Evaluation of the Results of the Quality Assurance Meeting 2007 in the framework of JMBB/TMAP

– with comparison to the results of 1993 - 2005

– Technical Report –

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by order of the National Park Agency, Schleswig-Holstein, Tönning

February 2008

Contents

1. Introduction

In the framework of the Trilateral Monitoring and Assessment Programme (TMAP) the Joint Monitoring Group of Breeding Birds (JMBB) is responsible for the coordination, implementation, assessment and documentation of the monitoring programme of breeding birds. Since 1990, breeding birds in the entire Danish-German-Dutch Wadden Sea have been monitored in about 80 census areas in the framework of the Trilateral Wadden Sea Cooperation.

Since 1992, a trilateral group of experts has met every year at so-called Quality Assurance Meetings (QAM) in the framework of the JMBB to further evaluate the quality of the methods, to identify factors influencing the counts and to eliminate the latter as far as possible. Each year, one of the three countries invited the colleagues of the JMBB for a meeting.
The goals of those meetings, with regard to comparative counts, have been:

- to test and prove whether everybody can apply the counting methods and yield comparable results,
- to conduct comparable counts and yield results which can be compared to the standard monitoring methods,
- to conduct counts with different methods and compare the results.

Results from 1993 to 2005 have been published and recommendations for further QAMs have been given, in general for all counts as well as for particular situations (for details see BLEW 2003a/b, BLEW 2004, KOFFIJBERG 2006).

General recommendations for QAMs were:

- prepare and keep an exact protocol of each count;
- provide “control numbers” as close as possible to the count;
- make sure participants are experienced.

Particular recommendations were:

- conduct more counts on medium to large colonies to evaluate stochastic and systematic errors;
- conduct more counts on non-colony species to evaluate stochastic errors and include more counts of species other than Oystercatcher;
- compare methods especially with regard to counting effort (walking into the plot).

During the last QAM 2005 in the Netherlands, the focus had been on counting gull and tern colonies, with some cases of mixed species colonies. Recommendations were to conduct colony counts with more than one, preferably up to five observers and to take as many estimates of species ratio as possible to arrive at reliable results.
In light of past experiences and setups, the Quality Assurance Meeting 2007 was prepared and conducted in Schleswig-Holstein. In this report, results of this QAM are presented and comparisons to results of former QAM are given.

2. Method and materials

Participants of the meeting were:
Lorna Deppe (SH); Lieuwe Dijksen (NL); Dietrich Frank (Nds); Thomas Grünkorn (SH); Melanie Hahn (SH); Bernd Hälterlein (SH); Norbert Kempf (SH); Kees Koffijberg (NL); Thorsten Krüger (Nds); Angelika Kühn (SH); Karsten Laursen (DK); Karsten Lutz (SH); Petra Potel (Nds); Frank Rabenstein (Nds), Lars Maltha Rasmussen (DK); Ole Thorup (DK), Hermann Wietjes (Nds), Stefan Wolff (SH) and Jan Blew (SH).
Klaus Günther (SH) participated on May 23rd, 2008 to ring the Spoonbills.

In 2007 in Schleswig-Holstein, Germany, the counts were conducted on the Hallig Oland (IH2)

- the Hallig Oland inside and outside the summer dike, May 22nd, 2008; 16 counters (divided in two groups on same route, but different direction), all species (plots A to O, see Figure 1) (

Additional counts took place in the North of Hallig Oland, counting a Black-headed Gull colony (plots R and S) on May 22nd as well as counting mixed colonies of Black-headed, Common and Herring Gulls (plot T) on May 23rd. Those counts have not been analysed with regard to counting errors.

In preparation of the count, each counter received a map with delimitations of the counting area, subdivided into several counting plots. Directly before the count the procedure was explained to all participants in detail. The entire counting area represents the Hallig Oland inside and outside the summer dike. It was recommended to walk on the dike and conduct the counts with deliberately chosen observation points. The group of 16 observers was divided into two groups of eight observers each, one walking clockwise, the other counter-clockwise around the Hallig.
The area inside the summer dike is approximately 96 ha, the entire area to be counted 160 ha.

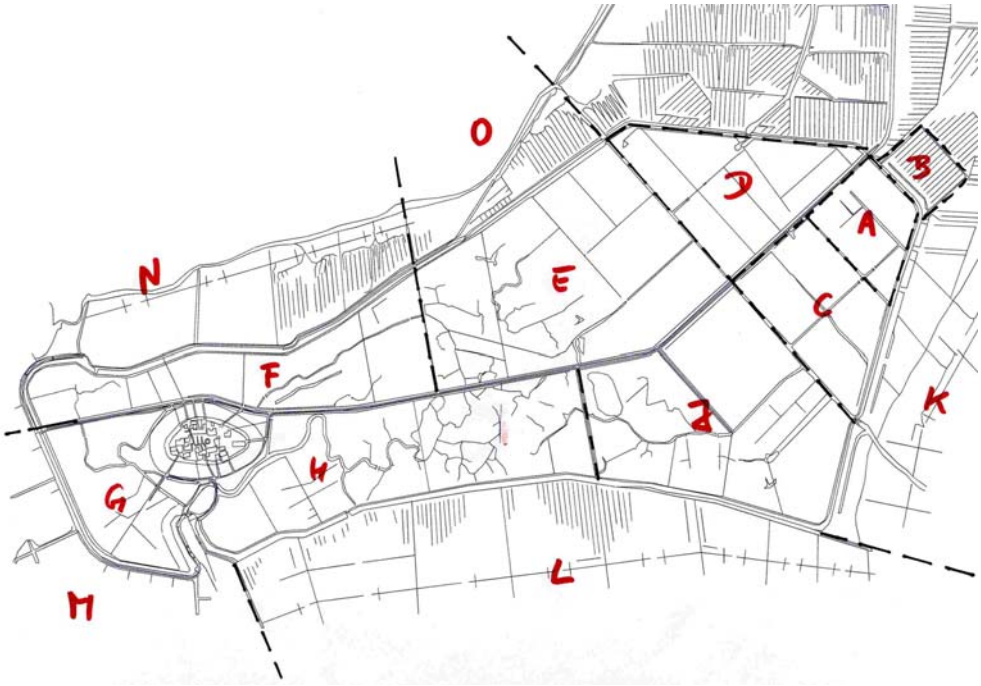

Figure 1: Counting areas A to O

3. Results

As during the QAM of the recent years and the current QAM in 2007, data has been sorted depending on the number of birds counted:

- counts of medium to large colonies – this applies for colonies with more than 50 breeding pairs;

- counts of non-colony species with an average number >= 5 in the plot – this applies for all non-colony species (Oystercatcher, Redshank etc.), but can also apply for colony species (e.g. Ringed Plover, Common Tern etc.) which breed in low numbers in the census areas;
- counts of non-colony species with average number < 5 in the plot – this applies for counts in which some species occur in very low numbers.

For the count of the Hallig Oland in 2007, all three categories occurred.

Results of the counting plots outside the summer dike of Oland are not considered, since a number of counters did not consider them during their census.

3.1. Counts of medium to large colonies

The count of medium to large colonies is always subject to several individual counting errors:
- some of the birds might not be visible from one point,
- the size of the colony might be too large to completely view it from one point,
- some of the birds might not be present during the count,
- non-breeders might also be present in the colony.

During five meetings (Baltrum 1996, Langli 1997, Langeneß 2000, Borkum 2001, Texel 2005), medium to large colonies have been counted, looking at different conditions. The area on the Hallig Oland in 2007 included three species in this category. The **Avocet** was registered in 7 of 9 areas inside the dike and only a few individuals in the five areas outside the dike. The **Black-headed Gull** was registered in 6 of 9 areas inside the dike and additionally in 1 of 5 areas outside. The **Arctic Tern** has been registered in 7 of 9 areas inside the dike. Thus, the distribution of these three species - though clumped - is rather spread out.
The RSD for the Avocet and the Black-headed Gull are 13.0% and 13.9%, respectively and thus within reasonable limits (Table 1). While the Avocet is a rather conspicuous species, this result for the Black-headed Gull, with more than 400 individuals frequently sitting rather deep in the vegetation, is considered very satisfying. For the Arctic Tern, the range of estimates is rather large (84 to 212) and the RSD 30.1%. The count of this species in this area posed the problem, that different proportions of the breeding birds could only be seen from different vantage points; in addition, some parts of the colony in area “E” were very located close to the middle of the Hallig and thus hard to see and count.

3.2. Counts of non-colony species with an average number of >= 5 per plot

3.2.1. Individual counting errors

From the Hallig Oland in 2007, in this category counts of **Oystercatcher** and **Redshank** are available. Counts with results from only 3 or less counters are omitted. In **Table 2**, the results of the year 2007 are given in addition to those results with comparable conditions and numbers from the former years.

Oystercatcher: considering the entire counting area, this result averaging 364 individuals is by far the highest among all comparable counts of recent QAMs; yet, the RSD (12.7%) is rather low, while the results range from 259 to 472. The individual counting error seems to be independent of the number of birds present.
Redshank: With the large range of numbers (15 to 66) and an RSD of 46.3% the Redshank proves to continue a case with notoriously bad results in comparable counts.

Table 1: Counts of medium to large colonies: individual counting error and colony size

Species	Counting Area	Number of individuals Avg	SD	RSD** [%]	Max	Min	n	Comments
Avocet	Oland inside dike 2007	101	13.7	13.0	129	82	15	large area
Black-headed Gull	Langeneß 2000	280	108.5	38.8	462	191	4	walking in census area
	Baltrum 1996	967	420.3	43.5	2000	600	9	counted are flying birds
	Langli 1997	3448	1306.7	37.9	6040	1970	12	afternoon, high tide
	Langli 1997	5341	981.4	18.4	6860	3600	11	noon, low tide
	Texel De Petten 2005	124	17.8	14.4	145	89	8	***
	Oland inside dike 2007	411	56.9	13.9	492	314	15	large area
Common Gull	Langli 1997	324	30.8	9.5	360	265	12	
Lesser Bb Gull	Langli 1997	38	8.8	22.9	50	19	12	
Lesser Bb / Herring Gull	Baltrum 1996	136	10.2	7.5	152	124	10	
	Baltrum 1996	223	20.0	9.0	253	190	9	morning
	Baltrum 1996	298	52.3	17.5	370	230	7	afternoon
	Texel de Muy I 2005	1612	230.0	14.3	3000	1300	10	***
	Texel de Muy II 2005	1701	296.9	17.5	3100	930	10	***
	Texel Westerduinen 2005	1467	159.0	10.8	1740	850	9	***
Herring Gull	Langli 1997	1208	204.3	16.9	1520	870	12	
Sandwich Tern	Langli 1997	834	409.9	49.2	1930	480	12	afternoon, high tide
	Langli 1997	1422	258.1	18.1	1890	1100	11	noon, low tide
Common Tern	Langeneß 1997	99	29.7	30.0	140	60	4	walking in census area
"Commic" Tern	Borkum /2001	50	7.5	15.1	65	42	7	
	Hed.koog 1994	79	12.9	16.4	100	64	7	
Arctic Tern	Langeneß 2000	49	11.0	22.4	56	30	4	walking in census area
	Langli 1997	89	15.5	17.4	120	70	8	
	Oland inside dike 2007	126	37.9	30.1	212	87	15	large area
Little Tern	Borkum 2001	46	5.1	10.9	56	40	9	

* Abbreviations:

Area	- location at which the QAM was conducted	Figure	- the Figure where results are presented
Avg	- arithmetic mean of the counting results	SD	- standard deviation of the counting results
RSD	- ratio of standard deviation over mean of results	Min	- lowest counting result
Max	- highest counting result	n	- number of counters

** Values of RSD > 20% are highlighted

*** KOFFIJBERG & DIJKSEN 2007

Table 2: Counts of non-colony species (Avg >= 5 per plot) for the calculation of the "individual counting error"; counts of 2007 (shaded) and comparable counts from earlier QAMs

Species	Counting Area	Year	Counted individuals			Estimated pairs		
			Avg	SD	RSD* [%]	Avg	SD	RSD** [%]
Mallard	SH NHK 2nd run	2004	14.8	9.8	65.8			
	SH NHK 1st run	2004	3.2	1.9	60.6			
Oystercatcher	SH NHK	1993	97.7	14.1	14.4	50.3	3.6	7.1
	Langli	1997	88.4	18.6	21.0			
	SH HeKo	1994	71.0	23.7	33.4	46.8	10.8	23.1
	SH NHK	1994	64.9	8.2	12.7	43.6	7.1	**16.3**
	Baltrum	1996	58.9	7.1	12.0	42.4	5.6	**13.3**
	Borkum	2001	*46.3*	*3.0*	*7.3*			
	SH WeHe grazed	2004	42.0	5.8	13.8	30.0	5.0	**16.6**
	SH WeHe	1994	42.0	7.6	18.2	27.2	6.3	**23.0**
	SH WeHe	1995	38.6	6.0	15.6	25.4	4.1	**16.1**
	SH NHKo 2nd run	2004	37.7	2.6	7.0	22.2	2.6	**11.6**
	SH WeHe	1995	37.4	7.6	20.4	28.9	5.6	19.4
	SH WeHe	1994	36.2	8.7	24.2	22.0	4.9	22.4
	Borkum	2001	30.3	5.1	16.9	20.0	2.6	12.9
	Borkum	2001	27.8	5.7	20.6	17.8	3.4	19.3
	SH NHK	1994	24.5	4.3	17.4	16.8	3.5	**20.8**
	SH NHK 1st run	2004	24.4	7.0	28.8	16.3	5.4	**33.0**
	SH WeHe ungrazed	2004	21.0	6.2	29.4	12.3	5.1	**41.4**
	Oland inside dike	2007	363.5	46.1	12.7			
Avocet	SH NHK	2004	10.0	2.2	21.8			
	SH HeKo	1994	5.3	2.5	48.4	4.4	1.8	39.7
Redshank	SH NHK 2nd run	2004	28.9	8.4	29.0			
	SH Langeneß	2000	25.0	11.7	46.7	19.7	11.3	**57.6**
	SH NHK 1st run	2004	15.3	7.6	49.7			
	SH WeHe	1994	11.2	1.6	14.1	6.8	1.1	**15.7**
	SH NHK	1994	6.5	3.7	56.4	4.0	2.2	55.0
	SH HeKo	1994	6.0	3.3	55.0	4.9	3.0	60.7
	SH WeHe	1995	6.0	2.2	36.7	4.7	1.5	31.4
	Oland inside dike	2007	30.0	13.9	46.3			
BH Gull	SH WeHe	1995	44.4	9.0	20.3	26.9	3.4	12.5
	SH WeHe grazed	2004	28.1	13.2	47.0	24.0	7.4	30.6
	Borkum	2001	10.1	1.7	17.1	7.3	1.3	17.1
	Borkum	2001	7.4	0.7	9.5	5.4	0.5	9.1
	SH HeKo	1994	6.0	3.7	62.3	4.5	3.4	**75.6**
Arctic Tern	SH WeHe	1994	11.3	4.9	43.4	6.6	3.3	**49.4**
	SH WeHe grazed	2004	9.1	6.2	67.5			
	SH WeHe	1995	6.6	2.8	42.7	4.0	1.4	35.3
	SH WeHe	1995	6.0	2.0	33.3	4.6	1.5	32.2

Abbreviations: see Page 6.
* Values of RSD ("counted individuals") > 20% are highlighted;
** Values of RSD ("estimated pairs") are in **bold**, if they are higher than RSD ("counted individuals").

3.3. Counts of non-colony species with an average number of <= 5 per plot

There are a number of species with only a few individuals / breeding pairs on the census area. Since the census area is rather large, also species with more 5 - 10 individuals are included (Table 3).

Table 3: Counts of non-colony species (Avg <= 10 per plot) for the calculation of the "individual counting error".

Species	Area	Year	Counted individuals			Estimated pairs		
			Avg	SD	RSD* [%]	Avg	SD	RSD** [%]
Shelduck	Oland inside dike	2007	6.5	3.6	54.9			
Ringed Plover			6.8	4.7	69.0			
Lapwing			10.3	4.1	39.6			

The species Ruff, Common Gull, Common Tern and Little Tern have been only counted by a few observers and cannot be assessed with regard to counting errors.

3.4. Comparison with control counts

Control numbers were provided by KARSTEN LUTZ who counted the areas several times during his studies between April 10th and June 10th. Results show, that control numbers are always higher than the averaged counting results for every species. Considering the range of results, the maximum count is sometimes higher, in most cases close to the control number. Exception is the Arctic Tern; this species reaches its peak breeding numbers in the last decade of May or first decades of June; thus, the very high control number very likely included birds which have not been present during the QAM.

Table 4: Average and maximum of counting results compared to control number.

Species		counting plots									sum inside dyke
		A	B	C	D	E	F	G	H	J	
Oystercatcher	average	15.9	4.1	25.3	29.3	61.5	41.8	37.6	89.5	66.1	363.5
	maximum	24	6	39	45	111	55	70	123	105	472
	control	22	2	33	31	115	43	34	54	55	389
Avocet	average	1.9	0.0	26.5	10.9	7.5	3.8	0.0	29.6	22.7	101.4
	maximum	4	0	37	15	15	7	0	40	45	129
	control	7	0	31	12	6	0	0	16	36	108
Lapwing	average	1.3	0.2	2.1	1.5	1.7	0.1	0.5	0.2	2.8	10.3
	maximum	3	1	3	5	6	1	2	1	5	16
	control	2	0	2	2	3	1	0	2	8	20
Redshank	average	2.7	0.9	2.4	3.7	7.1	3.0	0.9	5.1	4.6	30.0
	maximum	7	5	6	11	23	10	4	14	11	66
	control	3	2	4	6	7	6	2	6	7	43
Black-headed Gull	average	0.1	0.0	147.2	24.9	30.4	47.0	2.1	67.9	97.6	410.6
	maximum	1	0	195	47	95	74	4	98	151	492
	control	3	0	121	64	72	50	0	112	78	500
Arctic Tern	average	11.4	0.0	14.9	4.7	67.1	7.1	0.0	6.7	15.1	126.1
	maximum	32	0	22	12	136	13	0	22	42	212
	control	27	0	37	10	266	30	0	22	40	432

3.5. Timing of counts and potential disturbances

Among other factors, both the timing of the count as well as disturbances can influence counting results.
Timing of the count: The count had been carried out around low tide (12:40h on May 22nd) between 09:30h and 14:30h. However, influence of high tide (18:45h) is only to be expected starting around 16:45h. Influences, however, with regard to morning and afternoon effects are possible.
Disturbances: At Hallig Oland, the large group of counters (16) had been divided into two groups of each 8 persons. Both groups started between the counting plots G and H. Group 1 (south) walked counter-clockwise, starting with plot H, J, C, A and B before crossing paths with the second group and ending with plot G, while Group 2 walked clockwise, counted the plots G, F, E and D and ending with plot H. Observations during the counts suggested, that disturbing the birds during the first time will result in a rearrangement of individuals. This way, counting activities and disturbances by the first group would potentially influence the results of the second group.
To analyse counting results under this aspect, the summed results of the counting plots counted first one group are compared to the summed results yielded from the other group; in Table 5 for each group those plots encountered first are marked in yellow.
For Oystercatcher, results clearly show, that the results from the first contact are generally higher than those of the second contact. For Avocet and Black-headed Gull results are less clear, however, a tendency can be seen, that group 1 counted a) more individuals and b) those were accounted for by the plots counted first. For Arctic Tern, however, results suggest the opposite effect; here, the angle of view resulting from the walking direction might override other influences. For Ringed Plover, Lapwing and Redshank, numbers are too low to yield clear effects.
In summary, effects of timing of the count are less likely. Results from past QAMs have shown, that morning counts might lead to lower numbers than in the afternoon, however, a) our results would suggest the opposite, b) our counts have been conducted around noon making an influence of morning vs. afternoon less suitable. Thus, it seems to be likely that the disturbance of the group first encountering the birds leads to those different results.

Table 5: Average of counting results of the two groups of counters. Fields marked in yellow are those encountered first by the respective group of counters.

Gr	Species	A	B	C	D	E	F	G	H	J	**sum south**	**sum north**	**sum inside dyke**
1	Oystercatcher	16.0	4.4	23.6	28.4	55.4	37.1	23.9	101.3	71.8	**217.1**	**144.7**	**358.3**
2	Oystercatcher	15.7	3.7	27.1	30.3	68.4	47.1	51.4	76.0	58.5	**181.0**	**197.3**	**369.4**
1	Avocet	2.1	0.0	22.4	9.9	7.9	4.0	0.0	33.4	26.8	**84.6**	**21.8**	**106.4**
2	Avocet	1.7	0.0	31.3	12.0	7.0	3.6	0.0	25.3	17.3	**75.6**	**22.6**	**95.7**
1	Ringed Plover	0.0	0.3	0.0	0.0	0.4	0.4	0.3	0.8	2.5	**3.5**	**1.0**	**4.5**
2	Ringed Plover	0.5	0.5	0.0	0.3	1.4	3.0	0.4	2.6	2.0	**5.6**	**5.1**	**9.0**
1	Lapwing	1.5	0.3	1.8	1.6	1.1	0.1	0.0	0.3	3.0	**6.8**	**2.9**	**9.6**
2	Lapwing	1.1	0.2	2.4	1.4	2.4	0.1	1.0	0.1	2.5	**6.4**	**5.0**	**11.0**
1	Redshank	2.5	0.4	1.6	2.8	2.6	1.6	0.1	7.8	4.8	**17.1**	**7.1**	**24.1**
2	Redshank	2.9	1.5	3.3	4.9	12.3	4.6	1.7	2.0	4.5	**14.1**	**23.4**	**36.7**
1	Black-headed Gull	0.0	0.0	131.0	28.4	28.5	46.1	1.7	82.3	109.0	**322.3**	**104.7**	**426.8**
2	Black-headed Gull	0.3	0.0	165.7	21.0	32.6	48.0	2.4	51.4	82.5	**299.9**	**104.0**	**392.1**
1	Arctic Tern	13.0	0.0	12.8	5.5	86.1	9.0	0.0	4.6	11.6	**42.0**	**100.6**	**142.6**
2	Arctic Tern	9.6	0.0	17.4	3.7	45.3	5.0	0.0	9.1	19.8	**56.0**	**54.0**	**107.1**

4. Discussion and conclusion

General remarks
The large census area of the Hallig Oland posed some very particular problems to the participating observers.

1) Size of census area: The census area is rather large, contains different habitats with different bird communities and some areas are very difficult to see from the recommended walking route, like for example the sub-areas E and G close to the middle of the Hallig. This way, observers made different appraisals of visibility, chose different observation points and focussed on different species.
2) Division between the areas inside and outside the summer dike: it was unclear to some participants which birds had to be "assigned" to which area. Clearly, some individuals feeding or resting outside the summer dike have their breeding place inside the summer dike; if one wants to assess the number of breeding pairs - independent of their sighting place - individuals outside the summer dike would be "used" to calculate the number of breeding pairs inside the summer dike. In contrast, if one simply counts the number of individuals at their place of observance, results will be distributed differently. This was handled differently and has probably not been explained sufficiently to all observers. Thus, for both situations, different numbers are yielded for the areas inside and outside the dike and some observers simply did not count the areas outside the summer dike.
3) Recommended walking route: Counting conditions resembled to a degree a "true" situation of the census work conducted in the Wadden Sea. However, the fixed walking route without the option a) to look into more detail at certain areas, b) to chose additional walking routes, c) to potentially walk into the area and d) to deliberately invest more time lead to increased insecurity with regard to the results.
4) Two groups facing different situations: The two groups walked in different directions around the Hallig. Thus, they counted the sub-areas during different times and encountered most likely different situations. Birds either flushed or disturbed by one group might have been distributed differently in the area for the other group; naturally, the chosen vantage points are dependent on walking direction and this way observers were more likely to chose different vantage points than just walking all in the same direction; lastly, birds have been counted in the different areas during other times with regard to the tides.

Results of Quality Assurance Meetings 1993 - 2005 led – among others – to the conclusion to more precisely prepare the QAM counts in the field and thus to reach a higher degree of standardization with the goal that the counting results will show a lower variance across participants. It has been rather clear in this case, that the conditions of the count of a rather large and diverse area plus the request to count all species partly reduces overall comparability. Discussions within the group directly after the count suggested that it would have been easier to concentrate at certain species, to let each counter choose its own time management and to allow additional walking routes. However, both organisational limitations as well as the aim to minimize potential disturbance to the present breeding birds determined the recommendations for the counters.
In light of these complications, results with regard to RSD are surprisingly good. Species with high numbers such as the colony breeders Avocet and Black-headed Gull plus the Oystercatcher yielded large ranges of results but RSDs between 12.7% and13.9%. In contrast, the results of Arctic Tern as well as of Redshank showed a higher variation which can be explained by counting conditions (Arctic Tern) and the well-known difficulties reaching comparable results for the Redshank.

Recommendations for further QAMs include again to spend more time instructing the counters and making them familiar with the counting area. The potential to choose different walking routes as well as individual time management will be limited by the conditions a large group faces as opposed to the single counter.
Former recommendations of BLEW (2003) have not changed in light of these results. It is advantageous to keep collecting data especially on medium sized colonies - e.g. of Terns, Gulls or Avocet - and of non-colony species at different locations, especially for species other than Oystercatcher, since the existing comparable data is still scarce. Different locations should be chosen since different environments (e.g. high vegetation, dispersed colonies) present different problems to the counters.

5. Acknowledgements

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