MARINE RESERVE IMPLEMENTATION PROGRAMME: SOUTH COAST

BIOLOGICAL SURVEY OF THE MAJOR BENTHIC HABITATS OF THE SOUTH COAST (RED ISLAND - STARVATION BOAT HARBOUR): 23 MARCH - 2 APRIL 1998

Field Programme Report: MRIP/SC/F - 12/1998

A collaborative project between CALM Marine Conservation Branch, CALM South Coast Region and the University of Western Australia

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CALM Collaboration

- Tim Daly - Technical Officer, MCB.
- Peter Collins - District Wildlife Officer, Albany District.
- Mark True - Ranger, Fitzgerald River National Park.

External Collaboration

- Gary Kendrick - Botany Department, University of Western Australia.
- Simon Montgomery - Botany Department, University of Western Australia.
- Albertus Smit - Botany Department, University of Western Australia.
- Jamie Allnutt - South Coast Regional Co-ordinator, Coastwest-Coastcare.
- John Lukins - CALM Volunteer.
- Rein von Nordheim - CALM Volunteer.

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SUMMARY

This report presents details of a shore-based field survey, to be undertaken from 23 March 1998 to 2 April 1998, along the south coast of Western Australia from Red Island to Starvation Boat Harbour. The survey is being carried out to systematically and quantitatively examine the shallow water fish fauna and macroalgal communities of the major benthic habitats along the coast adjacent to the eastern section of the Fitzgerald Biosphere Reserve.

This fieldwork is being undertaken to follow-up the biological survey of the major benthic habitats adjacent to the western section of the Fitzgerald Biosphere Reserve, from Groper Bluff to Red Island, which took place in March 1997.

The primary objectives of this survey are to provide quantitative information on the fish fauna and macroalgal communities at representative sites within the major benthic habitats and to investigate of the influence of physical parameters, such as substrate type and wave exposure, on community diversity. The survey will also involve the collection of data that can be utilised as baseline information for long-term monitoring of biological communities in these waters, before and after marine reserve implementation.

1. INTRODUCTION

1.1 General background

This report presents details of a shore-based field survey, to be undertaken from 23 March 1998 to 2 April 1998, along the south coast of Western Australia from Red Island to Starvation Boat Harbour. The survey is being carried out to systematically and quantitatively examine the shallow water fish fauna and macroalgal communities of the major benthic habitats along the coast adjacent to the eastern section of the Fitzgerald Biosphere Reserve.

This fieldwork is undertaken as a follow-up survey to the biological survey of the major benthic habitats adjacent to the western section of the Fitzgerald Biosphere Reserve, from Groper Bluff to Red Island, which took place in March 1997 (Colman, 1997). Bad weather and sea conditions during the first week of the 1997 survey prevented sampling of the limestone reef system from Starvation Boat Harbour to East Mount Barren (apart from two sites immediately adjacent to Hopetoun) and of schist/quartzite reef sites between East Mount Barren and Red Island. During the second week of the 1997 survey, attempts were made to sample additional limestone and schist/quartzite reef sites. As a result of continued poor sea conditions and extremely low in-water visibility no limestone reef sites were sampled east of Hopetoun and only a further three schist/quartzite reef sites were sampled in the area between Culham Inlet and Point Ann. Consequently, during the course of the 1997 survey only four limestone reef sites and five schist/quartzite reef sites were sampled quantitatively, compared to 18 granite reef sites and 12 seagrass sites. This current survey is being carried out to sample additional limestone reef and schist/quartzite reef sites to complete the data sets for the inshore marine environment adjacent to the entire Fitzgerald Biosphere Reserve.

Preliminary numerical analysis of the fish and macroalgae presence/absence data from the 1997 survey has been undertaken by the Botany Department, University of Western Australia. It appears that the fish and macroalgae presence/absence data, combined with information on fish abundance and macroalgal biomass, can provide sufficient information for an assessment of the relative diversity and conservation values of different inshore areas, both within and between major benthic habitats. Therefore, during this follow-up survey only the reef fish fauna and macroalgal assemblages will be sampled, and there will be no sampling of the mobile macro-epibenthic invertebrate fauna (which was quantitatively sampled during the 1997 survey).

1.2 Objectives

The objectives of this survey are to provide quantitative information on the fish fauna and macroalgal communities at representative sites within the major benthic habitats and to investigate of the influence of physical parameters, such as substrate type and wave exposure, on community diversity. The survey will also involve the collection of data that can be utilised as baseline information for long-term monitoring of biological communities in these waters, before and after marine reserve implementation.

Primary objectives:

- quantitative description of the fish fauna and macroalgal assemblages at representative sites within the major benthic habitats;
- quantitative analysis of species diversity and richness within the major benthic habitats;
- investigation of the influence of physical parameters, such as substrate type and wave exposure, on community diversity; and
- collection of fauna and flora density and biomass data as baseline information for long-term monitoring of communities before and after marine conservation reserve implementation.

Secondary objectives:

- opportunistic collection of qualitative information on visually dominant fauna and flora.

1.3 Survey area

The nearshore marine environment adjacent to the eastern section of the Fitzgerald Biosphere Reserve can be divided into two major coastal types, on the basis of geomorphological features. These are:

1. Limestone shores, with narrow reefs and platforms parallel to the shore (Starvation Boat Harbour to East Mount Barren); and

2. Schist/quartzite cliffs and shores of the metasedimentary Barren Ranges (East Mount Barren to Point Ann).

The total length of coastline from Starvation Boat Harbour to Red Island is approximately 95 kms.

2. METHODS

2.1 Site selection

Benthic habitat classification for the survey area has been compiled by Dr Hugh Kirkman, CSIRO Division of Marine Research. The relevant digital data sets have been obtained through the Coastal Resource Atlas at the Western Australian Department of Transport (DOT), and transferred to the MCB marine GIS currently being established in Fremantle. Benthic habitat maps for the survey area have been generated from these data.

Based on these benthic habitat data, the nearshore waters of the survey area can be broadly classified into three major benthic habitats:

1. Limestone reef (Starvation Boat Harbour to East Mount Barren);
2. Schist/quartzite reef (East Mount Barren to Red Island); and
3. Bare sand.

Site selection will be made using the benthic habitat maps, in conjunction with aerial photographs and bathymetric charts. The primary objective of this survey is to quantitatively sample the shallow water fish fauna and macroalgal communities at representative sites within limestone reef and schist/quartzite reef habitats. Consistent with the methodologies employed for the 1997 Fitzgerald marine biological survey (Colman, 1997), bare sand habitats will not be surveyed during in this survey.

The limestone reef habitat from Starvation Boat Harbour to East Mount Barren extends over approximately 62 kms, and the schist/quartzite reef habitat from East Mount Barren to Red Island extends over approximately 33 kms. Weather and sea conditions permitting it is planned that the sampling locations will be located about 5 kms apart and that 2-3 sites per day will be sampled. It is anticipated that a total of approximately 20 sites will be sampled during the 9 days of the survey (weather and sea conditions permitting), with 13 sites in the limestone reef habitat and 7 sites in the schist/quartzite reef habitat. Sites will be located where the spatial extent of the habitat is large enough to ensure that the transects do not extend outside the habitat boundaries (i.e. on to bare sand). This ensures that potential sample bias, caused by 'edge effects', will be minimised whenever possible.

2.2 Quantitative sampling methodology

The methodology outlined here is adapted from the quantitative sampling methods utilised for the 1997 Fitzgerald marine biological survey, as described in the CALM Data Report (Colman, 1997).The biological survey will consist of two quantitative elements:

- the relative diversity, species richness and abundance of visually obvious, non-cryptic reef fishes; and
- the relative diversity, species richness and density of macroalgal assemblages.

A combination of a visual census for fish fauna and quadrat sampling of macroalgal assemblages will be employed at each sampling site.

All sampling will be carried out using two inflatables. At each site two contiguous weighted and scaled 100 m transect lines will be deployed, from one of the inflatables. Thus a 200 m transect will be sampled at each site and the transects will be laid across the slope, between the 5 m and 10 m depth contours. The 0, 100 and 200 m points of the transect line will be buoyed with small pimple floats. This will indicate to the standby diver and boatman on the surface the position of the transect line on the seabed and will assist them in determining where on the line the divers are located. The position of mid point along the transect will be recorded using a hand-held Scoutmaster GPS. At each site a team of 5 divers will be used, 4 divers in the water carrying out the fish and macroalgal sampling, and a fifth diver in one of the inflatables as a standby diver. On completion of sampling the transect lines will either be retrieved from the surface using the inflatables or they will be reeled up underwater by the divers if the line gets snagged in kelp cover or under rocks. The time taken to sample each site, including the time required to deploy and retrieve the transect lines, will be around 60 minutes.

2.2.1 Visual census of reef fish fauna

Much of the sampling methodology for limestone and schist/quartzite reef sites is adapted from the methodologies utilised for short-term monitoring of biotic change in Tasmanian marine reserves (Edgar & Barrett, 1997).

The presence, abundance and estimated size of all visually obvious reef fishes will be recorded by two divers, on standard Fish Data Sheets (Appendix I), swimming (at an average speed of 0.2 m sec^{-1}) along the centre of a 5 m wide swathe on each side of the 200 m transect line. This visual census will take approximately 20 minutes to complete and the two divers will remain together, separated by a distance of 5 m. The data will being recorded separately for each 50 m section (T1-T4), representing 4 x 50 m sub-samples. A total area of 4 x 500 m^2 will thus be surveyed for reef fish fauna.

2.2.2 Quadrat sampling of macroalgal assemblages

The second pair of divers will enter the water and follow up behind the first pair of divers, placing a 0.25 m^2 quadrat at 20 m intervals along one side of the transect line. They will record, on a standard Macrophyte Data Sheet (Appendix II), the number of times each macroalgal species occurs directly under 50 points (at which perpendicularly placed wires cross each other) within the quadrat (Edgar & Barrett, 1997). From this point intercept data the percentage cover of each macroalgal species can be calculated. Alternatively, the divers will record an estimated percentage cover for each macroalgal species, using a 0.25 m^2 quadrat without cross wires. A total of 10 quadrats (2.5 m^2) will be sampled for each 200 m transect. Only approximately horizontal upper surfaces will be sampled using, and if a quadrat falls on a vertical surface the nearest horizontal surface will be sampled.

2.2.3 Qualitative sampling

Qualitative information will also be collected at each site. This will entail divers taking video footage of visually dominant flora and fauna and close-up photographs of sessile invertebrates. General information about each sampling site will be recorded on a standard Habitat Data Sheet (Appendix III) and details of all video footage taken will be recorded on a standard Video Data Sheet (Appendix IV).

3. FIELD PROGRAMME

3.1 Survey team

The survey team will be comprised of 9 people, 7 of whom are divers.

CALM

Jeremy Colman	Project Leader, MCB
Tim Daly	Dive Supervisor, MCB
Peter Collins	Wildlife Officer, Albany District
John Lukins	CALM Volunteer
Rein von Nordheim	CALM Volunteer

External

Gary Kendrick	Botany Department, UWA
Simon Montgomery	Botany Department, UWA
Albertus Smit	Botany Department, UWA
Jamie Allnutt	South Coast Regional Co-ordinator, Coastwest-Coastcare

3.2 Field itinerary

The field survey will be shore-based from three locations in the area between Red Island and Starvation Boat Harbour. These are:

1. Quoin Head (in the Fitzgerald River National Park);
2. Hopetoun; and
3. Starvation Boat Harbour.

The survey team will camp at these locations, with three days of sampling planned from each base camp. Sampling will be carried out by a team of six divers (five in the water carrying out the fish and macroalgal censuses, and a sixth remaining on the surface as a standby diver) operating out of a 5m inflatable. A standby 4m inflatable will also be used at every site. The boats will be launched from the beach at Quoin Head, from the slipway at Hopetoun and from the beach at either Starvation Boat Harbour or Mason Bay.

Table 1: Field itinerary for the Fitzgerald marine biological survey, March 1998.

Date	Activity
23/3/98	Gary Kendrick, Simon Montgomery and Albertus Smit depart Fremantle for Hopetoun in UWA Landcruiser with trailer. Jeremy Colman, Tim Daly and Rein van Nordheim depart Fremantle for Albany in MCB Landcruiser, pick-up camping trailer in Albany, and continue on to Hopetoun. Peter Collins departs Albany for Hopetoun in SCR Landcruiser, towing inflatable. Survey team meets up with John Lukins at Quoin Head (Fitzgerald River National Park).
24/3/98	**Field survey commences (am) from Quoin Head.**
24-26/3/98	Sites between Red Island and East Mount Barren are surveyed.
25/3/98	Peter Collins departs Quoin Head for Albany in SCR Landcruiser (pm). Jamie Allnutt departs Albany for Quoin Head in this vehicle.
26/3/98	Survey team moves camp to Hopetoun Caravan Park (pm).
27-29/3/98	Sites between East Mount Barren and Twelve Mile Beach are surveyed.
28/3/98	Jamie Allnutt departs Hopetoun for Albany in SCR Landcruiser (pm).
29/3/98	Survey team moves camp to Starvation Boat Harbour (pm). John Lukins departs for Perth in own vehicle.
30/3-1/4/98	Sites between Twelve Mile Beach and Starvation Boat Harbour are surveyed.
30/3/98	Peter Collins departs Albany for Hopetoun in SCR Landcruiser and meets survey team at Starvation Boat Harbour (pm).
2/4/98	**Field survey completed (am).** Jeremy Colman, Tim Daly and Rein van Nordheim depart Hopetoun for Fremantle in MCB Landcruiser, towing trailer. Gary Kendrick, Simon Montgomery and Albertus Smit depart Hopetoun for Albany in UWA Landcruiser, towing camping trailer, which they deliver to Albany. They then continue on to Perth. Peter Collins departs Hopetoun for Albany in SCR Landcruiser, towing inflatable.

It is possible that the 4WD track into Quoin Head may be closed for dieback management purposes (as a result of the fire in the Fitzgerald River National Park in January 1998). The contingency in the event of this occurring is that the survey team will be based at the Four Mile campsite below East Mount Barren, and the inflatables will be launched from Four Mile Beach and Barrens Beach. This will probably mean that the survey team will be restricted to sampling sites east of Edward's Point, given the distances that would have to be covered in the inflatables. Alternatively, the field itinerary will be reversed and the survey will start from Starvation Boat Harbour and work east towards the Fitzgerald River National Park, to allow for the fact that the track into Quoin Head may be open during the last three days of the survey (having dried out after rain).

3.3 Safety

All safety procedures relating to fieldwork during this survey and the personal safety of all team members are the responsibility of the Project Leader. All safety procedures relating to navigation and associated boating activities using the inflatables are the responsibility of the designated boat skippers. Alterations to survey procedures based on any safety aspects related to weather conditions and sea state are the responsibility of the Project Leader. Decisions to modify the methods of the field survey will be made by the Project Leader and Dive Supervisor, in consultation with the designated boat skippers and other team members.

The Project Leader (Jeremy Colman) has primary responsibility for ensuring that all field work undertaken by members of the survey team is conducted according to CALM's departmental safety procedures and protocols.

The Dive Supervisor (Tim Daly) has primary responsibility for all personnel participating in diving operations and for ensuring that all diving operations are conducted according to the CALM dive code and to an approved dive plan.

The dive plan for this survey has been approved by the Departmental Diving Officer. No decompression dives will be undertaken. External participants in this field survey will dive according to their own diving codes of practice, where appropriate. They have a responsibility for their own personal safety and for the safety of other members of the diving team.

3.4 Communications and emergency contacts

Both inflatables will be used for all diving and each will be carrying a CALM hand-held VHF and EPIRB, in addition to standard safety gear. Base camp communications will consist of: CALM VHF radios in the MCB and SCR Landcruisers; a long range HF radio in the MCB Landcruiser; and a satellite phone borrowed from CALM Esperance.

General

CALM, Marine Conservation Branch: Ph. 08 9432 5100, fax 08 9430 5408
Mobile: 041 904 5285
CALM, Albany: Ph. 08 98 424500, fax 08 98 417105
CALM, Esperance: Ph. 08 90 713733, fax 08 90 713657

Fitzgerald River National Park
Ranger-in-charge (Lindsay Brown): Ph. 08 98 355043, fax 08 98 355045
Ranger - Hopetoun (Mark True): Ph. 08 98 383060, fax 08 98 383060
Stokes National Park
Ranger-in-charge (Ian Hughes): Ph. 08 90 768541, fax 08 90 768541

Fisheries Department, Albany: Ph. 08 98 417766

Department of Transport, Albany: Ph. 08 98 414944

Ravensthorpe Police: 08 98 381004
Albany Police: Ph. 08 98 410555

Royal Flying Doctor Service: Ph. 08 9414 1200
Radiophone booking line: 08 9414 1300
Medical & emergency calls: 1800 625 800

Albany Hospital: Ph. 08 98 922222

Esperance Hospital: Ph. 08 90 719222

Hopetoun Medical Centre: Ph. 08 98 383244

Fremantle Hyperbaric/Diving Services: Ph. 08 9431 2233 or 08 9431 3333

Hopetoun Caravan Park: Ph. 08 98 383096

Satellite Telephone

Survey Team (CALM Esperance satellite phone): Ph. 014 511 8119

Radio

CALM VHF - channel 16 (Starvation Boat Harbour to Point Ann)
channel 19 (Point Ann to Groper Bluff)
Simplex channel 66 (hand-held VHF boat-to-shore channel)

3.5 Budget

Marine Conservation Branch budget

	Days
CALM MCB staff resources	
Jeremy Colman (4 days prep., 11 days in field)	15
Tim Daly (4 days prep., 11 days in field)	15
Mike Lapwood (3 days prep.)	3
TOTAL	**33 days**

Item	**$**
Costs	
Food (8 persons x 11 days @ $15/person/day)	1320
Accommodation (3 nights camping @ $38/night)	114
Diving/camping allowances (2 persons x 9 days)	400
Commercial diver medicals (3 persons @ $118 each)	354
Specialist consultancy	
Simon Montgomery (9 days @ $100 per day)	900
Equipment	
Boat fuel/oil (2 inflatables x 9 days @ $20 each/day)	360
Film/video tapes	200
Vehicles	
MCB Landcruiser (1,500 kms @ 15 cents per km, including fuel)	225
UWA Landcruiser (1,500 kms @ 50 cents per km, including fuel)	750
Contingency	500
TOTAL	**$4887**

3.6 Equipment

A detailed equipment list is included as Appendix V.

4. REFERENCES

Colman, J.G. (1997). South Coast Terrestrial and Marine Reserve Integration Study. Biological survey of the major benthic habitats of the South Coast (Starvation Boat Harbour to Groper Bluff). Data Report: MRIP/SC/F - 11/1997. Department of Conservation and Land Management, Perth, Western Australia.

Edgar, G.J. & Barrett, N.S. (1997). Short term monitoring of biotic change in Tasmanian marine reserves. *Journal of Experimental Marine Biology and Ecology*, **213**: 261-279.

APPENDIX I

Fish Data Sheet

FISH DATA SHEET

LOCALITY/AREA		SITE NO		DATE	
SITE DESCRIPTOR		RECORDER			
VIDEO REFERENCE		SLIDE REF			

SPECIES	LENGTH (INCHES)												
	1	2	3	4	5	6	8	10	12	15	20	25	30+

APPENDIX II

Macrophyte Data Sheet

MACROPHYTE DATA SHEET

Locality/area		Site No.		Date	
Site descriptor.		Recorder			
Video reference		Slide ref.			

Species	Quadrat number									
	1	2	3	4	5	6	7	8	9	10

APPENDIX III

Habitat Data Sheet

HABITAT DATA SHEET

Project	FITZGERALD MARINE BIOLOGICAL SURVEY				**Field Survey**		MARCH 1998
Site No.		**Site Name**		**Date**		**Recorder**	
Vessel	MV Sealion		**Time**		**Weather**		
Sea			**Water depth (m)**		**Water visibility (m)**		
GPS Latitude			**GPS Longitude**		**Differential**		
° ' S			° ' E		**Yes** ☐		**No** ☐
Site location							

Habitat Description

Dominant Species

Sea-grass	
Macro-algae	
Coral	
Fish	
Invertebrates	

Other Features

Impact or Activity

Video reference	MRIP/SC/ /#	**Aerial reference**	/WA /RUN /
Slide reference		**Print reference**	

Marine Conservation Branch, Department of Conservation and Land Management

APPENDIX IV

Video Data Sheet

VIDEO DATA SHEET

Project	FITZGERALD MARINE BIOLOGICAL SURVEY				**Field Survey**	MARCH 1998	
Site No.		**Site Name**		**Date**		**Recorder**	
Start time		**Finish time**		**Depth (m)**		**Visibility (m)**	

Video System	Blaupunkt CC894 camcorder in StingRay SR-700 housing											
Focus mode				**Exposure mode**				**Program mode**				**White balance mode**			
Auto	☐	Manual	☐	Auto	☐	Manual	☐	Sports	☐	High-speed	☐	Auto	☐	Outdoor	☐
Lens system				**Filters**								**Lights**			
Wide-angle	☐	Zoom-macro	☐	None	☐	Red	☐	Yellow	☐	Orange	☐	On	☐	Off	☐

Video operator		**Tape no.**	MRIP/SC/ /#	**Height above substrate (cm)**	
Time coding for all video footage at site:		**From:**	: : :	**To:**	: : :

Transect time coding	**Start**	**Finish**	**Total time (mins/secs)**
T1	: : :	: : :	.
T2	: : :	: : :	.
T3	: : :	: : :	.

Notes:

APPENDIX V

Equipment List

EQUIPMENT LIST

DIVING

- 6 SCUBA cylinders
- 2 BCDs
- 2 regulator sets
- 2 weight belts, each with 24 lb of weights
- Spare weights
- 2 dive computers
- 2 u/w torches
- 2 compasses
- 1 spare mask and snorkel
- 1 pairs of fins
- Spare straps
- 1 underwater viewfinder

Accessories
- 3 dive flags, 2 large, 1 small
- Diving spares/repair kit
- Dive compressor with spares/repair kit

Diving Safety
- Comprehensive diving first aid kit
- Emergency response flow-sheet
- Emergency contact flow chart
- Patient information log
- Incident/accident log sheets
- Oxy-Viva oxygen therapy equipment
- Spare oxygen D cylinder
- Sunscreen/spare hats

BOATING

- Zodiac inflatable with spares/repair kit, inflation pump etc.
- Boat safety gear (rope, anchor, paddles, flares, lifejackets, EPIRB etc.)
- 15hp outboard motor
- 9hp outboard motor
- Fuel tanks, fuel lines, 2 stroke oil, funnel
- Outboard spares/repair kit
- 2 hand-held CALM VHF radios with waterproof ziplock bags

SAMPLING

- 3 x 100m weighted and scaled transect lines, with reels
- 3 x 0.25 m^2 quadrats with cross wires
- 2 pairs of clippers
- 10 calico bags
- 1 gear crate
- Pimple floats and lines (2 x 5m; 2 x 10m; 2 x 15m)
- 2 railway line weights, with rings
- 3 catch bags
- 2 Naly crates with lids (35l, 55l)

Data recording
- 3 underwater slates and graphite sticks
- 60 fish data sheets on waterproof paper
- 60 macrophyte data sheets on waterproof paper
- 1 box of rubber bands
- Spare graphite sticks

CAMERAS

Video
- 1 Blaupunkt CC894 Hi 8 video camcorder, with battery packs (3), battery chargers (2), battery discharger (1), yellow and orange filters
- 1 StingRay SR-700 underwater video housings with colour monitor back, super wide-angle and zoom-macro lenses, and built-in red filter
- 1 SunRay underwater lighting system with battery pack (3), battery charger (1), and spare lamps (2)
- Instruction manuals
- 5 Sony professional 90 min Hi 8 video tapes
- Housing O-ring kits and silicone grease
- Cleaning kit

Still photography
- Nikonos V camera, 35 mm lens, SB102 strobe unit, close up kit
- 15 mm wide angle lens and optical viewfinder
- 28 mm lens
- Canon EOS camera and lens
- 20 rolls of 36 exposure slide film (SENSIA 100 ASA)
- 5 rolls of 36 exposure print film
- Kit of camera spares
- AA batteries

INFORMATION

- Marine Charts: DMH 575
- Field identification guides for temperate water fishes, macro-algae, seagrasses, benthic invertebrates
- Benthic habitat maps
- Aerial photographs of coastline
- Habitat data sheets
- Video data sheets
- Sharp laptop computer and accessories
- 10 high density discs

POSITION FIXING

- 1 Scoutmaster hand-held GPS units and accessories

MECHANICAL/ELECTRICAL REPAIRS

- Comprehensive mechanical tool kit
- Comprehensive electrical repair kit
- Equipment log book

CAMPING

- Engel portable refrigerator
- Inflatable mattress, swag
- 25l water containers (3)