Report Name: Hauraki Gulf Forum Community Shellfish Monitoring Programme annual report 2010-2011

File no.:

Executive Summary

This report updates the Hauraki Gulf Forum on the community shellfish monitoring programme for the period 1 July 2010 to 30 June 2011. Thirteen sites were monitored over the period by schools, community groups and iwi supported by Auckland Council, Waikato Regional Council and Department of Conservation, with data from the surveys analysed by the Ministry of Fisheries. Close to 600 volunteers, including those from 11 schools, were involved in the programme. Sites are now located in both the Auckland and Waikato regions, although there is a clear dominance of sites within the Auckland region. The programme is developing useful long term monitoring information. The information from the programme is also used to support Ministry of Fisheries (MFish) monitoring of shellfish in the Hauraki Gulf, including informing trends and management decisions for areas in the region.

Cockle results are presented for all sites. Most beaches show either no significant change or an increase in cockle density since the last survey. For Kawakawa Bay West, and Te Matuku Bay, data recorded shows that there has been an increase in the size of cockles over the period of monitoring. Only one site, Whitianga Estuary, showed a decline in density since the last survey. The size of cockles at most sites has remained stable or fluctuated without an overall trend. The Whangateau Harbour is showing signs of stabilising cockle numbers after a cockle die off during the summer of 2008-09.

Pipi results are presented for the community monitored sites at Ngaio Bay, Okahu Bay, and the MFish monitored site at Whangateau Harbour. Pipi density has increased in Okahu Bay, but changes are not significant for other sites monitored. Pipi size data shows no significant variation in pipi sizes for the sites monitored.

Participating schools and community groups continue to experience educational benefits from the programme. With the support of coordinators and the project leader, training and development is available for individuals participating in the programme. Evaluation forms completed by teachers show the programme continues to be well received and supported by the schools involved. The message that kaitiakitanga is practiced by all[1] is emphasised throughout the programme.

Tangata whenua involvement with the programme continues to strengthen, and the first te reo translation of the teacher resource kit is expected to be published by the end of 2011. Iwi have been increasingly involved in site monitoring, and educating participants on kaitiakitanga and local histories of sites.

The joint partnering agreement between groups and agencies that form the project steering group was renewed on 1 July 2011. The new agreement will run through to 2014, and reaffirms each party's commitment to the project and the value of the programme. The outcomes of the project are useful to many groups, including MFish. MFish values the information from the project as it helps to inform fisheries management and science monitoring.

[1] Nā Betty Williams, tangata whenua representative on the Hauraki Gulf Forum 2000-2011

Recommendations

a) That the report be received.

b) That the Forum supports the scoping of potential reef monitoring and beach health monitoring programmes to replicate the success of the shellfish monitoring programme.

c) That a report on the feasibility of such programmes be reported back to a subsequent meeting of the Forum.

Background

Intertidal shellfish are a valued fishery resource (pätaka kai). They are valued as food by customary Maori and recreational fishers, as taonga by Maori, and as an indicator of the general well-being of the environment by others. Shellfish are also important within the food chain and make an important ecological contribution.

In 2006 the Forum agreed to lead and support a community/iwi/school based intertidal shellfish monitoring programme to detect trends in shellfish populations at selected beaches. A number of existing shellfish monitoring programmes undertaken under the leadership of Forum constituent parties at Te Matuku Bay, Cockle Bay, and Whangateau Harbour, were brought under the umbrella of the programme.

MFish also operates an intertidal shellfish monitoring programme as part of its responsibilities under the Fisheries Act. Both programmes are co-ordinated to support each other and MFish scientists analyse data from the Forum's programme. MFish surveys use a more scientifically rigorous and complex sampling method than the community surveys. However due to funding limitations, MFish surveys are not repeated annually at all sites where there are known shellfish resources. The community shellfish monitoring therefore compliments MFish monitoring by providing more frequent information and potentially earlier warning of intertidal shellfish depletions than is provided by its sampling alone. Community involvement helps to support the implementation and enforcement of management responses such as closures. It also provides scope for monitoring of sites where environmental rather than harvesting pressures may be driving shellfish population changes, which may not be a high priority for MFish funded monitoring,

The data collected by the various community surveys has been groomed for this report. This ensures that the results present are for consistent sample areas and therefore present the most accurate trend information.

It should be noted that the programme also collects data on a variety of other shellfish species. This report principally presents data on cockles. Data on pipi has been presented for two locations. Pipi trends for these locations have been included as the pipi data include size frequency information.

Analysis

Advances in the Programme

The community shellfish monitoring programme is now well established. A key strength of the programme is the well developed teacher resource kit, the coordinator guidelines and the provision of expert assistance during survey days. Close to 600 volunteers, including those from 11 schools from primary through to tertiary levels, are involved in the programme. This represents an increased participation rate of 25% since last year.

Iwi involvement in the programme has been strengthened this year. Representatives from Umupuia Marae have participated in briefing sessions at the start of all surveys in the Nga Tai rohe and led karakia to bless the activity. The survey at Okahu Bay has been undertaken for the third time by Ngati Whatua secondary school students taking part in the school holiday programme at Orakei Marae. Progress is being made in having the teacher resource kit translated into Te Reo Maori. This work is being done by Ngaati Whanaunga Incorporated Society (NWIS) and will sit alongside work the Iwi has done with NIWA for the estuarine tool kit 'Ko Ngaa Waihotanga Iho'. Ngaati Whanaunga is working with the Ministry of Education and Waikato Regional Council to deliver the tool kit to seven schools within the Thames Coromandel district. The bilingual shellfish monitoring tool kit has been developed to be part of an educational strategy of NWIS to promote kaitiaki practices, research and

development of “Ko Ngaa Waihotanga Iho” as a Maori language teaching and learning resource for tauira, and kaiako that is aligned with the curriculum reo used within science and maths. This is intended to assist with developing a Ngaati Whanaunga Marautanga, which will contribute to educational initiative of identity, language, and culture. It is an integrated agency approach through which Kaupapa A-Iwi is integrated into the school marautanga.

A new method of analysis has been used for one of the sampling sites, Whangateau – Lews Bay. The stratified analysis used for this site improves confidence of estimates of shellfish density and abundance. The stratified analysis can also analyse sites even when a station is temporarily omitted from monitoring, something the current analysis does not allow. As the programme continues, the stratified analysis method can be applied to more sites in the future.

New sites are being monitored by MFish this year as part of its obligations under the Fisheries Act. MFish monitored sites include Whangateau Harbour, Okoromai Bay, Cockle Bay and Umupuia Beach. Results from the surveys are included in this report, and these sites were surveyed using support from the local iwi where practical. Because the research methods used by MFish are different to those used by the community monitoring programme, the results of MFish research are not directly comparable to the results from community groups. Sites that are monitored by both community groups and MFish can validate the findings of both groups, by comparing general trends and estimates.

The community shellfish monitoring helps MFish by providing more frequent information and potentially earlier warning of intertidal shellfish depletions than is provided by its sampling alone. The community monitoring may also inform selection of sites to be sampled under MFish funded research in the future

Sites Monitored

Since the establishment of the community monitoring programme in 2006, the number of sites monitored has increased from 3 to 18. At most sampling sites a variety of shellfish species are recorded in addition to cockles and pipi, including wedge shells, nut shells and gastropods however these are not measured or reported as the sampling programme is focussed on the dominant shellfish species, which is in most cases is cockles.

The Pine Harbour site was added last year for Maraetai Beach School as Umupuia Beach is still unavailable due to a rāhui at the request of Ngai Tai ki Umupuia Te Waka Totara Trust. However, MFish conducted an intertidal survey at Umupuia in 2009.

Two new sites have been added to the programme during 2010-11: Wharekawa and a third site within Whangateau Harbour, near Horseshoe Island. Wharekawa Harbour (Opoutere) on the Coromandel Peninsula is the second site in the programme to be supported by Waikato Regional Council. Two surveys have been undertaken by Ecoquest at Wharekawa in September 2010 and February 2011.

The Horseshoe Island site was initiated by the Whangateau Harbour Care Group and Auckland Council in response to interest by Mahurangi College to take part in monitoring as the survey timing and nature of the other two established community survey sites (Lews Bay and the Causeway site) were not so well suited to the school’s needs. The Causeway site was not surveyed this year but will continue to be surveyed periodically. The MFish survey of Whangateau Harbour covered four different areas of the harbour and the results are included in this report.

Cockle Bay was not sampled during 2009-2011 due to changes in community group capabilities; however MFish conducted an intertidal survey at Cockle Bay in 2010. Cockle Bay is now due to be picked up as a community monitoring site by Howick College in 2011-12. Duder Regional Park was not surveyed this year, due to cultural safety concerns raised by iwi. Cheltenham Beach was not surveyed by the independent Cheltenham Beach Caretakers group this year.

One new site is planned to be added to the programme during 2011-12 at Gardiners Gap, Motutapu Island. This site was surveyed by the Cheltenham Beach Caretakers three times during the period 1996 -2003 and will be re-surveyed by students taking part in the 'Mad About Marine' programme, supported by Auckland Council, Department of Conservation and WWF.

A map showing the locations of the community monitoring sites is included as Attachment 3 and a map showing the locations of the MFish inter-tidal monitoring sites as Attachment 4.

Cockle Population Density Trends

Cockle density can be highly variable, both spatially and temporarily. This can be the result of either harvesting or natural events. No regional scale pattern is evident in the data, some sites are showing an increase and some are showing a decrease in densities. At this stage each site is best considered in the context of its own previous monitoring.

The monitoring site at Te Matuku Bay is located within the Te Matuku Marine Reserve. As such, harvesting of marine life, including shellfish, is prohibited and any population trends are the result of environmental changes. The cockle population at Te Matuku Bay has increased since 2009. Last year's report discussed a decrease in the average size of animals at Te Matuku. This year's data shows an increase in the average size of animals, possibly due to the larval settlement growing through into the population.

Other sites that have shown an increase in density are Kawakawa Bay East and West, Ngaio Bay, Whangapoua Harbour, and Wharekawa. The cockle density at Ngaio Bay continues to show a strong upwards trend, increasing from less than 100 to around 500 cockles per square metre since 2008.Whangapoua Harbour has also shown a strong increase in density since last year, from around 150 to 350 cockles per square metre.

Increases in cockle density at Okahu Bay is because of an increase in juvenile recruitment, however historic length-frequency data does not support the theory that the higher recruitment will grow into larger cockles at this area.

The Whitianga site was identified in the 2009-2010 report as having the highest cockle density of all the beaches monitored. The results this year show a significant decrease in density, from around 900 to 400 cockles per square metre. The decrease may be due to harvesting pressures or environmental factors.

Whangateau Harbour was the site of a significant cockle die-off in 2009. Since 2009 the Lews Bay area continues to appear stable. This confirms observations that the die-off has ceased, however estimated densities are still at least 32% lower than densities recorded in 2004 (as recorded either from the MFish or community monitoring).The new monitoring site of Horseshoe Island has a cockle density higher than that of Lews Bay, however trends will not be available until further monitoring of the site occurs. The density of cockles found at Horseshoe Island is relatively high compared to other monitoring sites in the Auckland region. Whangateau Harbour is one of two sites where monitoring is carried out by both the community and MFish.

A series of charts are provided in Attachment 1 showing the changes in shellfish density at the various monitoring locations.

Pipi Population Density Trends

At Ngaio Bay pipi density estimates have varied without any detectable difference between 2008 and 2011. At Okahu Bay mean pipi density estimates have varied from approximately 60-80 per square metre from 2007 to 2009 then increased to approximately 130 per square metre in 2011.

Sites monitored by MFish reported mixed levels of pipi. At Whangateau Harbour, the pipi population has remained relatively stable. Similarly, at Umupuia Beach, Cockle Bay and Okoromai Bay, pipi densities were less than ten per square metre for current and previous surveys.

Size Class Information

Size class information is an indication of the "wellness" of the population. Natural populations generally show a broad distribution of age classes, however, this can be affected by a number of factors. Human harvest is generally size selective, and populations subject to harvest pressure tend to show a decline in the number of larger animals. It is likely that a number of the sites where cockles larger than 30mm are uncommon or are decreasing in frequency are also experiencing environmental pressures.

A series of charts showing size frequencies from monitored sites are provided in Attachment 1.

Cockle Size Class Information

No regional scale pattern is evident in the data. Some sites are stable in terms of the size distribution of cockles and pipi, and at others the average size of shellfish is increasing or decreasing. At this stage, each site is best considered in the context of its own previous monitoring (when available).

For Whangateau Harbour – Lews Bay, the size distribution of the surveyed cockles confirms the mortality event of the summer of 2008-09. Prior to 2009, 25-30 mm cockles were the most common. Following 2009 the size structure has been rebuilding towards this, with the modal size in May 2010 being in the 25 to 30 mm size range. However, the number and proportion of large cockles is still relatively low compared to previous years. The average number of cockles of harvestable size sampled from 2004 to 2008 was 240 or 17% of all cockles sampled. The average number of cockles of harvestable size sampled from the same sites after the mortality event was 39 or 5% of all cockles sampled.

The MFish survey at Umupuia found that despite an increase in the total cockle population since the beach was closed to harvesting, the number (and proportion) of harvestable cockles still appeared to be in decline.

For Kawakawa Bay-West, the modal size of cockles has increased from 15-20mm in 2010 to 20-25mm in 2011. The Te Matuku site has also seen an increase in the modal length since 2010.The increases are typical of a large recruitment of cockles growing through the population. It is possible that next year's results from the sites will show the largest component of the population to be in the 25-30mm length range, provided that the cockles do not die off or are not harvested.

For Kawakawa Bay East, the size composition has varied over time with no detectable trend.

At the Beachlands and Beachlands, Motukaraka site, the size composition was found to be stable, with modal sizes being 15-25mm and 20-30mm respectively. Stable trends in cockle size were also observed at Ngaio Bay, Okahu Bay, Pine Harbour, Whangapoua Harbour and Whitianga.

Pipi Size Class Information

The most commonly found length of pipi at Ngaio Bay has decreased from 25-30 mm to 20-25 mm between 2008 and 2011. For Okahu Bay, the site is dominated by small pipi less than 15 mm in length and the increase in density in 2011 appears to be driven by high numbers of pipi in these small size classes. It is worthwhile noting that pipi start reproducing at about 40mm shell length, and can actively drift, therefore these sites represent a population of mainly juveniles that may potentially support pipi populations in other areas.

Monitoring Information and Management

The information being generated by the community shellfish monitoring programme complements and extends the limited monitoring that MFish is able to fund in the Hauraki Gulf. The Forum's programme delivers quality information, which is often difficult to achieve in community-led programmes. This reflects the rigorous planning, coordination and close engagement with the groups maintained by the project leader and other council staff.

The value of the programme is already evident to MFish, but the longer the monitoring continues, the more useful the information will become.

Information from the monitoring programme has already been greatly influential in shellfish management within the Hauraki Gulf Marine Park. Data from the programme has been used to support a two year closure to cockle harvesting at Umupuia Beach and was the primary information used in the establishment of the seasonal closure to shellfish harvesting at Cockle Bay. Both of these controls commenced in late 2008. The closure at Umupuia was renewed after a temporary closure application, under section 186A of the Fisheries Act, by the Ngai Tai ki Umupuia Te Waka Totara Trust was successfully lodged. Umupuia is now closed until October 2012.

The seasonal closure at Cockle Bay is continuing. The area is closed for the taking of all shellfish from 1 October to 30 April each year, during the times when harvesting pressures are heaviest. Reports from honorary fisheries officers indicate that the control is working well.

Information from the Whangateau Harbourcare surveys was influential in determining the magnitude of the cockle die-off within the Whangateau Harbour. This area is now closed to the harvest of cockles and pipi for a three year period until March 2013.

Environmental Health Information

In 2009-10 NIWA studied three sites in the Hauraki Gulf region as part of its Estuarine Ecodiagnostics research. Okahu Bay, Kawakawa Bay and Beachlands were studied for shellfish, water, and sediment quality in conjunction with community survey events. The results were presented in last year's community shellfish monitoring report. Unfortunately NIWA did not have the funding to continue partnering with the Forum's programme or to contribute new environmental health information this year.

Shellfish health at the studied sites was within prescribed guidelines, with metal contaminants in shellfish being at relatively low levels.

Metal contaminants in sediment at the Beachlands and Kawakawa Bay sites were also found to be within safe limits. However, sediment samples taken from Okahu Bay showed relatively elevated, but still safe concentrations of a number of metals. Last year's report explained the reasons behind the levels, concluding that the levels were not unexpected for an inner city urban beach.

Cheltenham Beach Caretakers

The Cheltenham Beach Caretakers monitor a suite of invertebrates including cockles at Cheltenham Beach, Devonport. This programme commenced in 1995, and although information sharing occurs, is independent of the Forum's project. Their most recent survey was undertaken in May 2010. The survey recorded 12 cockles over the entire sampling area. However, a small area of juvenile cockles was found during a pre-survey inspection. This area contained juveniles in the 5-25mm size class with a density of up to 140 m^2. The average density was 30m^2.

Pipi are also present at the beach, however, numbers are low. The survey recorded only 5 pipi. No juveniles were recorded.

It is noted that Cheltenham Beach has been closed to the harvest of all shellfish for 17 years, and despite this prohibition the cockle population has not rebuilt.

Survey of Participants

Each year schools and community groups participating in the surveys are requested to complete an evaluation form. Of the 13 groups participating in 2010-11, six groups (three primary schools, one intermediate school, one secondary school, one tertiary institute) responded.

On a scale of 1-5, where 5 is 100%, the following results were recorded from the six respondents:

- Meeting school learning outcomes 5.0
- Usefulness of teacher resource kit and resources 4.8
- Quality of survey organisation 4.8
- Suitability of equipment 5.0
- Level of student involvement and interest 4.8
- Value added to student knowledge, skills attitudes 4.8
- Would you participate in the programme again 5.0

The survey also asked a number of other questions. Some of the comments received include the following quotes.

"I like what you are doing for learning in this area. Well researched. It is a great way for students to learn outside of a school environment"

"Students (from Mahurangi College) are focussing on an Action Plan that involves informing the community about shellfish monitoring and why it is done, who does it and how. I am hoping they will emphasise the need to keep the Whangateau harbour healthy and how and why they and the community can do this"

"We think that these surveys have a lot of value – involving communities / schools is critical in terms of broad spectrum education about the issues surrounding our coastal areas,

estuaries and human use/impact. The surveys are set out and supported in such a way that lay people can participate and valuable data is collected. As far as long-term monitoring is concerned, this is a great way of doing this"

"The importance of place-based learning is often underestimated. These surveys provide for this in a unique way: schools and communities can actively collaborate in understanding their local environments and making the local place a good one in which to learn, work and live"

Consistent with last year's response from eight schools, this year's results show that participants continue to rate the programme and the supporting resources very highly. The programme has an excellent level of support within participating groups/schools.

Significance of Decision

The recommendation acknowledges the success of the programme, and the potential for its replication, to build knowledge and awareness about the attributes and quality of the Hauraki Gulf Marine Park environment.

Consultation

This report was developed with an officers group from participating agencies.

Financial and Resourcing Implications

Scoping work can occur with the existing allocation for the shellfish monitoring programme. Additional support will be sought from Auckland Council.

Legal and Legislative Implications

There are not considered to be legal or legislative implications arising from the report.

Implementation Issues

Existing commitments should ensure the programme operates at similar levels in coming years.

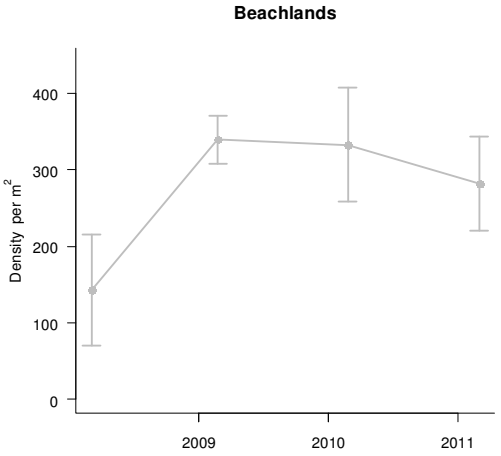
Attachments

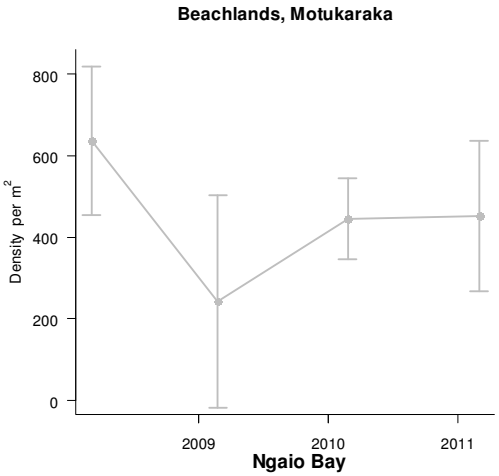
1. Population density trends and size frequency distribution
2. Glossary
3. Location map of community shellfish monitoring sites
4. Location map of MFish monitoring sites

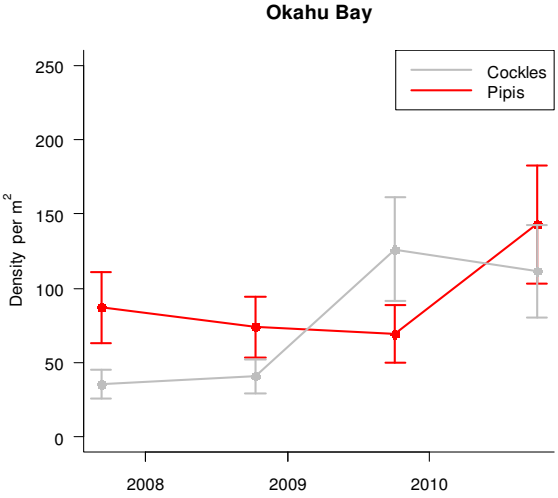
Signatories

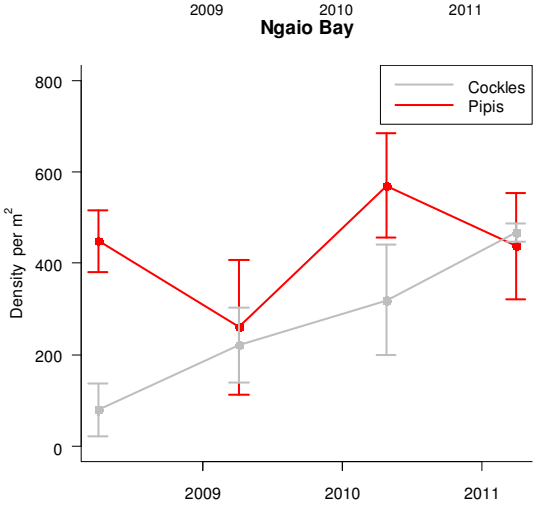
Authors	Liz Ross, Environmental Programmes Advisor, Auckland Council, Shannon Tyler, Fisheries Analyst, Ministry of Fisheries, :
Authorisers	Janis McArdle, Manager, Environmental Services, Auckland Council

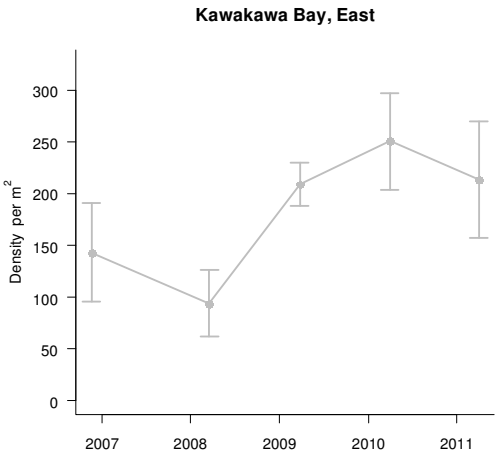
Attachment 1
Population Density Trends
Unless otherwise stated, density trends shown are for cockles.

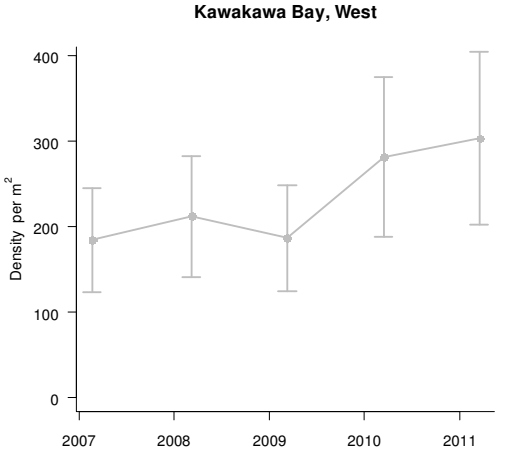




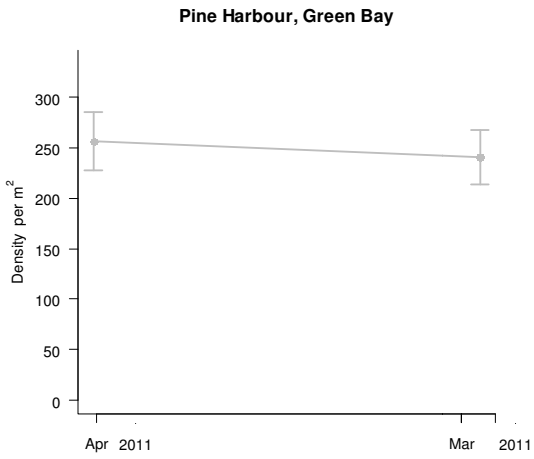


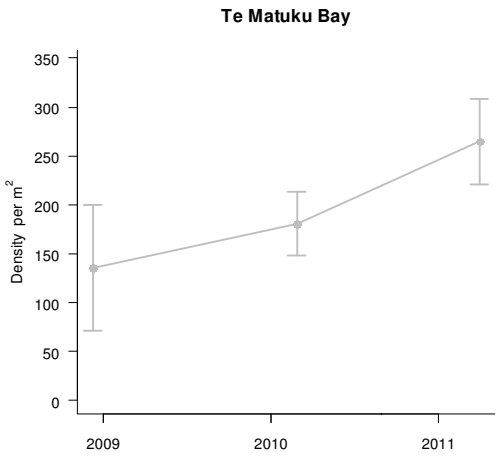


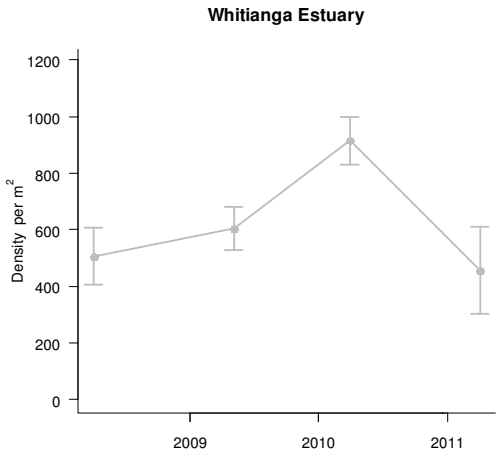


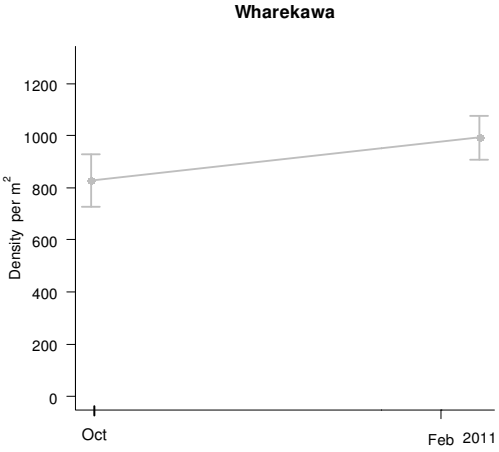


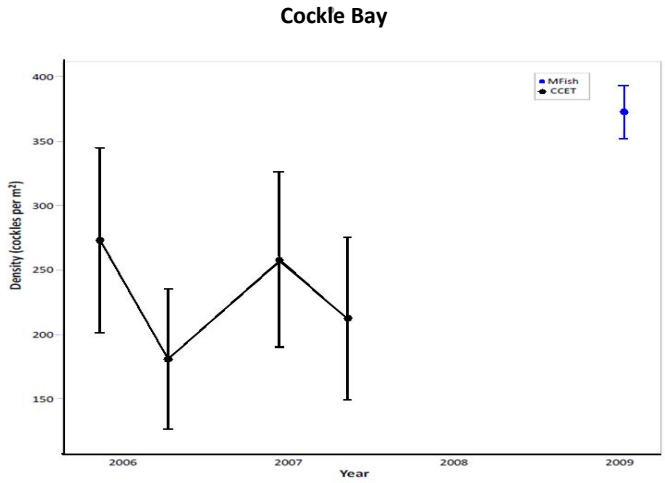
The Cockle Bay estimates were from monitoring by the CCET (2005-2007) and MFish (2009). Direct comparisons between surveys are not feasible since the MFish survey had a broader survey extent[2].





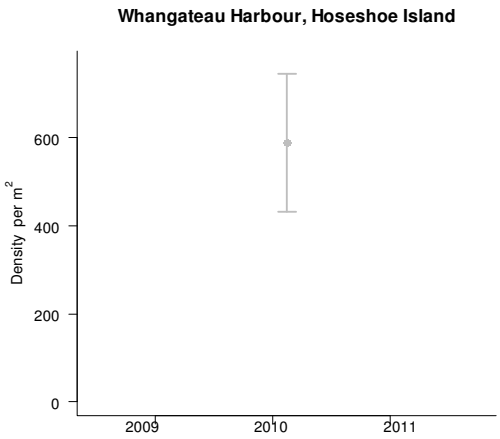


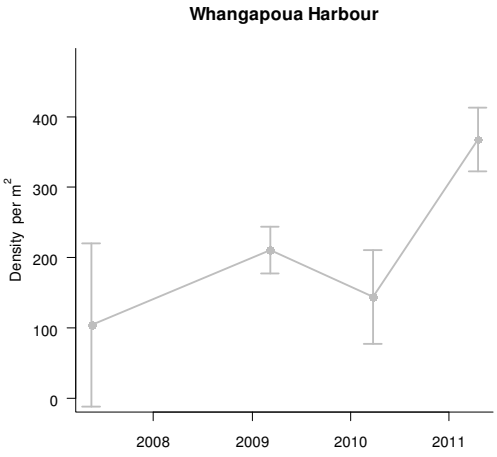


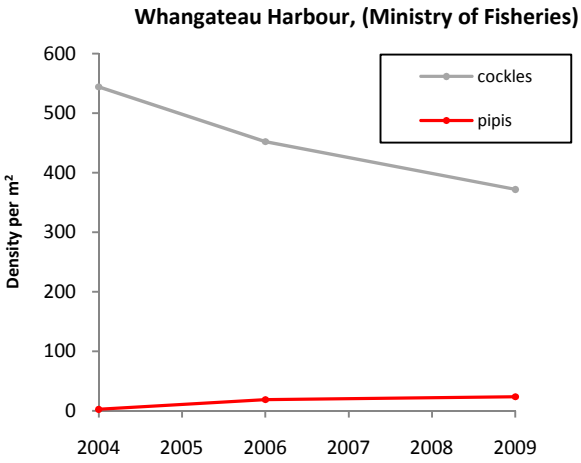


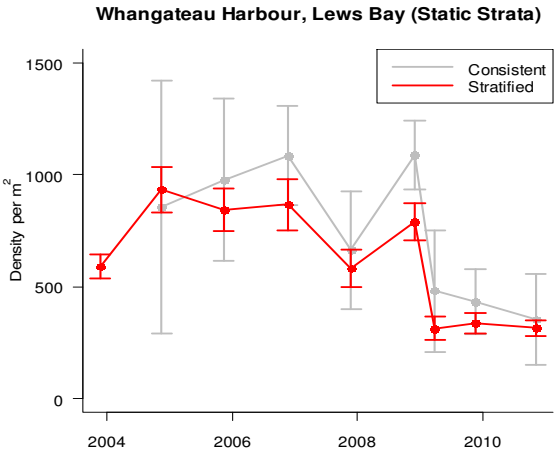
[2] Ministry of Fisheries Report:
Pawley, M.D.M. (2011). The distribution and abundance of pipis and cockles in the Northland, Auckland and Bay of Plenty regions, 2010. *New Zealand Fisheries Assessment Report 2011/24*.

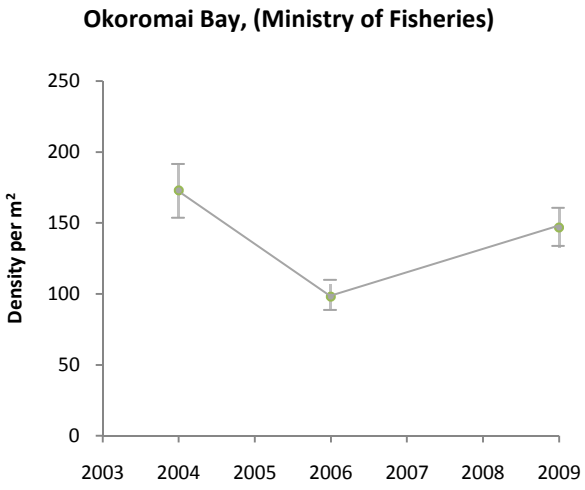
The consistent and stratified lines on the Whangateau Lews Bay graphic refer to different methods of calculating density, trends should be interpreted from the stratified line.

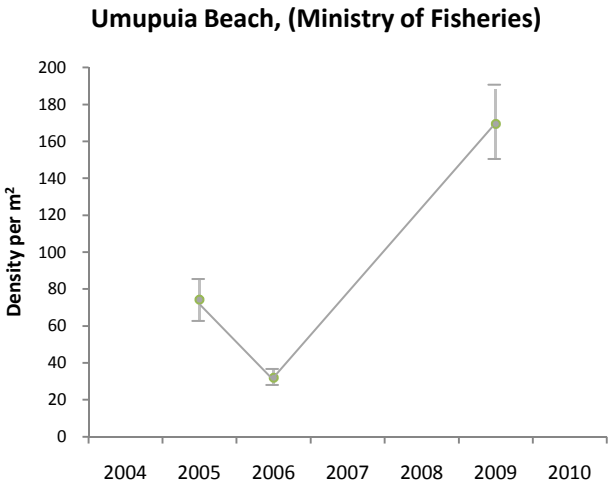




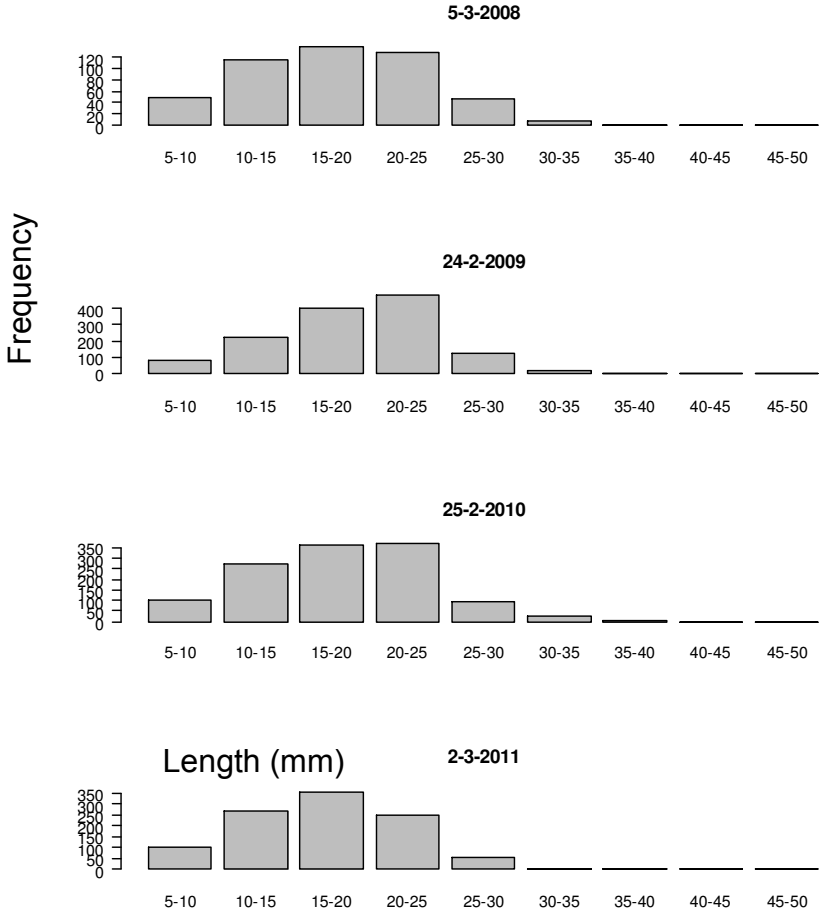






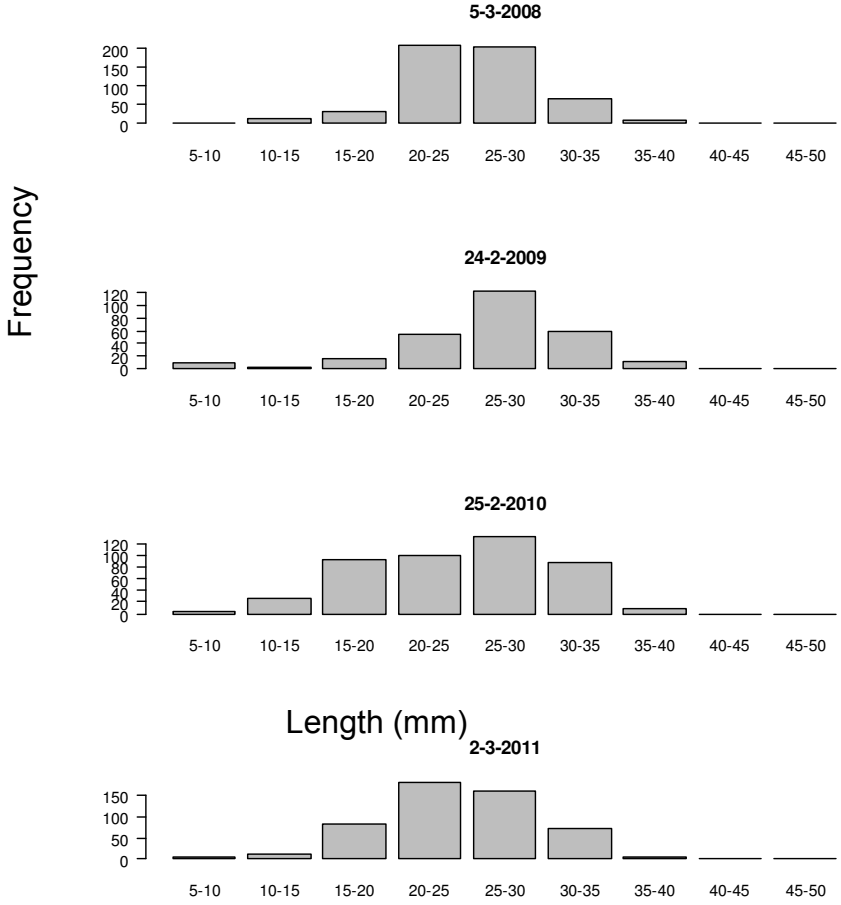


Size Frequency Distribution
Beachlands

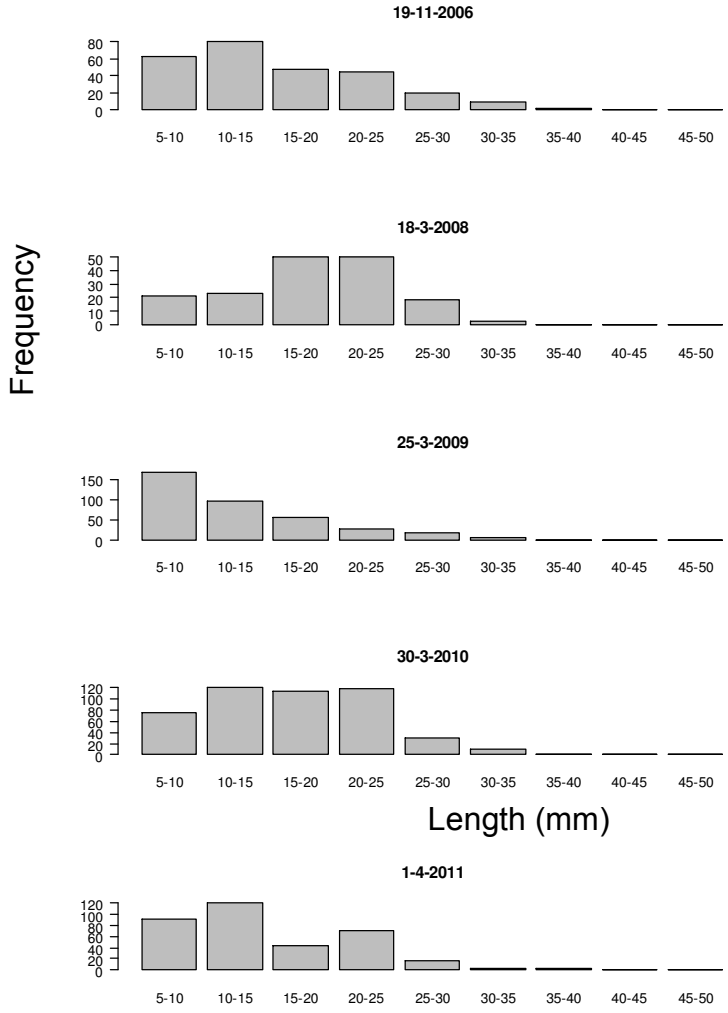


Unless otherwise stated size frequency distributions refer to cockles.

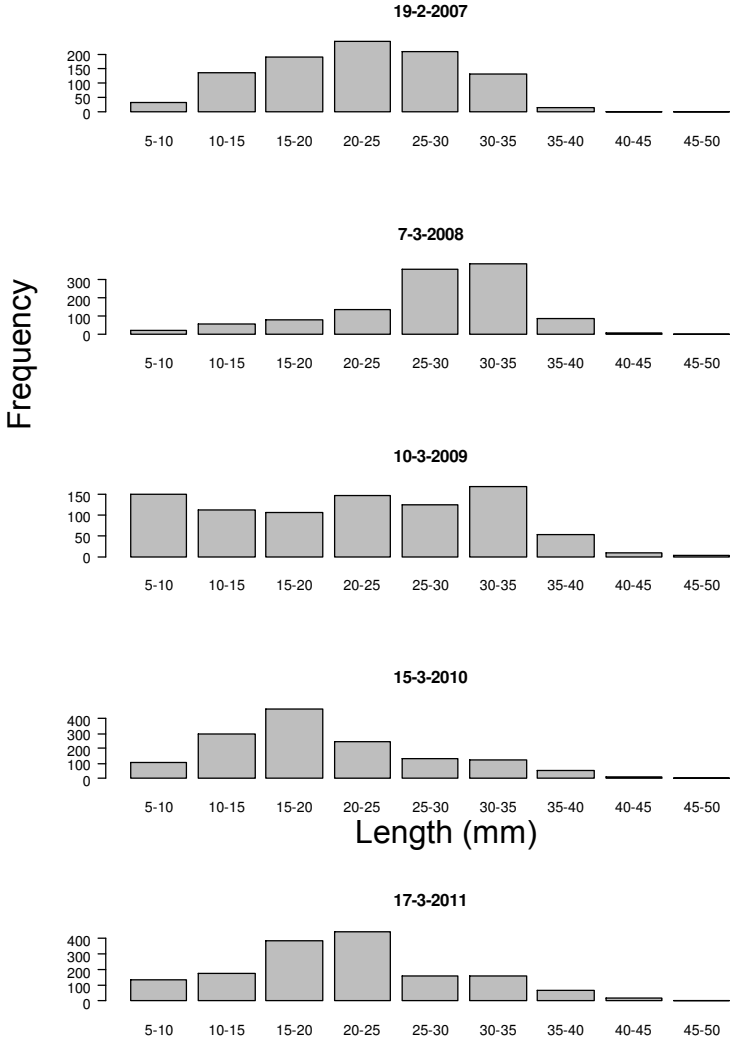
Beachlands - Motukaraka



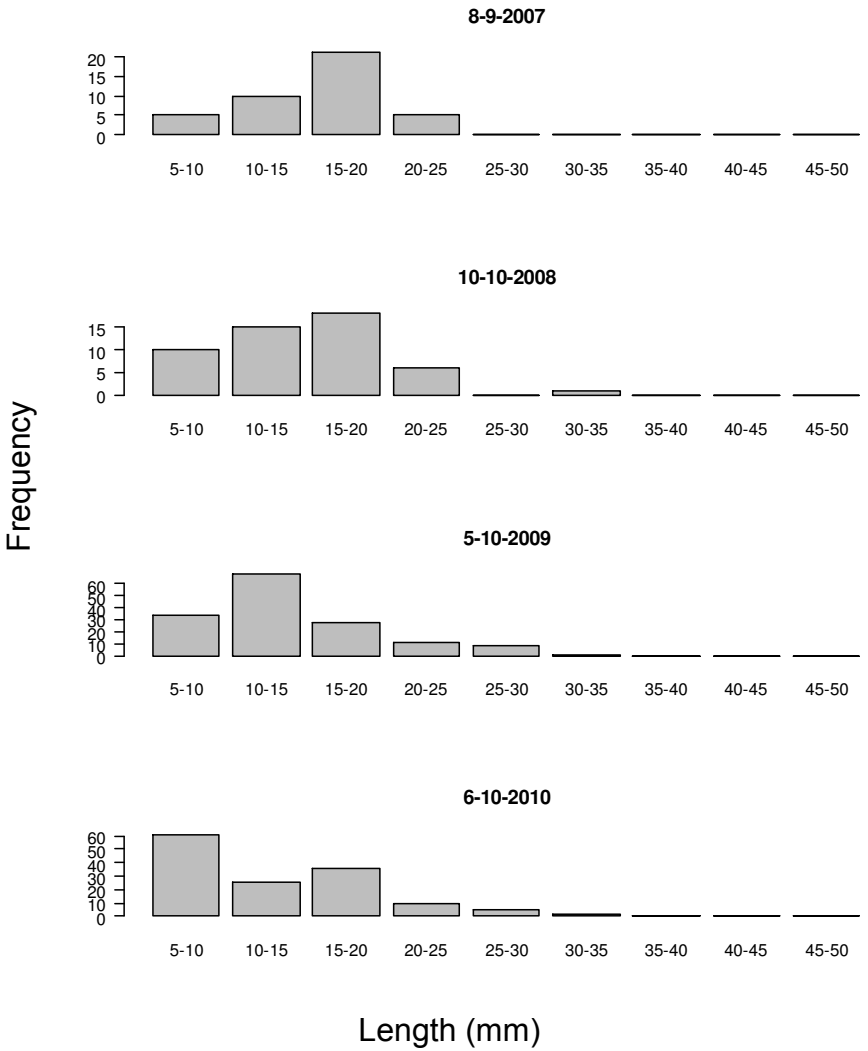
Kawakawa Bay, East



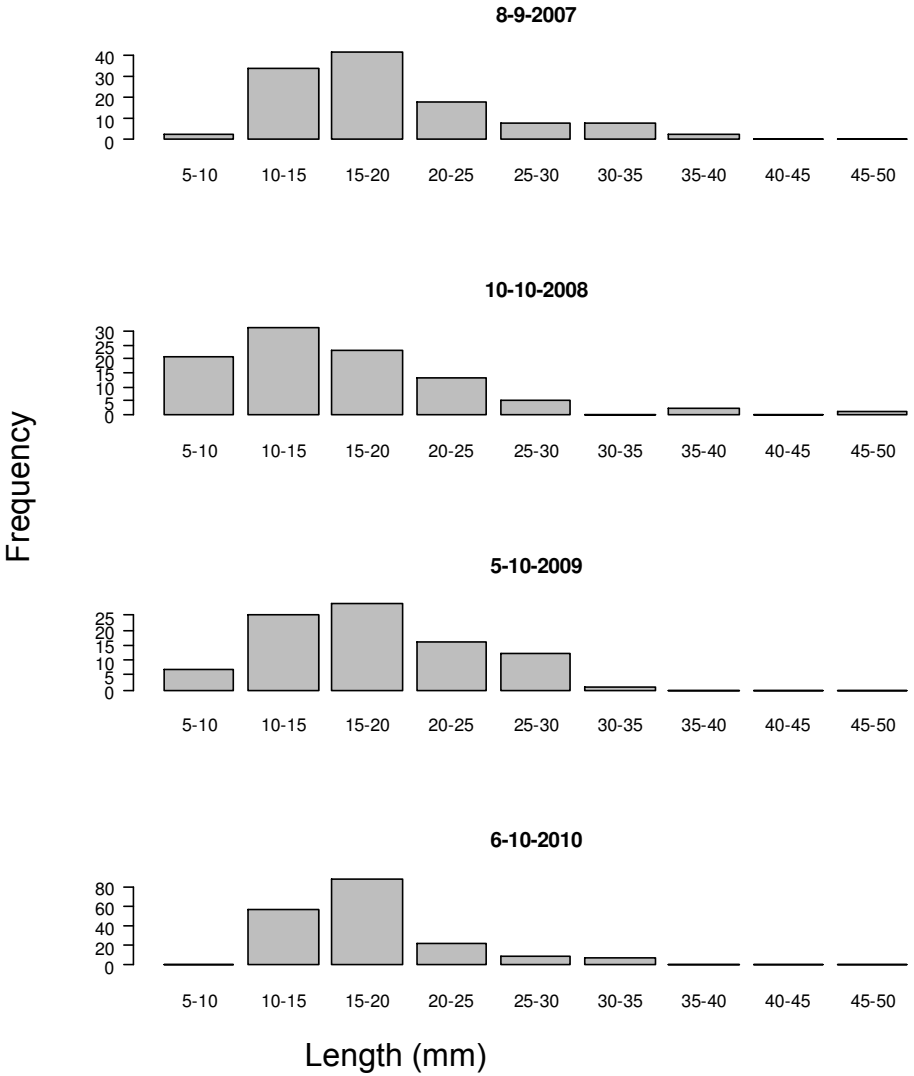
Kawakawa Bay, West



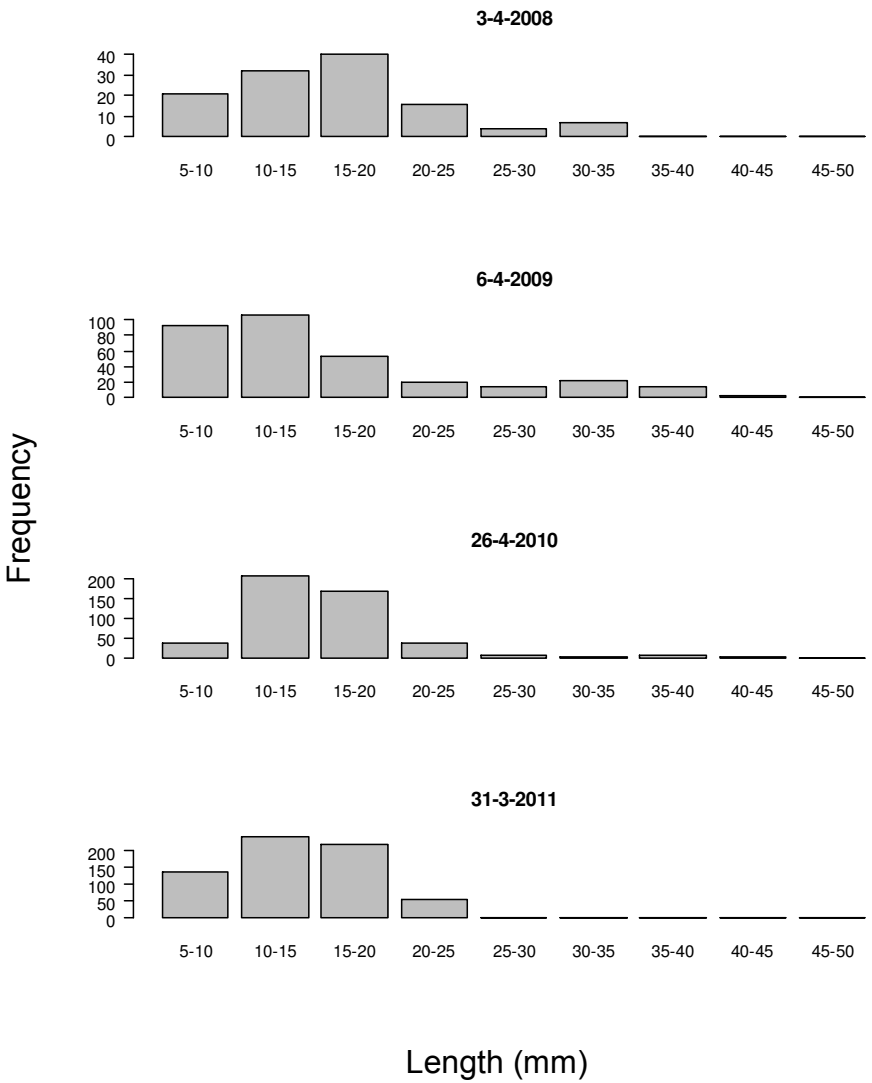
Okahu Bay (Cockles)



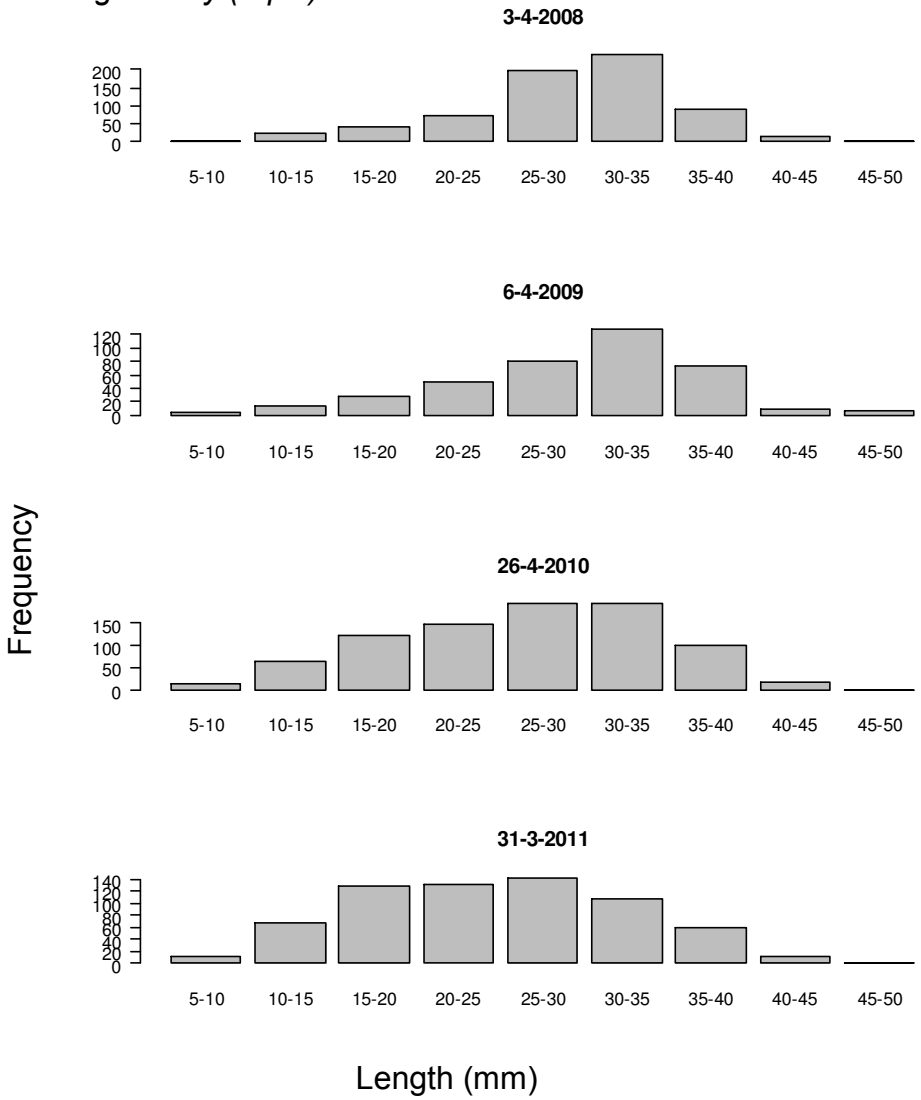
Okahu Bay (Pipis)



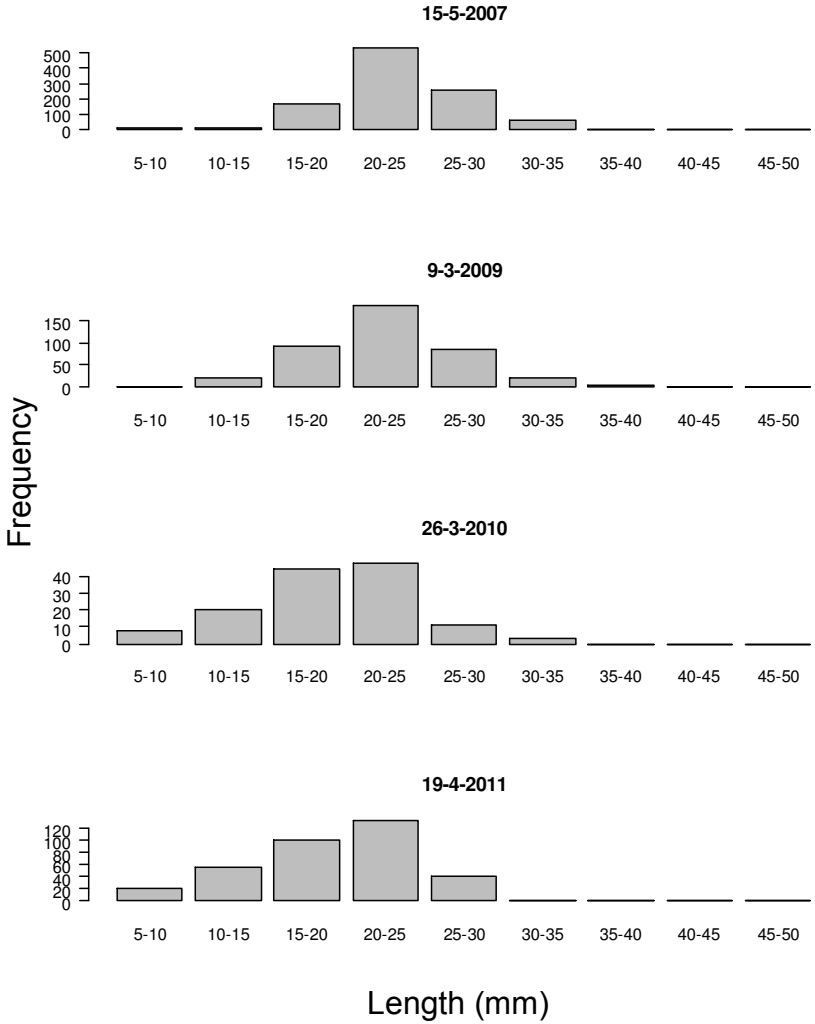
Ngaio Bay (Cockles)



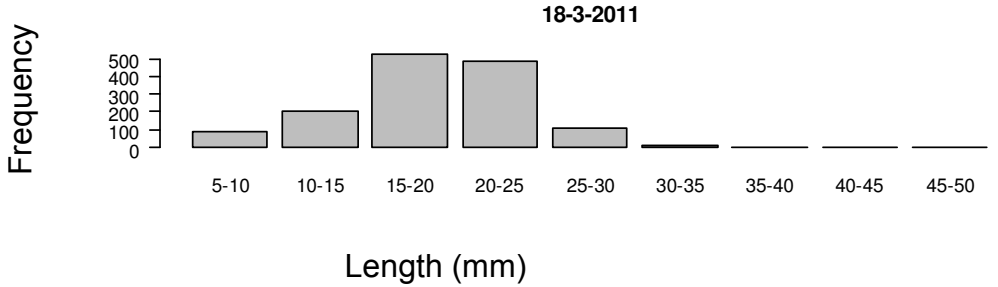
Ngaio Bay (Pipis)



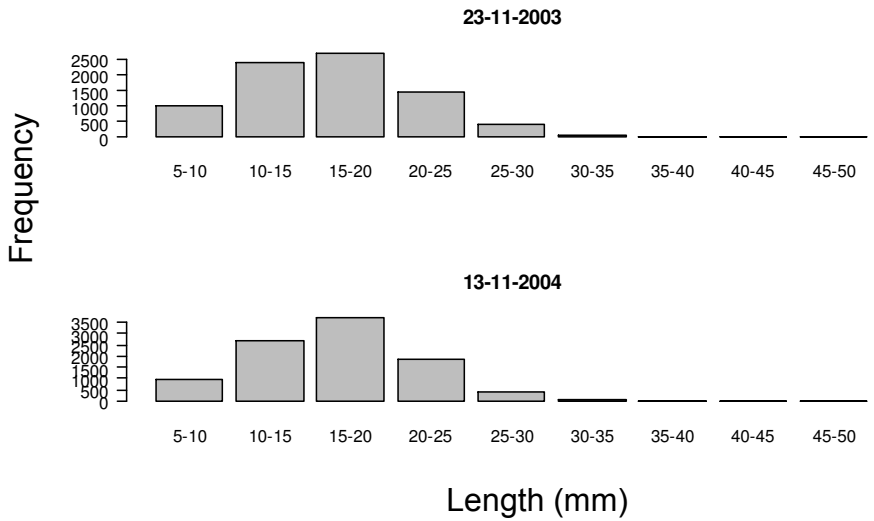
Whangapoua Harbour



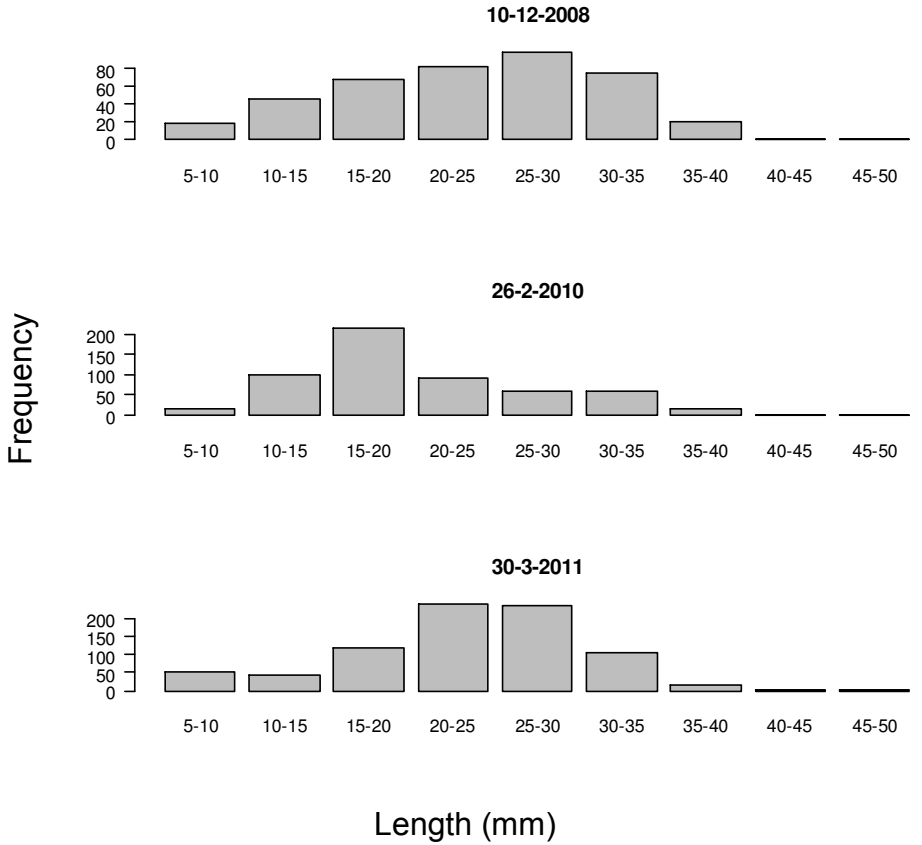
Whangateau Harbour, Horseshoe Island



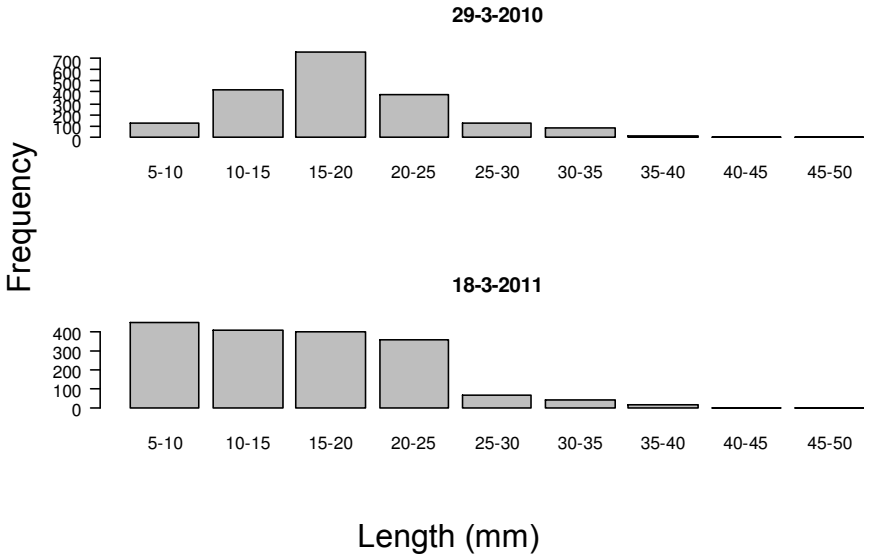
Wharekawa



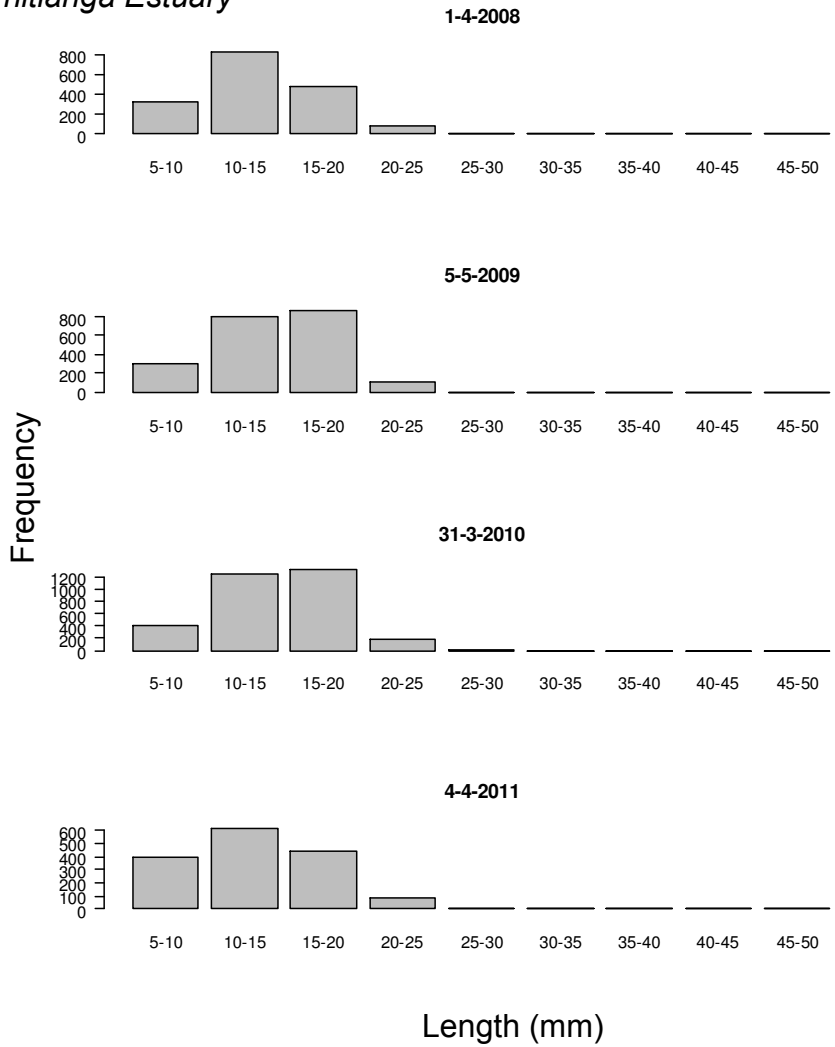
Te Matuku Bay



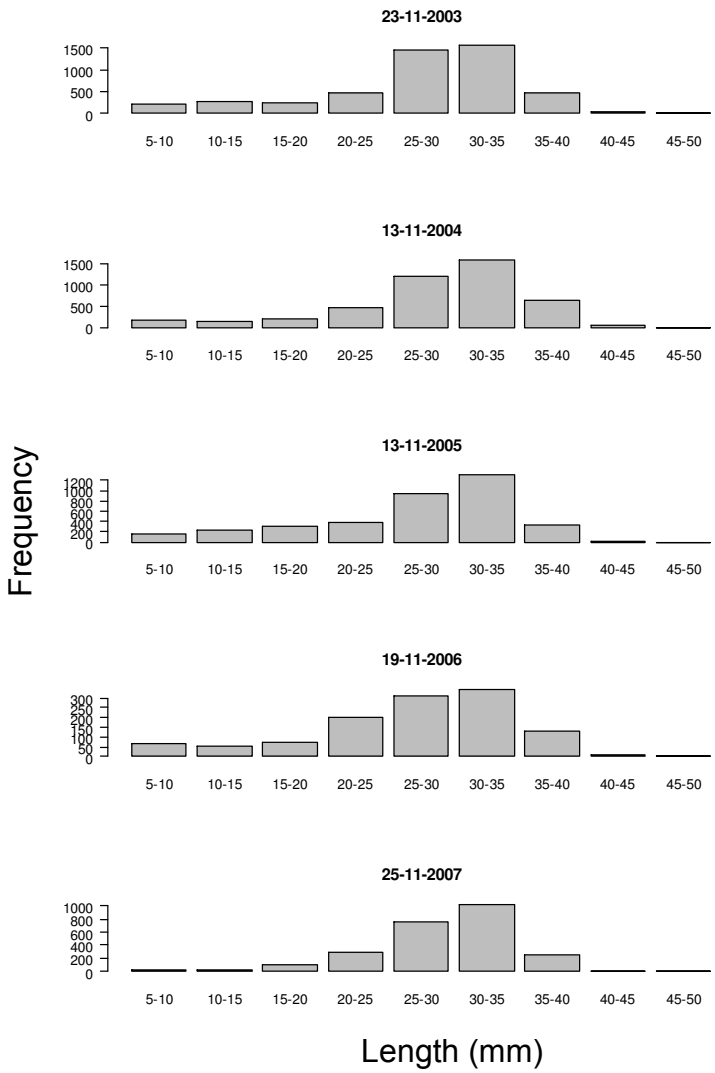
Pine Harbour, Green Bay

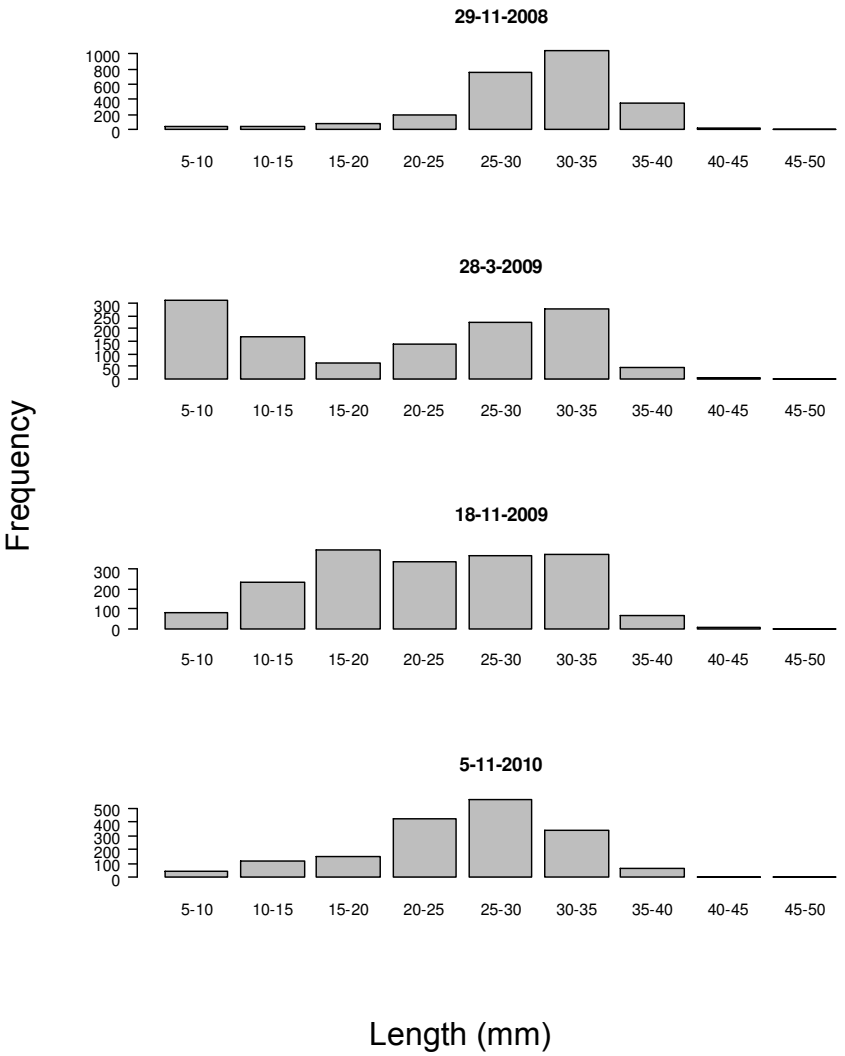


Whitianga Estuary



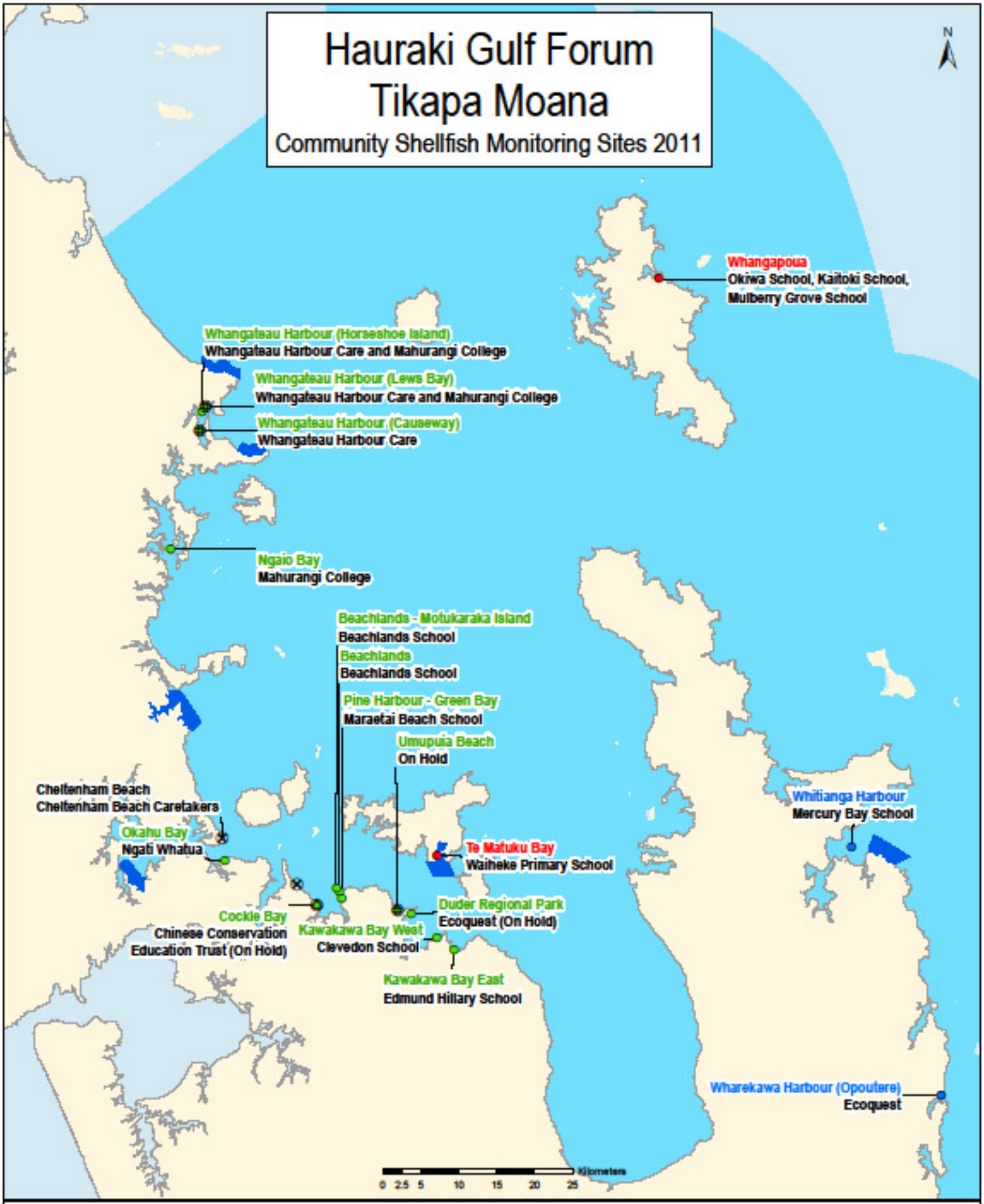
Whangateau Harbour, Lews Bay

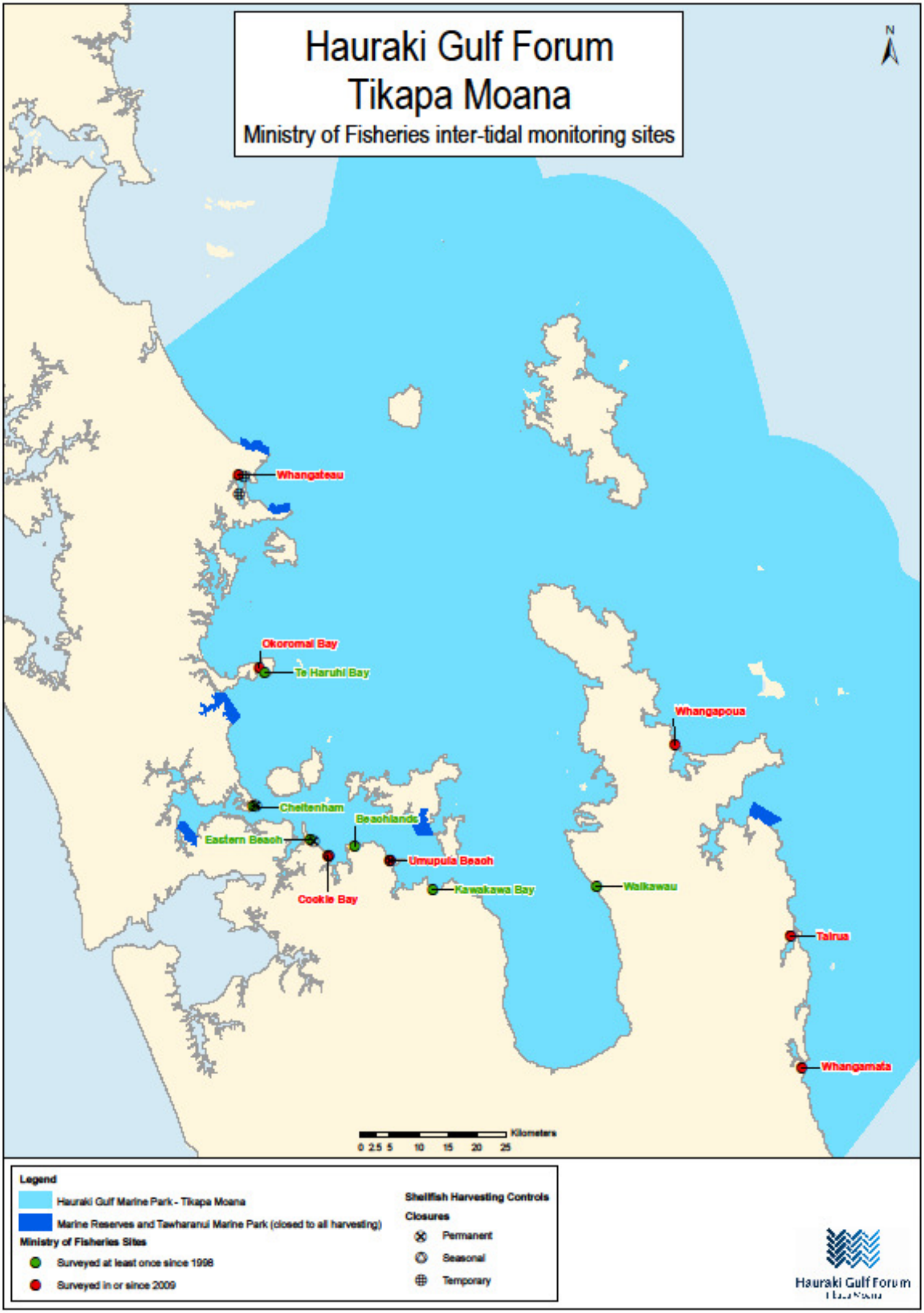




Attachment 2
Glossary

Ko ngaa waihotanga iho	Those treasures that have been left behind by our tuupuna for us to care for.
Kaitiaki	Guardian
Tauira	Students
Kaiako	Teachers
Marautanga	Curriculum
Ngaati Whanaunga Marautanga	Ngaati Whanaunga Curriculum
Kura a Iwi	Iwi based Schools
Kura	Schools
Kaupapa a Iwi	Iwi based initiatives


Hauraki Gulf Forum
Tikapa Moana
Community Shellfish Monitoring Sites 2011
N
Whangapoua
Okiwa School, Kaitoki School, Mulberry Grove School
Whangateau Harbour (Horseshoe Island)
Whangateau Harbour Care and Mahurangi College
Whangateau Harbour (Lews Bay)
Whangateau Harbour Care and Mahurangi College
Whangateau Harbour (Causeway)
Whangateau Harbour Care
Ngaio Bay
Mahurangi College
Beachlands - Motukaraka Island
Beachlands School
Beachlands
Beachlands School
Pine Harbour - Green Bay
Maraetai Beach School
Umupuia Beach
On Hold
Cheltenham Beach
Cheltenham Beach Caretakers
Okahu Bay
Ngati Whatua
Te Matuku Bay
Waiheke Primary School
Whitianga Harbour
Mercury Bay School
Cockle Bay
Chinese Conservation Education Trust (On Hold)
Kawakawa Bay West
Clevedon School
Duder Regional Park
Ecoquest (On Hold)
Kawakawa Bay East
Edmund Hillary School
Wharekawa Harbour (Opoutere)
Ecoquest
Kilometers
0 2.5 5 10 15 20 25
Legend
Hauraki Gulf Marine Park - Tikapa Moana
Marine Reserves and Tawharanui Marine Park (closed to all harvesting)
Shellfish Monitoring Sites
Auckland Council
Cockle Bay
Beachlands - Motukaraka
Kawakawa Bay – East
Kawakawa Bay – West
Umupuia Beach
Beachlands
Duders Beach (Regional Park)
Ngaio Bay, Mahurangi Harbour
Okahu Bay
Whangateau Harbour - Causeway
Whangateau Harbour (Horseshoe Island)
Whangateau Harbour, Lews Bay
Dept. of Conservation
Te Matuku Marine Reserve, Waiheke Island
Whangapoua Harbour, Great Barrier
Waikato Regional Council
Whitianga Harbour, Coromandel
Wharekawa Harbour (Opoutere)
Hauraki Gulf Forum


Hauraki Gulf Forum
Tikapa Moana
Ministry of Fisheries inter-tidal monitoring sites
N
Whangateau
Okoromai Bay
Te Haruhi Bay
Whangapoua
Cheltenham
Beachlands
Eastern Beach
Umupuia Beach
Cockle Bay
Kawakawa Bay
Waikawau
Tairua
Whangamata
Kilometers
0 2.5 5 10 15 20 25
Legend
Hauraki Gulf Marine Park - Tikapa Moana
Marine Reserves and Tawharanui Marine Park (closed to all harvesting)
Ministry of Fisheries Sites
Surveyed at least once since 1998
Surveyed in or since 2009
Shellfish Harvesting Controls
Closures
Permanent
Seasonal
Temporary
Hauraki Gulf Forum