997–98, and subsequently decreased, ranging from 4 to 76 t (average 32 t) between 1998–99 and 2003–04. This decline in commercial catches from the Kaipara bed is probably related to historic participants retiring from the fishery. The commercial effort had greatly reduced by 1992, post moratorium implementation, and catches have been influenced by the fact that commercial fishing is intermittent with only one or two fishers involved. No landings were reported from TUA 9 for 2004–05 to 2008–09.

Table 1: Reported landings (t) of tuatua (*Paphies subtriangulata*) by Fishstock from 1989–90 to 2008–09. Data up to 2003–04 taken from page 163 of MFish's Initial Position Paper (IPP), dated 31 March 2005, data since from CELR and CLR (early CELR and CLR data erroneously record commercial landings from FMA 9 as FMA 1 because permit holders were not filling in the forms correctly). There have been no reported landings of tuatua in TUA 5, TUA 6, and TUA 8. There were no landings reported from 2004–05 to 2008–09. Tuatua were introduced into the QMS on 1 October 2005; a TACC of 43 t was allocated (to TUA 9 only), and FMA 1 was divided into TUA 1A and TUA 1B.

Year	TUA 1	TUA 2	TUA 3	TUA 4	TUA 7	TUA 9	Total		TACC
1989–90	0	0	0	0	0	69.015	69.015		–
1990–91	0	0	0	0	0.176	68.245	68.421		–
1991–92	0	0	0	0	1.667	82.002	83.669		–
1992–93	0	0	0	0	0.891	109.280	110.171		–
1993–94	0	0	0.042	0	0	177.165	177.207		–
1994–95	0	0	0	0	0	182.262	182.262		–
1995–96	0	0	0	0	0	100.016	100.016	*	–
1996–97	0	0	0.125	0	0.005	68.575	68.705		–
1997–98	0	0	0.184	0	0	192.262	192.446	*	–
1998–99	0	0	0	0	0	76.205	76.205		–
1999–00	0	0	0	0	0	44.450	44.450		–
2000–01	0	0	0	0	0	16.150	16.150		–
2001–02	0	0	0	0	0	4.900	4.900		–
2002–03	0	0	0	0	0	36.160	36.160		–
2003–04	0	0	0.054	0	0	34.336	34.390		–
2004–05	0	0	0	0	0	0	0		–
2005–06	0	0	0	0	0	0	0		43.000
2006–07	0	0	0	0	0	0	0		43.000
2007–08	0	0	0	0	0	0	0		43.000
2008–09	0	0	0	0	0	0	0		43.000

1.2 Recreational fisheries

Tuatua support an extensive recreational fishery, with harvesting occurring in all stocks wherever there are accessible beds, particularly in the upper North Island. Tuatua are harvested entirely by hand gathering, and there is no MLS (although large tuatua are preferred).

There is a recreational daily catch limit of 150 tuatua per person, except in the Auckland - Coromandel region where the limit has been 50 per day per person since November 1999.

Currently, there are no reliable estimates of recreational harvest of tuatua. Estimates of tuatua catch by recreational fishers have been made on three occasions (1996, 1999–2000, and 2000–01) as part of national recreational fishing (telephone and diary) surveys. These estimates indicate that the majority of recreational tuatua harvests were taken from QMA 1, moderate harvests were taken from QMA 9, and smaller quantities were taken from other areas. A review by the Marine Recreational Fisheries Technical Working Group concluded that these estimates were not likely to be reliable. The current level of recreational harvest and its impact on the status of tuatua beds are unknown. There are concerns about the depletion of popular tuatua beds in some areas, whereas in other areas it appears they are in a healthy state.

1.3 Customary non-commercial fisheries

In common with many other intertidal shellfish, tuatua are an important customary species taken as kaimoana. Both oral tradition and the numerous middens of *P. triangulata* shells around the coastline clearly show this fishery has been an important one to Maori for at least several hundred years. However, no quantitative information on the level of customary non-commercial take is available.

1.4 Illegal catch

The illegal catch of tuatua is probably significant in some areas, with some recreational fishers exceeding their bag limit, but no quantitative information on the level of illegal catch is available.

1.5 Other sources of fishing-related mortality

No quantitative information on the level of other sources of mortality is available. Tuatua are generally sedentary and beds are susceptible to localised depletion, not only by harvesting pressure, but also by habitat disturbance and degradation. Incidental mortality of tuatua is likely in the Kaipara Harbour dredge fishery if tuatua are damaged during encounters with the dredge. Changes in bank stability could arise from dredging operations and might cause additional incidental mortality. However, the level of dredge-related mortality is unknown. As suspension feeders, tuatua may also be adversely affected by high sedimentation loads in the water column. In some areas, such as Ninety Mile Beach, Dargaville and Muriwai, vehicles driven along the beach pass directly over tuatua beds, increasing mortality either directly by damaging tuatua or indirectly by adversely modifying surface sand conditions leading to desiccation of tuatua.

2. BIOLOGY

Tuatua (*Paphies subtriangulata*) belong to the family Mesodesmatidae, a group of moderate to large wedge-shaped surf clams that include toheroa (*Paphies ventricosum*), deepwater tuatua (*Paphies donacina*), and pipi (*Paphies australis*). *P. subtriangulata* is extensively distributed around New Zealand in localised abundant populations, but mainly occurs around the North Island, and at more scattered locations in the northern South Island, Stewart Island, and the Chatham Islands.

Tuatua are ecological markers of fine, clean, fluid sands on ocean beaches with moderate wave exposure The densest beds are found in the zone from the low intertidal to the shallow subtidal (down to about 4 m depth). The tuatua is a suspension feeder with short siphons. It is usually wedged only a few centimetres into the sand, with the straight siphonal end often characteristically exposed and discoloured by a green or brown algal film. Individuals are often dragged about the surface and redistributed by swash and backwash before actively burrowing back into the sand.

Tuatua have separate sexes (1:1 sex ratio) and reproduce by broadcast spawning, synchronously releasing eggs and sperm into the water column for external fertilisation. In north-eastern New Zealand, two main spawning periods have been documented, one between September and November, the other between February and April. Spawning events have been observed *in situ* at high water on a number of occasions, with only a small proportion of the population participating in each event. These spawning events were synchronous with pipi spawning in the same area.

Planktonic larval development takes about two to three weeks, so larvae have the potential to disperse widely if conditions allow. Larval settlement is thought to occur high in the intertidal, but spat and juveniles are highly mobile, moving around with the tidal flow before reburying themselves rapidly. Tuatua appear to migrate down the beach to occupy the lower intertidal and shallow subtidal as they grow larger. Growth appears to be rapid but variable, with tuatua reaching 40–70 mm shell length in about 3 years. Maximal length is variable among areas, ranging from about 50 to 80 mm, and the maximum age is probably about 5 or more years. Highly variable recruitment has been observed on the northwest coast of the North Island, and this is likely to occur in other areas. As in other surf clams, natural mortality is likely to be high.

A length-weight relationship has been estimated for tuatua sampled from East Auckland, and a southern population (probably Dunedin) where weight (in g) = a (length (in mm))^{b} , where a = 0.2 x 10^{-3} and b = 2.927. Data source: D. Allen (MFish) unpub. datas. Because the samples were from one northern and one southern population, the estimated relationship may not be representative of other populations.

3. STOCKS AND AREAS

Little is known of the stock structure of tuatua. There have been no biological studies directly relevant to the identification of separate stocks of *P. subtriangulata* around New Zealand, although “stocks” are likely to be linked by larval dispersal. For management purposes stock boundaries are based on QMAs,

with the exception of TUA 1, which was divided into TUA 1A and TUA 1B on either side of Te Arai Point because there are likely to be significant differences in the state and use of the tuatua beds between the Northland and Hauraki Gulf / Bay of Plenty areas, and the respective alignment of recreational and customary fishing interests to those management areas. The circulation patterns that maintain the separation of the surf zone habitat to form a self contained ecosystem also retain planktonic larvae of surf clams probably isolating surf clams genetically as well as ecologically.

4. ENVIRONMENTAL EFFECTS OF FISHING

4.1 Seabed disturbance

With the exception of the TUA 9 dredge fishery in the Kaipara Harbour entrance, all tuatua are harvested by hand gathering, a low-impact method which causes minimal disturbance to the seabed. Commercial dredging for tuatua in the Kaipara Harbour entrance undoubtedly disturbs the seabed to some extent, but the environmental and ecosystem consequences of this disturbance are unknown. The surf zone is a high-energy environment subjected to frequent natural disturbance and high sand mobility. There is probably a considerable natural movement of sand at the entrance to the Kaipara Harbour during each tidal cycle, and the impacts of dredging disturbance to the seabed in relation to natural disturbance processes are unknown. Widespread and intensive dredging, however, has the potential to adversely modify the benthic environment.

4.2 Incidental catch (fish and invertebrates)

Where tuatua are harvested by hand there is little, if any, by-catch of other species. A range of other benthic species may be taken in the Kaipara Harbour dredge fishery, but no information on the level of incidental catch of fish and invertebrates is available

4.3 Incidental catch (seabirds and mammals)

Not relevant to tuatua fisheries.

4.4 Community and trophic structure

The effects of harvesting tuatua on community and trophic structure are unknown. Tuatua beds represent important habitats for many coastal benthic communities, and tuatua are prey for a wide range of organisms, including starfish, paddle crabs, octopus, fish, and seabirds.

4.5 Spawning disruption

The effects of harvesting on spawning are unknown, but dredging in particular is likely to remove or disrupt the spatial aggregation of individuals necessary for successful spawning and fertilisation.

4.6 Habitats of special significance for the purposes of fisheries management

Habitats of special significance have not been defined for this fishery.

4.7 Biodiversity

The effects of fishing for tuatua on the maintenance and healthy functioning of the natural aquatic ecosystem are unknown. Tuatua probably help to maintain biological diversity by providing important food and habitat resources for other species, and by maintaining water quality and sediment stability in intertidal/shallow subtidal environments.

4.8 Aquaculture and enhancement

Not relevant to tuatua fisheries.

5. STOCK ASSESSMENT

5.1 Estimates of fishery parameters and abundance

There are no estimates of fishery parameters or abundance for any tuatua fishstock.

5.2 Biomass estimates

There is no time series of biomass surveys for tuatua both in the bed in the Kaipara Harbour entrance where commercial harvesting by dredge occurs now, or anywhere else that would indicate whether tuatua populations are changing in response to past and current levels of harvesting.

5.3 Estimation of Maximum Constant Yield (MCY)

MCY has not been estimated for *P. subtriangulata*.

5.4 Estimation of Current Annual Yield (CAY)

CAY has not been estimated for *P. subtriangulata*.

6. STATUS OF THE STOCKS

There are no estimates of biomass or sustainable yields of tuatua for any tuatua stock and the status of all stocks is unknown. Because natural mortality is high and recruitment is variable, the biomass of tuatua is likely to be highly variable.

7. FOR FURTHER INFORMATION

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