Inquiry 10-202: M.V. *Anatoki*, grounding, off Rangihaeata Head,
Golden Bay, South Island, 6 May 2010

The Transport Accident Investigation Commission is an independent Crown entity established to determine the circumstances and causes of accidents and incidents with a view to avoiding similar occurrences in the future. Accordingly it is inappropriate that reports should be used to assign fault or blame or determine liability, since neither the investigation nor the reporting process has been undertaken for that purpose.

The Commission may make recommendations to improve transport safety. The cost of implementing any recommendation must always be balanced against its benefits. Such analysis is a matter for the regulator and the industry.

Final Report

Marine inquiry 10-202
M.V. *Anatoki*, grounding, off Rangihaeata Head, Golden Bay, South Island, 6 May 2010

Approved for circulation: March 2012

Transport Accident Investigation Commission

About the Transport Accident Investigation Commission

The Transport Accident Investigation Commission (Commission) is an independent Crown entity responsible for inquiring into maritime, aviation and rail accidents and incidents for New Zealand, and co-ordinating and co-operating with other accident investigation organisations overseas. The principal purpose of its inquiries is to determine the circumstances and causes of the occurrence with a view to avoiding similar occurrences in the future. Its purpose is not to ascribe blame to any person or agency or to pursue (or to assist an agency to pursue) criminal, civil or regulatory action against a person or agency. The Commission carries out its purpose by informing members of the transport sector, both domestically and internationally, of the lessons that can be learnt from transport accidents and incidents.

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Important notes

Nature of the final report

This final report has not been prepared for the purpose of supporting any criminal, civil or regulatory action against any person or agency. The Transport Accident Investigation Commission Act 1990 makes this final report inadmissible as evidence in any proceedings with the exception of a Coroner's inquest.

Ownership of report

Citations and referencing

Information derived from interviews during the Commission's inquiry into the occurrence is not cited in this final report. Documents that would normally be accessible to industry participants only and not discoverable under the Official Information Act 1980 have been referenced as footnotes only. Other documents referred to during the Commission's inquiry that are publicly available are cited.

Photographs, diagrams, pictures

Unless otherwise specified, photographs, diagrams and pictures included in this final report are provided by, and owned by, the Commission.

The *Anatoki* entering Tarakohe Harbour

Source: mapsof.net

Location of accident

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Abbreviations

AIS	automatic identification system
Commission	Transport Accident Investigation Commission
GPS	global positioning system
kW	kilowatt(s)
m	metre(s)
Maritime NZ	Maritime New Zealand
SOLAS	International Convention for the Safety of Life at Sea, 1974 as amended
STCW	International Convention on Standards of Training Certification and Watchkeeping for Seafarers 1978 as amended
UTC	co-ordinated universal time
VHF	very high frequency

Glossary

AIS	an automated tracking system used on ships and by Vessel Traffic Services (VTS) for identifying and locating vessels by electronically exchanging data with other nearby ships and VTS stations. AIS information supplements marine radar, which continues to be the primary method of collision avoidance for water transport.
skeg	a sternward extension of the keel of a boat or ship that has a rudder mounted on the centre line.

Data summary

Vessel particulars

Name:	*Anatoki*
Type:	coastal bulk carrier
Class:	New Zealand safe ship management
Limits:	New Zealand coastal
Classification:	Maritime New Zealand
Length:	51.03 metres (m)
Breadth:	8.3 m
Gross tonnage:	561
Built:	Furimoto Tekko Shipbuilding, Japan, 1992
Propulsion:	single medium-speed Matsui 6M26KGS-01 diesel engine developing 415 kilowatts driving a single fixed-pitch propeller through a Niigata MN630 gearbox
Service speed:	10 knots
Owner/operator:	Coastal Bulk Shipping 2007 Limited
Port of registry:	Nelson
Minimum crew:	4

Date and time	6 May 2010 at about 0505[1]
Location	off Rangihaeata Head, Golden Bay, South Island latitude 40° 47'.68 S longitude 172° 48'.53 E
Persons involved	4
Injuries	nil
Damage	minor to ship's hull

[1] Times in this report are New Zealand Standard Time (UTC+12 hours) and are expressed in the 24-hour mode.

1. Executive summary

1.1. The *Anatoki* was a New Zealand-registered coastal cargo vessel on a short coastal voyage from Nelson to Tarakohe. The *Anatoki* departed Nelson at about midnight on 5 May 2010 and was due to arrive off Tarakohe at 0545 the next day

1.2. On 6 May 2010 at about 0506 the *Anatoki* ran aground off Rangihaeata Head in Golden Bay, close to the Tarakohe Harbour. The mate on watch at the time was unaware that the vessel had run aground for at least another 10 minutes. The mate then spent several minutes attempting to refloat the vessel before advising the master of the grounding.

1.3. The Transport Accident Investigation Commission (Commission) **found** that the grounding occurred because the progress of the *Anatoki* was not being monitored at the time and that the performance of the mate on watch was probably impaired by acute sleep loss, possibly exacerbated by the consumption of alcohol the evening before, which is known to affect the quality of sleep.

1.4. The Commission made other **findings** relating to standards of safe ship management.

1.5. The Commission made a **recommendation** to the Director of Maritime New Zealand to check the quality of the company's safe ship management system.

1.6. Key **safety lessons** coming from this inquiry were:

- responsible watchkeepers should take the opportunity to have adequate sleep to prevent their becoming fatigued.
- under no circumstances should crew undertake safety critical tasks when impaired by alcohol.
- alcohol consumption can reduce the quality of sleep even hours after consumption stops.

2. Conduct of the inquiry

2.1. On 6 May 2010 at about 0800, the Commission was notified by Maritime New Zealand that the *Anatoki* had run aground at about 0505 that same day near the port of Tarakohe, Golden Bay.

2.2. The Commission opened an inquiry under section 13(1) of the Transport Accident Investigation Commission Act 1990 and appointed an investigator in charge.

2.3. An investigator from the Commission travelled from Wellington to Tarakohe on 6 May 2010, and on that day and the following day he interviewed the master and crew of the *Anatoki* and the Tarakohe harbour manager.

2.4. Information was sourced from the Maritime NZ ship file, the vessel's owner and the Port of Nelson. Data recorded by Marico Marine from the *Anatoki*'s automatic identification system (AIS) was used to recreate the actual track taken by the *Anatoki.*

2.5. On 14 December 2011 the Commission approved the circulation of a draft final report to interested persons.

2.6. The draft final report was circulated to 7 interested persons with a request that submissions be forwarded to the Commission no later than 1February 2012. This date was later extended to 21 February 2012. Submissions were received from Maritime NZ, Coastal Bulk Shipping 2007 Limited, the Tasman District Harbourmaster and the master of the *Anatoki*.

2.7. The draft final report was assessed and amended with respect to the submissions received. On 29 March 2012 the Commission approved the publication of the final report.

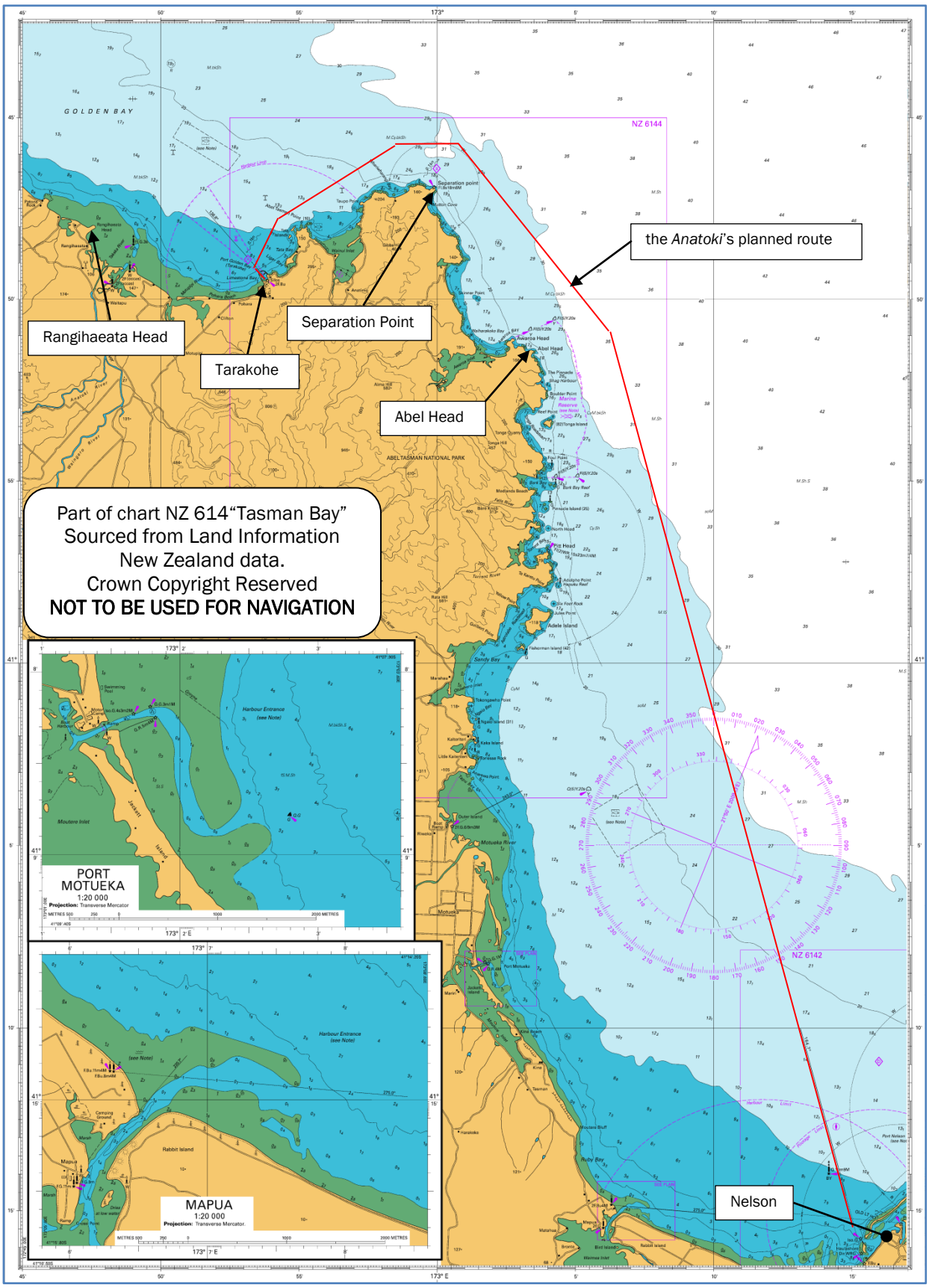

Figure 1
Chart of the general area showing the *Anatoki*'s intended route

3. Factual information

3.1. Narrative

3.1.1. On 4 May 2010 at about 0730, the *Anatoki* arrived in Nelson, South Island, New Zealand for repairs and maintenance. While the repair gang was working the master and crew took fuel bunkers, purchased victualing stores and carried out maintenance on the vessel. The crew comprised the master, engineer, mate, and watchkeeper.

3.1.2. At about 1500, all the crew except for the watchkeeper, who did not live in Nelson, left the vessel and went home for the night. The watchkeeper went to bed at about 1930 that day.

3.1.3. On 5 May 2010 the master engineer and watchkeeper of the *Anatoki* resumed work at about 0800. The mate returned to the vessel at about 0930 and started work. The master had intended the vessel to set sail at about 1400 that day. During the morning the master learnt that the maintenance work would not be complete until about 1600, so, he changed the vessel's departure time to midnight that day.

3.1.4. The maintenance work was completed by 1600. The master elected to stay on board to allow the watchkeeper to go ashore if he wanted. The engineer left the vessel to go home and the mate and the watchkeeper, after having something to eat went ashore at about 1800 to a nearby restaurant and bar. The master went to bed at about 1800.

3.1.5. The watchkeeper said later that he had had 2 pints of beer in the restaurant and bar then went for a walk, returning to the vessel at about 2045. The watchkeeper went to bed at about 2115. The engineer arrived back at the vessel at about 2145. He went on board and started to write up his daily work book before he started to prepare the engine for departure.

3.1.6. The mate said later that he had 4 or 5 pints of beer in the restaurant and bar and then returned to the vessel at about 2130, had a snack and a coffee, then went to rest before the vessel sailed. The engineer said later that "the mate arrived back after me, probably at about 2215 grabbed some food off the stove and went to bed at about 2230".

3.1.7. The master woke up at about 2230. At this time the remainder of the crew were called to prepare the ship for departure.

3.1.8. The master and crew went about doing their normal pre departure routines, the engineer went to the engine room, the watchkeeper was carrying out his duties on deck and the mate was doing the loaded cargo advice and emails. The master said later that the watchkeeper and mate "looked as though they had had a couple [of drinks] but didn't look drunk".

3.1.9. At about 2350, the *Anatoki* sailed from Nelson with the mate on the helm and the master having control of the vessel. After clearing the harbour the engineer switched the power from the harbour generator to the shaft generator. The master wrote his night orders, noting:

- keep to the course on the chart, observe standing orders
- ETA at Tarakohe 0600, aim to be on waypoint at 0545
- shaft generator changeover 0500, call engineer at 0445
- if arrive earlier stay 5 nm offshore, watch out for "M farms" and "M barges".

3.1.10. On 6 May 2010 at about 0015, the watchkeeper arrived on the bridge and took over the control of the vessel from the master, having first read and signed the night orders. The mate was still on the bridge when the watchkeeper arrived, but left the bridge at about 0020 after asking the watchkeeper to make sure he "gave him a buzz" for his watch.

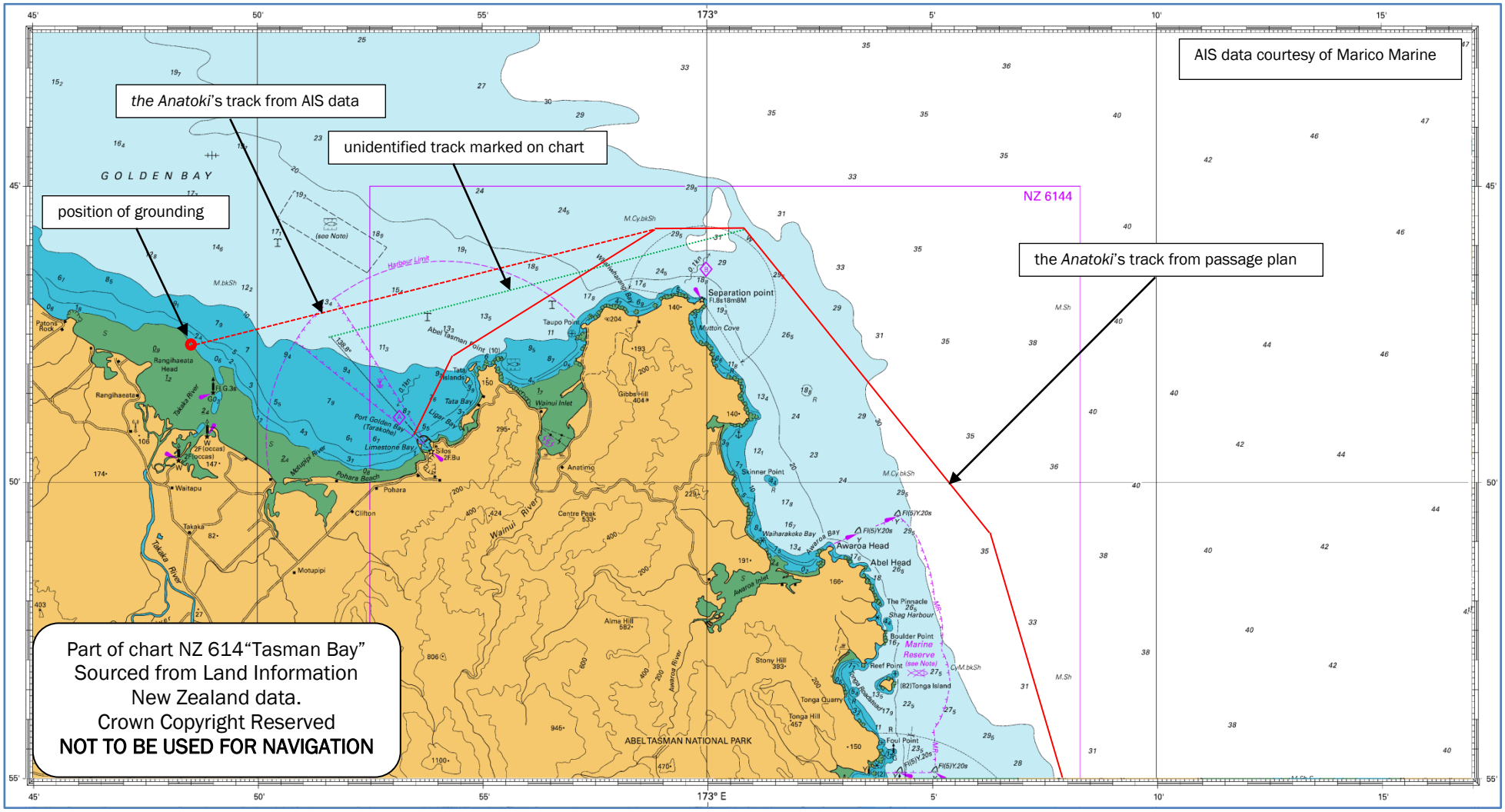

Figure 2
Chart of the *Anatoki*'s planned, intended and actual tracks

3.1.11. The master left the bridge after handing over the watch to the watchkeeper. The engineer left the engine room, confirmed with the master the estimated time of arrival at Tarakohe and went to his cabin at about 0100.

3.1.12. The watchkeeper maintained the vessel on its designated track, regularly plotting the vessel's position on the chart and altering course at about 0300 off Abel Head (see Figure 2) and again at about 0350 off Separation Point (see Figure 2).

3.1.13. As the watchkeeper altered course off Separation Point at 0350, he called the mate for the 0400-0800 watch. The mate arrived on the bridge at about 0403. After the mate had read and signed the master's night orders, the watchkeeper handed over the navigational watch to the mate. The watchkeeper then left the bridge.

3.1.14. At about 0408, the course of the *Anatoki* was changed to about 253 degrees (°). The mate said later that the vessel "had just passed the third to last waypoint heading on our way to the second to last waypoint" (see Figure 3). The mate also said that "it was about 0440 when we got on the Tarakohe leads and I had to call the engineer at about 0500".

3.1.15. At about 0442, the *Anatoki* entered the "spat catching area" as designated by the New Zealand notice to mariners NZ 235(T)/09 (Temporary Notice to Mariner), which was still in force on the day of the grounding. The temporary notice noted that "mariners are requested to exercise caution when navigating in the area". A spat catching area was permanently marked on chart NZ 614, but the temporary notice extended the area beyond that permanently marked. Reference to the temporary notice had been written on the chart in pencil, but the full extent of the cautionary area had not been plotted on the chart.

3.1.16. The AIS data shows that the *Anatoki* ran aground approximately 0.7 nautical miles off Rangihaeata Head at about 0506 (see Figure 3).

3.1.17. At about 0515, the mate used a buzzer to call the engineer to change from the shaft generator to the harbour generator. As the engineer was getting out of bed he was again "buzzed" by the mate. The engineer went to the engine room and changed the generators over. He noted that the engine sounded different but was operating normally.

3.1.18. Once the engineer advised the mate that the shaft generator had been taken off load, the mate took the engine out of gear and went to turn the vessel away from the coast. At about this time the mate realised that the vessel was not moving through the water. The mate said that once he realised that the vessel was aground he used the engines to try to get the vessel free, but was unsuccessful.

3.1.19. At about 0525, the mate informed the master that the vessel was aground. The master immediately went to the bridge and took command. Once he had ascertained that he was unable to re-float the vessel, he ordered soundings to be taken around the vessel and a check of all compartments and tanks to see if the vessel was damaged.

3.1.20. At about 0535 the master ordered the water ballast in the vessel to be adjusted in an attempt to re-float the vessel, but this was unsuccessful.

3.1.21. At 0705 the master abandoned attempts to re-float the vessel and issued an Urgency call advising that the *Anatoki* was aground 4 nautical miles northwest of Tarakohe. The master was then in contact with the owner, the harbour manager and Maritime New Zealand through the Rescue Coordination Centre New Zealand.

3.1.22. At about 1300 that same day, the *Anatoki,* assisted by a workboat and a charter fishing vessel, was re-floated on a rising tide.

3.1.23. The *Anatoki,* went under its own power to anchor off Tarakohe to be examined by divers for damage before being allowed to enter the port.

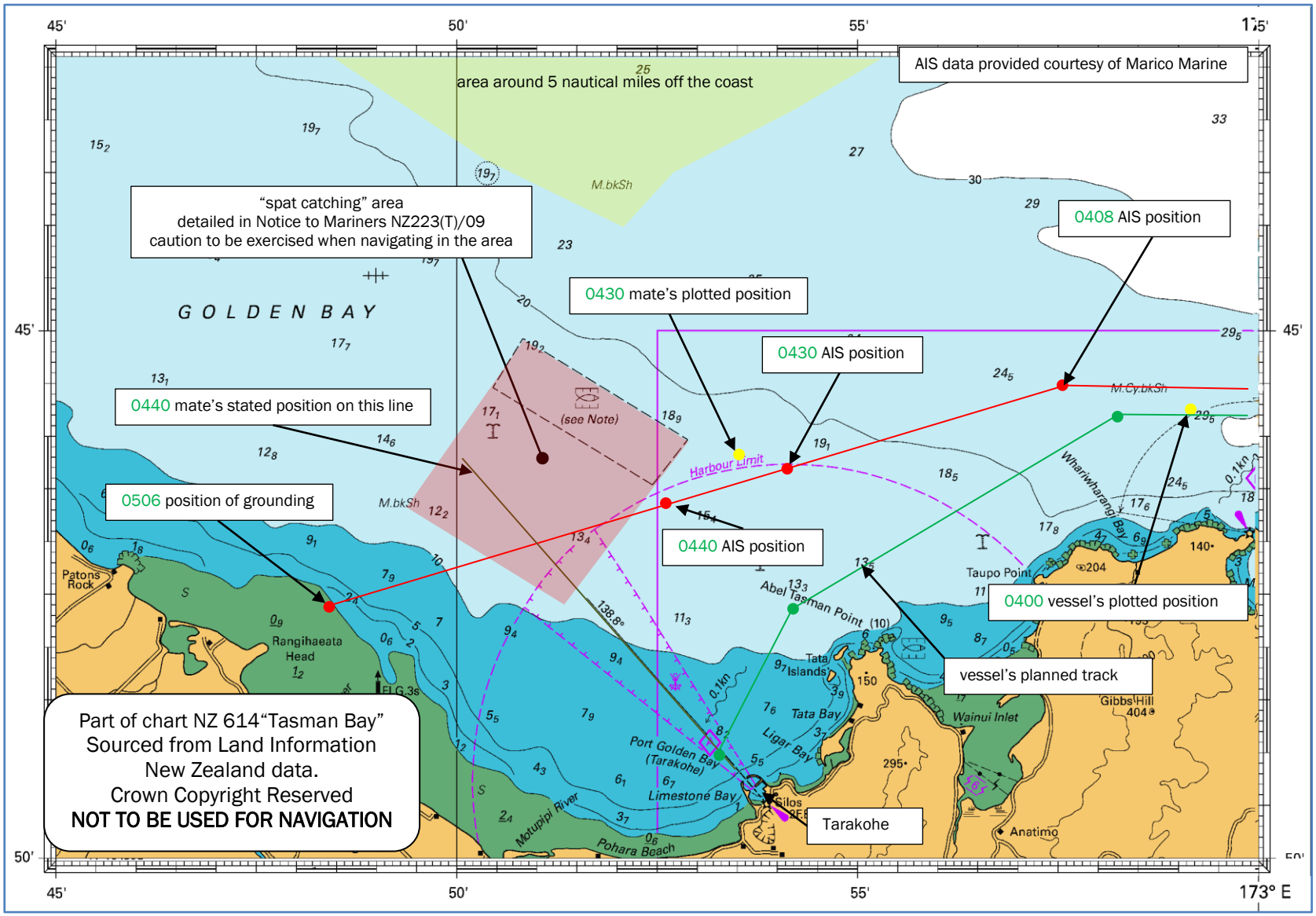

Figure 3
Larger scale chart of eastern Golden Bay

3.2. Personnel and qualification information

3.2.1. Under Maritime Rules Part 31B Crewing and Watchkeeping Offshore, Coastal and Restricted (Non-Fishing Vessels), the manning of the *Anatoki* had to be sufficient for the safe operation of the vessel. The minimum crew was derived either from the applicable tables and flow charts or by application for a minimum safe crewing document, which was issued by the Director of Maritime NZ. Maritime Rules Part 31B also contained a list of acceptable equivalents for the required certificates of competency.

3.2.2. The manning for operation in the coastal area was set at one New Zealand offshore master certificate of competency with STCW (the International Convention on standards of training, certification and watchkeeping of Seafarers 1978) endorsement, 2 New Zealand offshore watchkeeper certificates of competency and one marine engineer class 4 certificate of competency (including equivalent certificates) as laid down in Maritime Rules Part 31B.

3.2.3. STCW had entered into force on 28 April 1984. Annexed to the Convention was the STCW code. The Convention and its code underwent significant amendments in 1995 and 2010. The Convention applied to seafarers serving on board seagoing ships entitled to fly the flag of a party, except to those serving on board warships, fishing vessels, pleasure yachts not engaged in trade or wooden ships of primitive build. New Zealand was a party to the Convention.

3.2.4. STCW defined a seagoing ship as "a ship other than those which navigate exclusively in inland waters or in waters within, or closely adjacent to, sheltered waters or areas where port regulations apply". Specific mandatory requirements were included in the STCW code for the "certification of officers in charge of a navigational watch on ships of 500 gross tonnage or more".

3.2.5. The master on board the *Anatoki* had worked on board Russian fishing vessels until 1996, when he moved to New Zealand and started working in the fishing industry as a deck hand. He had gained a New Zealand certificate of competency as offshore watch keeper in April 2007, before being employed by Coastal Bulk Shipping 2007 Limited as watchkeeper. He had gained his certificate of competency as New Zealand offshore master in August 2009, and had been employed as mate/relief master and then master on board the *Anatoki*. He had joined the *Anatoki* for this voyage on 23 April 2010 in Bluff.

3.2.6. The mate on board the *Anatoki* had worked in the fishing industry for about 18 years. He had worked on a variety of fishing vessels prior to being employed by the owner, originally in 2008 before the vessel had been laid-up for a period of time. He had been employed by the owners again since the vessel came out of lay-up for about one and a half years. He held a New Zealand offshore watch-keeping certificate of competency; not the required New Zealand offshore master certificate. He had joined the *Anatoki* on 23 April 2010 in Bluff.

3.2.7. The watchkeeper on board the *Anatoki* had worked in the maritime industry since 1982. He had gained his certificate of competency as offshore watch-keeper in October 2001. He had joined the *Anatoki* on 10 April 2010.

3.2.8. The engineer on board the *Anatoki* had worked in the fishing industry as a chief engineer on freezer trawlers before working in the Australian offshore industry as an engineer. He had joined the *Anatoki* as engineer on 23 April in Bluff. The engineer held a certificate of competency as marine engineer class 4 and a certificate of competency as marine engineer class 3. He had joined the *Anatoki* on 23 April 2010.

3.2.9. The master and deck crew of the *Anatoki* worked a standard 4-hours-on, 8-hours-off watch routine where the master took the 8-12 watch, the watchkeeper the 12-4 watch and the mate the 4-8 watch.

3.2.10. The master and crew were employed under the standard terms and conditions of employment of the owner. Section 34 of the standard terms and conditions contained the owner's alcohol and drug policy. Paragraphs 34.1 – 34.3 and 34.7 were relevant in this case and stated:

> **34 Alcohol and Drug Policy**
>
> **Introduction**
>
> 34.1 The employer is obliged under the OSH [occupational safety and health] legislation to take all practicable steps to ensure health and safety within the workplace.
>
> 34.2 Impairments due to drug or alcohol use and abuse are hazards within the workplace that may result in harm. The employer has a zero tolerance to alcohol and drugs, while the employee is working a voyage.
>
> 34.3 Employees are required to maintain an alcohol free and drug free level at all times while working a voyage and employees must not attend work under the influence of alcohol or drugs.
>
> **Consumption outside work hours – i.e. while vessel is in port**
>
> 34.7 Employees must limit their consumption prior to coming to work so that there is no alcohol in the body while at work.

3.2.11. After the accident, when the vessel had been refloated and anchored off of Tarakohe, the owner arranged for post-incident drug and alcohol screening of the master and crew. The testing was done between about 1550 and 1620 on 6 May 2011. The results were negative for both drugs and alcohol for the master and crew.

3.2.12. In June 2010, the International Maritime Organization amended the STCW convention to establish a blood alcohol limit of 0.05 grams of alcohol in 100 millilitres of blood. The deadline set for compliance is currently 1 January 2013.

3.3. Vessel information

3.3.1. The *Anatoki* was a coastal bulk carrier built in Japan in 1992. The *Anatoki* had been purchased in Japan by the owner in December 2007 and was owner operated. The vessel was registered in New Zealand and had valid certificates issued by or on behalf of Maritime NZ. The *Anatoki* was under safe ship management (SSM) with Survey Nelson Limited.

3.3.2. The *Anatoki* had an overall length of 51.03 m and a breadth of 8.30 m, with a gross tonnage of 561. It had an assigned freeboard of 1.049 m.

3.3.3. The *Anatoki* was powered by a single Matsui 6M26KGS-01 diesel engine developing 415 kW driving a single fixed-pitch propeller through a Niigata MN630 reversing gearbox, giving a service speed of 10 knots. It had a Becker rudder located directly behind the propeller. The vessel was not fitted with a bow thruster.

3.3.4. The *Anatoki* was fitted with 2 radars (one with an automatic radar plotting aid), an electronic chart plotter, a global positioning system (GPS) receiver, an automated identification system (AIS), an echo sounder, an autopilot, one dual-watch very high frequency (VHF) radio, 2 handheld VHF radios, a gyro compass and a magnetic compass.

3.3.5. The *Anatoki* operated a one-man-bridge-operation, but was not fitted with a watchkeeping alarm, nor was it required to have one. The International Maritime Organization had realised the safety issue of watchkeeper distraction and falling asleep and amended SOLAS (the International Convention for the Safety of Life at Sea, 1974) in July 2011 to require all new passenger vessels and cargo ships greater than 150 gross tons to be fitted with a bridge watch navigational and alarm system. This equipment was to become mandatory for existing passenger ships and cargo vessels greater than 3000 gross tons from July 2012 and cargo ships between 500 and 3000 gross tons in July 2013. Maritime New Zealand has proposed that an amendment to Maritime Rule Part 45 (Navigational Equipment) be developed for the Minister of Transport's consideration requiring existing cargo ships of greater than 500 gross tonnage to be fitted with bridge navigational watch alarm systems no later than the first survey after 1 July 2013.

3.3.6. An inspection of the *Anatoki* by divers and later the surveyor found the damage to the vessel to be a scrape of about 400 millimetres in length on the skeg of the vessel. The surveyor noted at 1245 on 7 May 2010 that the vessel was considered fit for purpose and able to load cargo and sail.

3.3.7. At the time of the accident the *Anatoki* had approximately 19 tonnes of diesel fuel and approximately 500 litres of lubricating oil on board.

3.4. Environmental information

3.4.1. The weather during the *Anatoki*'s voyage from Nelson to Tarakohe was logged on board the vessel as being variable to westerly winds with a speed of about 5 knots with calm seas and no discernible swell. The watchkeeper noted that visibility was good, with a bit of moon and enough light to make out the land easily.

3.4.2. The table below shows the times and heights of high and low water for Tarakohe based on the standard port of Nelson on the 6 May 2010 as obtained from the New Zealand Nautical Almanac (Land Information New Zealand, 2009).

Date	High water		Low water		High water		Low water	
	Time	Height	Time	Height	Time	Height	Time	Height
06/05/2010	0242	3.29m	0907	1.50m	1529	3.09m	2134	1.5m

3.5. Organisational and management information

3.5.1. Maritime Rules Part 21 Safe Ship Management (SSM) Systems came into force in 1997. The SSM system was based on the established International Safety Management system, but was modified for domestic commercial vessels. Part 21 was supported by and included the New Zealand Safe Ship Management Code, which outlined how an SSM system should be implemented. Since 2001, Maritime NZ had been preparing a revised Part 21. At the time of writing it had been circulated internally within Maritime NZ and to the SSM companies, but still had to be circulated for comment to the general public.

3.5.2. On 11 April 2008, the owners of the *Anatoki* obtained the design approval letter for the vessel signed by a recognised naval architect stating that the vessel was fit for its intended service and intended operating limits. This letter contained details of the vessel, its intended service, intended operating limits, and service restrictions.

3.5.3. On 11 February 2010, after some modifications had been made to the *Anatoki*'s structure Maritime NZ issued a new international tonnage certificate for the vessel with a gross tonnage of 561 and a net tonnage of 230.

3.5.4. On 17 February 2010, Survey Nelson Limited issued the *Anatoki* with a fit-for-purpose document for offshore limits, with a manning requirement of 4 persons and a maximum operating displacement of 920 tonnes. On 18 February, Maritime NZ issued an SSM certificate for the *Anatoki* to operate as a non-passenger ship in the New Zealand offshore limits subject to certain special conditions, with a compliance date of 18 August 2010.

3.5.5. On 19 March 2010, the Maritime NZ registrar of ships issued an amended certificate of registry, including the revised tonnages.

4. Analysis

4.1. Introduction

4.1.1. The *Anatoki* was on what should have been a short, routine voyage between Nelson and Tarakohe. The vessel had been in Nelson for 2 days undergoing maintenance rather than working cargo. The crew therefore had a work routine that afforded them ample time for rest and recreation. The grounding was not a result of any technical or mechanical failure.

4.1.2. This analysis discusses how the grounding occurred and discusses the effect that lack of sleep can have on human performance, and the effect that alcohol consumption can have on the quality of sleep. These 2 issues are considered to have been the main factors contributing to the grounding.

4.2. How the grounding occurred

4.2.1. The standard of navigation on board the *Anatoki* leading up to the grounding was not in accordance with the practices recommended in STCW. The reasons for this are discussed below. The coastline that the *Anatoki* was following was conducive to accurate coastal position plotting. The *Anatoki* followed the passage plan up to the end of the 0400 watch. The plotted positions were a mix of single radar range and bearing or GPS plots (see Figure 4). From 0400 to the time of the grounding the standard of navigation deteriorated.

4.2.2. From about 0408 the mate deviated from the passage plan, but that was in keeping with the master's night orders. The night orders said "if arriving earlier stay 5 miles off the coast". Although achievable this instruction was ambiguous and not very practicable. The vessel's passage plan had the ship closer than 5 nautical miles to the coast from Separation Point to the arrival waypoint, which was less than one mile off the port. In his submission on the draft report, the master said he meant for the ship to arrive off Tarakohe, and from then on to stay 5 miles off the coast. This too did not seem logical as it required the watch-keepers, who had just navigated the ship from Nelson within 5 miles of the coast for much of the way, to then turn away from the coast and negotiate the spat catching area before being able to comply (see Figure 3)

4.2.3. The course the vessel travelled missed the spat catching area permanently marked on the chart, but the area had been enlarged as contained in the notice to mariners NZ 235(T)/09 and the vessel encroached on this area. Fortunately the obstructions in the area had been removed a few days earlier but the notice to mariners was still in force and was not cancelled until 28 May 2010. Although the master noted in his night orders to watch for "M. farm and M. barges" the mate would not have been aware of the extended precautionary area as this had not been marked on the chart (see Figure 4).

4.2.4. The AIS data shows that the mate adjusted the vessel's course at about 0408 to achieve a course over the ground of 253°, and the vessel's track and speed did not change from then until the time it grounded. The alteration of course was made without plotting the vessel's position, and no reliable position was placed on the chart until the master came to the bridge and plotted the position where the vessel lay aground.

4.2.5. The position placed on the chart labelled 0430 did not correspond with the actual position of the ship as shown by the AIS plot. There was no way of determining what method the mate used to plot the 0430 position. The possibility that it had been placed on the chart after the vessel grounded could not be ruled out.

4.2.6. The mate was supposed to call the engineer at 0445, but he did not do this until 0515, 30 minutes late and when the ship had already been aground for about 8 minutes.

4.2.7. The mate was adamant that he had not fallen asleep after altering the vessel's course to 253°, but the sequence of events described above show this as a strong possibility. If he had not fallen asleep, he must have been doing something other than monitoring the progress of the vessel. If a working bridge watch navigational and alarm system of some sort had been fitted to the *Anatoki,* then he may have been alerted in time to prevent the vessel

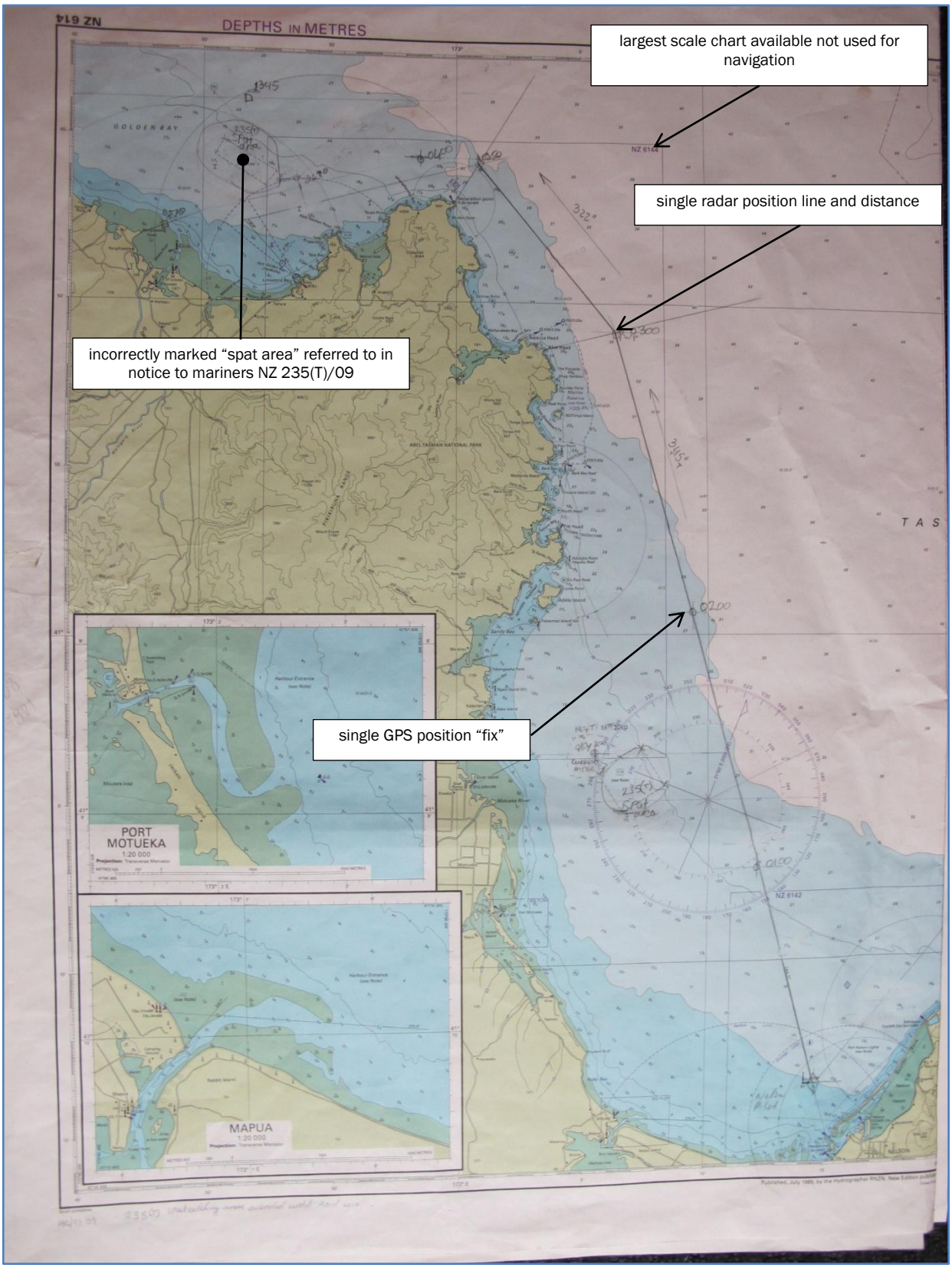

Figure 4
Photograph of chart in use by the *Anatoki* at the time of the accident

running aground. A recommendation has been made to the Director of Maritime New Zealand to address this safety issue.

Finding:

The *Anatoki* ran aground because the mate was not adequately monitoring the progress of the ship against the passage plan and the master's night orders, and in the period immediately before the grounding, could not have been monitoring the progress of the vessel at all.

Finding:

A working bridge watch navigational and alarm system should have been fitted to the *Anatoki* to mitigate the known risk of one-man bridge operations. Had one been fitted the mate might have been alerted in time to prevent the grounding.

4.3. Self-imposed sleep deprivation

4.3.1. The working schedule for the *Anatoki* in the 2 days before the grounding afforded the crew ample opportunity for rest and recreation.

4.3.2. Both the master and the engineer took their opportunities to sleep and had not consumed alcohol on the evening of departure from Nelson. Their performance was therefore unlikely to have been impaired by lack of sleep.

4.3.3. The watchkeeper had also taken his opportunities to rest, but he said he had consumed 2 pints of beer about 4.5 hours before going on duty. Alcohol intake affects individuals in different ways depending on physical characteristics and circumstances. It is unlikely that the watchkeeper's performance was impaired by alcohol at the time he went on duty; however, it is questionable whether he was complying with the company policy on alcohol at the time.

4.3.4. The mate, on the night of 4 May, had taken the opportunity to spend the night at home with his family. On 5 May he decided to accompany the watchkeeper ashore to a local bar/restaurant where he consumed "4 to 5 pints of beer" before returning to the vessel at about 2215, 45 minutes before he went on duty. Even when considering that alcohol affects individuals in different ways, the mate's performance would likely have been impaired when he was steering the *Anatoki* out of Nelson under the master's command, which meant that he would not have complied with the company drug and alcohol policy at that time.

4.3.5. It was not able to be established whether the mate would have still been impaired by alcohol at the time he came on watch shortly after 0400 on 5 May. The company instigated post-incident testing for alcohol and drugs, the results of which were negative for both drugs and alcohol for the master and crew. However, the post incident testing was not carried out until about 1550 on the day of the grounding, more than 10.5 hours after the *Anatoki* had run aground and more than 18 hours since any of the crew said they had last consumed alcohol.

4.3.6. For post-incident screening for alcohol and drugs in a person's body to be effective the screening should be carried out as soon as possible after the incident otherwise the body either metabolises or ejects the substance as time passes. After 18 hours it was unlikely that any of the crew would have had any alcohol remaining in their bodies.

4.3.7. Research has shown that even consuming a small amount of alcohol prior to sleep can affect the quality of sleep leading to daytime fatigue and sleepiness. The National Institute on Alcohol Abuse and Alcoholism of the National Institutes of Health in the United States of America stated in their publication Alcohol Alert No. 41 in July 1998 that:

> **Alcohol and sleep in those without alcoholism**
>
> Alcohol consumed at bedtime, after an initial stimulating effect, may decrease the time required to fall asleep. Because of alcohol's sedating effect, many people with insomnia consume alcohol to promote sleep. However, alcohol consumed within an hour of bedtime appears to disrupt the second half of the

> sleep period (7). The subject may sleep fitfully during the second half of sleep, awakening from dreams and returning to sleep with difficulty. With continued consumption just before bedtime, alcohol's sleep-inducing effect may decrease, while its disruptive effects continue or increase (8). This sleep disruption may lead to daytime fatigue and sleepiness. ...
>
> Alcoholic beverages are often consumed in the late afternoon (e.g., at "happy hour" or with dinner) without further consumption before bedtime. Studies show that a moderate dose(1) of alcohol consumed as much as 6 hours before bedtime can increase wakefulness during the second half of sleep. By the time this effect occurs, the dose of alcohol consumed earlier has already been eliminated from the body, suggesting a relatively long-lasting change in the body's mechanisms of sleep regulation (7,8).
>
> The adverse effects of sleep deprivation are increased following alcohol consumption. Subjects administered low doses of alcohol following a night of reduced sleep perform poorly in a driving simulator, even with no alcohol left in the body (9,10). Reduced alertness may potentially increase alcohol's sedating effect in situations such as rotating sleep-wake schedules (e.g., shift work) and rapid travel across multiple time zones (i.e., jet lag) (9). A person may not recognize the extent of sleep disturbance that occurs under these circumstances, increasing the danger that sleepiness and alcohol consumption will co-occur[2] (National Institute on Alcohol Abuse and Alcoholism of the National Institutes of Health, 2000).

4.3.8. After the vessel had left Nelson the mate left the wheelhouse to go to bed at about 0020. He was called again at about 0350 which left him about 3 5 hours in which to sleep, having been awake from about 0700 the day before.

4.3.9. "To be alert and to function well, each person requires a specific amount of nightly sleep. If individual "sleep need" is not met, the consequences are increased biological sleepiness, reduced alertness, and impaired physical and mental performance. For most people, getting 2 hours' less sleep than they need on one night (an acute sleep loss of 2 hours) is enough to cause measurable impairment of performance and alertness the next day. The reduction in performance capacity is particularly marked if less than about 5 hours' sleep is obtained"[3]

4.3.10. The mate had only had 3.5 hours' sleep in the previous 21 hours by the time he went on watch at 0400. It is possible that the quality of that 3.5 hours' sleep was lowered by the effects of alcohol that he had stopped consuming about 3 hours before going to sleep. Either way, the mate's performance was likely to have been impaired owing to acute sleep loss.

Finding:

The mate did not take enough of the ample opportunity he had to rest before being required for watchkeeping duties.

Finding:

The mate's performance was likely to have been adversely affected by him only having a maximum of 3.5 hours sleep in the preceding 21 hours and possibly the effects of alcohol affecting the quality of that sleep.

[2] References, in brackets, in this document can be found at the end of the document on the National Institute on Alcohol Abuse and Alcoholism website if required

[3] Philippa Gander, BSc, MA(hons), PhD (Auckland), Sleep/Wake Research Centre, in collaboration with Te Ropu Rangahau Hauora a Eru Pomare and the Wellsleep Clinic at the Wellington School of Medicine and Health Sciences. Expert Testimony: Collision of the passenger ferry *Aratere* and the fishing boat *San Domenico*, 5th of July 2003, New Zealand Transport Accident Investigation Commission, 2003.

4.4. Safe ship management and qualifications

4.4.1. When Maritime NZ and the *Anatoki*'s owner started corresponding to determine the Maritime Rules that applied to the *Anatoki*, it was apparent that the vessel naturally fell somewhere between a SOLAS vessel and a coastal vessel less than 45 m tonnage length. After the vessel's arrival in Nelson from Japan, the owner had had the vessel modified to shorten the tonnage length of the vessel to under 45 metres thus allowing the vessel to enter the safe ship management system and be manned in accordance with Maritime Rules Part 31B.

4.4.2. The correlation between SOLAS, STCW and the New Zealand Maritime Rules is complex. The *Anatoki* fell somewhere between the requirements of each and this had caused substantial dialogue between Maritime New Zealand and the owner, which was still on-going and unresolved at the time this report was published. The Commission has recommended that the Director of Maritime New Zealand resolves the issue of the number and type of qualifications applicable to the vessel.

4.4.3. Regardless of what qualification the national and international rules said the mate should have held, the main issue contributing to the grounding was the standard of navigation. The offshore watchkeeper's qualification that the mate held should have been sufficient to enable him to navigate the *Anatoki* from Nelson to Tarakohe. That aside, the coastal navigation syllabus for an off-shore master is more extensive than that for a watch-keeper. Whether the grounding would have happened if the mate had held an offshore master certificate is a matter of conjecture. Regardless of the qualifications held by the watchkeepers, the navigation standards on any vessel come under the auspices of the master, and ultimately the owner who are responsible for ensuring the standards of navigation are up to industry best practice.

4.4.4. The consumption of alcohol by the watchkeeper and mate, and the master's tacit acceptance of their behaviour in that regard, showed that the owner's drug and alcohol policy was not being complied with.

4.4.5. When the grounding occurred the safe ship management system for the *Anatoki* was in its exemption period, where time was allowed for the accumulation of records that showed the operator was measuring and monitoring standards, investigating accidents and incidents and taking corrective actions in the spirit of the concept of continuous improvement. The *Anatoki* had yet to undergo any form of safe ship management audit since the safe ship management certificate had been issued in February 2010. However, this was a new certificate after the vessel's modification in February and the vessel had been within an safe ship management system since commencing operations in New Zealand in 2008. There are 3 safety issues raised in this report that indicate that more work is needed by the owner and its crews before the safe ship management system can be said to be working as it should.

4.4.6. At the time of the accident there were no rules limiting the amount of alcohol and other performance-impairing substances for commercial seafarers and recreational boat drivers in charge of a vessel. The Commission considers that it is a serious safety issue because being in charge of a vessel is equal to, if not more demanding than, driving a car on the road, and the consequences can be the same.

4.4.7. On 8 March 2011, in its report on a collision between a jet boat and a jetski, (Transport Accident Investigation Commission, 2011) the Commission made a recommendation to the Secretary of Transport regarding substance impairment in the maritime sector. The recommendation and the reply on behalf of the Secretary of Transport are shown below:

> Until legislation is made setting limits for and testing of alcohol and other performance impairing substances for recreational and commercial boat drivers, the risk of alcohol-related accidents will be elevated.
>
> It is recommended that the Secretary for Transport address this safety issue by promoting appropriate legislation to set maximum allowable levels of alcohol and other performance impairing substances for persons in charge of recreational and

commercial craft, and supporting legislation to allow testing for such levels in these cases. (005/11)

On 16 March 2011, the Manager Maritime and Freight of the Ministry of Transport replied to the final recommendation:

> The recommendation is that the Secretary for Transport promote legislation to set limits and establish a testing regime to address the risk of recreational and commercial boating accidents due to the use of alcohol or other performance-impairing substances.
>
> Recreational and commercial boating is one of three areas of transport activity where no alcohol and drug limits or testing regime yet exists. The introduction of such a regime in any of these areas would be a major policy decision for government that would need to be informed by a thorough understanding of the problem and the policy options. The Ministry therefore intends to develop a report to government on the feasibility of a compulsory post-accident and incident drug and alcohol testing regime for the aviation, maritime and rail transport sectors.
>
> Accordingly, implementation of recommendation 005/11 would only be practicable once the relevant policy work had been undertaken by the Ministry, and then only if the results indicated that a drug and alcohol testing regime is a feasible option.

4.4.8. Whether alcohol consumption contributed to this accident or not, this is another case where abuse of alcohol in the maritime workplace has been identified as an issue. The Commission is convinced that the feasibility report referred to in the response to the recommendation should be given the utmost urgency.

Finding:

The qualifications held by the crew on the *Anatoki* should have been sufficient to navigate the ship safely on the voyage from Nelson to Tarakohe.

At the time of the grounding there was uncertainty between Maritime New Zealand and the owner of the *Anatoki* on what was a suitable level of crewing for a ship of that size and tonnage. The complexity of the relationship between New Zealand and international standards for crewing ships is an issue that New Zealand needs to resolve.

Finding:

The company drug and alcohol policy was not at the time of this accident complied with by the *Anatoki*'s master and crew.

Finding:

The owner and the master on board the *Anatoki* were not effectively managing the standards of navigation and the drug and alcohol policy at the time of the grounding.

5. Findings

5.1. The *Anatoki* ran aground because the mate was not adequately monitoring the progress of the ship against the passage plan and the master's night orders, and in the period immediately before the grounding, could not have been monitoring the progress of the vessel at all.

5.2. A working bridge watch navigational and alarm system should have been fitted to the *Anatoki* to mitigate the known risk of one-man bridge operations. Had one been fitted the mate might have been alerted in time to prevent the grounding.

5.3. The mate did not take enough of the ample opportunity he had to rest before being required for watchkeeping duties.

5.4. The mate's performance was likely to have been adversely affected by his only having a maximum of 3.5 hours sleep in the preceding 21 hours and possibly the effects of alcohol affecting the quality of that sleep.

5.5. The qualifications held by the crew on the Anatoki should have been sufficient to navigate the ship safely on the voyage from Nelson to Tarakohe.

5.6. At the time of the grounding there was uncertainty between Maritime New Zealand and the owner of the *Anatoki* on what was a suitable level of crewing for a ship of that size and tonnage. The complexity of the relationship between New Zealand and international standards for crewing ships is an issue that New Zealand needs to resolve.

5.7. The company drug and alcohol policy was not at the time of this accident complied with by the *Anatoki*'s master and crew.

5.8. The owner and the master on board the *Anatoki* were not effectively managing the standards of navigation and the drug and alcohol policy at the time of the grounding.

6. Safety actions

General

6.1. The Commission classifies safety actions by 2 types:

(a) safety actions taken by the regulator or an operator to address safety issues identified by the Commission during an inquiry that would otherwise result in the Commission issuing a recommendation; and

(b) safety actions taken by the regulator or an operator to address other safety issues that would not normally result in the Commission issuing a recommendation.

Safety actions addressing safety issues identified during an inquiry

6.2. After the accident the owner of the *Anatoki* had a bridge watch-keeping navigational alarm system fitted to the *Anatoki* and ensured that the standing orders were modified to incorporate the use of this alarm system.

7. Recommendations

General

7.1. The Commission may issue, or give notice of, recommendations to any person or organisation that it considers the most appropriate to address the identified safety issues, depending on whether these safety issues are applicable to a single operator only or to the wider transport sector. In this case, recommendations have been issued to Maritime New Zealand..

7.2. In the interests of transport safety it is important that these recommendations are implemented without delay to help prevent similar accidents or incidents occurring in the future.

Recommendations

7.3. On 29 March 2012 the following recommendations were made to the Director of Maritime New Zealand:

7.3.1. The owner and the master on board the *Anatoki* were not effectively managing the standards of navigation and the drug and alcohol policy at the time of the grounding.

The Commission recommends the Director of Maritime New Zealand audits Coastal Bulk Shipping 2007 Limited's safe ship management system both ashore and on board the *Anatoki* to ensure that it meets the standards required by the New Zealand safety management system. (017/12)

On 12 April 2012 the Director of Maritime New Zealand replied:

> Maritime New Zealand accepts this recommendation and intends to undertake a comprehensive audit of Coastal Bulk Shipping 2007 Limited's safe ship management system in response to the Commission's draft report. This has been timetabled for completion, and compilation of a report, by the end of July 2012.

7.3.2. At the time of the grounding there was uncertainty between Maritime New Zealand and the owner of the Anatoki on what was a suitable level of crewing for a ship of that size and tonnage. The relationship between New Zealand and international standards for crewing ships is unclear and appears complex.

The Commission recommends the Director of Maritime New Zealand resolves the correct level of crewing for the Anatoki and clarifies for industry the relationship between New Zealand and international crewing standards. (018/12)

On 12 April 2012 the Director of Maritime New Zealand replied:

> Maritime New Zealand accepts this recommendation and intends to establish the correct level of crewing for the *Anatoki* This will include first establishing theoretical minimum safe manning required by the Rules, a visit to the operator to assess whether that level is suitable, and the comprehensive audit, scheduled in response to the Commission's draft report. This has been timetabled for completion, and compilation of a report, by the end of July 2012. Following the determination of the correct crewing level, Maritime New Zealand intends publishing advice as to the relationship between New Zealand and international crewing standards in September 2012 edition of our quarterly publication, Safe Seas Clean Seas.

7.3.3. A working bridge watch navigational and alarm system should have been fitted to the Anatoki to mitigate the known risk of one-man bridge operations. Had one been fitted the mate might have been alerted in time to prevent the grounding.

The Commission recommends the Director of Maritime New Zealand requires New Zealand-registered coastal vessels operating under one-man-bridge-operation to have a bridge watch navigational and alarm system to mitigate the known risk of sole watchkeepers falling asleep or becoming distracted from monitoring the progress of their vessels. (019/12)

On 12 April 2012 the Director of Maritime New Zealand replied:

> Maritime New Zealand notes this recommendation and agrees it is desirable to make such alarms mandatory. Maritime New Zealand is proposing to develop and include an amendment to this effect in a package of SOLAS amendments for possible inclusion in the Minister of Transport's 2012-2013 regulatory programme

8. Key lessons

8.1. Responsible watchkeepers should take the opportunity to have adequate sleep to prevent their becoming fatigued.

8.2. Under no circumstances should crew undertake safety critical tasks when impaired by alcohol.

8.3. Alcohol consumption can reduce the quality of sleep even hours after consumption stops.

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09-203	Jet boat, DRJS-11 grounding and subsequent rollover Dart River, near Glenorchy, 20 February 2009
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