

Report – Zirfaea

Progress

In total, 4284.1 km were surveyed, including some underway survey effort in the channel. 3063.1 km was covered in dual platform mode and an additional 632.6 km on single platform (see Figure 1). 190 sightings were recorded from the primary platform and 230 sightings from the tracker platform. Eight cetacean species were recorded (of which one species, killer whales (*Orcinus orca*), occurred off effort), with the majority of sightings being common dolphins (*Delphinus delphis*) and harbour porpoises (*Phocoena phocoena*) but also with a large number of bottlenose dolphin (*Tursiops truncatus*) sightings. A summary of the main cetacean species is presented in the table 1 below. We also had large numbers of sunfish (*Mola mola*) sightings, some basking sharks (*Cetorhinus maximus*) and a leatherback turtle.

Species	Sightings - primary	Sightings - tracker	Best group size (range primary platform)
Bottlenose dolphin	10	23	3 - 28
Common dolphin	34	43	2 – 280
Common /striped	8	4	4 – 50
Harbour porpoise	64	116	1 – 5
Long finned pilot whale	3	4	1 – 4
Minke whale	7	13	1 - 2
TOTAL (all species)	190	230	

Table 1 Sightings from primary and tracker platform of main cetacean species.

Set – up

The platform positions for this trip were pre-determined by Mardik Leopold and the boxes used for primary platform and bird observers were provided by him/Alterra. The tracker platform was the area above the bridge – it was a wide platform, easy to move around and we were able to set up the big eyes, 7 x 50 binoculars and computer/aluminium box reasonably easily. Tarpaulin was wrapped around the railings, which afforded us some protection from the wind (see Figures 2 & 3a). We were able to run a cable down to the meeting room so it was possible to validate records during the daytime.

The primary platform was some distance away on a mast. It was a small box, just comfortable enough for 2 people but observers had to come in and out of the box to change sides, which was ok but a little worrying in swell. There really was no option to sit – a lot of the bow would have been obscured and we took the decision to stand from the start. There was no wind protection around the primary box, which I was very conscious of, but we couldn't think of anything in that regard that would have allowed us to fix the angle boards as well as some sort of protection (Figure 3b). Both primary and tracker observers stood for the whole survey!

The bird observers were on the bow of the ship. They sat while surveying and had some protection from the wind as the panels were slanted. This platform had to be raised on blocks of wood as there was no way that they would see clear of the bow without this elevation (Figure 2). This box was hidden by large planks of wood, so that the primary platform (PP) could not see the bird observers and this worked out well most of the time. On occasion,

these observers were visible so were not 100% isolated from the PP. However, given the height and the wooden structure used to isolate them, it would have been difficult without some additional structure, to increase the height of the screen, especially with the wind and ship speed.

Overall, while there was distance between the platforms, I think there were times when the platforms were not completely independent. When the wind was behind, even though the trackers spoke very quietly (most of the time) into the microphones etc, the button clicks were sometimes audible to the primary platforms (unbelievable as that sounds). I don't think that this had a significant influence on the primary platform observers though.

Observer selection and distance experiments

While in transect through the channel, we did training and a training exercise, as we didn't get a chance to do anything in port. Everyone tried out all positions, and in the end, apart from allocating Anneli Englund (the acoustics person) to the primary platform and me to the tracker platform, everyone else was allocated based on skills and in particular how familiar and comfortable they felt with the big eyes and their distance estimation (see appendix 1 Table 2). One other training exercise took place before the 1st experiment on 14th July 05 (Table 3). For the training component, observers were either on the main deck or in the primary platform and so obviously not everyone had access to the angle boards all of the time. Most people thought that the training exercises were very useful.

Two sets of experiments were held, one on 14th July (Table 4) and the final one on 27th July (Table 5 after an unsuccessful attempt on 26th –while the sea state was good there was fog on the horizon, so the software could not be used). For the 1st experiment, all observers were tested and rotated through the primary platform box in pairs. The trackers measured distance from their platform using the 7 x 50 binoculars and distance software programme and angles were determined using the 7 x 50 angle board. Given that we were rotating everyone, 10 readings/person were done at this stage, with the expectation that another 10 would be done at the end of the period.

For the second experiment, we had a small weather window of opportunity and I was only able to test the main primary observers (except one- see later) at this point so for some of us, there are only 10 readings. However, those of us had very few sightings as primary observers. It might be possible in one case to incorporate the training estimates to produce a correction factor.

One primary platform observer did have some sea sickness but managed to cope with work, mainly because on days when we were in primary platform mode, I rotated everyone through the primary platform – so everyone, at some point, was a primary platform observer (working in pairs). In addition to that, towards the end, one of the primary observers got quite ill, and wasn't able to work at all, so again, I had to use some trackers as primary observers. Obviously, here the "pairs" broke down a little. In addition to this, I did distance estimation experiments with all observers, although for "traditional" trackers, not as many replicates were obtained (see later).

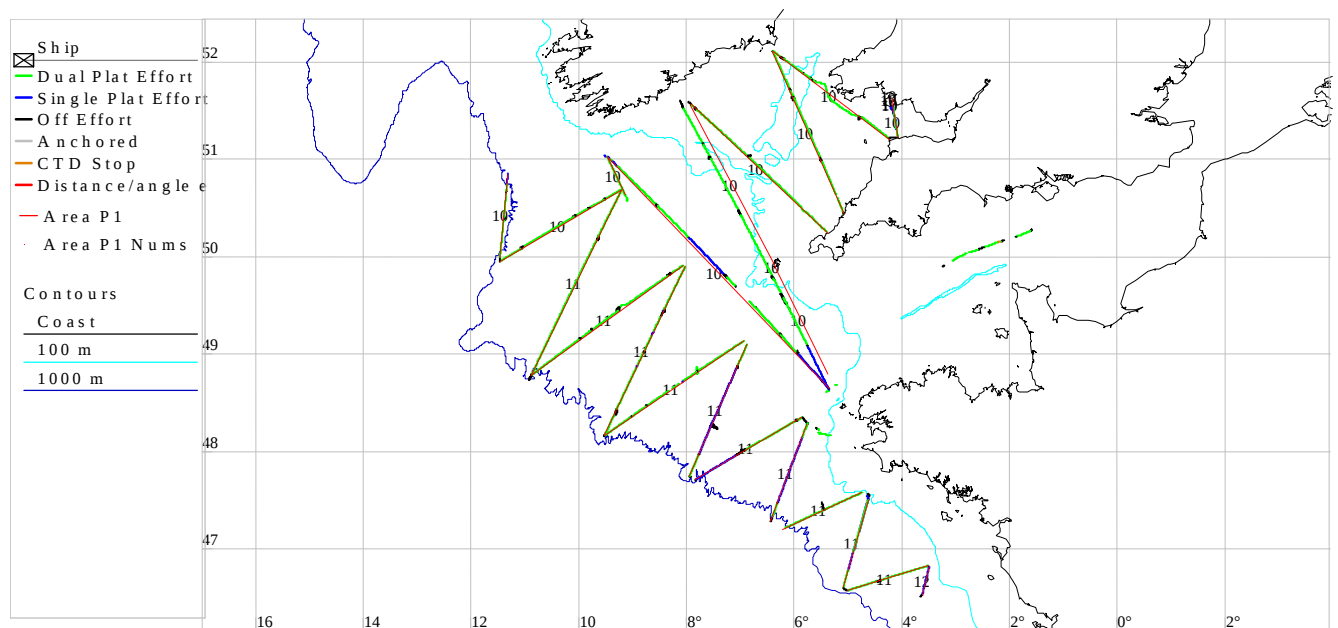


Figure 1 Zirfaea tracklines. Green lines indicate dual platform effort, and blue single platform effort. The discrepancy between logger line 106/107 and actual transect is not real.

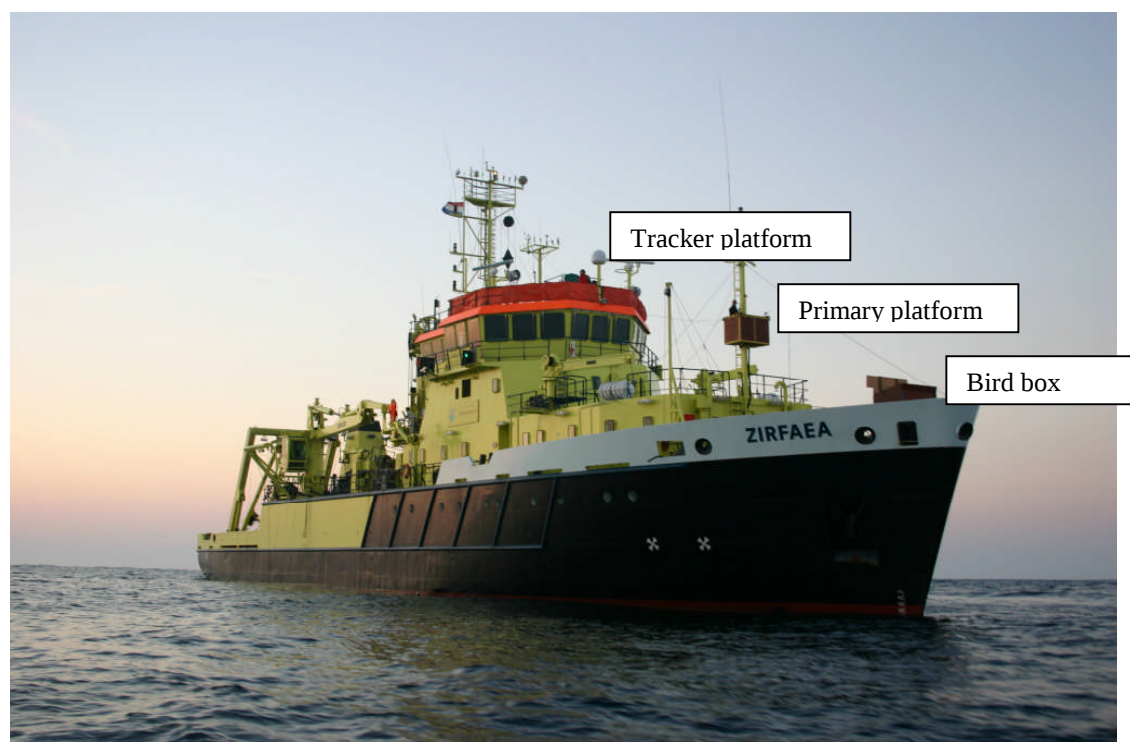


Figure 2 RV Zirfaea & relative position of platforms



Figure 3a Arrangement of the tracker platform

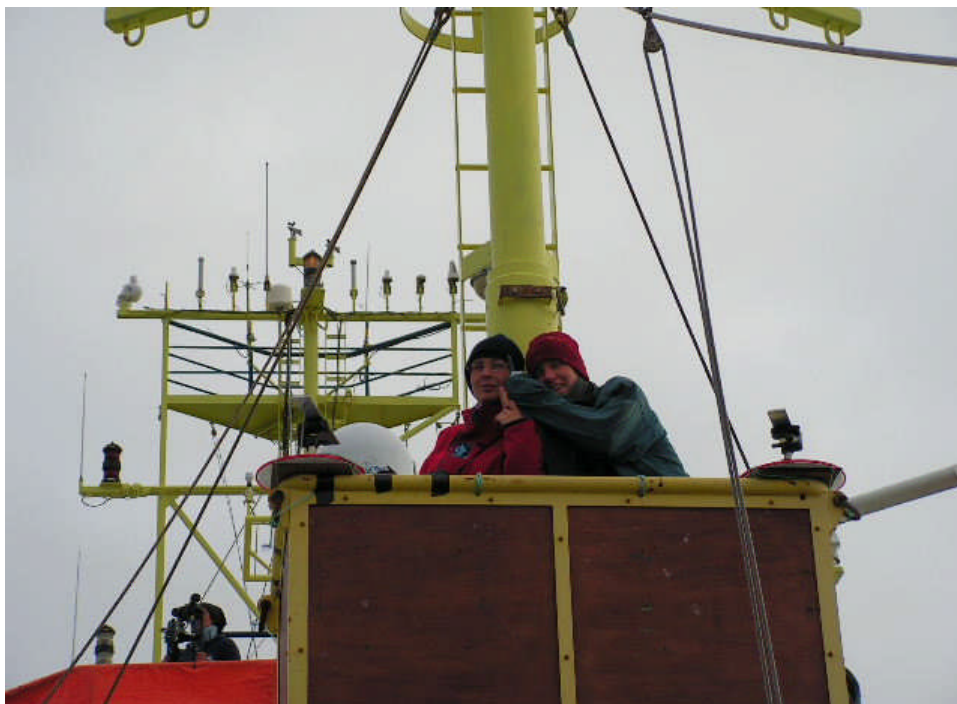


Figure 3b Primary platform

Overall, the “wooden” porpoise was very successful and certainly made the experiments and training more realistic. The training buoys were not used very much (in addition to the difficulties of deploying and retrieving them and losing so many on our ship) I don’t think that many people used them for training, despite reminders. The bird observers also believed that they attracted birds, as it looked like we were fishing. The distance sticks were very useful and people were very confident with them in the end. Occasionally during experiments – the observers may have used the wrong side of the stick (read from the tracker platform instead of primary platform side), which I suppose might also occur during real sightings.

Rounding – despite all the warnings – I think it is inevitable that people round when estimating distance. Not least because the units on the measuring stick were “rounded” – and if you become dependent on that, the observers felt that it was inevitable to round to whatever was on the measuring stick. Most people rounded to the nearest 10m, especially in the detections <500m.

The software for measuring distance was also useful BUT it did (or we did) get it wrong occasionally – which in the middle of the experiment when it takes the ship approx. 10 minutes to maneuver into position was a little frustrating, as was trying to get the timing of recording the position and distance with the observers and the people taking the measurement. It was suggested that maybe a GPS deployed onto the porpoise might be more accurate (position and timing would be correct as observers record the time of sighting).

OTHER ISSUES

A day by day account is given in the log in Appendix 2. To follow is a summary of some of the problems and some positive things! We had an end of cruise de-briefing, which was useful and so the comments are a combination on mine and the observers.

Weather – NATO and detection probability.

There is no doubt that the weather was far from ideal for some of the trip, particularly the 1st part of the trip and that combined with the French-NATO restrictions put us under a lot of pressure to survey under far from optimal conditions, with no real alternatives. So for the 1st week of actual surveying – 1 – 7th July – I am not very confident in these data. And this was pretty much all of the transects in French waters... In addition to that, when the weather was fine (i.e. not raining) we had a lot of swell, which took time to dissipate – so even though in some instances sea state was 4 – we still were having swell and am sure that we missed sightings with this.

I don’t know what options there are here – it might be best to do two estimates – one with that area included and the other with the area excluded.

Swell in general is an issue with the Atlantic and I don’t know whether you can generate a rule about it. Certainly our probability of detecting porpoises, minke and common dolphins (unless they are breaching) must decrease very quickly over 1m. This might be something to look at in the analysis. Linked with swell was the ability to use the **big eyes** (which had their own problems – see later). Obviously there is a point where you can’t hold the big eyes long enough to search, let alone track, without looking at the sky. Probably some “rule” about this would be useful for the future.

Primary platform observers were wind blasted during times when we were sailing into the wind – and in addition to this, when it was cold, they were certainly cold. As mentioned

previously, there was no obvious way of “fixing” this problem – especially since we had no real time in port to do anything structural – but for the future – especially as the observers were standing –additional protection/heating would be useful. I did consider whether the bridge could have been used as an alternative, but decided against it.

Primary platform

From the start the **button box** counter did not work. It never counted up the button presses, and even though we tried to fix it we never solved that. So we got around that by just telling the primary platform what the sighting number was, each time they made a sighting.

Connector and connector pins. This is clearly quite sensitive – and over time the connection and pins weakened and wobbled to the extent that it was triggering “phantom” sightings and re-sightings and/or not connecting at all. In the end, we decided not to unplug it at all, and to leave it connected with elaborate protection and our fingers crossed in case it got wet.

Binoculars – it probably would have been better if there was a single dedicated pair of binoculars for the primaries. Although people had their own and used them, there was some difference in these and maybe a single dedicated pair would have been better.

Communication between the PPs and the DR/DI when windy was very difficult. It lead to the observers crouching down to speak or turning round – not ideal. It might be useful in the future for the primary observers to have individual headphones with speakers attached. That has the added value of acoustic isolation with the other platform.

The primary observers felt that it would have been useful to have had a 3rd person to scribe for them, as in the first SCANS survey. They felt that the person writing (other observer) didn’t get a chance to help the main observer with species id, numbers of individuals and felt disadvantaged by this.

DI position

The tracking map on the back of the file was not particularly useful. However, the file (and printed laminated sheet) that converted reticule distance from both big eyes and 7 x 50’s was really, really useful.

The angle board on the big eyes was very high (and in our case had to be mounted backwards which made it very difficult to read). And often, given how difficult the big eyes were to hold, it was very awkward to manoeuvre to read off the angle without disturbing the tracker.

DR position

Communication with primary platform often was a problem. Apart from the electrical noise which was constantly there through the speakers (despite playing with the sound system), when there was wind, it was difficult to hear observers over the speakers and to speak through the walkie talkies. Perhaps marine radios would have been better?

The computer and keyboard were not water proof or salt proof and we often scrambled to protect the equipment (especially the cameras) and the laptop and the cables. In fact, we had a short in the circuit in the first few days which did lead to people being “shocked” by contacting metal objects – the worst probably coming through the big eyes. We managed to solve the problem by changing one of the plugs. Some more robust weatherproof equipment

(if it exists) and additional rain tarpaulins would have been useful, which could have also provided shade as well.

The firestores often failed – sometimes because of overheating, but other times for no apparent reason. This was very frustrating, especially if it went undetected for a while, e.g. during a lot of sighting activity.

Logger crashed occasionally and the laptop crashed a few times, once during a high density area in very hot weather which was extremely frustrating. We solved this problem by standing it on “legs” and allowing air to circulate around it. Also – on the logger form – it would have been better to have moved the angle “box” further up the page – as scrolling down between boxes was difficult (in retrospect, I probably could have done that!). Again for some reason, the buttons didn’t work, during a period of high activity, but we were able to use default option and we got through it – although it was messy – as again, we were busy with sightings. AND the mouse was pathetic!

Towards the end, the computer crashed again and we resorted to paper forms for a few hours, which is why on Figure 1 there appears to be a gap in effort. We had to re-install windows and GPS software before we got it back to “normal” again.

Webcam images were very pale and washed out initially and it took us a while to work out how to fix that. They also appeared to be interconnected – so, for example, if you “fixed” one, the other would become pale. Not sure why that would be?

Trackers

Leviathan binoculars were difficult. The big eyes were heavy, difficult to manoeuvre especially initially but became a little more flexible after some oil was applied to the hinge. We were not able to fix handles – which I think added to our problem. They were not easy to manipulate. We also had vibration which we tried to overcome using a combination of techniques – but there was vibration for part of the time, which made everything very uncomfortable. Eye cups would have been very useful!

When we did finally get good weather and we were able to detect porpoises very far away, trackers did understand the reason for the magnification, but most considered it too far. During validation, it was often very difficult, if not impossible, to find the image on the video, probably because the video didn’t pick the animals up at that distance.

7 x 50’s. Obviously much easier compared with the big eyes. The monopod combined with all the attachments and cables were difficult to avoid at times and we should look at improving this set-up somehow. Also the frame and camera were not that easy to move and changing the zoom on the camera still meant that the camera and binoculars were mis-aligned – so that often the horizon was missing for distance estimation software. The angle board was glued to a heavy duty cardboard when it arrived and we tried to water-proof it a little bit more with masking tape, but it did detach from the board one evening and had to be glued back again. We had marked the previous point of alignment, so hopefully that won’t make any difference to angle readings. The pointer for this angle board was rather robust and made reading off the angle a little difficult. Perhaps for next time, we could make it stronger and thinner!

On the plus side, the webcams and the distance software were good additions (when they worked!) and all were happy about them.

Acoustics

The ship was four “thrusters”, which made towing the hydrophone behind the ship impossible as the noise was too great. In the end, the hydrophone was deployed at the side of the ship on one of the cranes which seemed to work. There were occasional crashes of the system, sometimes due to electric noise or some other mechanical noise. But overall, while not the quietest of ships, Anneli managed well and the hydrophone picked up most species.

RV Zirfaea

The ship was great. While we did not all have our own cabins (four people shared), the ship was comfortable, spacious, and we had a large meeting/working area which was perfect. We had a portacabin at the back which we used as the acoustics lab. All four captains were fantastic, flexible, friendly, professional. The crew were very hospitable, helpful, friendly and enthusiastic. The two people from Rijkswaterstaat (Marco and Michel) were really good – very helpful, supportive, fully engaged in the project and with the logistics and I couldn’t have asked for better colleagues.

The only “issue” which wasn’t really an issue, was that there was no flexibility around meal times. It wasn’t possible to rotate that many people over meal times, so we took breaks for lunch (which was the main meal of the day) and tea (which was smaller). So – we worked slightly later hours as a result.

Acknowledgements

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Go raibh míle máith agaibh go léir.

Appendix 1 Results from distance training and experiments (see excel sheets for additional comments)

Table 2 Results from training exercise (28th June 2005). Distances estimated using ships radar. Blue distances estimated from primary platform, remainder from main deck.

Real Distance	P. Le Nilot	O. Boisseau	C. Faustino	Maid er	Lea	Annali	Lucia
370	300	240	250	60	80	275	88
592	580	560	580	550	470	425	920
463	420		300	425	300	320	435
277	340	290	250	200	300	224	355
180	120	95	80	125		185	153
518	880	1150	924	730	500	637	640
148	80	110	130	175	180	172	93
90	280	220	350	80		245	295
40	25			50	50	20	39
463	990	480	480	500	575	493	600
888	880	930	1020	875	580	753	905
667	620	720	410	650	700	600	700
350	410	440	490	425	350	323	495
185	165	150	180	275	220	188	175
148	80	85	65	75	90	62	73

Table 3 Results from 2nd training exercise (14th July 2005). Distances estimated using ships radar. Blue distances estimated from primary platform, remainder from main deck

Real		CF		Maid er		PL eN		Lea		AE		Lucia	
Angle	Dist.	Angle	Dist.	Angle	Dist.	Angle	Dist.	Angle	Dist.	Angle	Dist.	Angle	Dist.
19	440		650	21	400		430	18	600		625	29	425
42	245		350	50	210		210	40	250		295	41	263
68	486		550	43	430		630		450		675		492
355	440		510	345	425		380	350	490		460	342	451
350	309		420	332	275		230	342	350		395	329	294
350	667		750	358	750		750	354	750		825	353	789
49	404		500	51	380		570	43	425		520	39	453
40	224		310	39	205		220	38	225		325	37	216
31	207		270	24	220		180	33	220		289	23	203
120	284		360	112	335	120	330	130	380		356	113	291
340	626	320	560		625	340		310	350	321	895		634
343	292	330	290		385	328	280	325	350	326	290		342
347	221	335	180		158	334	168	345	160	333	148		141
353	113	340	130		115	342	147	338	160	345	126		112
30	71	20	75		85	24	32	27	80	25	86		81
38	383	20	380		475	26	390	40	450	21	525		409
52	226	50	215		215	51	180	58	250	98	251		207
127	116	130	145		160	124	110	130	150	130	138		152

Table 4 Experiment 14th July 2005. See excel sheet for comments

Time	Real		OB		ER	
	Angle	Distance	Angle	Distance	Angle	Distance
16 22	17	658	18	720	19	780
16 25	341	558	341	580	340	800
16 27	38	398	48	360	42	370
16 48	295	100	281	102	276	95
16 50	31	108	39	128	40	130
16 53	325	74	317	63	315	61
16 59	65	407	71	467	69	480
17 00	69	334	78	326	71	390
			PLeN		Maider	
15 34	50	508	52	460	67	430
15 37	340	314	344	220	349	385
15 39	40	149	45	87	48	162
15 40	101	87	132	90	131	125
15 48	340	292	343	315	347	375
15 51	38	410	43	110	42	140
15 53	86	85	79	57	85	110
16 00	317	471	318	550	321	595
16 03	25	272	26	280	31	263
16 07	63	70	56	60	60	79
			Lucia		Lea	
19 00	50	242	31	227	47	250
19 06	74	441	68	148	69	150
19 07	100	320	93	112	88	100
19 12	39	92	30	80	34	80
19 17	357	377	348	374	347	400
19 20	352	264	339	225	343	310
19 22	336	79	318	61	318	75
19 23	359	81	341	68	351	60
19 30	42	402	29	381	29	430
19 31	40	322	38	293	37	380
			AE		CF	
19 41	18	440	7	434	10	620
19 43	32	310	25	335	12	510
19 46	41	108	35	123	30	440
19 55	23	471	13	502	48	110
19 56	356	265	337	307	344	295
20 00	330	54	311	127	318	124
20 06	40	377	57	309	319	56
20 10	37	69	22	92	33	79
20 11	20	107	6	143	11	143
20 12	246	103	323	107	338	87

Table 5 Experiment 27th July 2005

Time	Real		Claudia		Anneli	
	Angle	Distance	Angle	Distance	Angle	Distance
15 46 40	323	319	314	380	311	535
15 48 00	323	212	308	240	316	246
15 53 10	24	331	6	460	11	325
15 55 20	35	97	42	90	46	88
16 15 26	353	317	359	448	347	315
16 28 00	28	365	20	380	21	382
16 30 00	45	123	39	112	51	128
16 31 22	88	79	89	94	89	93
16 40 03	351	229	342	222	346	285
17 09 16	315	522	314	670	313	621
			Lucia		Maiden	
17 39 40	68	388	64	423	65	485
17 42 50	355	293	347	237	341	272
17 44 30	341	119	330	113	328	118
17 54 30	18	691	14	627	10	675
17 57 00	24	398	20	419	18	480
17 58 40	30	246	26	229	25	241
18 00 00	19	127	16	110	14	133
18 04 18	326	451	323	409	320	555
18 06 40	49	367	50	364	46	417
18 10 50	21	153	20	147	17	151
18 12 25	25	89	28	74	25	82

Appendix 2 *Zirfaea*

28th/29th June

Everyone turned up by 1700hrs. Stayed in port that night – trying to organise permission from France and setting up platforms and testing equipment. Angle boards aligned. Started off at about 1000hrs on 29th. Did briefing on SCANS. Fixed big eyes with steel to railing – seems like good solution. Unable to fix handles.

Sailed through channel – most people ok. One a little sea sick. Did distance training – not angle training. Did about 15 trials. Used boats sonar to fix distance. Completed buoys. Did some practice on boats, porpoises etc.

30th June 2005

Lots of practice on boats, porpoises etc. Rotated everyone through positions etc. Towed buoys for a while. Hydrophone tested. Some “validation” attempted – some training. Still in passage. Briefing on horizon, reticule reading, DR protocol, DI protocol, form filling after looking at previous days efforts.

1st July

Some more training – some problems detected during validation and training. Buoys on rope not staying attached.

Webcam not allowing light in, button counter on primary not working, Starboard video not recording onto firestores. Got extension from France with restrictions – east of 5° on 5th and east of 6° on 6th, free on 7th and then north of 48° after that.

Appears to be problem with validation of tracker platform sightings. Seems like software issue.

2nd July 2005 Transect 115

Single platform. Some of it. Webcam fixed by changing light settings on computer – then other one faded – strange. Filters didn't work. Counter still not counting up. Tried everything in manual. Big eyes very stiff – got engineer to look at it. No handles though... Lost more buoys – only 2 left 100m & 200m. Computer time changed to GMT - so was not in synch with GMT earlier.

3rd July Transect 16

Double and single platform for 116. Started transect 117. Problems with electricity - some shocking experiences. Seems like something was shorting and electrifying big eyes. Obviously quite serious. Engineers fixed it. Computer crashed with power cut. Validation problems – still thinks it is Skaggerak database. Tried everything – then got an email from Russell – answer to problem. Fixed – everything seems ok now. Email from Doug about box on primary platform – tried dismantling box – still not fixed. Will do without.

4th July

Single and double platform – bad weather – Transect 118. Bad start – lots of off effort sightings while deploying hydrophones and buoys – frustrating especially since some nice pilot whales. Computer crashed again. Again – problems with firestores – possibly fixed into the wrong socket – hopefully fixed now. Finished 18 - but mostly on single effort. French airplane fly over. Few more km to go – will start early tomorrow. Angle board came away from tracker 7 * 50 – had to fix and re-align – may not be the same angle as original one.

5th July

French restriction – east of 5° today. Started with 118 – just a few miles beyond 5 degrees. Transit to 119 and finished on double platform. Still weather horrible. Swell sea state very marginal – no time to finish 120 – heavy fog/rain. Computer crashed for 3 minutes- so effort lost – probably.

6th July – French restriction east of 6° - did 120 all on single platform in far from good conditions. Terrible weather – saw nothing. Going to go to 118 – to fill in gaps and do some double platform – weather permitting.

Repeated some of 118 – about 3 hours on double. No sightings – weather marginal for porpoises and moderate for common dolphins. Swell still between 2.5 – 3m. Wind seems to die down in late afternoon but evening light also difficult.

7th July

Free day from France. Transiting over night to start 114 on outer edge. Long transit. Started 114 on double platform but again – weather poor – sailing directly in to the wind – very tough conditions – always 4 – 5. Mostly done on single platform. Very frustrating. While off effort some “sightings” forms opened on logger – from primary platform - mostly – a few from tracker. Saw 2 CDs the whole track.

8th July

Better day – sea state 2 - calmer. Finished 114 on double platform. Started 113. Computer doing odd things – while in transit – primary platform “logged” 37 sightings and 22 re-sightings !

9th July

Woke up early and saw killer whales before on effort – great sightings – lots of good spirit. 112. Problems with button presses – all platforms – reverted to using button press option on laptop – solved trackers at lunchtime – still primary problems.

10th July

Finished 112 in very cold weather. Summer finally. Started new line 111 in sun and warmth. A few glitches in system. Primary platform buttons not working – pin problems with connector cables. Fixed primary platform buttons. Two trackers pressed at same time – only one form appeared. Also firestore problems – too many “bus stops” – a bit messy for validation – and frustrating. Computer crashed during sighting. Long day! Amazing what good weather does. Did some glare avoidance.

11th July

Finished 111. Good weather – mostly. Lots of BND sightings. Other species. Had to alter course for 20 minutes – expansive fishing gear avoidance.

12th July

Nice morning – good tracks and sightings. Started 110 – sea state 0.5. Problems with network – difficult to establish – for some reason. Very high density areas for HPs. Saw BNDs and minke. Finished 110 and started 109 – did about 2 hours. Lots of validation to do. Network cable connecting on and off.

13th July

Another lovely day. Sea state 0 initially. Some porpoises. Still problems with cable. Firestore (port) crashed again. Have tried cooling firestores with fan and also raising laptop and shading it – which may help.

14th

Finished 108 and started 107 (which is really 106 – except that logger thinks it is 107 – so that is what is entered on form. Did distance training and experiment.

15th

Carried on with 107 – some problems with engine – speed slowed to 7 knots. Off effort for a while – lost about 2.5km trackline. Overnight to Cork.

16th

Arrived in port in early morning - crew change at midday. Large amount of rope removed from props in Cork. Did some shopping – then left port at 1430. Did some of spare 5 (called 305). Good sightings conditions – saw lots of minke whales and some dolphins. Good day.

17th

Another good day – weather sea state 1 and calm. Lots of porpoises – got beyond Scilly islands. Stayed on spot overnight.

18th

Dreadful day - sea state high – tried to do some of 106 – very unsuccessful. Steamed to some of 102.

19th

Weather better but not great. Started 102 – lots of obstacle avoidance on the track – mostly trackline badly drawn – so couldn't do the entire length – and on top of that - there were military activities – so more ziz zags. Wind behind but mostly SS 4. Tried to do 101 from England – sea state too high – resorted to single platform and tried other way (Wales to England) - still poor – but wind behind – so not too bad. Saw some common dolphins. Problems with firestore – restarted logger.

20th

Much better day – thankfully. – firestore problems again. Nothing saved onto starboard firestore this time. Hazard avoidance. Sailed back overnight.

21st

Finally finished 102 – Very hot in afternoon - ended 103 in Cornwall with basking sharks. Finished at 6ish and sailed back to Cork overnight to pick up 104.

22nd

Reasonable day – ended up in Cornwall on 105 spare.

23rd

Again – weather poor. Tried various combinations of starts and stops in different areas. Finished on double effort with laptop dying. Had one of many emergency shutdowns after trying to re-connect webcam. Wouldn't boot windows. Had to resort to paper forms. Finally managed to re-start by reloading windows and in the morning reloading GPS /USB port.

24th

Weather still crap. Sea state 6! Off Ouesant. Still need to do rest of 106 and 105.

25th

Weather poor. Managed to complete last 3 hours of 106 in fog and calm water – very frustrating – death by 1000 cuts. Steamed overnight to get to gap in 206 further back.

26th

Managed to finish last hour after waiting for a while.... Bird people surveying in passage. Tried to do distance expt – but horizon too fuzzy for software.

27th

Did distance experiment in late afternoon – weather reasonably ok, fog lifted for a while.