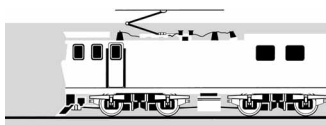
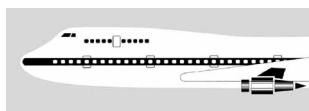


MARINE OCCURRENCE REPORT

04-205

Fishing vessel *Bronny G*, grounding, Banks Peninsula

26 March 2004



**TRANSPORT ACCIDENT INVESTIGATION COMMISSION
NEW ZEALAND**

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Report 04-205

**fishing boat
*Bronny G***

grounding

Steep Head, Banks Peninsula

26 March 2004

Abstract

On Friday 26 March 2004 at about 0215, the fishing boat *Bronny G* grounded on rocks at Steep Head on the Banks Peninsula while on passage from fishing grounds to Lyttelton Harbour. Before abandoning the boat the skipper was unable to transmit a mayday call but was able to use his cellphone to contact his partner ashore, who raised the alarm.

The crew of the *Bronny G* were uninjured, and able to make it to the beach from where they were airlifted to safety by a rescue helicopter at daybreak. The *Bronny G* was unsalvageable and suffered extensive damage from the continual action of the sea. The boat was subsequently declared a constructive total loss.

The safety issues identified included:

- the lack of a working watchkeeping alarm for a single-handed wheelhouse operation
- the undertaking of navigational watchkeeping and helmsman tasks whilst impaired by the effects of fatigue

Safety recommendations were made to: the Managing Director of Pegasus Fishing Limited, the General Manager of SGS Ships Management Systems, the General Manager, Trade and Education of the Seafood Industry Council and the Director of Maritime Safety.



The *Bromy G* aground under the cliffs at Steep Head

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Abbreviations

ACC	Accident Compensation Corporation
GPS	global positioning system
IMO	international maritime organization
kW	kilowatt
m	metres
MSA	Maritime Safety Authority
nm	nautical mile
NZST	New Zealand Standard Time (UTC + 12 hours)
SITO	seafood industry training organization
SSB	single side band
SSM	safe ship management
STCW	international convention on standards of training, certification and watchkeeping
STCW-F	international convention on standards of training, certification and watchkeeping for fishing vessel personnel
UTC	co-ordinated universal time
VHF	very high frequency

Glossary

chine	the join between the side and bottom of a vessel
conduct	in control of the vessel
conning (con)	directing the course and speed of a ship
displacement tonnage	weight of liquid displaced by a solid floating or immersed in it
green fish	a fresh caught fish not yet knifed or gutted
gross tonnage	a measure of the internal capacity of a ship; enclosed spaces are measured in cubic metres and the tonnage derived by formula
kort nozzle	solid shroud around the propeller of a vessel
knot	one nautical mile per hour
loom	the diffused glow due to atmospheric scattering observed from a light below the horizon or hidden by an obstacle
neap tide	tidal undulation that has the highest low water, and lowest high water, in a series
paravane	a stabiliser or roll-damping device on small to medium-sized trawlers, rigged on booms extending out from both sides of the trawler and towed by cables or chains a few metres below the sea surface. Also called flopper stopper
spring tide	tidal undulation that has the lowest low water, and highest high water, in a series
tidal stream	the periodic movement of water in a horizontal direction, and is due ultimately to the same causes as the tide
transceiver	a combined radio transmitter and receiver

Data Summary

Vessel Particulars:

Name:	<i>Bronny G</i>
Type:	Trawler
Limits:	Offshore
Length:	19.91 m
Breadth:	5.95 m
Gross tonnage:	81
Built:	1970
Propulsion:	a single Gardener 8L3B diesel engine developing 171 kW power driving a controllable pitch propeller housed in a Kort nozzle.
Service speed:	8 kts
Port of registry:	Lyttelton
Owner:	MT Trawlers Limited
Operator:	Pegasus Fishing Limited
Crew:	3
Date and time:	26 March 2004 at about 0215 ¹
Location:	Steep Head, Banks Peninsula
Persons on board:	crew: 3
Injuries:	crew: nil
Damage:	constructive total loss
Investigator-in-charge:	Captain I.M. Hill

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

Factual Information

1.1 History of the voyage

- 1.1.1 On Thursday 25 March 2004 at about 0200, the skipper and 2 crew of the *Bronny G* gathered at the fishing boat to prepare for a fishing trip to the east coast of Banks Peninsula.
- 1.1.2 After readying the boat and loading ice they departed Lyttelton Harbour at about 0330, and made their way to a position, chosen by the skipper, off Goughs Bay to commence fishing (see Figure 1). On passage the skipper discovered that the autopilot was malfunctioning, so the *Bronny G* had to be hand steered for the rest of the voyage.
- 1.1.3 On the trip to the fishing grounds the 2 crew emptied the fish hold of water and stowed the ice into the fish hold. They then secured all the loose equipment on deck. This work took them about 2 hours to complete.
- 1.1.4 As the boat approached Long Lookout Point the skipper handed the con over to the senior of the 2 deckhands. The skipper instructed him to wake him 0.5 nm before reaching a position he had designated on the global positioning system (GPS) receiver.
- 1.1.5 After reaching the designated position, the skipper and the senior deckhand shot the net and commenced trawling. The skipper went to his bed leaving the senior deckhand in charge of the fishing.
- 1.1.6 At about 1015, the senior deckhand called the skipper and the junior deckhand to haul the net. The catch from the first trawl was disappointing so the skipper decided to proceed further out to sea before resuming trawling.
- 1.1.7 After about 2 hours steaming the skipper decided that they were in a position to resume trawling and the net was shot, after which the senior deckhand went to bed. The skipper conducted the trawl, which lasted for about 4 hours while the junior deckhand reportedly went to bed from about 1330 to 1645.
- 1.1.8 At about 1700, all the crew were awake and the net was hauled and the fish stowed and then shot for the third trawl at about 1800. The senior and junior deckhands went to their beds at about 1830, while the skipper conducted the trawl waking the 2 deckhands again at about 2115 to haul the net.
- 1.1.9 By about 2215 the net had been hauled and the paravanes and stabiliser arms stowed. The junior deckhand was at the helm and the senior deckhand completed stowing the fish leaving the green fish out ready to gut. He then went to the wheelhouse and took the helm while the junior deckhand went on deck to clear up.
- 1.1.10 The skipper gave the senior deckhand instructions to call him 2 nm before passing Godley Head and then went to bed. After the junior deckhand had finished clearing up he relieved the senior deckhand on the wheel, who went to gut the green fish.
- 1.1.11 As the senior deckhand was preparing to gut the green fish he found that the movement of the boat was making it difficult. He elected to leave gutting the fish until the *Bronny G* was more sheltered from the swell as it approached Lyttelton. After securing the green fish, he told the junior deckhand on the wheel to wake him as they approached Long Lookout Point and went to bed.
- 1.1.12 After some time, the junior deckhand left the wheel and went to make himself a hot drink. Returning to the wheelhouse he discovered that the boat had swung around about 180° while he had been away. The junior deckhand brought the boat back to the required heading and continued to con the boat towards Lyttelton.

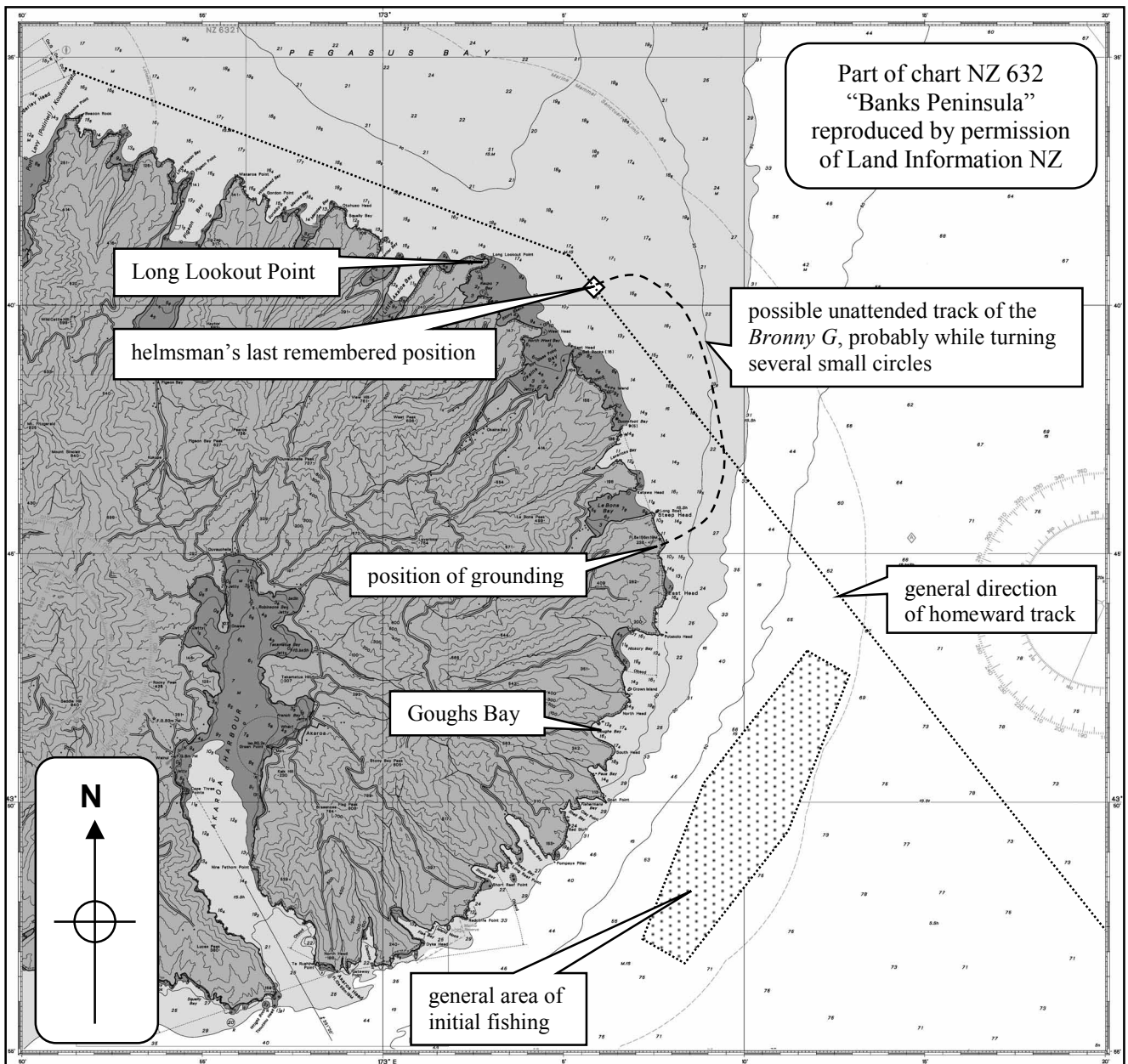


Figure 1
General area of accident

- 1.1.13 The junior deckhand later remembered being about 2 nm off of Long Lookout Point, although he could not remember the time, and thinking that he would shortly have to call the senior deckhand to commence processing the fish.
- 1.1.14 At about 0215 on Friday 26 March 2004, all the crew, including the deckhand on the helm, were woken up by the noise and motion of the *Bronny G* as it grounded on a rock shelf under cliffs. The skipper immediately made his way to the wheelhouse and put the engine to astern. This however did not have any noticeable effect.
- 1.2 Abandonment and rescue**
- 1.2.1 When the skipper realised that he could not free the boat, he tried to use his radio transmitters to call for help. However, he found that they had no electrical power so he resorted to using his cellphone.
- 1.2.2 While inspecting the boat for damage the skipper concluded that it must have grounded at Steep Head close to Le Bons Bay. This was the only place on the peninsula with cliffs similar to the

ones they were underneath, and he could see the loom of a navigational light clipping the top of the cliff above him.

- 1.2.3 When the skipper used his cellphone, he first attempted to contact the emergency services on 111, but, due to the intermittent cellular network coverage he was unable to make contact. Next he tried to contact another fishing boat the *Lady Sarah*, followed by the Pegasus Fishing Limited Manager's cellphone, both without success. He finally managed to get through to his partner's answer phone where he left a message.
- 1.2.4 The skipper's partner rang back almost immediately to say she had received the message and would contact the *Bronny G's* operator. After the Skipper's partner had contacted the *Bronny G's* operator, the operator in turn contacted Waikuku Marine Radio to ascertain if they could contact the *Bronny G* and also contacted 3 of his managed fishing boats that were alongside in Lyttelton to put to sea and search for the *Bronny G*. Waikuku Marine Radio were unable to contact the *Bronny G*, so informed the Police at about 0430. The Police then launched a search and rescue operation involving the local rescue helicopter.
- 1.2.5 While the skipper was trying to contact help, the senior deckhand instructed the junior deckhand to don his lifejacket and donned his own, he then got the junior deckhand up by the wheelhouse and told him to stay there. Noticing that the life-raft had already inflated and was in danger of breaking free, he made his way along the boat to secure the life-raft to the side and then re-entered the accommodation to get blankets and any other useful items he could find.
- 1.2.6 As the senior deckhand re-entered the accommodation he noted that the box that contained the batteries for the radios and other safety equipment was missing, and presumed this was the reason that the radios were not working. He remembered having looked at the box previously and thinking that he should secure the box at some time.
- 1.2.7 All the crew then boarded the life raft, abandoning the *Bronny G*, and tried to paddle to the shore, a distance estimated to be 20 m. As the life-raft approached the beach a wave toppled the raft, which started to roll down the face of the wave. The skipper and the junior deckhand were tipped from the raft and managed to swim the last 10 metres to the shore. However, they re-entered the water to help the senior deckhand who was caught up in the raft. The three then made it back to the shore, but the raft and its equipment were lost.
- 1.2.8 Once the crew were on the beach, they decided to try and walk along under the cliffs to Hickory Bay to the south. However, they were unable to due to the nature of the terrain, the distance involved, the state of the tide, and the number of seals with pups in the area. They then thought about trying to walk to Le Bons Bay to the north but were unable to do this due to the state of the tide.
- 1.2.9 The crew took shelter under a rock overhang at the bottom of the cliff near to the *Bronny G* where the rescue helicopter found them at about 0500, shortly before the 3 fishing boats dispatched by the Pegasus Fishing Limited manager arrived on the scene.
- 1.2.10 The rescue helicopter was unable to winch them to safety immediately due to the proximity of the sea cliffs and the darkness, so they landed nearby and awaited daylight before rescuing and transport them to hospital in Christchurch. The crew were discharged from the hospital after undergoing medical checks.

1.3 Boat information

- 1.3.1 The *Bronny G* was a 19.8 m stern trawler with a steel double chine hull built in New Zealand in 1970. The boat had a moulded beam of 5.95 m and a maximum displacement of 130 t.
- 1.3.2 The *Bronny G* was powered by a Gardner 8L3B diesel engine driving a single controllable pitch propeller housed in a Kort nozzle.

1.3.3 The wheelhouse was equipped with the standard equipment necessary for navigation and fishing, which included:

- a Lilley and Gilley magnetic compass
- a TMQ autopilot (not working)
- a Furuno radar
- a Furuno depth sounder
- a Furuno Global Positioning System (GPS)
- 2 very high frequency (VHF) radio transceivers, 1 Furuno, 1 Icom
- a Codan single side band (SSB) radio transceiver.

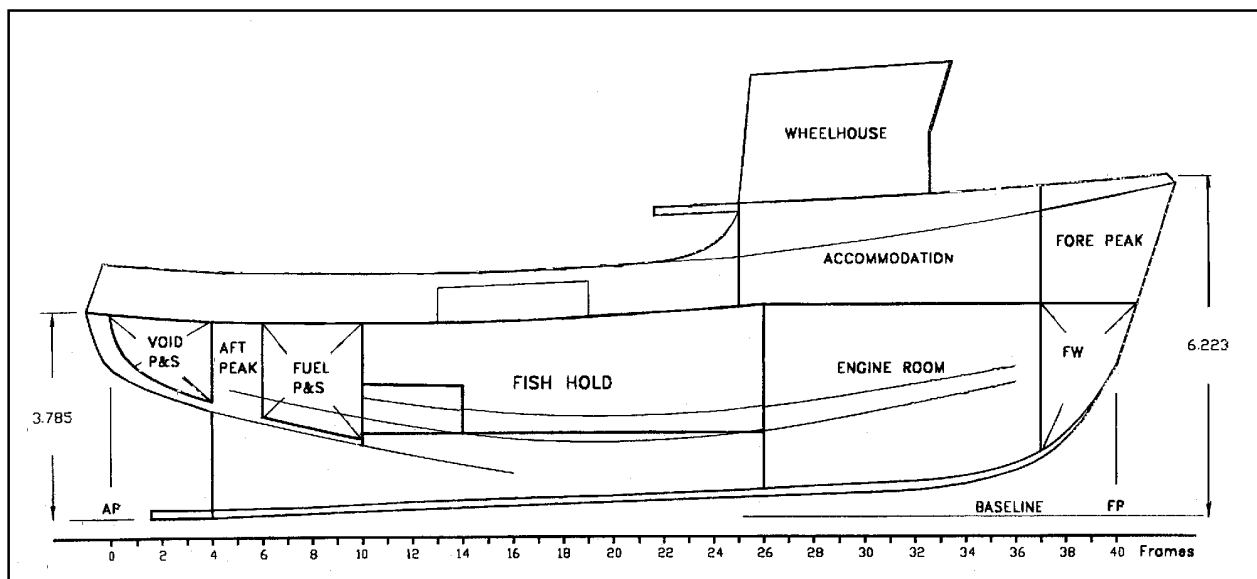


Figure 2
Plan of the *Bronny G*

1.3.4 The *Bronny G* was owned by M.T. Trawlers and managed and operated by Pegasus Fishing Limited. The manager of Pegasus Fishing Limited was also the only named director of Pegasus Fishing Limited and M.T. Trawlers Limited. The manager of Pegasus Fishing Limited had also been managing director of Pegasus Bay Fishing Limited a now defunct entity and was the only named director of Windward Fishing Company Limited.

1.3.5 After the accident, both the skipper and the operator opined that it was unlikely that the *Bronny G* took a slow turn in either direction when the wheel was left unattended. It was more likely that the boat would have made a series of smaller circles before grounding.

1.3.6 A watchkeeping alarm² was fitted, that derived its electrical power from the same source as the autopilot. However, the autopilot malfunctioned during the outward leg of the voyage so the skipper switched it off. As a result the watchkeeping alarm was also switched off.

1.3.7 The Maritime Safety Authority (MSA) promoted the use of watchkeeping alarms and was developing draft requirements for the fitting of watchkeeping alarms on small fishing boats operating at night with a single watchkeeper as an aid to developing appropriate fatigue management. However, at the time of the accident there was no statutory requirement for such an alarm to be fitted or used.

² An alarm in the wheelhouse that is set to activate at a predetermined time interval and has to be manually cancelled

- 1.3.8 The MSA had also convened the Fishing Industry Safety and Health Advisory Group (FISHgroup) in mid 2001 as part of the measures to counter the effects of fatigue on fishing vessel crews. One of the recommendations in the FISHgroup's final report, dated June 2003, was:

the fitting and use of watchkeeping alarms (or suitable alternative warning systems) on fishing boats for night operations with a single watchkeeper (while recognizing the limited benefits of this approach and the need for broader-based countermeasures), and ask that this work also consider the possibility of providing incentives for the use of such systems.

- 1.3.9 FISHgroup was replaced by fishSAFE with the primary aim of developing and managing an implementation plan to give effect to the recommendations in the FISHgroup report.

1.4 Damage

- 1.4.1 When the *Bronny G* became fast on the rocks below the cliffs at Steep Head, the owner, operator and insurer employed a firm of salvors to investigate the possibility of refloating the boat or at least reducing the impact the wreck may have had on the environment.
- 1.4.2 Because of the sea and swell the boat was extremely difficult to approach. However, a group of salvors managed to get close to the boat on the 27 March 2004 about 36 hours after the accident. They were unable to carry out any more than a cursory inspection before the sea and swell increased to an extent that they had to leave the scene.
- 1.4.3 On 2 April 2004, when the sea and swell had reduced, the salvor was able to get a team of divers to the boat, although it was too risky for them to board they were able to see that the boat had lost a large quantity of shell plating on the inshore side, the main engine had been ripped out and one of the fishing winches had fallen from the deck into the fish hold. There was no sign of pollution. The decision was taken between the salvor, operator and regional council to abandon the boat.

1.5 Climatic and tidal conditions

- 1.5.1 At the time of the accident there was a high-pressure system situated over New Zealand, but a low pressure to the south of New Zealand. The associated weather systems caused a swell affecting the east coast of South Island (See Figure 3).
- 1.5.2 Banks Peninsula is situated on the boundary between 2 of the New Zealand coastal waters forecast areas, namely Conway and Rangitata. New Zealand Meteorological Service (Metservice) issued Coastal waters forecasts at well-documented regular intervals.
- 1.5.3 Coastal area forecasts are a general indication of average conditions expected in a particular coastal area. The forecasts are for open waters within 60 nm of the coast and do not apply to enclosed areas such as small bays and harbours.
- 1.5.4 The coastal waters forecast issued at 0014 26 March 2004 was as follows:

MARINE WEATHER BULLETIN FOR NEW ZEALAND COASTAL
WATERS FORECAST ISSUED BY METEOROLOGICAL SERVICE OF
NEW ZEALAND AT 0100HRS 26-MAR-2004. VALID UNTIL MIDNIGHT
TONIGHT 26-MAR-2004. SOUTH ISLAND:

RANGITATA

Northerly 15 knots, rising to northwest 25 knots late afternoon then easing to 15 knots south of the Rangitata River tonight. Sea becoming rough. Southwest swell easing to 2 metres.

OUTLOOK FOLLOWING 12 HOURS: Northwest rising to 25 knots.

CONWAY

Northerly 15 knots, rising to northwest 25 knots this evening. Sea becoming rough. Southerly swell 2 metres.

OUTLOOK FOLLOWING 12 HOURS: Northwest 25 knots.

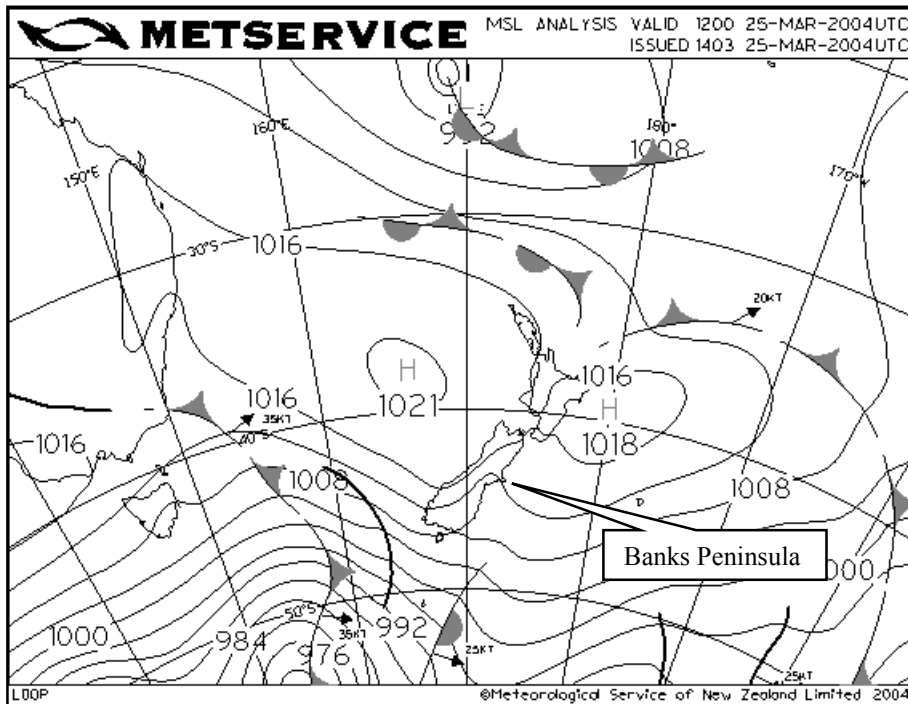


Figure 3
Mean sea level analysis synoptic chart for 0000 26 March 2004

1.5.5 Tidal stream rates are shown on chart NZ632 for specific geographical positions designated by a magenta diamond shape enclosing a letter, known as a tidal diamond (see Figure 1). The rates shown are for average spring or neap tides referred to high water at Lyttelton. If the tidal range is greater than normal the rates will be increased roughly in proportion. The spring rate of tides tabulated in the New Zealand Nautical Almanac for Lyttelton was 1.87 m and the neap range 1.62 m. The range at the time of the grounding was 1.6 m and therefore a neap tide. The neap rates for the relevant diamond is shown:

Position	Time	Direction	Rate
Diamond "A" 43° 44'.7 S 173° 14'.6 E	26/03/2004 0013	215°	0.2 kts
	26/03/2004 0113	206°	0.5 kts
	26/04/2004 0213	203°	0.5 kts

1.5.6 When a tidal stream runs against a sea and swell it causes the sea to steepen and the wave period to decrease, conversely when a tidal stream runs with a sea and swell it causes the sea to flatten and the wave period to increase. The tidal stream at the time of the accident was running in a 203° direction while the swell was coming from a south (180°) to south westerly (220°) direction, therefore running against the tidal stream.

1.6 Crew

1.6.1 The *Bronny G* was certified to operate within offshore limits as defined in Maritime Rule Part 20. To operate within these limits up to 100 nm off the coast the required minimum crewing under Maritime Rule Part 31C Section 3 was 2, the skipper was required to hold a New Zealand Offshore Master's (NZOM) certificate and one of the crew, which may be the skipper, was required to hold a Marine Engineer Class 6 (MEC6) certificate. Under Maritime Rule Part 32.36 a New Zealand Coastal Master's (NZCM) certificate was considered equivalent to a NZOM and a second-class diesel trawler engineer's (2DTE) was considered equivalent to a MEC6.

1.6.2 The skipper of the *Bronny G* had gone to sea in 1985 at the age of 16, and had been in the fishing industry since then. He progressed through the ranks of the fishing industry gaining his commercial launch master's certificate in 1988, his coastal master's certificate in 1991 and his

second-class diesel trawler engineer's certificate in 1992. He had been the skipper on the *Bronny G* since October 2003.

- 1.6.3 The senior of the 2 deckhands had first gone to sea in 1984 at the age of 14 and had been working in the fishing industry since then apart from a few periods of work ashore, one of them for a local ship-building firm. He held no formal maritime qualification and had crewed on the *Bronny G* since October 2003.
- 1.6.4 The junior of the two deckhands was 16 at the time of the collision and had been working in the fishing industry since the end of August 2003. He held no formal maritime qualification. He had worked on the *Bronny G* since about November 2003.

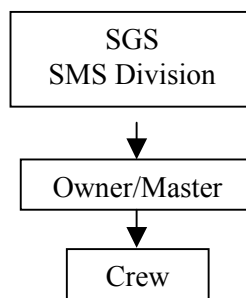
1.7 Remuneration and routines

- 1.7.1 The crew on the *Bronny G* were self-employed contractors as was the case on most New Zealand fresh fish vessels. They were not paid wages or salaries but received a percentage share of the catch value. Each person's percentage was dependent on their position on board. Their earnings were therefore directly proportional to the amount of fish caught.
- 1.7.2 All the *Bronny G*'s crew worked as required shooting and hauling the net, and dealing with and stowing the catch. Meals and rest periods were taken around those work periods, and therefore had no fixed routine.
- 1.7.3 When the boat was trawling, on passage between fishing grounds and proceeding to or from its home port the skipper designated who was to steer and keep a lookout.
- 1.7.4 After the accident the skipper and 2 deckhands gave their recollections about their sleep wake pattern in the 72 hours prior to the accident (see Figure 4).
- 1.7.5 The accuracy of the sleep information supplied by the skipper and crew is inherently limited by the fact that subjective reports of sleep duration and timing are not necessarily reliable, and by the fact that the accident had intervened between the sleep episodes and when they were being recalled.

1.8 Safe ship management

- 1.8.1 The *Bronny G* was under safe ship management (SSM) with SGS M&I. The certificate was issued on 12 January 2004, and subject to periodic audit/inspection of the ship and its management system, was valid until 20 November 2007.
- 1.8.2 The SSM manual for the *Bronny G* included the following:

In the implementation of the Ship's Safety Management System, the following structure will apply:



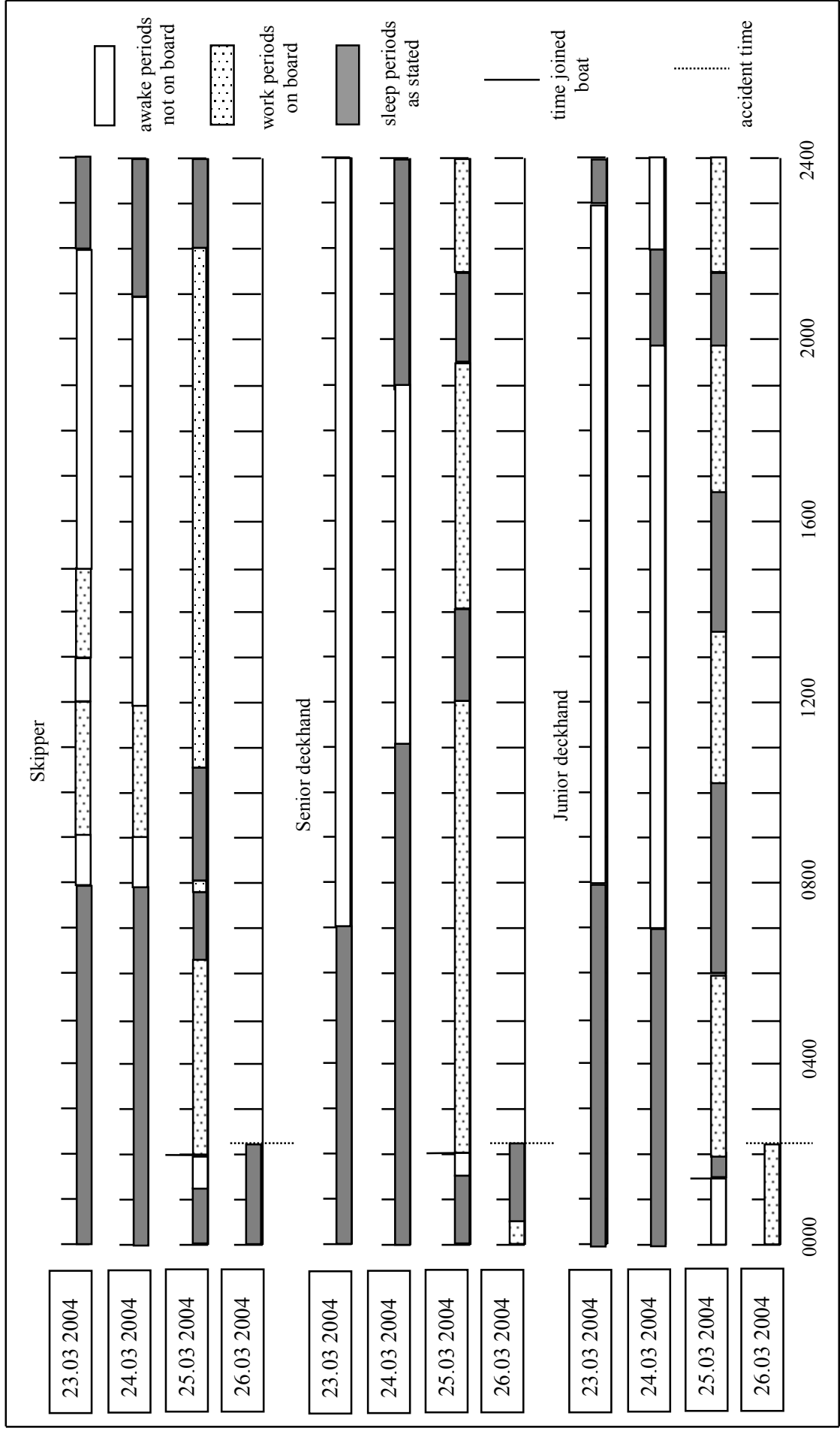


Figure 4
Crew sleep/wake information prior to accident

The owner will, at all times, employ only appropriately qualified, certified, experienced and medically fit seafarers to man this ship. The only exception to qualifications will be seafarers under training and then only as additional crew to the minimum manning levels required by legislation or regulation.

Ships Master: Responsibilities:

- The master has the ultimate responsibility for the operation of this ship and is responsible to the owner.
- He/she is responsible for ensuring that the safety and environmental protection policies defined in the Ships Management System are strictly adhered to.
- He/she is responsible for ensuring that all crew are trained in and understand the Ships Management System and observe the requirements.
- He/she is responsible for all instructions and orders given relating to the operation of the ship, that these instructions and orders are simple, clearly understood and followed by all crew or land-based support staff who from time to time report to him/her.
- He/she is responsible for verification that all of the foregoing is observed.
- He/she is responsible for reviewing the Ships Management System and reporting to the Company any improvements identified or deficiencies found.

Authorities

- The master has ultimate authority, while at sea, to decide on and take whatever action he sees fit to maintain the safety of the crew, the environment, the ship, and its cargo
- In conjunction with the owner, the Master has the authority to recruit appropriately qualified and experienced persons to fill crew positions.
- In all other respects he/she has the authorities as detailed in his /her conditions of employment.

The manual did not detail any information with regard to fitness for duty or fatigue.

1.9 Fatigue

1.9.1 There are many definitions of fatigue but no universally accepted one. The extent to which individuals may be affected by a given set of circumstances will vary. The definition most widely accepted by the shipping industry was that used by the International Maritime Organization (IMO), namely:

A reduction in physical and/or mental capability as the result of physical, mental or emotional exertion which may impair nearly all physical abilities including strength; speed; reaction time; co-ordination; decision-making or balance.

1.9.2 The IMO International Convention on Standards of Training, Certification and Watchkeeping, 1995 (STCW-95) prescribes specific minimum hours of rest for watchkeepers. STCW-95 does not apply to fishing vessels. However, the IMO International Convention on Standards of Training, Certification and Watchkeeping for Fishing Vessel Personnel, 1995 (STCW-F) recommends watchkeeping in the deck department to be arranged so that personnel are not impaired by fatigue, but no minimum hours of rest are prescribed. This convention was adopted by IMO in July 1995 but had not entered into force at the time of the accident.

1.9.3 On 1 February 2001 Maritime Rule Part 31C, Crewing and Watchkeeping Fishing Vessels, came into force, replacing the Shipping (Manning of Fishing Boat) Regulations 1986. Part 31C took account of STCW-F and introduced new requirements that supported an awareness of fatigue issues and their countermeasures.

1.9.4 Section 4 of Part 31C was entitled Watchkeeping and stated in part:

31C.14 Fitness for Duty

- (1) The owner and master of a fishing vessel must establish and implement procedures in respect of the vessel's crew, taking into account the requirement in 31C.15(1), to ensure that all crew are fit for duty when keeping a watch.
- (2) The crew of a fishing vessel must ensure, taking into account the requirement in rule 31C.15(2), that they are fit for duty at all times when keeping a watch.

31C.15 Fatigue

- (1) When the owner and the master of a fishing vessel establish and implement procedures for ensuring a seafarer's fitness for duty, they must take into account that-
 - (a) the level of alertness of a person keeping a navigational or engine-room watch may be affected by fatigue; and
 - (b) whenever alertness is affected by fatigue, performance can be impaired.
- (2) A seafarer on a fishing vessel, when considering his or her fitness for duty, must take into account-
 - (a) the signs, symptoms, and effects of fatigue, and
 - (b) that fatigue will affect his or her level of alertness, and
 - (c) that the performance of any person whose alertness is affected by fatigue can be impaired.

31C.16 Watchkeeping Standards

- (1) The owner and the master of a fishing vessel must establish and implement watchkeeping procedures addressing-
 - (a) for navigational watchkeeping-
 - (i) the composition of the watch; and
 - (ii) the fitness of duty of the watchkeepers; and
 - (iii) navigation planning and duties; and
 - (iv) the use of navigational equipment; and
 - (v) look-out duties; and...
- (2) The crew of a fishing vessel must comply with watchkeeping procedures established under rule 31C.16(1).

1.9.5 The advisory circular that accompanied Part 31C stated that owing to the diverse range of vessels covered by the rule, actual hours of work or rest could not be prescribed. However, it had a table of the signs and symptoms of fatigue and a section titled Fitness for Duty, which stated:

The watch system should be such that the efficiency of watchkeeping personnel is not impaired by fatigue. Duties should be so organised that the first watch at the commencement of a voyage and the subsequent relieving watches are sufficiently rested and otherwise fit for duty.

1.9.6 FISHgroup's final report identified that fatigue was a significant causal factor that led to fatalities and injuries in the fishing industry. FishSAFE, which replaced FISHgroup, was

formed with the aim of developing and managing an implementation plan to give effect to the recommendations in the FISHgroup report.

- 1.9.7 FishSAFE had its inaugural meeting on 21 May 2004; the group had representatives from MSA, Seafood Industry Training Organization (SITO), Accident Compensation Corporation (ACC) and a wide spectrum of the fishing industry.
- 1.9.8 Under the umbrella of FishSAFE the MSA was undertaking 2 projects relating to fatigue management:
1. development of a safe code of working practice for commercial fishers, focusing primarily on the owner/operator end of the commercial sector. The fitting and use of watchkeeping alarms would be covered in this code.
 2. development of practical fatigue management guidelines in consultation with industry and to use these as the basis for the development of fatigue management training and education throughout the maritime industry with the following objectives:
 - raise awareness of the importance of fatigue management amongst workers in the maritime industry
 - develop practical methods of managing fatigue
 - provide training in fatigue management techniques to both employers and employees within the maritime industry.

Fatigue study information

- 1.9.9 Work-related fatigue has three main causes:
1. excessively long and/or hard work (time-on-task fatigue and workload)
 2. inadequate, irregular or poor-quality sleep
 3. working and resting at inappropriate times in the circadian rhythm³, which leads to reduced task performance and impaired sleep quality respectively.
- 1.9.10 To be alert and able to function well, each person requires a specific amount of nightly sleep, the average for an adult being 7 to 8 hours. If the individual “sleep need” is not met, the consequences are increased sleepiness and impaired performance. For most people, getting 2 hours’ less sleep than they need on one night produces an acute sleep loss and is enough to consistently impair their performance and alertness the next day. The reduction in performance is particularly marked if less than 5 hours’ sleep is obtained.
- 1.9.11 Short periods of sleep would usually mean long periods of time awake. Laboratory studies consistently show that the longer a person stays awake, the sleepier they become and the more slowly and inaccurately they perform any type of work.
- 1.9.12 The effect of several nights of reduced sleep accumulates into a “sleep debt”, with sleepiness and performance becoming progressively worse. Recovery of the lost hours of sleep need not be on an hour-for-hour basis, but it typically takes 2 good nights’ sleep to return to normal after sleep loss.
- 1.9.13 Sleep is not equally possible across the 24-hour day. How quickly a person can fall asleep and how long they remain asleep is regulated by their circadian body clock. This can be visualised in terms of competing sleep and wake “drives”. The sleep drive is highest in the early hours of the morning when the urge to fall asleep is most overwhelming and can be completely uncontrollable.

³ The inherent pattern of physical and mental characteristics related to a 23 - to 25-hour internal central nervous system activity cycle.

- 1.9.14 Not only the amount of sleep but also the quality of sleep can have important effects on wake-time functioning. Sleep that is restless and fragmented by frequent awakenings leaves a person sleepy and at increased risk of making errors. Sleep can be disrupted by a wide variety of factors including physical sleep disorders and other health problems, changing work and rest schedules, poor sleep habits and ill-informed attitudes about increasing wake-time activities by cutting back on sleep.
- 1.9.15 Environmental factors can have an important effect on sleep quality. For crew sleeping on board, such factors as noisy or cramped quarters and rough sea conditions can be expected to reduce sleep quality.

1.10 Previous occurrences

- 1.10.1 On Sunday 19 August 2001, the fishing vessel *Hans* ran aground on West Head at the entrance to the Tory Channel (TAIC Marine Occurrence report 01-212). Safety issues identified included:
- the inadequate watchkeeping arrangements aboard the *Hans*
 - the manning level of the *Hans* for the operation undertaken
 - the operator, skipper and crew not implementing Maritime Rule Part 31C
 - the lack of procedures and guidelines regarding fitness for duty and fatigue in the Safe Ship Management manual
 - the lack of a watchkeeper monitor alarm for a single-handed wheelhouse operation
- 1.10.2 The *Hans* was owned by Windward Fishing Company Limited and was operated by Pegasus Bay Fishing Company Limited. The *Hans* was in Safe Ship Management with Lloyd's Register of Shipping.
- 1.10.3 On 5 April 2002 the Commission recommended to the Managing Director of Pegasus Bay Fishing Limited that he:
- Implement the requirements of Maritime Rule 31C for all vessels operated by his company and update the Safe Ship Management manuals as necessary. (008/02)
 - Ensure that the manning of fishing vessels operated by his company is adequate to enable at least one crew member capable of watchkeeping to be sufficiently rested at all times. (009/02)
 - Fit watchkeeping alarms to the wheelhouse of all vessels operated by his company. (010/02).

Pegasus Bay Fishing Limited provided evidence to show that it had implemented the recommendations and on 10 June 2004 the Commission recorded that the safety recommendations had been implemented and signed them off as "closed acceptable".

2 Analysis

- 2.1 The *Bronny G* grounded on a stretch of coast accessible only in the fairest of weather and sea conditions. All shipboard records of the accident and the preceding trip were lost. As a result the investigation was based primarily on interviews with the crew and operator, and available documentation from the operator and Safe Ship Management Company.
- 2.2 Owing to the inherently irregular and prolonged nature of work during fishing operations and the harsh, uncomfortable and noisy conditions often experienced aboard fishing boats, fatigue is common amongst fishing boat crews. This fact has been recognised and legislation requires the owner, skipper and crew to take responsibility for recognizing and managing the problem.

- 2.3 The regime under which the crew worked in being paid a share of the catch encouraged them to work longer hours, undertake longer voyages, make more voyages in a given time and to minimise the number of crew so as to maximise their remuneration. Any of the foregoing may have led to working arrangements that would increase the probability of the crew becoming fatigued.
- 2.4 The unpredictable working hours while fishing meant that the skipper and crew could not plan a regular work/sleep pattern. Continuous work periods were long with inadequate rest periods between.
- 2.5 When working a regular shift, an individual's circadian rhythm and ability to sleep may adjust to changed sleep patterns after a period of time, but continually changing hours of work and rest accentuates the problem making any adjustment longer to achieve. The skipper and crew had recently rejoined the boat after a period ashore and would still have been adjusting to a different sleep/wake pattern.
- 2.6 The junior deckhand's level of alertness should have been heightened by his knowledge that he had to shortly call the senior deckhand, and that the boat was closing with a rocky dangerous shore. However, given that he remembers nothing from then to the time the boat grounded, he most certainly fell asleep. Falling asleep at this point of the voyage indicated that the junior deckhand was very fatigued. In the case of chronic fatigue it is likely that microsleeps or unplanned longer sleeps might occur after extended hours of work.
- 2.7 The manning level of the *Bronny G* was above minimum legislative requirements for the area in which the boat was fishing. However, as all the crew were required while hauling the net there was no deckhand available to be rested to keep watch on the journey back to port.
- 2.8 The junior deckhand had a sleep period of 2 hours about half an hour prior to starting the voyage back to port. Previously he had a rest period of about 3 hours, 3 hours before the last rest period. In the 24-hour period prior to starting the voyage back to port the junior deckhand had 3 rest periods totalling about 8 hours. He would be considered to be fatigued and be accumulating a sleep debt. In the 48 hours prior to starting the voyage back to port he had 16 hours of sleep in 5 periods, the maximum being 8 hours at the beginning of the 48-hour period, giving him a broken sleep pattern and probably poor sleep quality. From this it would appear that he was chronically fatigued.
- 2.9 At the time of the accident the junior deckhand had been working for about another 5 hours further increasing his level of fatigue.
- 2.10 In the 24 hours prior to starting the voyage back to port the senior deckhand had 3 periods of reported sleep totalling 7 hours, which would indicate that he was also fatigued and possible suffering from a sleep debt. In the 48 hours prior to the accident he had amassed a total of 21 hours reported sleep in 4 periods, so although fatigued, he would not have been chronically fatigued.
- 2.11 In the 24 hours prior to starting the voyage back to port the skipper had 3 periods of reported sleep totalling about 6 hours and would be considered to be fatigued. In the 48 hours prior he had 17 hours of sleep in 4 periods, so although fatigued would not have been chronically fatigued.
- 2.12 At the start of the voyage back to port neither the skipper nor either of the 2 crew of the *Bronny G* could be considered sufficiently rested to undertake the navigational watch.
- 2.13 The junior deckhand was tasked with steering the *Bronny G* back towards Lyttelton, while he was at the time the least rested of the crew. Being the most junior person on board he may have been unwilling to question his seniors on the merits of placing a relatively inexperienced young seafarer on watch at the low point of his circadian rhythm after a relatively hard days work.

- 2.14 The lack of an operating autopilot required the watchkeeper to have to continually steer the *Bronny G* making watchkeeping a more demanding task.
- 2.15 The junior deckhand was more used to watchkeeping with the aid of an autopilot and so being free to move around. When he found that the ship had swung around while he was making a hot drink, it should have alerted him that the helm needed constant attention and he should be applying the general principles of good watchkeeping by not leaving the wheelhouse and wheel unattended and also the necessity to remain alert and keep a good look out.
- 2.16 It is possible that when the junior deckhand fell asleep the *Bronny G* made a wide slow turn to starboard before grounding on the coast as shown in Figure 1. If the *Bronny G* had made a turn to port it would have collided with the coast earlier and further north, possibly in the vicinity of Okains Bay.
- 2.17 It is more likely that the junior deckhand fell asleep considerably earlier than he remembered, possibly confusing his proximity to Long Lookout Point with that of another point on the peninsula as shown on the radar. The *Bronny G* could then have described several smaller tighter turns slowly bringing the boat closer to the coast until it eventually grounded.
- 2.18 The owner/operator had complied with the Commission's safety recommendation 010/02 that arose from the grounding of the *Hans* by fitting all his boats with watchkeeping alarms. However, these had been fitted to work in conjunction with the autopilot as he considered that it was more likely that the watchkeeper would fall asleep while the boat was in autopilot than when being steered manually. As the autopilot had failed on the outward voyage the watchkeeping alarm was also non operational. Had the watchkeeping alarm been operational and in use it is probable that the alarm would have roused the junior watchkeeper in time to avert the accident or would have alerted either the skipper or senior deckhand.
- 2.19 Had the Safe Ship Management manual contained procedures and guidelines regarding fitness for duty and fatigue and the owner's, operator's, and crew's requirements to ensure that they implemented the contents of Maritime Rule Part 31C, the crew might have been better informed. Had they undertaken the required measures the owner, operator and crew would have been more aware of the symptoms and dangers of fatigue and could have taken appropriate measures to manage it and avert the grounding.

3 Findings

Findings are listed in order of development not in order of priority.

- 3.1 The *Bronny G* grounded on rocks at Steep Head on the Banks Peninsula because there was nobody monitoring its progress. The deckhand who was on watch fell asleep because he was probably impaired by the effects of fatigue.
- 3.2 The number of crew aboard the *Bronny G* exceeded the stipulated minimum crewing level. However, the way the fishing operation was organised meant that there were not enough crew to work the vessel and still have a well-rested person available to navigate the vessel back to port.
- 3.3 The Safe Ship Management system under which the *Bronny G* was operating did not adequately address the responsibilities for preventing fatigue on board as required by Maritime Rule Part 31C.
- 3.4 The system of remuneration for the crew encouraged longer working hours and was not conducive to applying appropriate measures to prevent fatigue and may have contributed to the *Bronny G's* grounding.
- 3.5 The workload of the crew was increased by the failure of the autopilot on the outward journey requiring the boat to be hand steered for the remainder of the voyage.

- 3.6 The watchkeeping alarm was not working because it derived its electrical power from the same source as the autopilot, which had failed and been switched off.
- 3.7 Had the watchkeeping alarm been working and in use, it is probable that the accident would have been averted.

4 Safety Actions

- 4.1 After the accident Pegasus Fishing Limited implemented the following actions:
- produced written instructions to all skippers that no crew under the age of 18 was to be on watch alone during the hours of darkness on any of the company's vessels
 - repeated written instructions regarding Maritime Rule Part 31C and the attached advisory circular
 - a new induction and instruction procedure for on-board training of watchkeepers
 - a safety meeting for all the company's skippers with MSA staff to reinforce the requirements of Maritime Rule Part 31C.

5 Safety Recommendations

Safety recommendations are listed in order of development not in order of priority.

- 5.1 On 10 August 2004, the Commission recommended to the Managing Director of Pegasus Fishing Limited that he:
- 5.1.1 in conjunction with the Safe Ship Management Company implement the requirements of Maritime Rule Part 31C Section 4 for all vessels operated by his company and update the safe ship management manuals as necessary. (039/04)
- 5.1.2 in conjunction with the Safe Ship Management Company include a section in the Safe Ship Management manual on the signs, symptoms and effects of fatigue and practical methods of managing fatigue. (040/04)
- 5.1.3 fit watchkeeping alarms independent of all other equipment in the wheelhouse of all vessels operated by his company and put in place a procedure to ensure that the watchkeeping alarms are operated whenever a navigational watch is undertaken. (041/04)
- 5.2 On 24 August 2004 the Managing Director of Pegasus Fishing Limited replied:
- We intend to implement your safety recommendations: 039/04, 040/04 and 041/04.
- Completion date is expected to be 17th September 2004. We will advise on completion.
- 5.3 On 2 August 2004, the Commission recommended to the General Manager of SGS M&I Ships Management Systems that he:
- 5.3.1 implement the requirements of Maritime Rule Part 31C Section 4 for all vessels under the SGS M&I Safe Ship Management system. (042/04)
- 5.3.2 include a section in the SGS M&I Safe Ship Management manual on the signs, symptoms and effects of fatigue and practical methods of managing fatigue. (043/04)
- 5.4 On 22 July 2004, the General Manager of SGS M&I Ships Management Systems responded to the preliminary safety recommendations, which were subsequently adopted unchanged as the Commission's final safety recommendations. That response stated, in part, the following:

- we will be pleased to adopt your recommendations that we include more detail in our manual regarding fatigue . This will include, as we have done for hazard recognition , a simple document that can be displayed on the vessel for all to see ,which highlights symptoms of fatigue and its causes ,as well as including an appropriate section within the manual.
- As an observation we strongly believe that the curriculum for the training of seafarers should be reviewed and amended to include an appropriate module to cover the requirements of Safe Ship Management , and “man management “ with respect to recruitment and manning with appropriately qualified persons, and Alcohol, Drug, and Fatigue management. This we believe should be mandatory for ILM and above qualifications.

5.5 On 10 August 2004, the Commission recommended to the General Manager, Trade and Education of the Seafood Industry Council that he:

5.5.1 include an article in the Seafood New Zealand magazine featuring this report, the intent of Maritime Rule Part 31C together with its advisory circular and the work of the Maritime Safety Authority convened FISHgroup and fishSAFE initiatives. (044/04)

5.6 On 25 August 2004 the Communications Manager of the Seafood Industry Council replied:

We hope to publish a summary of the report in the September issue of the Seafood NZ magazine.

5.7 On 20 August 2004, the Commission recommended to the Director of Maritime Safety that he:

5.7.1 develop with industry a communication and education strategy to implement fatigue management guidelines taking into account the outcomes and recommendations from the fatigue management study currently being conducted by the MSA. (052/04)

5.8 On 23 August 2004 the Director of Maritime Safety replied, in part:

This recommendation is acceptable to the Maritime Safety Authority, and we will be implementing it over the next 12 months as our fatigue management study is completed.

Approved on 19 August 2004 for publication

Hon W P Jeffries
Chief Commissioner



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Price \$ 22.00

ISSN 0112-6962