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Alternative low cost methods of fishing sea urchins (English version)

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Summary/recommendation:

The current project intends to develop novel low cost harvesting techniques for sea urchins that may prove more economically viable due to their low cost in terms of both infrastructure (boat and associated equipment) and running costs. These novel techniques include utilising the aggregating behavior of urchins on any objects found on the sea floor (passive trapping).

A series of experimental experiments were carried out to test the efficacy of three trap types, identify the optimal period of time to set the traps and also to test two bait types. The results clearly showed that the round collapsible trap design were most effective with the highest catch rates. The simple rope traps were also effective at accumulating urchins into concentrated areas which would useful for dive or ROV collection.

The optimal period for setting the traps was 7 days (± 1-2 days) and this is the recommended set time for commercial operations. However, optimal catch periods may vary according to local environmental conditions (eg feed availability) and urchin abundance and commercial fishermen should take this into account.

The trials clearly showed that using fish bait was more effective than using algae baits but the former attracted much higher bycatch than the algae baits. The more bait stations (of either algae or fish bait) used the greater the catch but the higher catch rates must be weighed against the increasing cost and time required to set more bait stations. A quick, easy bait station is required (eg a net pocket in the netting) that would simplify setting baits. If this can be achieved then we recommend at least two bait stations in each trap, but increasing the number of bait stations would increase the catch rates.

The commercial trials undertaken as part of this study clearly show that it is absolutely essential to have some knowledge of the abundance of urchins, depth and bottom topography of an area prior to commencing fishing. This can be gained by fishing an area over a long period of time, or by undertaking rapid, relatively cheap surveys using mini ROVs as used in the salmon industry.

In summary the results of this study show there is considerable potential to utilise passive trapping to develop sea urchin fisheries and possible sea urchin roe enhancement ventures throughout Norway. The results of the study will be used in follow up commercial projects with Lynsskjellan AS (Lyngen) and Capefish As (Hønningsfjord) to develop these capture techniques on a commercial scale. The former intend to supply sea urchins into the local Norwegian market and the latter intend supplying sea urchins to international markets.

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1 Introduction

In Norway the biomass of the green sea urchin (*Strongylocentrotus droebachiensis*) is estimated to be a massive 80 billion individual animals, or 56,000 tons. Despite this huge biomass the production of sea urchins in Norway has been sporadic (between 10-100t) and the current annual harvest is less than 20 ton. If only a small percentage of this total population could be harvested sustainably (approximately 5 % or 2800 tons) this alone would be create a fishery equivalent to the *S. droebachiensis* fishery in Maine (2006) which employed over 500 people. The main bottleneck to the development of a sea urchin fishery in Norway is the ability to collect sea urchins reliably, efficiently and consistently, particularly in the northern parts of Norway where conditions can be severe. In, addition to being biologically feasible the fishing method must be logistically and economically viable.

There has been both research and commercial development into a number of techniques to harvest sea urchins in Norway but none have yet proved to be sufficient to fully develop a consistent fishery. Previous efforts have focused on the use of SCUBA diving teams and more recently using a remotely operated underwater vehicle (ROV). Each of these has faced a number of difficulties in the conditions experienced in Norway, particularly in winter in the northern regions. Each method of harvest has advantages over the other but to date no study has conducted a cost/benefit analysis of each technique. Following the closure of Scan Aqua AS (based in Hammerfest) in 2010 an extensive report was undertaken to review why the venture was unsuccessful. In regard to fishing methods the authors estimated that catch rates of 300-600kg of urchins / day (a seasonal estimate of 30 tonne) using traditional traps could be achieved. They list the advantages of traps as being suitable for use in times of low visibility and that the urchins were in better condition than when harvested by divers. Using SCUBA dive teams the authors estimated it would be possible to have a catch rate of 1000-1500kg/day when the conditions were ideal with an average catch of 1250 kg / day. Dive operations were severely limited by logistics, weather and the underwater visibility. No diving was possible between May and August due to algal blooms and between November and January due to winter conditions. Direct costs were not included but dive operations required a boat, 2 crew members and a minimum of 3 divers. Scan Aqua AS also used a similar size team for exploratory dives to find new areas to harvest sea urchins which was extremely expensive. More recent attempts to use divers to collect sea urchins by Norway Sea Urchin AS in Båtsfjord proved to be logistically difficult and not economically viable. Scan Aqua AS in Hammerfest also used an ROV especially designed for collecting sea urchins (the seabed harvester). They reported optimal catches of 125 kg urchins in 25 minutes. However, average catch rates and the cost of using the ROV were not estimated. A study in 2012 conducted by Nofima, funded by FHF and run in collaboration with Norway Sea Urchin AS showed that a realistic catch rate of export quality sea urchins (excluding bycatch) using the ROV in Båtsfjord in the winter period was 660kg / day. Catch per unit effort was calculated in this project and could provide an accurate method of comparing different harvesting techniques in subsequent studies.

In order to establish a resilient and viable sea urchin fishery, based on live capture and immediate sale, or based on live capture and subsequent holding and fattening a cost efficient and reliable harvesting method must be found. Alternatively, it may be that a number of methods must be utilized, depending on the characteristics of different areas (such as environmental conditions, time of year and the conditions on the seafloor topography).

The current project intends to develop novel low cost harvesting techniques that may prove more economically viable due to their low cost in terms of both infrastructure (boat and associated equipment) and running costs. These novel techniques include utilising the aggregating behavior of urchins on any objects found on the sea floor (passive trapping).

These new harvesting techniques could be used by the following:

1. New entry fishing vessels of relatively small size. These could deliver sea urchins for immediate sale or into land or sea-based holding facilities.
2. The existing Norwegian inshore fishing fleet (which would enable fishermen to fish sea urchins during periods of low activity without extensive modification to their boats). This type of fishing could service seasonal markets such as the Christmas demand for sea urchins in Italian markets.
3. Specifically designed sea urchin harvesting vessels that would deliver sea urchins to a processing plant, sell live sea urchins immediately on landing, or deliver them into land or sea-based holding facilities for roe enhancement.

It should be stressed that the harvesting methods developed in this project would not necessarily be the only techniques that would or could be used to further develop the sea urchin industry in Norway. For example ROV technology will continue to be developed but the low cost techniques in this project will provide an alternative cost effective method of fishing sea urchins to complement future high technology (and more expensive) solutions and allow fishers to enter the fishery without large start-up costs. Alternatively, some of the techniques developed in the project may prove to be suitable for attracting and aggregating sea urchins so that they are considerably easier to catch with more technological methods such as the ROV.

2 Experimental Trials

2.1 Introduction

A series of experiments was conducted to test the efficacy of various trap types, bait types and the effects of using increasing frequency of baits. The trials were done at two sites in Indre Kårvik in Kvalsund near Tromsø (See Figure 1).

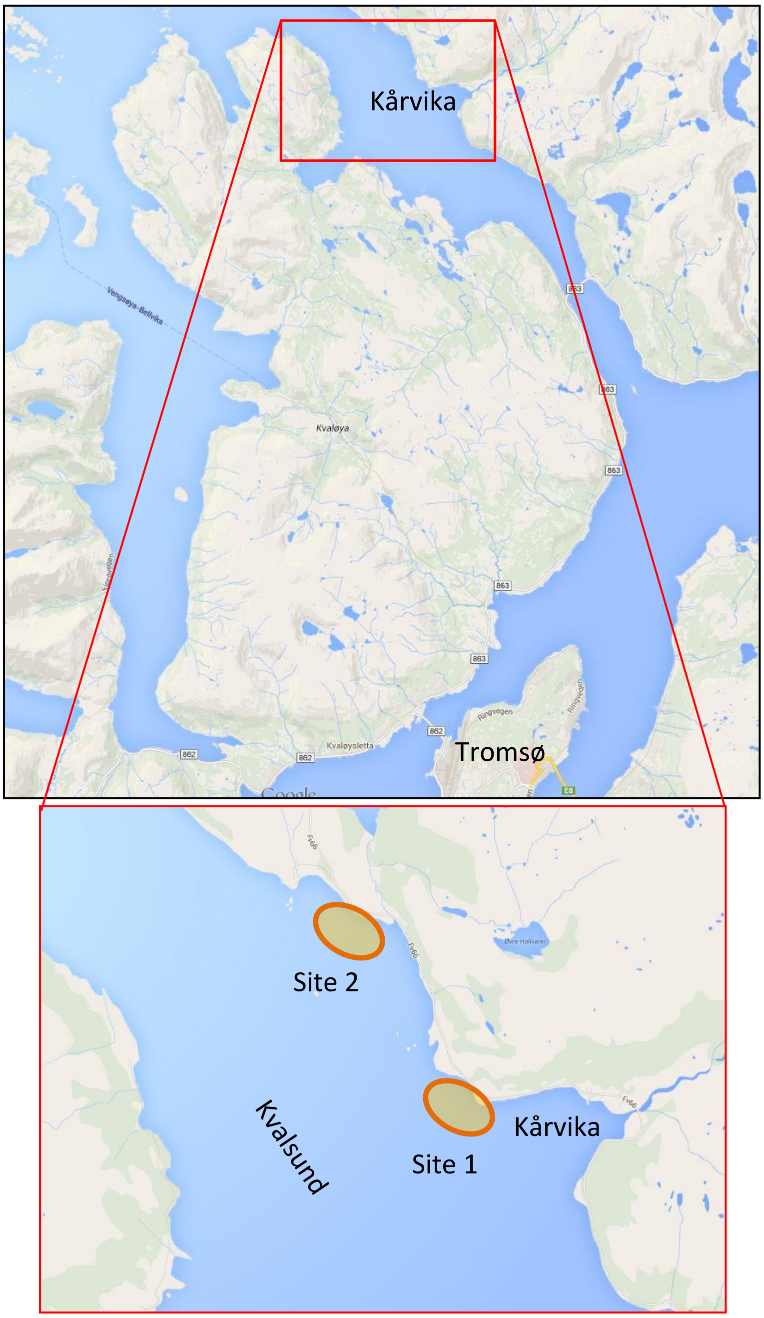


Figure 1 The two sites in Kvalsund where the experimental trials were carried out.

2.2 Trap Trials

2.2.1 Trap types

The following three trap types were designed and tested:

Rope: Three replicates of 10m of weighted 42mm braided rope (commonly used as mooring rope). Each 10m rope had a bait station every 1m (10 bait stations per 10m rope section) (Figure 2).

Panels: Three replicates of 10m long, 1m wide mesh panels. Each 10m panel had a bait station every 1m (10 bait stations per 10m panel section) (Figure 2).

Round traps: Three replicates of a line with 5 round (1m diameter) collapsible urchin traps attached at 2m intervals. Each line had two bait stations per trap (10 bait stations per 10m line with 5 traps) (Figure 3).

Figure 2 The weighted rope (Rope) and mesh panel (Panels) traps tested in the Experimental trap trials.

Figure 3 The round collapsible trap (Round trap) tested in the Experimental trap trials (this trap has a single bait station using algae).

2.2.2 Experimental methodology

The various trap types were tested by setting three replicates of each in a specified area (Site 1 in Figure 1) which had a flat area of seafloor (approximately 500m x 50m) at depths of 2-7m. Each of the traps had 10 bait stations which consisted of a handful of algae attached with lashing chord. The traps were left for 1 day, 3 days, 5 days and 8 days. At the conclusion of these periods they were pulled from the water and the number and size of the urchins in each trap replicate were measured. The number of urchins that were dislodged as they were being removed from the water was also recorded. The baits were replaced as required between each set.

The number of urchins was recorded every time the traps were pulled. The size of the urchins was measured twice to estimate the size of urchins being caught in each of the traps.

The number of size of urchins in 4 randomly chosen 1m^2 quadrats was measured in the fishing area in order to estimate the average number of urchins (per m^2) in the area and their average size.

2.2.3 Results and discussion

The urchins catch rate results (Figure 4) clearly show that the round trap is the most effective trap used in the trial. However, the increase in the catch rates in these traps was reduced as the traps were left in the water longer (up to 8 days). After 8 days the round traps still had an approximately 50% higher catch rate than the other two trap types. The catch rates in all 3 trap types increased over time, peaking at a set time of 5 days for the round trap and continuing to increase for both the Panel and Rope traps until a set time of 8 days. The recommended set time for trapping using the round trap is 5-7 days.

There was little difference in the size of the urchins caught in the Round and the Panel traps but these were larger than the urchins caught on the Rope trap. Both the Round and the Panel trap attracted larger urchins than the average wild size in the area whilst the Rope trap attracted small urchins than the average wild size in the area.

The number of urchins in the trapping area (calculated from the quadrat measurements taken during the trial) was 27.3 urchins/m^2 and the average size was 24.2mm test diameter.

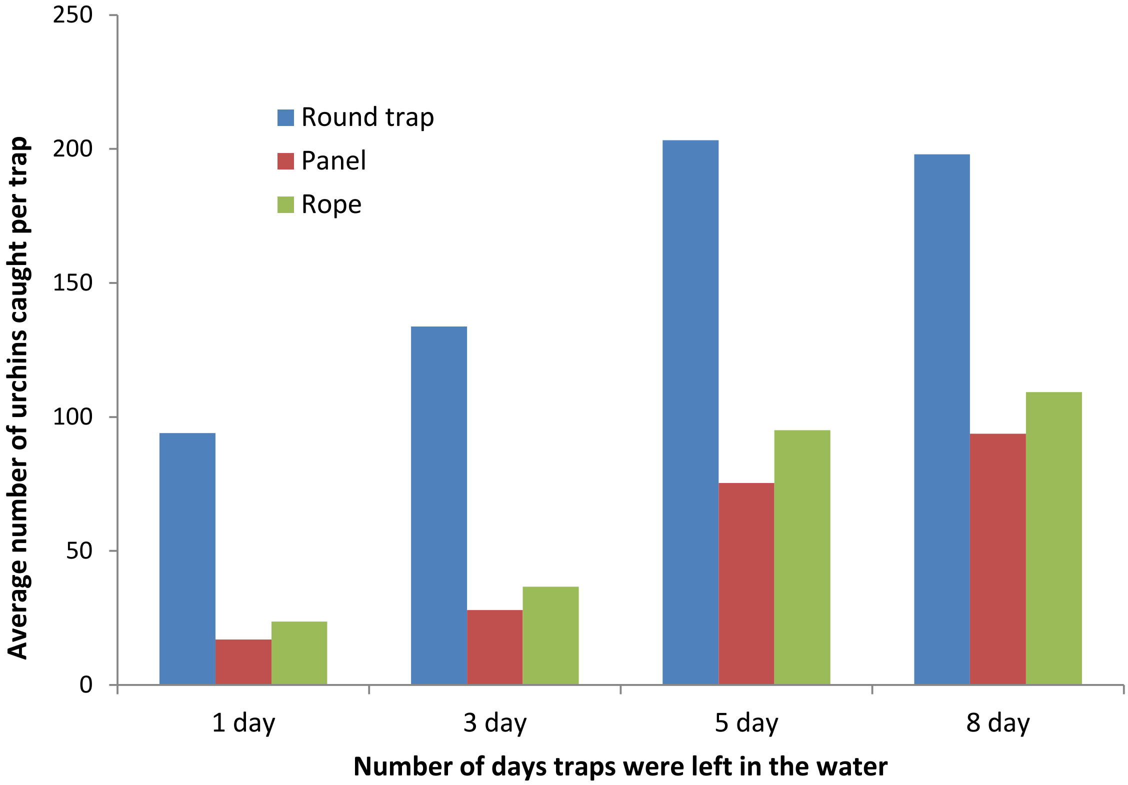


Figure 4 *The average number of urchins caught in the 3 trap types (Round, Panel and Rope) over increasing set periods (1, 3, 5 and 8 days).*

Table 1 *The average size of the urchins caught in the various traps compared with wild urchins samples in the catch area.*

Averages	**Size**
Rope	22,5
Panel	25,7
Round trap	26,7
Wild samples	24,2

2.3 Bait trials

2.3.1 Bait type and quantity used

The round traps described in section 2.2.1. were used in the bait trials. Two bait types were tested;

1. Algae; (*Laminaria hyperborea*) (Figure 5)
2. Whole fish, herring (*Clupea harengus*) (Figure 6)

In addition to the two bait types varying levels of bait amount were tested. The algae bait was presented as 1 bait station, 4 bait stations and full coverage per trap (Figure 7). The fish baits were presented as whole fish in bait bags as 1 bait station or 4 bait stations per trap (Figure 8). Three replicates of each treatment (a total of 15 traps) were used in the trial.

Figure 5 The algae (Laminaria hyperborea) used in the bait trials.

Figure 6 The herring (Clupea harengus) used in the bait trials together with the bait bags that held the fish on the traps.

Figure 7 The three bait frequency types used in the bait trial for algae baits: A) single bait; B) 4 bait and C) total coverage.

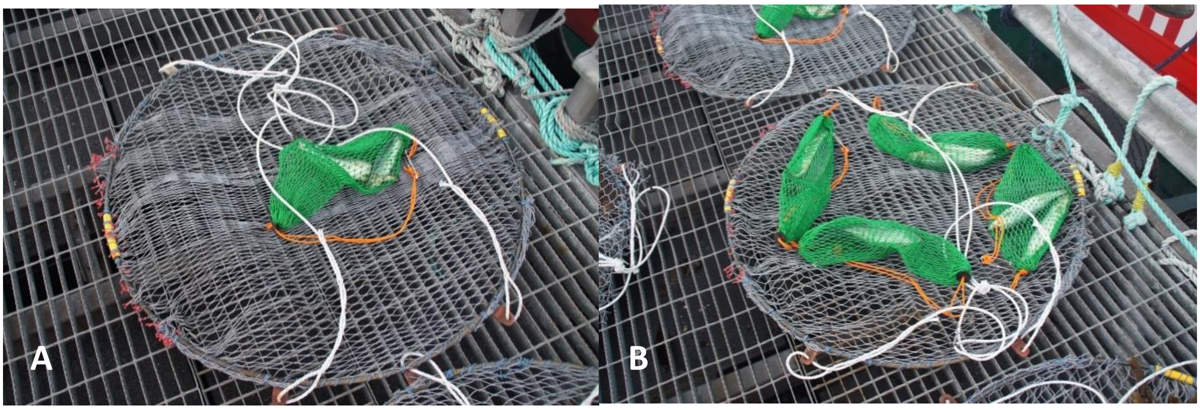


Figure 8 The three bait frequency types used in the bait trial for fish baits: A) single bait per trap and B) 4 bait per trap.

2.3.2 Experimental methodology

The various bait types were tested by setting three replicates of each bait treatment (*n* = 15) in a specified area (Site 2 in Figure 1) which had a flat area of seafloor (approximately 600m x 100m) of approximately 4-8m depth. The traps were set on a single longline in random order and were left on the water for a period of 5 days. At the conclusion of these periods they were all pulled from the water and the number and size of the urchins in each of the traps were measured.

The number of size of urchins in 4 randomly chosen 1m^2 quadrats was also measured in the fishing area in order to estimate the average number of urchins per m^2 and their average size.

2.3.3 Results and Discussion

The catch results for urchins as well as by-catch of Starfish, Crabs and Kingsnail are shown in Figure 9. The higher the number of bait stations used the higher the urchin catch for both fish and algae. If full coverage of algae was used the catch rates of urchins was similar to using 4 fish baits. There is significant amount of time and effort required to bait the traps and in this trial the single fish bait appears to be the most cost effective baiting technique. More bait stations would increase the catch rate but quick and effective baiting techniques (e.g. permanent bait pockets in the net) would need to be developed to make it cost effective to use more bait in each trap. Along with higher catch rates using fish baits there was significantly higher by-catch when using fish baits (See Figure 9 and 10).

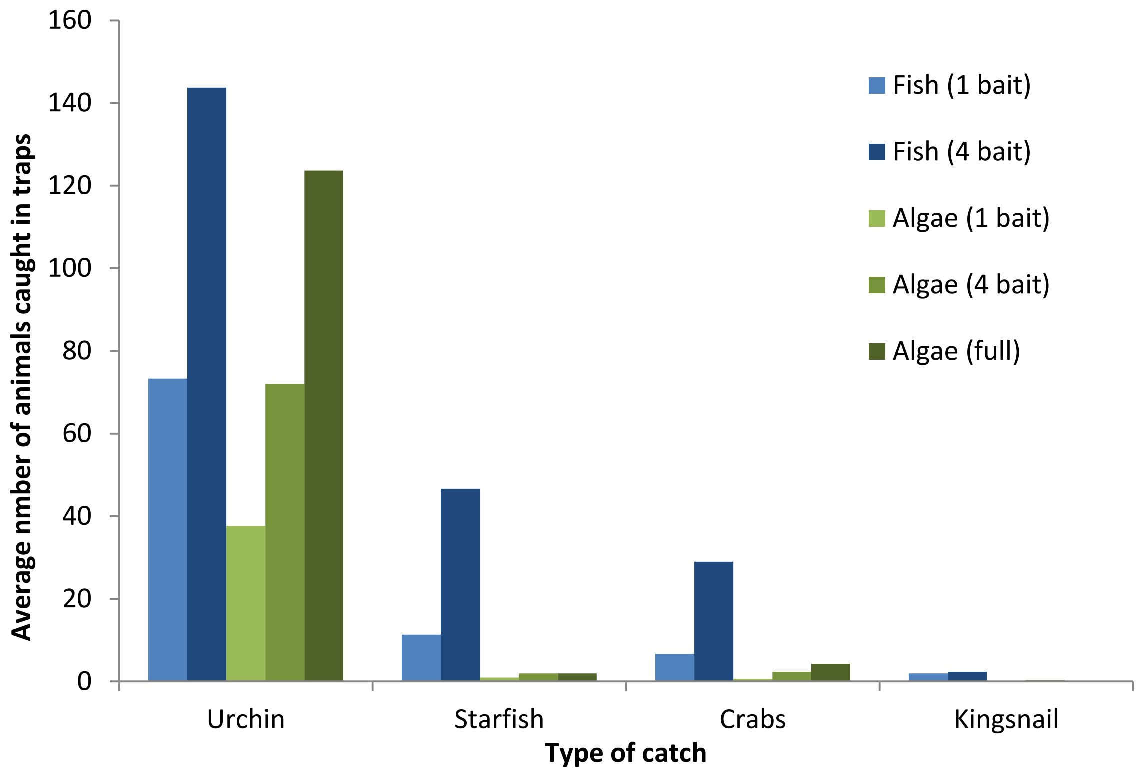


Figure 9 The average number of urchins, Starfish, Crabs and Kingsnail caught in the various bait types and frequencies used in the 7 day bait trial.

The size of the urchins caught when using fish baits was larger than the urchins caught when using algae baits. This in turn was larger than the average size of the urchins found in the area from the quadrat sampling (24.2mm test diameter). The number of urchins/m^2 in the trapping area (calculated from the quadrat measurements taken during the trial was 30.3m^2 (Table 2).

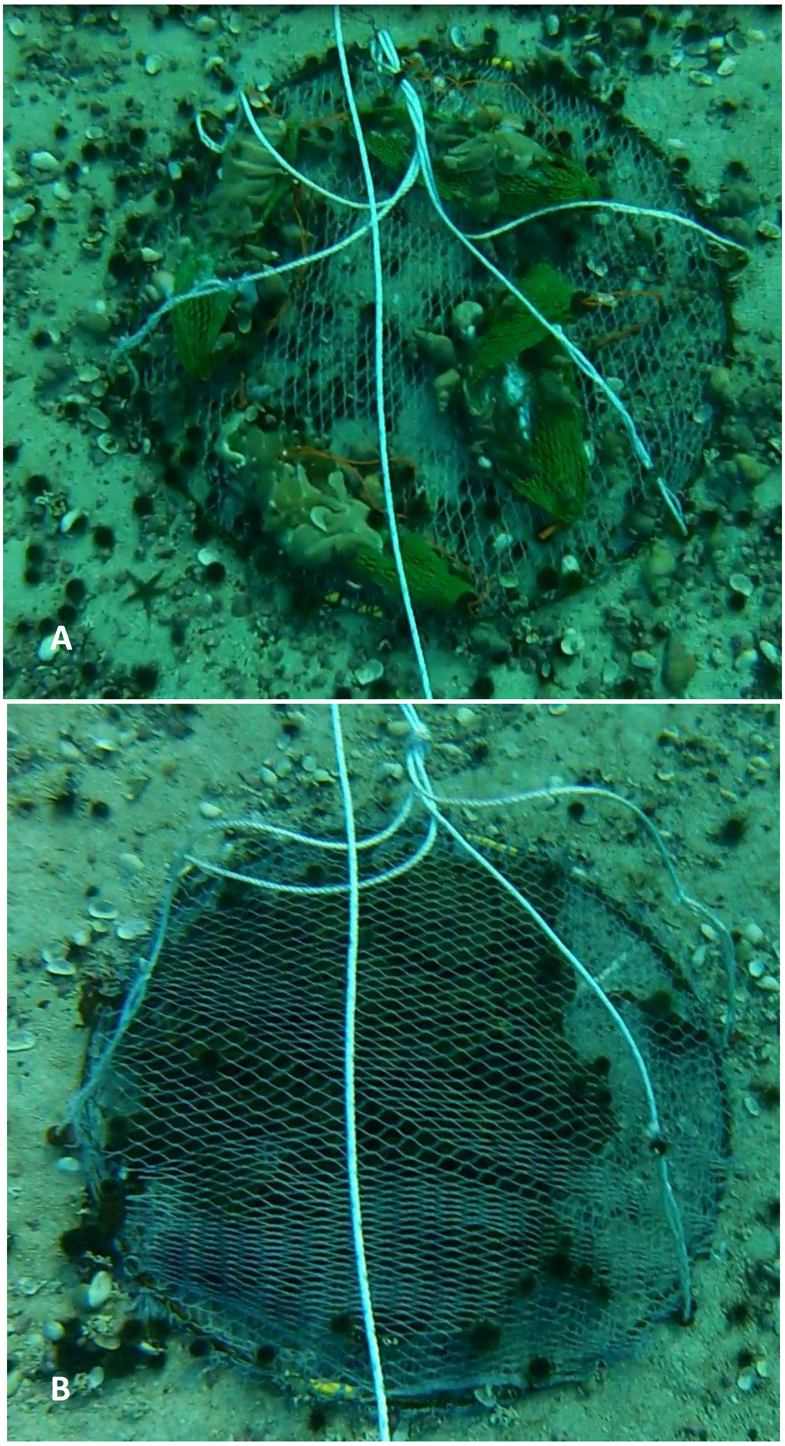


Figure 10 A comparison of the amount of by-catch present on the 4 fish bait (A) compared to the full coverage algae bait (B).

Table 2 The average size of the urchins caught in the various traps compared with wild urchins samples in the catch area.

Averages	**Size**
Algae bait	24,0
Fish bait	27,8
Wild samples	21,1

2.4 Summary of Trap type and Bait type and frequency experiments

The trapping experiments clearly showed that the most effective trap/bait combination was the round collapsible trap with multiple fish or algae baits. The ideal set time for these traps was around 7 days. Using these traps, baits and set times it was possible to catch on average 200 urchins per trap at Site 1 and 120-140 urchins per trap at Site 2 in Kvalsund.

These sites used in the trials were ideal for the experiments with large flat areas with urchins present evenly across them but the urchins were relatively small in this area. If the traps were set in an area with large urchins (approximately 40 g per urchins which is market size) it is estimated that the traps would yield between 4.8 and 8.0 kg/trap (165 urchins x 40g).

At the conclusion of the trials the round collapsible traps were then transported to Lyngen to be tested at Lynsskjellan AS, a Company interested in developing sea urchin fishing to supply fresh sea urchins to the Troms restaurant market. In addition, Lynsskjellan AS has a mussel farm in the sea close to Rotsund in Lyngen and does regular testing for algal biotoxins. This is one of the legislative pre-requisites for supplying sea urchins for human consumption and so it is an ideal site to test holding and supply of urchins using urchins from this trial.

3 Commercial trials

3.1 Introduction

A series of four commercial scale trapping trials were undertaken to test the most efficient trap from the experimental trials (the round collapsible traps) in a commercial setting. The trials were run in conjunction with the fisher/farmer, Arne Samuelsen from Lynsskjellan AS, situated at Rotsund, Lyngen. Lynsskjellan AS undertake weekly water quality testing so the farm is an ideal holding place for urchins prior to being sold into the local high-end seafood market.

Each trial involved setting a minimum of three lines of between 4-10 traps (baited with a variety of algae and fish baits) in areas around Uløya (Figure 11). The traps were set for periods between 6-9 days (see Table 3 for dates of trap setting and collection).

Figure 11 The areas where the trap lines were set around Uløya in Lyngen.

Table 3 The number of traps, trap lines, dates traps went into and out of the water and the catch numbers for the commercial trapping trials conducted in either the Uløya or Rotsund area in Lyngen.

	Set 1			Set 2			Set 3						Set 4			
	(Uløya)	(Uløya)	(Uløya)	(Uløya)	(Uløya)	(Uløya)	(Uløya)	(Uløya)	(Uløya)	(Uløya)	(Rotsund)	(Rotsund)	(Rotsund)	(Rotsund)	(Rotsund)	(Rotsund)
Trap No.	Trap line 1	Trap line 2	Trap line 3	Trap line 1	Trap line 2	Trap line 3	Trap line 1	Trap line 2	Trap line 3	Trap line 4	Trap line 5	Trap line 6	Trap line 1	Trap line 2	Trap line 3	Trap line 4
Number of traps	10	10	10	10	10	10	5	5	5	5	5	5	6	4	9	9
Date In	22 Apr	22 Apr	22 Apr	29 Apr	29 Apr	29 Apr	6 May	6 May	6 May	6 May	6 May	6 May	18 May	18 May	18 May	18 May
Date Out	29 Apr	29 Apr	29 Apr	6 May	6 May	6 May	15 May	15 May	15 May	15 May	15 May	15 May	26 May	26 May	26 May	26 May
Number of days	7	7	7	7	7	7	9	9	9	6	6	6	8	8	8	8
Catch urchins < 40mm TD	0	0	46	0	0	10	6	4	6	14	79	13	105	113	44	69
Catch urchins > 40mm TD	0	0	80	0	0	16	5	5	6	15	73	6	63	82	35	50

3.2 Trapping results

3.2.1 Urchin catch and size

Table 2 shows the catch results for the commercial trials conducted around the Rotsund area. At the beginning of the trials it was clear the traps were set in inappropriate sites and depths with no urchins being caught in 2 out of three trap lines on the first two attempts. This highlights the need for surveys to be undertaken prior to commencing fishing. This was suggested in the initial project outline for this project but due to budget restrictions it was removed from the project. There are a number of ways to do quick and fast monitoring of areas to estimate the urchin biomass, size of urchins and the type of bottom terrain present in an area. Traditionally this has been done by SCUBA divers but a much cheaper and equally effective technique is by using free divers or mini-ROV's. Nofima recommended the use of a mini-ROV (which are now commonly used in fish farming operations) to do fast and relatively cheap transects of areas. This can be done from a small, fast boat (the ROV used by Nofima and shown in Figure 12 can be operated from a 3m boat with a petrol generator) which would allow a very large area to be covered in a relatively short time. This would make subsequent trapping operations much more effective as the traps could be set in areas of known urchin abundance rather than relying on extensive trapping efforts to find good fishing areas.

The final catch rates in the commercial trials were considerably lower than those in the experimental trials in Kvalsund. This is due to the substantial fishing effort required to find fishing areas with sea urchins present in realistic numbers as outlined above. The catch rates consistently increased over the experimental period and both the commercial client (Lynsskjellan AS) is very interested in developing a sea urchin fishery utilising passive trapping.

Figure 12 The Nofima ROV which is similar to those used in commercial salmon farming operations and which could be used to complete fast and relatively cheap urchin biomass surveys.

3.2.2 By-catch

The by-catch observed and recorded during the commercial trials (Appendix 1) showed similar results to the experimental trials with significantly higher by-catch occurring in traps using fish baits compared to those using algae baits. The by-catch primarily consisted of small snails, hermit crabs and Kongesneker (Figure 13). The latter is a valuable species and could form a valuable by-catch from sea urchins fishing ventures.

Figure 13 By-catch observed during the commercial trapping trials.

3.3 Comparison of various trapping methods

When comparing the efficacy of various trapping techniques it is important to take into consideration not just the catch rates but also the cost of fishing, the logistics of each technique and the commercial viability of each technique. The following is a brief discussion of each of these points for the following collection techniques; passive trapping, SeaHarvester ROV, SCUBA divers and free divers.

3.3.1 Passive trapping

Previous studies that have investigated whether trapping could be a viable alternative to diving to harvest green sea urchins. In 2003 ring traps were shown to be more effective than dropnets or box traps. This is a similar result to the current study where the round collapsible traps were the most effective trap type tested. The study in 2003 recorded an average catch of 1.43 kg trap^{-1} day^{-1}. The study further estimated that a one or two-man fishing boat operating 300 traps over 10 trap lines, could theoretically capture 300-600 kg per fishing day.

The results of the current study show a higher estimated average catch than the 2003 study. If the traps were set in an area with large urchins (approximately 40 g per urchins which is market size), but with a similar density to that measured in the experimental area it is estimated that the traps would yield between 4.8 and 8.0 kg/trap. This would reduce the estimated number of traps required significantly from the previous study and would require approximately 150 traps to fish approximately 1 ton of sea urchins after a set time of one week.

There are a number of advantages to fishing sea urchins with traps. They can be used in both summer and winter and this method of fishing is very flexible regarding extreme weather events. Sea urchins caught using traps are alive and undamaged and are of very high quality. The traps do not destroy the seaweed or the environment. Logistically trapping is much easier than other collection techniques as the fisherman does not reply on dive crews and/or expensive equipment. This method of fishing can also easily be incorporated into other fishing activities.

3.3.2 Remote Operated Vehicle (SeaHarvester)

The results of the FHF funded ROV trial, conducted in 2012, showed that in 4.5 days of fishing (excluding Day 1 and morning of Day 2) a total catch of 1.88t was recorded with 34.9 % of the total catch (659.5 kg) consisting of export quality sea urchins (> 45mm test diameter). The authors suggest that the amount of sea urchins from the total catch that could be sold could have been increased to 52.1 % of the total catch (807 kg) by lowering the minimum size of the urchins that were kept to the industry recommended size of 40mm test diameter and processing any damaged sea urchins to utilize the roe in these animals.

The results of the trial clearly show that the SeabedHarvester ROV provides an effective method of collecting sea urchins in winter conditions in northern Norway. The economic viability of ROV fishing has yet to be proven and it is more labour intensive than passive trapping and requires extensive investment in equipment. Using the ROV requires a suitable boat, use of the ROV (rental or purchase), a boat driver and 1-2 crew to operate the ROV.

The density of sea urchins present at any given site and the type of bottom terrain play an important role in determining the catch efficiency of the ROV and so, as is the case with passive trapping, it will be important to undertake preliminary mapping of an area prior to committing time and capital resources into ROV fishing.

3.3.3 SCUBA divers

There is limited data on the catch rates for divers collecting urchins in Norway, however the catch records from Norway Sea Urchin AS for sea urchin collections made by a team of two divers and one boat skipper from 1 August 2011 to 5 Dec 2011 (a total of 10 days collecting) show an average daily (a day was approximately 8 hours long) catch of 90.9kg (± 16.4 kg) export quality sea urchins (minimum catch/day = 21kg; maximum catch/day = 198kg). The large variation in catch rates by divers (ranging from 21 kg to 198 kg/day) reflects the inherent difficulties with dive operations, even under relatively benign weather conditions.

Divers cannot spend long periods underwater searching an area for sea urchins without seriously reducing the catch rates. In contrast, if an area has very high densities of urchin in relatively shallow water (the largest catch rates were recorded when the urchins had migrated into very shallow water in September 2011) then catch rates can be relatively high for dive operations as they are for catch rates using snorkelling.

One of the longest running sea urchin collection operations in Norway (Arctic Caviar in Bodø) uses SCUBA as the collection technique. Catch figures are not available from this operation but it supplies small quantities of high quality urchins to exclusive markets and the owner operator is also the diver. In larger oprations it is unlikley that SCUBA diving will prove economiccaly viable.

3.3.4 Free diving

There is no catch data available for free diving with a snorkel for sea urchins in Norway. However, this technique is widely used in other parts of the world where weather conditions are more benign. Regular catches of sea urchin broodstock are made by Troms Kråkebolle AS in Tromsø using free diving technique and a sample was collected during the current trials. The catch information from this collection is included in this report not as an accurate report of catch rates but for consideration in future efforts to collect sea urchins. The location where the snorkel collection took place was on a shallow reef within 50m of Site 2 in Figure 1. The catch rates were 617 individual urchins (approximately 24 kg) (average size 44.3 mm test diameter) in a single 25 minute snorkel (Figure 14).

Figure 14 An example of part of the catch collected in a single 25minute freediving collection close to the experimental site used in the current trials.

4 Summary and Conclusions

- Experimental trials showed passive trapping can be more effective than both ROV and SCUBA collection and can be performed at a significantly lower cost (minimal labour cost and much reduced infrastructure costs).

- The infrastructure investment for passive trapping is considerably less than for ROV fishing. SCUBA fishing requires considerably more investment in terms of logistics, organization and cost than passive trapping.

- Passive trapping can be undertaken by a range of vessel sizes and types. In the current experiment vessels ranging from 3m to 8m were used but larger commercial fishing vessels with pot haulers could also be used if they can get access to shallow inshore waters.

- The vessel should be equipped with a depth sounder and GPS to enable accurate mapping of resources and catch rates.

- Free diving for sea urchins in shallow water proved to be the most cost and time effective method of collecting sea urchins. This has limited practical application in Norway but should be considered in future ventures.

- The authors believe that passive trapping is the most cost effective and practical method of fishing in Norway and the authors of this report recommend that future commercial efforts to establish sea urchins fisheries should focus on this technique.

- Nofima is working with two commercial companies (Lynsskjellan AS and Capefish AS) to develop commercial scale fishing in Lyngen and Hønningsfjord in Northern Norway based on passive trapping utilising the results from this study.

Appendix

Catch-report – Sea urchin - By catch:

All trials:

Generally the kongesnegler was caught on the traps wit fish (herring, cod head etc.)

Set 1. 22. April - Harvest: 29. april 2014:

String 1 and 2: Nesset: 4 kongesnegler and 10 eremittkreps/ snails.
String 3: Beetween musselsite and Havnnes: 5 kongesnegler, and 25 eremittkreps/ snails.

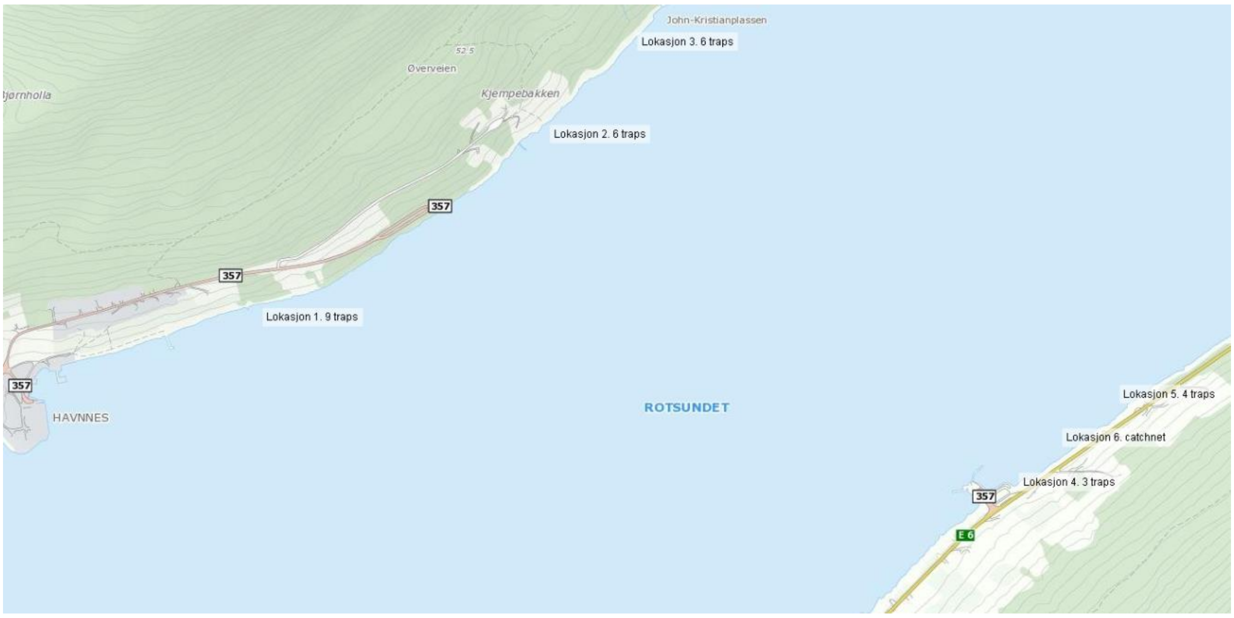
Set 29. April 2014 - Harvest: 7. Mai 2014:

String 1. Neeset N: 5 kongesnegler and 12 eremittkreps/ snails.

String 2: Nesset S: 3 kongesnegler and 5 eremittkreps/ snails.

String 3: Musselsite: 5 kongesnegler and 15 eremittkreps/ snails.

Set 7. mai – Harvest: 15. mai



Loc.	Kongesnegler	Snails and eremittkreps
1	1	12
2	0	5
3	4	10
4	5	2
5	3	12
6	4	10

Set 18. mai – harvest 26. mai 2014

		Kongesnegler	Snails/ eremittkreps
Station 1 (between fergekai and Bertelkaia)			
Trap nr.	Bait		
1	Dry fishskin	0	2
2	Dry fishskin	1	3
3	Dry fishskin+herring	1	2
4	Herring and kelp	0	1
5	Herring and kelp	1	2
6	Makrell and kelp	1	2
Sum		**4**	**12**

Station 2 (South of Bertelkaia)			
Trap nr.	Bait		
1	Codhead	1	5
2	Codhead	3	6
3	Codhead	2	10
4	Codhead	2	4
Sum		**8**	**25**

Staion 3 (North of Bertelkaia)			
Trap nr.	Bait		
1	Herring and kelp	0	1
2	Kelp	1	1
3	Kelp	0	0
4	Kelp	0	0
5	Kelp	0	0
6	Fishskin and kelp	1	3
7	Makrell and kelp	2	3
8	Blumussel, kelp and makrell	0	4
9	Blumussel and kelp	1	5
Sum		**5**	**17**

Station 4 (North of Bertelkaia)			
Trap nr.	Bait		
1	Herring and kelp	0	5
2	Herring and kelp	1	4
3	Makrell and kelp	0	4
4	Makrell	0	2
5	Codskin and kelp	2	2
6	Codskin	0	5
7	Bluemussel and kelp	0	4
8	Bluemussel, kelp and makrell	1	4
9	Codhead	2	5
Sum		**6**	**35**

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