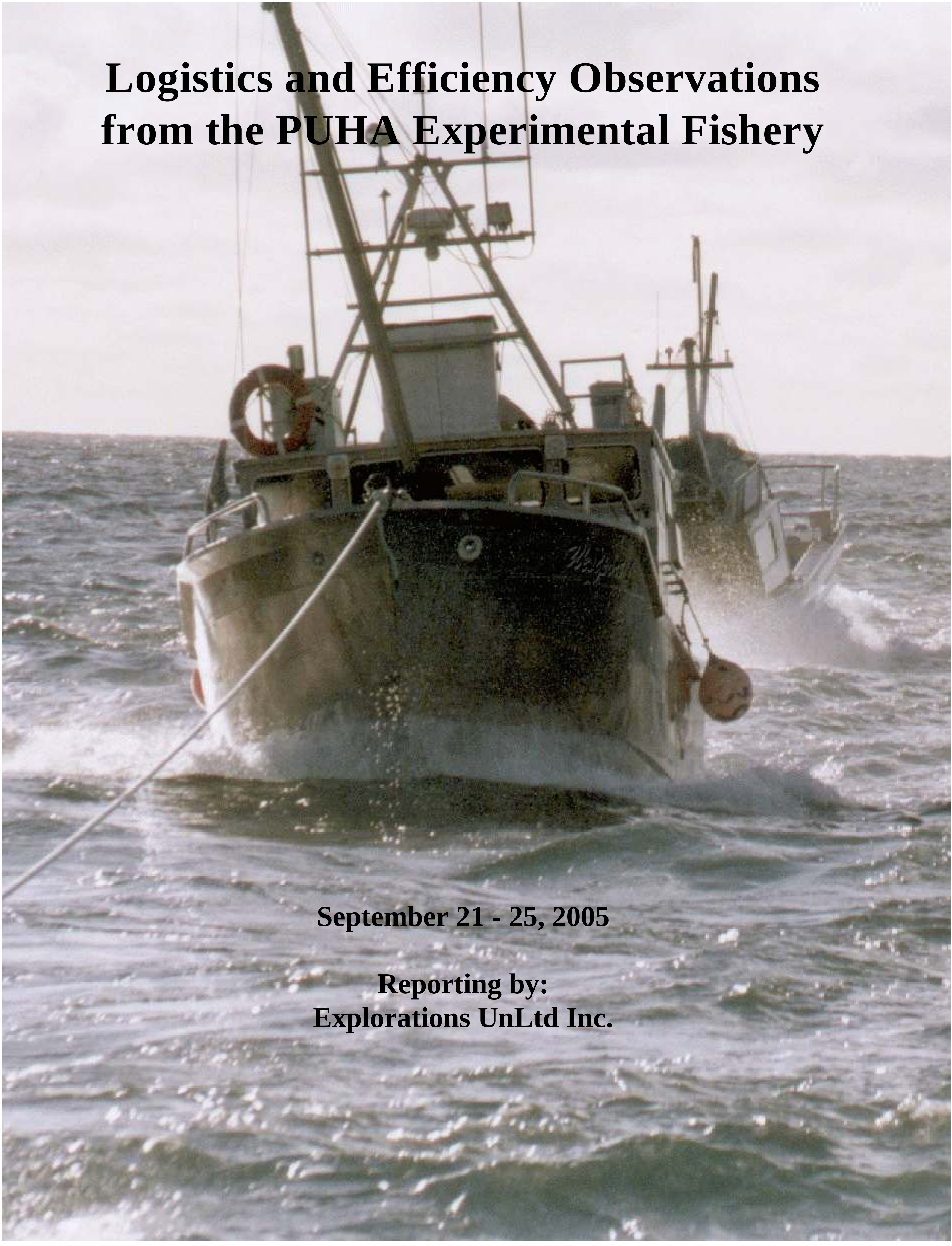
Logistics and Efficiency Observations from the PUHA Experimental Fishery



September 21 - 25, 2005

Reporting by:
Explorations UnLtd Inc.

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Table of Contents

List of Figures

List of Tables

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Introduction

The Ocean Ranger departed Port Hardy with the CFV Bartster and CFV Westport in tow for the trip to Thurston Harbour on the 21rst arriving September 22 about 1600 hrs. The Haida Guardian joined the group later that evening during the first arrival get-together for the year on the Queen Charlotte Islands. Formal review of the experimental fishing protocols were conducted the next morning prior to departing for the fishing sites. Bartster and Westport started on Experimental Site #'s 2 and 1 respectively. The Western Commander and Diver City arrived in the area about 3 hours after fishing commenced and CFV Diver City joined Westport in the early afternoon. The PUHA Biologist and the two guardians off the Haida Guardian worked with groups one and two respectively to clean up the urchins smaller than about 90 mm TD using smaller mesh bags and rakes. 56 bags comprising 10 -12,000 lbs. plus 106 lbs of smaller urchins were removed from the two reefs. The retained product was laid on the bottom until the Ocean Ranger was closer to departing at depths between 15- 40' and between 35 - 40' by the Bartster and the Westport respectively. The Ocean Ranger departed Thurstin Bay with a small load of 27,080 lbs, bound for Port Hardy to unload and pick up another couple of dive boats, at 2100 hours Sept. 24, 2005. The Ranger arrived in Port Hardy and started unloading at 2000 hours on Sept. 25, 2005.

Temperature loggers were inserted into 4 RSU (TDs: 130, 125, 117,115 mm) and five of the models (Volume-weight indices: 2-0, 2-2, 4-0, 4-1, 4-2) around noon on the Bartster. Additional Infra-Red Temperature (IRT) readings were taken on the urchins, dive boat and packer throughout the trip. Experiments were undertaken on this trip, and on a previous preliminary day trip in early September, with an eye to developing an easy-to-use simulation model of the urchins for use with the temperature loggers so their temperatures can be easily monitored and logged for comparison with other areas in different weather throughout the season (Figure 1). Other work included some preliminaries on quality impacts of heat accumulation, measured as °C- hours (°hrs). Additional chilling studies were planned but could not be undertaken at this time. Additional observations on apparent problem areas affecting the efficiency of the fleet, and possible measures to improve the situation with regard to quality preservation, reducing effort and time needs and generally increasing productivity were made and will be discussed.

Figure 1: 2, 4 and 6 oz. models with iButton thermo-loggers.

2.0 Unloading and Standardized Bags

The unloading is arguably a key efficiency bottleneck. This would dramatically shorten the time required to empty the bags and consequently the length of time the product is exposed. As a bit of an illustration, the duration of the 21,000 lbs unload of the Ocean Ranger on this trip was just under three hours. This works out to about 7,000 lbs /hour. Things started out even more slowly but once they got rolling they were emptying about 1 bag per minute which, at 200 lbs/bag, worked out to about 12,000 lbs/hour. The vessel crew was able to get about twice as many bags on deck in the same amount of time as the dock crew could process even at their best, suggesting that the boat crew can unload perhaps about 25,000 lbs/hour out of the hold. This comparison puts the on-board unloading efficiency in a fairly good light but only in this limited context.

As a sort of contrast, an unloading observed in Prince Rupert at the Keep it Cool station in April 2005 comprised just under 100,000 lbs on-grounds weight, which should work out to about 80,000 lbs dock weight. This operation took about five hours, which translates to about 16,000 lbs/hour, although to be fair it seemed that the small holes on the Blue Pacific were rate limiting once the decks were cleared so they may also be able to handle perhaps 20,000 - 25,000 lbs/hour, a number which still leaves considerable room for improvement.

Increasing the capacity of the unloading operation would seem to require a bit of a rethink on the stowage- unloading process and one of the first things to jump out again is the handling of the dive bags. One solution might be to empty the bags into a hopper on the packer deck from which the urchins are carried to the totes by a covered conveyor. The capital costs of moving in this direction are not likely to be well received by the unloaders so careful calculation of the benefits and costs would be required.

The bags are very versatile and the currently used system seems to be fairly efficient although the diverse capacities of the urchin bags, they come sizes ranging from about 200 lbs right up to probably 500 - 600 lbs, precludes other, possibly more efficient, unloading procedures. Each is individually hung by its own line for each lift so that a bundle has a diameter that is directly proportional to the number of bags in the bundle (Figure 2). This spreads the bags so they are easier to untie and empty as per the current practice. However this also limits the number that can be ganged out of the hold on most packers, sometimes perhaps even to single bag lifts, which combined with the need to individually untie and empty each one, really slows things down.

Figure 2: unloading red Sea Urchins in Prince Rupert.

The use of standardized bags would

allow the design and use of a sort of modular hang system with gangs of bags hanging vertically as a sort of column with the same vertical axis, a single hookup point and a uniform diameter which is independent of the number of bags. The bags would be designed so they naturally assume defined dimensions (radius and length) and can be attached head to toe (so to speak) so they can be hung vertically and share the same central axis. Figure 3 is a proposed draft design schematic. A top ring or frame of some sort might be used on top of each gang, perhaps as a component of the boom connector system, to retain a uniform diameter and shape when hanging.

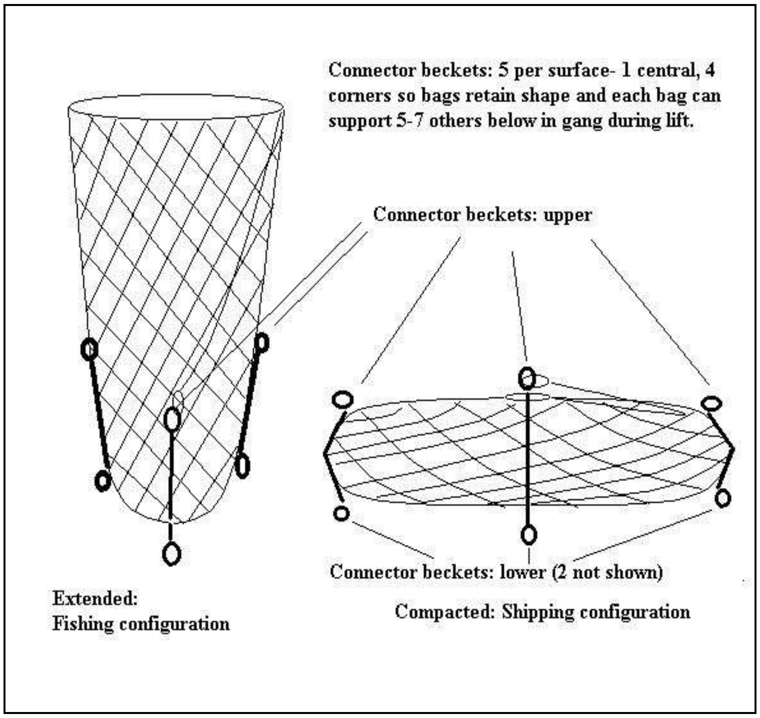

Figure 3: draft design outline for standardized RSU bags

The capacity of the bags could be designed around the capacity of the currently used totes so that two bags (@300 lbs each) will fit into and fill a tote to capacity. In this way the divers 'portion' the catch to a standard weight right from the get go. The bags might also be better designed so they are squared off a bit as opposed to round to increase the efficient use of space within the totes. The reinforcement straps, with the outer connector becket extensions, would fit edge to edge across the tote while the bulges between would fit corner to corner. Different numbers of bags could be attached to accommodate different hold depths if they are hung vertically. The columns could also be laid out horizontally and still extracted as a single pull but there would no doubt be some compromises required to design in enough flexibility that it will work on all the packers.

The bags could be either assembled into gangs comprising 2 - 4 bags and gangs could likewise be connected so one pull could lift 2-4 gangs, depending upon the capacity of the transfer boom etc. Assembly could be undertaken on the diver vessel deck during their normal recovery procedure, or, alternatively, the gangs could be assembled bag by bag using the dive boats boom over the side for hanging the product in the water when the packer is not assisting. Transfer of the gang to the packer from either the dive vessel or the hanging station could in either case be again through a single hook-up connector. Depending upon the number of bags in the gang, a consistent 400 - 2,000 + lbs would be lifted in each pull through a single hookup once the gang(s) is assembled.

Designing the standardized bags so gangs comprising 2 bags can be directly lowered into the totes without actually removing the urchins from the bag would eliminate the time used to empty the bags but would mean that the bags would be making the trip to Vancouver. A quick cost-benefit analysis should reveal the balance on shipping the extra weight of the bags (fuel surcharges etc) to the labour savings. This would increase the number of bags needed to circulate through the system but large runs of standardized bags (say 1,500 plus) may be available very cheaply from China as a custom product once the proper dimensions and other spec's are developed. Each vessel generally prefers to have enough bags on board to cover 2 days of fishing, call it 75 bags (@ 300 lb capacity) for each boat or 3,750 bags for the fleet. An adequate number of bags for the fleet would have to be some multiple of this to account for the bags in transit to and from the plants.

2.1 Vertical Stowage System Proposal

Eventual (long-term plan) design and development of a synchronous engineered quick snap vertical stowage system in the hold, would provide additional operational benefits and allow a huge increase in efficiency and a huge decrease in the amount of muscle required. Aside from ease of use, the overhead system would also provide other advantages including continuing to hold some of the weight thereby relieve at least some of the compression on underlying urchins. The height of the frame holding the overhead rails should also likely be adjustable (by hydraulics?) so the load could settle somewhat if the hold is not filled or there is still otherwise too much movement. In rough weather the holds could be tanked down a bit to increase stability with the columns and/or dividers acting as barriers to excessive "sloshing".

A quick snap suspension stowage would comprise a frame within the hold with overhead suspension beams. The bags would lowered into the hole until the connector could be snapped onto a roller assembly mounted to the overhead rail. Once the column is attached to the roller system, the boom line is detached and goes to retrieve another set while the just attached column is 'rolled' back and set (locked?)into its stowed position. Some mechanism to pull the roller back into place would reduce if not eliminate the need for any men in the hold and allow the operation to proceed at say one pull (@ say 1,500 lbs each) per minute. Separator plates (aluminum?) could be used to reduce friction between adjacent rows and ease the movement of the product columns back and forth in the hold during the stowage operation. It may be possible to incrementally implement such a system but even in this case it would of course require a considerable investment on the packers and so is not a reasonable priority for the short to medium term although in the longer term it may be more attractive.

The overhead rack system could also be transferred to the trailer so it too just hauls the gangs of bags suspended from an overhead system, in the same manner as the vessel holds, to eliminate the weight of the totes from the hauling equation (10 rows of 6 totes weigh in the neighborhood of 6,000 lbs) but this is likely to meet considerable resistance from the reefer owners. If this proves workable some sort of height adjustment to permit settling the weight (and center of gravity) to increase load stability would also be recommended which would again increase the investment costs to the truck owners - so that is probably out for the short to medium term at least.

2.2 An Alternative Incremental On-board Stowage Improvement

A more realistic start in the holds might be in systematizing the stowage and removal to reduce the time and effort required moving the product on and off the packers. Getting the bags hooked up as a unit of 5-6 bags with a common hookup- tightly packed by hook up lines (ribs to take weight of 5-10 bags) that are otherwise released and just used to join the bags for transport. Tethers to each gang could be indexed along the off-side bulkhead as the pile is being built in the hold and sequentially picked up to de-construct the pile in a set pattern. Same for the plywood (replaced with aluminum with embedded CSW sprayers?)- each layer could have a single indexed line for removal. Building the ‘pile’ in the hold will require some design so it de-constructs in the intended pattern. The initial gangs could be laid horizontally in like sausages, with a different number of bags per gang to accommodate different hold widths and then using downwardly angled plywood will take things to a point eg: build pile from inside wall with plywood and layered gangs to about half depth then pull some up into upper corners- (how -stack and press with hydraulic wall? Block set into upper distal wall with handline extension for releasing back hook?) Holds take about 40klbs so that would be 130- 135 bags @300 lbs- 26-27 gangs of 5 bags each, or about 7 per hold. Gangs could also be used in combination with single bags manhandled to fill in spaces.

Unloading would just be the operation in reverse- attach index line to boom, remove bag/gang, -followed immediately by another index line as soon as the preceding gang is out of the way- again- one or more pulls (@ say 600- 2,400 lbs) per minute.

3.0 Chilling and Temperature Monitoring

Part of the plan for this trip included some ice so the effect of chilling the product down could be examined in further detail in terms of product recovery and texture with some emphasis on holding back the transition of the uni to a more immediate reproductive (soft and leaky) state. Two things sort of went wrong here. First off the ice did not show up and, perhaps as importantly, the control recoveries obtained from urchins right out of the water were all over the map. The experimental fishing protocols are different from normal commercial operations as all the urchins are picked with no regard to quality or feeding state etc. Once this became apparent, the validity of any inferences that might be developed as a result of this work likewise lost some of their sheen, particularly as no relationship between the heat accumulation and the recoveries would likely show up simply because of the randomness of the uni volumes in different animals.

Some preliminary work along this line was done earlier in the month on a day trip out of Port Hardy on the CFV Kuroshio. In this case the small temperature loggers (Figure 1) were sealed in five urchins which allowed three replicates for the chilled treatment and two for the normal handling (no cooling) treatment. These loggers recorded the internal temperatures of the urchins at one minute intervals for the next 32 hours or so to track the heat accumulation. The chill treatment involved holding the urchin is a chilled sea water bath for periods of between about 20 to 40 minutes to cool them down followed by storage in a cooler with ice packs. The ice used in

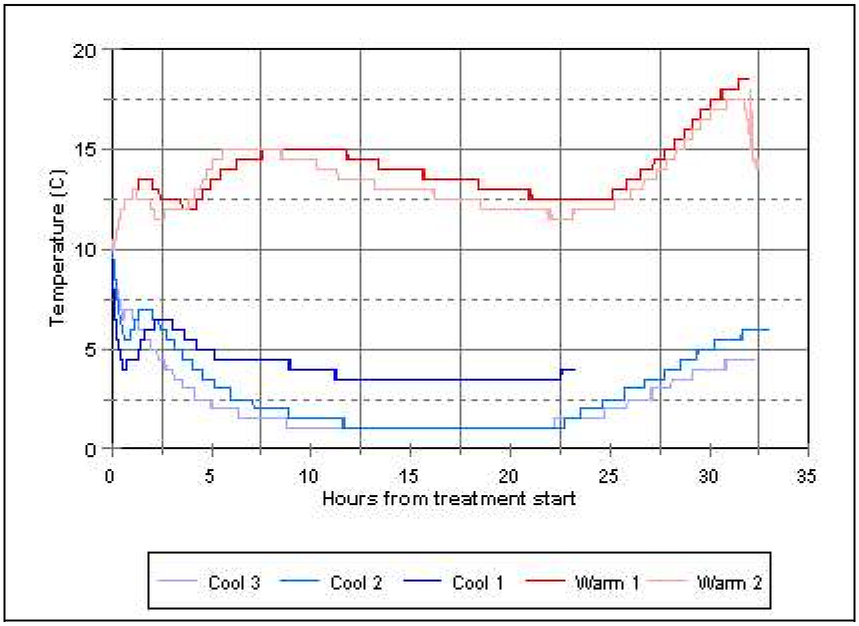

Figure 4: Temperature profiles for the urchin recoveries trials

the bath was kept in double layered plastic away from the water so as to minimize any reduction in the water's salinity. The temperature profiles for the two treatments can be seen in Figure 4. Eight other urchins were given the chill treatment and six others joined the no chill treatment to bring up the sample numbers for the recovery estimates at least a little bit. Nine other urchins were processed and their recoveries determined as soon as they came out of the water to provide a control which comprised a 0 (zero) degree-hours (°hrs) heat accumulation. The experimental urchins were processed in two batches, 5 chilled urchins and 4 not cooled urchins were processed after about 22 hours while the last 6 chilled and 4 not-chilled urchins were processed about 10 hours later or at about 31-32 hours post-treatment.

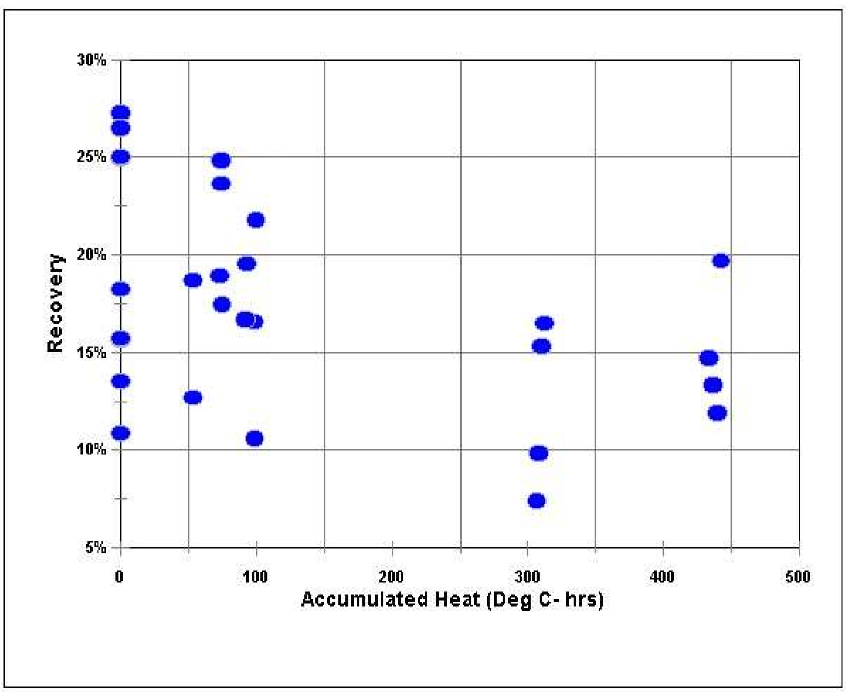

Figure 5: Scatter-plot of recoveries obtained at different accumulated heat states.

Figure 5 is a scatter-plot of the recoveries (vertical axis) obtained against the accumulated heat (x-axis) for the different treatments using the data presented in Table 1. The points on the far left hand side of the graph are the recoveries from the control urchin while the next group of points, between about 50 - 100 °hrs, are the two chilled urchin treatments. The not-chilled urchins are the last two groups, at about 300 and 400+ °hrs respectively. A non-parametric statistical test called the Spearmans Rank Correlation was run on the data and indicated a significant difference (@ α=

Table 1: Recoveries data from CFV Kuroshio trip (data used in Figure 5)

Recoveries results September 8, 2005 RSU trials

Control RSU's						Recovery		
#'	Rnd Wgt	TD (mm)	Drain Wgt	IR Temp	Uni wgt	Round	Drained	D-hrs
1	691.6	122	500	9.6	91.1	13.2%	18.2%	0
2	577	115	414.9	9.5	65.1	11.3%	15.7%	0
3	560	120	439	9.7	59.3	10.6%	13.5%	0
4	574.2	n/a	n/a	9.6	131	22.8%	n/a	0
5	644.2	122	460.5	9.8	50	7.8%	10.9%	0
6	492	111.5	377	9.5	59.1	12.0%	15.7%	0
7	378	105	369	9.5	92.1	24.4%	25.0%	0
8	564	115	499	9.7	136	24.1%	27.3%	0
9	550	115	456	9.6	120.8	22.0%	26.5%	0
Experimental RSU's								
C1	417.5	119	389	5.6	64.4	15.4%	16.6%	98.16
C2	509.5	111	346	6.5	36.6	7.2%	10.6%	98.99
C3	250	92	241	6.6	52.5	21.0%	21.8%	100.12
C4	561	128	469	6.4	59.5	10.6%	12.7%	53.48
C5	519.4	128	465	6.3	86.9	16.7%	18.7%	53.61
W1	378	n/a	317	12.8	23.4	6.2%	7.4%	306.87
W2	513	n/a	358.5	12.7	35.1	6.8%	9.8%	308.87
W3	294	n/a	272	12.5	41.6	14.1%	15.3%	310.89
W4	366	n/a	341	12.6	56.2	15.4%	16.5%	312.93
W5	524.5	120	395	17.4	58	11.1%	14.7%	434.23
W6	384	117	353.5	17.6	47.1	12.3%	13.3%	437.21
W7	386	121	354.6	17.4	42.1	10.9%	11.9%	440.06
W8	554	120	522	17.5	102.8	18.6%	19.7%	442.80
C6	446	112	402	7.8	67	15.0%	16.7%	92.02
C7	494.4	124	459	8	89.6	18.1%	19.5%	93.02
C8	525.5	118	338	6.4	64	12.2%	18.9%	73.55
C9	457.5	120	435.5	6.6	108.1	23.6%	24.8%	74.10
C10	454	113	426	6.6	100.6	22.2%	23.6%	74.60
C11	449	117	372	6.4	64.8	14.4%	17.4%	75.10

0.025) between the drained weight recoveries observed for chilled and not chilled urchins, supporting the hypothesis that recoveries decline with increasing heat accumulation. There was no significant difference on the green-weight based recoveries. Non parametric statistics were used because they are less dependent upon assumptions and more likely to provide valid inferences with limited data sets than are the more commonly applied parametric statistics which can provide a false positive result much more readily if the assumptions are violated.

The possible impacts of elevated temperatures on the product are not thus far substantiated in full but continuation of studies into the effects, and measures to contain the impacts, are recommended. In this regard it is also worth mentioning that salinity is another factor that should be taken into consideration because one of the final stages prior to spawning in urchins is the absorption of water by the gonads to bulk up and increase the internal pressure for expelling the actual gametes, eggs and sperm. Using a chilling medium with a lower salinity than full seawater which generally has a salinity of about 2.8 - 3.2%, could prove to be detrimental to product quality and should be guarded against as it may produce more watery uni. Using the same logic, using a more concentrated solution (@ say 3.8 - 4.0% salinity) in the chilling medium may help dry the uni out a bit while the urchins are still alive.

Given these constraints and the logic behind the temperature impacts though, studies into the effect(s) of chilling on the product quality should be pursued by industry, particularly in preparation for moving into warmer fishing seasons as market seasons are extended. If the benefits prove out, a chilled brine misting system could be fairly easily and cost effectively integrated into the packer holds to provide not too abrupt chilling for the product, thereby improving industry's on-grounds quality control capacity as a step towards increasing the value of the production.

Flooding the holds with Refrigerated Sea Water (RSW) for a short while after the urchins are loaded in might be worth looking at. However, the cooling in this instance is likely to be very abrupt which might also have an unpredicted and not necessarily beneficial effect on the product quality, particularly if the water is drawn from a relatively shallow depth in a low salinity bay. Further studies into this are warranted before the industry commits to this option.

3.1 Urchin Model Development

One of the uncertainties being looked at in this project revolves around the temperatures the urchins experience at various times through the fishing season as they are brought on the dive boats, transferred to the packer and eventually unloaded and shipped to Vancouver. Up to this point there has been no way to develop a temperature profile throughout the whole sequence of events so questions regarding what sorts of changes are advisable to avoid temperature abuse impacts on product quality have been moot. There simply has not been any objective tracking of what sorts of temperatures the urchins are subjected to at any point on their voyage.

A good part of the problem is the sheer variety of conditions prevailing during the fishery at different times of the season. Temperatures can range from the low 20's (° C) to perhaps -15° C and winds from calm to storm force at virtually any time the urchins are on the dive or packer vessels or are being unloaded. Once they make it into the reefer they are in a controlled environment.

There are a number of technologies available to monitor the temperatures but most of these will require significant efforts to coordinate different data sets so the temperatures measured at one time for a certain batch of urchins can be tied in with other temperatures measured on other carriers for the same batch at different points. It is probably also worth mentioning that it is the internal temperatures which are of primary interest and these are often difficult to infer from externally obtained sensors such as might be found on the decks and holds of the vessels and on the unloading dock.

The project consultant has obtained a number of small temperature loggers which are expected to be very useful in this regard. These iButton therm-loggers obtain and log the temperature at intervals ranging from every minute to once every few hours or even days. They record and store upwards of 2,000 records and are programmable through a PC so the operational parameters can be tailored to different mission requirements. In this instance, setting the interval at 10 minutes, so it will record for about 2 weeks would seem to be an appropriate regimen.

These devices are small enough that they could be inserted directly in the urchins but such an effort is not likely to find support from the guys on the grounds simply because it is fairly tedious process and they simply do not have the extra time available when they are working. The most workable solution would seem to be using a larger, and very noticeable model that they can simply place inside the bag as it is brought on board. The model would then ride with the urchins on the rest of their journey, pulled out at the plant when they are being processed and sent along to the consultant for downloading and analysis.

A separate higher capacity temperature logger will be sent up for mounting on the outside on a designated packer so that at the end of the trial period, which may encompass the whole season, the product temperatures can be better reconciled with the ambient temperatures prevailing at the time. If the packer crew can prepare some date and time stamped notes on the measures used for the shipment (eg. tarps, insulated blankets, in-hold storage, etc.) and the processors forward information on the product quality and recoveries for the shipments in question, we should be able to pick out what is and is not working and perhaps even quantify some of the differences in terms of quality impacts.

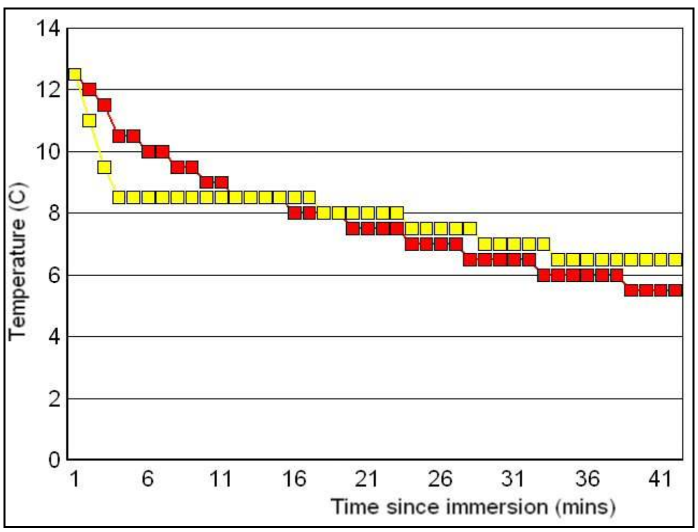

Figure 6: T profile for RSU in Chilled Sea Water.

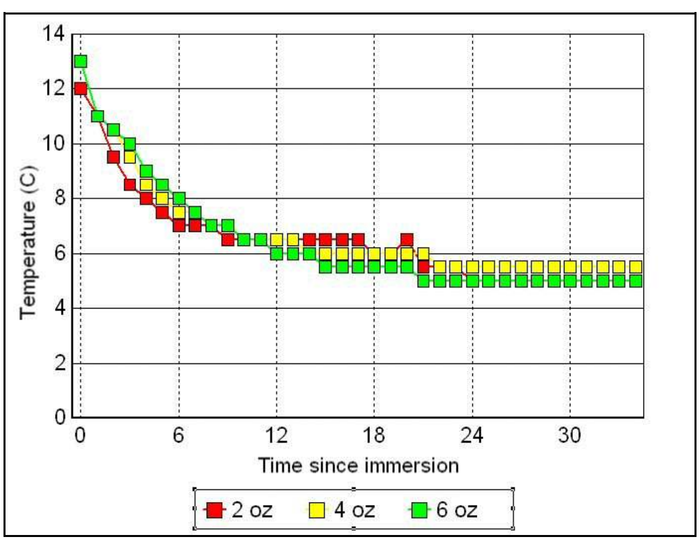

Figure 7: T profiles for models in Chilled Sea Water.

Some preliminary tests have been run on the plastic, food grade jars pictured in Figure 1. A number of different things were tried out including simply comparing their performance with air or seawater inside so their respective cooling rates could be compared with each other and with urchins which were also equipped with internal buttons. Figures 6 and 7 depict the cooling rates of a couple of urchins and the three water filled models (2 oz, 4oz, 6 oz). The studies thus far, including the ones in the preceding figures, have found that smaller jars cool and warm a bit faster than the larger ones, ones filled with water cool more slowly than those filled with air and all seem to cool faster than undrained urchins although they, including the urchins, stabilize at about the same temperature within about 10 - 15 minutes of each other once they are in a protected environment out of the wind. Tests with urchins in the open have thus far also found a fairly wide variance between different urchins but whether this is related to differences in test diameter, test thickness, differential exposure to wind and sun etc, has not been determined.

One other thing of note on Figures 7 and 8 is that the rate of cooling slows dramatically as the subject's temperature approaches the bath temperature. This suggests that if an Refrigerated Sea Water (RSW) or Chilled Sea Water (CSW) bath is used to chill product at some point, the Law of Diminishing Returns applies. In this case, the chilling rate declines by about one-half every 3 minutes or so suggesting a soak times beyond 12 or possibly 16 minutes are wasting chilling capacity when more product is waiting in line.

3.2 On-Board Temperature Monitoring

The temperature models were just being tested on this trip so they were just set up under the top bags in the forward starboard hold and not distributed throughout the load as would the proposed protocol. The temperature information from the different models was in general agreement and showed a steady increase from about 12.5 - 13.5 °C to between 14.5 - 15.0 °C by the time the product was unloaded. Infra Red temperatures (IRT's) were also shot on the product as it was being unloaded from different depths from all the different holds and had a range from about 12.4- 13.6 °C in the back hatches and about 14.6- 15.2 °C in the front hatches. The RSU were still looking pretty lively when they were removed although a couple of bags from the forward port hold had some urchins that were looking a bit green.

A number of IRT's were also taken from the surfaces in the holds. The back hatches seemed to be a bit cooler than those up front with average temperatures ranging from 12.6 - 13.2° C on the outboard surfaces and about 14° along the inside walls. The inside walls were a bit warmer on the forward holds with temperatures of about 15.6 - 16°C while the outboard walls were between 14.4 - 14.6°C. The forward walls, adjacent to the engine room, were the warmest at between 16.0 - 16.2 °. These readings were taken as soon as the holds were unloaded enough to allow the shots and, given the Ranger had just made a 23 hour run from Thurstin Bay, it is not surprising that the interior surfaces were a bit warmer than the floors or outboard surfaces.

The product heating from this was not considered substantial enough to warrant real concern but the marginally higher heat influx into the forward holds suggests that there might be some benefit from taking a couple of totes of ice into at least the forward hatches prior to leaving on a run to the grounds to keep things just that much cooler. This would again represent an additional cost so some additional monitoring is likely warranted. The deployment of the temperature models over the next couple of weeks and for a good part of the rest of the season should provide some additional insights.

4.0 In-water Holding

Another practice which appears to hold promise involves hanging or holding the product in the sea until the packer is loading up and getting ready to leave. This may be a somewhat intermittent problem as 2 or 3 day loads are not generally the standard practice during commercial fishing. Still, the differences in the recoveries realized at the plants strongly suggest that in-water product holding has dramatic and positive effects on the subsequent product quality or, perhaps more accurately, avoids the negative effects associated with holding it for an extra day on the packer.

To illustrate this, Grand Hale had 7 K-lbs delivered which was fished as part of the experimental fishery on the 25 and 26 of September, the two days then comprising a two day load on the packer (Western Commander). According to the company, the product from the second day's fishing was OK but the first day's product was rotten. This suggests, although I am still awaiting confirmation, that the first days product was loaded directly onto and held on the packer while it waited around for an extra day to get the second part of its load.

Contrast this with the experience at Kiku which accepted a two-day load from the Ocean Ranger. In this case the product from both days was in pretty good shape - although the recoveries seem a bit low at around 3-4%. In this instance, the first day's production was laid on the bottom and held in the water instead of on the packer. Kiku also took another load which it suspects was held on the packer for an extra day. This product too was not up to snuff, the RSU had few spines and they were stinky.

The quality advantages of holding the product in the water over holding the product on the packer are thus far apparently indisputable and the in-water holding for multi-day loads should be adopted as a Standard Operating Procedure until either further work counters these indications or an easier but equally effective alternative is proved. This will become even more important as the season goes on because the urchin quality tends to drop with the approaching spawning season. Additional work with chilling will likely prove advantageous in this regard but the in-water holding seems to be the most do-able option at this point.

Some boats had difficulty hanging product. Westport laid its catch out in a longline in short order while the Bartster still has not adopted an easy and/or efficient system. It would be interesting to find out how many boats actually have developed efficient in-water holding deployment and recovery procedures that work for them.

There is also still the question of the best sort of system here as well because it is hard to know if it is better to settle the bags down to the bottom- assuming only rocky, gravelly or otherwise hard bottoms are used, or if it is better to suspend them mid-water. Both methods most likely increase survival and subsequent shelf life of the product but the product on the bottom is also more likely to attract the unwanted attention of predators and parasites. In addition to this, if it is laid on the wrong bottom - soft mud with anoxic layers at only a cm or two depth, its quality (especially taste) will very likely be compromised by invasive sediments and/or hydrogen sulphide. On the other side, if the product is hung at too shallow a depth where the temperature is warmer and/or the salinity is lower, the uni may start absorbing water to the detriment of the product's quality.

The in-water system could provide additional advantages in that it could also serve as an in-water inventory to be picked up by packers using a reduced frequency of trips - which in itself would save considerable costs while possibly increasing the flexibility of supply options when the weather is not cooperating. Boats could fish hard when the weather is good and use the in-water inventory to hold excess production with (reportedly) very limited product impact for at least a week. Packers might also be able to drop off excess urchins closer in to Prince Rupert so the product is more easily available when insufficient quantities are being landed.

Using boom sticks as floats to saddle-suspend gangs - realistically starting with 2 - 4 bags per side at least until the inevitable bugs are worked out, at depths of between 30-40 feet would seem to be cost effective option for getting started. Discussions with crew on the packers on the gathering and anchoring of the log-based assemblies provided strong hints that they might actually have some fun doing this, giving them something to do during their down-time when they are just waiting around. There would of course be some costs involved but because there may only be a need for 10 -12 temporary sites in sheltered areas throughout the season, the securing line and/or anchoring systems need not be too elaborate which would simplify things considerably.

Using a rigid spreader to suspend one or more gangs per side per side, would be consistent with the previously mentioned design standard proposed above and would allow the packer(s) to pickup product and start loading, using 1,000 - 2,000 pound pulls, before dive boats are alongside so multi-day loads could be more efficiently handled while ensuring quality preservation. Loading could then be completed earlier (say by 7 PM vs. midnight) so the arrival times might be earlier and, in later parts of the season at least, air temperatures that much cooler at the dock. This would cascade all the way down to Vancouver as the unloading, even in the absence of other changes, would be completed, and the truck could leave, earlier. Using more robust and secure system of the same sort closer in to Prince Rupert could also provide an accessible live inventory for those times when the weather is restricting harvests and/or deliveries from more remote areas.

5.0 Amino Acid Profile Changes

One of the intended subjects for this trip was changes to the uni's amino acid profile as the heat accumulation increases. This was dropped initially because there was no ice available to chill some urchins so it was no longer possible to get a comparative set of data to examine the question meaningfully. This turned out to not be a bad thing though as it became apparent, most dramatically during the unloading, that there are more pressing and practical issues that should be addressed first. The amino acid profiling can easily wait as the texture and recovery effects are probably more important from the industry and market perspectives and it seems that making the transfer and unloading stages more efficient and test, monitor and optimize the handling procedures to minimize temperature and weather impacts are the obvious priorities.

6.0 Fleet Coordination and "Culture" Development

Everybody knows that the price of fuel is much higher than last year and is not likely to really decline for some time. This has further increased the importance of making sure the fleet resources, with particular reference to the packers, are used to optimum effect. Many of these arrangements are made by vessel owners who are in at least in periodic contact, and while I do not know how frequent their discussions are or what arrangements they make with each other, it is incumbent on them to keep abreast of what the other vessels are up to and to coordinate the actions of their vessels accordingly while keeping the fishermen and the various crews up to speed on the evolving operational 'big picture'.

There has been some controversy over what an appropriate packer load ought to be and there have been some instances where one packer has loaded up and spent an extra day on the grounds to get more product even though the next vessel in the order is en route to the grounds with the expectation of getting some product on board itself soon after arriving. This sort of layover may be a bit of a bingo for the fully laden vessel but it is wasteful in at least a couple of other regards: first off - the extra day on the packer can dramatically and detrimentally impact the product quality, a packer arriving with 100 k lbs generally gluts the system and the market for a couple of days and the disregard for optimum load parameters can be seen as opportunistic and damage the goodwill between players necessary to work together to maximize the economic benefits for the industry as a whole.

Fishing is naturally competitive and the people involved are in it at least in part for the autonomy it offers and independence of action it requires. Getting the fishermen and packer crews to buy in to some of the measures required (fishing restrictions, load restrictions, reinforcing a focus on quality, etc) to ensure a smooth flow of optimal volumes of maximum quality product to the market requires a 'teamwork' mentality and this, I think, still requires some work.
I am at a loss as to what sort of concrete measures might be applied to advance the development of more pride in a "BC Urchin Industry Culture" whereby everyone sees they are actually rowing the same boat (along the lines of a corporate culture) but expect that demonstrated success in getting guys more money for less work will be contagious. That of course will, in at least some cases, require raising the bar on quality and working harder to eliminate substandard offerings so the market sees the product more uniformly as being more valuable.

I cannot claim to know the mentality of the whole fleet but have noticed some disturbing attitudes on more than one occasion, although I will not get into specifics. Unfortunately, at least some players do not seem to have made the connection between what they do and the market's reaction(s) or the link between the market reaction and their pay scale(s). This is likely a consequence, in at least part, of the standard pricing regime whereby boats are paid the same whether or not they land better quality product. When one boat fishing strictly for volume makes the same unit price as a boat that fishes for quality and therefore makes more money on a day by day basis, you have to know that the 'quality' boats are going to start having second thoughts about what they are doing.

I have also heard comments on occasion from some guys in the fleet that they simply follow orders (sometimes resentfully), that their opinions and/or decisions do not get the respect they deserve and/or claim they have no interest in the product once it is off their boat and they are paid up. This sort of attitude may simply considered as part of the job but it can nonetheless be very damaging when trying to build up a team with a commitment to common goals. I have a feeling that some advice from a Human Resources (HR) perspective should be developed and, despite being beyond the scope of this project, will be checking into some HR books to confirm this as an issue of concern from an HR perspective as well as to get a bit of a handle on what sorts of things might help.

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