COUNTING WINTERING WADERS ON ROCKY SHORES IN EAST LOTHIAN, SCOTLAND

by E.S. & S.R.D. da Prato

Only since the inception of the Birds of Estuaries Enquiry (BOEE) in 1969 have ornithologists been able to assess quantitatively the wader populations wintering in Britain and to compare different sites in a meaningful way. B.O.E.E. counts (Prater 1971 et seq.) are generally of birds massed together on high tide roosts when intertidal areas are unavailable for feeding. This method was devised to cope with estuarine conditions where, at low tide, feeding birds are spread over very considerable areas of mud-flats where inaccessibility or the lack of features or presence of creeks which hide birds make counting difficult. Counts of roosts are much less demanding in time and effort than counts made at other stages of the tide and since the bulk of the counting effort is made by amateurs working at weekends high tide counts have obvious advantages. However since feeding areas are almost certainly more critical to waders than roost sites the main value of B.O.E.E. counts to wader conservation is limited to describing the importance of estuaries as whole units. Experienced counters frequently comment that high tide counts should not be used to rank feeding sites within an estuary (eg. Campbell 1978 for the Firth of Forth) but there are obvious temptations for local authority planners and even Nature Conservancy Council staff and other scientists to do this. The danger of ranking sites on the basis of roost counts is clearly demonstrated by the thousands of waders known to roost on ash lagoons adjacent to coal fired power stations. In the Forth two of the largest wader roosts are on ash lagoons which are virtually devoid of feeding opportunities (Vick 1975, Bryant and McLusky 1976).

A different problem arises when counts of waders on rocky or sandy shores are attempted. Published B.O.E.E. summaries (Prater 1971 et seq.) have frequently commented that the figures for certain species, notably Turnstone Arenaria interpres, Purple Sandpiper Calidris maritima and Sanderling C.alba are far too low due to lack of observer cover outside the major estuaries. Counts made on the predominantly rocky shores of eastern Scotland (Summers et al 1975) showed that such coasts do indeed hold significant numbers of waders. Besides the expected Turnstones and Purple Sandpipers considerable numbers of Oystercatchers Haematopus ostralegus, Redshanks Tringa totanus, Knots Calidris canutus, Dunlin C.alpina, and Curlew Numenius arquata also occur on several stretches of coast. These authors considered that the presence of offshore rocks and islands coupled with the length of coast to be covered meant that high-tide counts were of little value and they counted when walking along the shore during the half-ebb - low-tide - half-flood period. However, this method also has its problems: it takes several hours to cover a few miles of coast and waders moving along the shore as the tide moves can fly past the observers so that they are either missed or counted twice. Further, if the rocky shore is adjacent to an estuary covered by B.O.E.E. counters, then birds may be included in the counts for both areas (da Prato 1979).

This paper presents wader counts made on rocky shores in East Lothian by both methods, discusses the relationships of the rocky shore population to those in adjacent estuaries and attempts to summarize the merits and drawbacks of high and low tide counting on rocky coasts.

The Study Area

The study area consists of 22 miles (35.5km) of the East Lothian coast on the south shore of the Firth of Forth with a total intertidal area of 9.32km^2 (Fig.1). It is an attractive coast with varied topography consisting mainly of extensive flat, wave-cut platforms interspersed with sandy bays. Cliffs are few and when they occur are set back from the beach, so the intertidal zone does not drop sharply into the sub-littoral zone. The study area stretches from Gullane Point eastwards to the county boundary where the topography also changes to steep sea cliffs. The estuaries of Aberlady Bay and Tyninghame, with extensive mud and sand flats, are situated immediately to the west and in the middle of the rocky shore, respectively. The Gullane - Tyninghame section is further complicated by the presence of offshore islets varying in size but including five large ones (100 to 400m long) of which the Bass Rock, type locality of the Gannet Sula bassana, is the best known.

Wader populations

Table 1 presents the results of high tide roost counts and low tide feeding counts made over the last three winters. In 1976-77 and 1977-78 counts were made on successive days within the Christmas - New Year period. Severe weather and access problems to certain shores upset this programme in 1978-79 and counts were made on weekends in the second half of January 1979. In addition in 1979 one section was counted on both high and low tide on the same day (Table 2). Most of the count days were cold, in some cases the upper shore was frozen, so few birds were likely to have been feeding on inland fields.

Clearly these rocky shores support many waders. The high numbers of many species not normally confined to rocky shores is linked both to the adaptability of feeding methods of several species, eg. Oystercatcher, Redshank, Knot, and to the presence of sandy channels among the rocks for, eg., Ringed Plover Charadrius hiaticula and Dunlin (da Prato in prep).

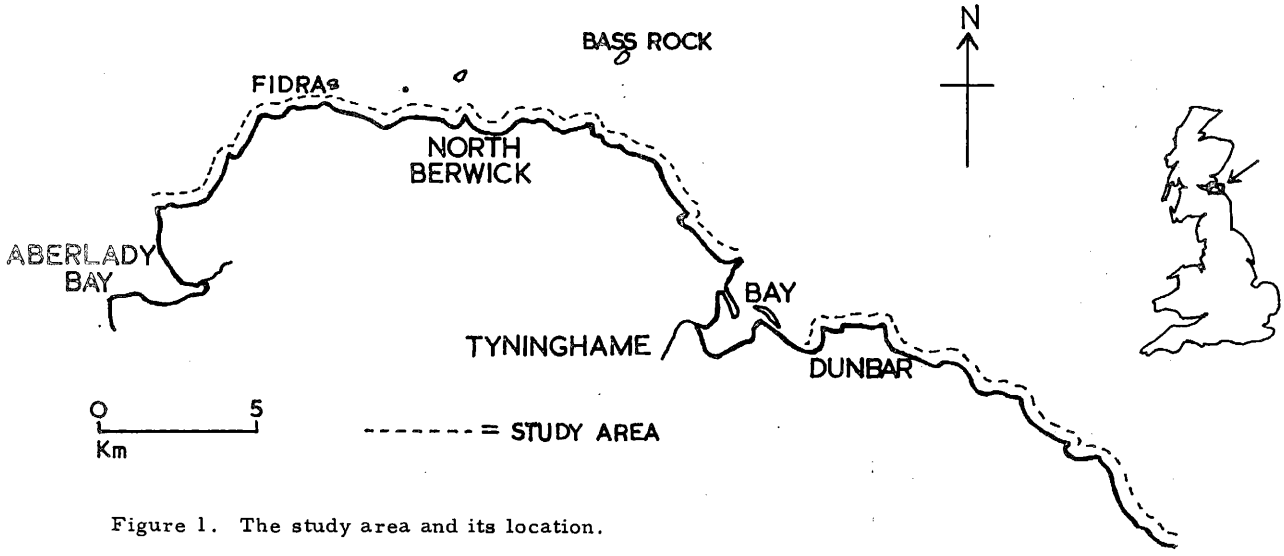

Figure 1. The study area and its location.

Table 1. Rocky Shore Wader Counts in East Lothian

	HIGH TIDE				LOW TIDE				% CHANGE
	76/77	77/78	Jan79	Mean	76/77	77/78	Jan 79	Mean	LT → HT
Oystercatcher *Haematopus ostralegus*	1169	1026	1451	1215	1576	1502	1629	1569	-22.6
Ringed Plover *Charadrius hiaticula*	148	121	164	144	257	263	160	227	-36.6
Grey Plover *Pluvialis squatarola*	17	0	14	10	25	7	19	17	-41.2
Golden Plover *Pluvialis apricaria*	506	200	400	369	1082	755	656	831	-55.6
Turnstone *Arenaria interpres*	1266	1451	1165	1294	1515	1633	1259	1469	-11.9
Curlew *Numenius arquata*	36	182	278	165	210	221	465	299	-44.8
Bar-tailed Godwit *Limosa lapponica*	32	0	2	11	42	17	15	25	-56.0
Redshank *Tringa totanus*	294	500	516	437	382	499	490	457	-4.4
Knot *Calidris canutus*	132	0	1047	393	422	813	2025	1087	-63.8
Purple Sandpiper *C.maritima*	446	435	568	483	642	659	746	682	-29.2
Dunlin *C.alpina*	1006	871	1232	1036	1101	882	1186	1056	-1.9

Omitted from table: Up to 300 Lapwings *Vanellus vanellus* and up to 10 Snipe *Gallinago gallinago* in cold weather; and up to 3 Sanderlings *Calidris alba*.

Table 2. High and Low Tide Counts on the same weekend, January 1979.

		HIGH TIDE	LOW TIDE	%CHANGE
Oystercatcher	*Haematopus ostralegus*	1128	1198	-5.8
Ringed Plover	*Charadrius hiaticula*	108	100	+8.0
Grey Plover	*Pluvialis squatarola*	5	10	-
Golden Plover	*Pluvialis apricaria*	230	348	-33.9
Turnstone	*Arenaria interpres*	814	927	-12.2
Curlew	*Numenius arquata*	160	332	-51.8
Bar-tailed Godwit	*Limosa lapponica*	0	9	-
Redshank	*Tringa totanus*	355	343	+3.5
Knot	*Calidris canutus*	997	1710	-41.7
Purple Sandpiper	*C.maritima*	463	565	-18.1
Dunlin	*C.alpina*	515	463	+11.2
All waders		4775	6005	-20.5

Shore length 20.2km (12.5 miles); shore area 5.5km^2.

The low numbers of Grey Plover Pluvialis squatarola and Bar-tailed Godwit Limosa lapponica suggests that certain species find it much harder to feed on rocky shores than others, since up to 200 Grey Plover and up to 2,000 Godwit occur on mudflats elsewhere in East Lothian.

The numbers of some species fluctuate considerably more than others. In the case of Golden Plover Pluvialis apricaria and, to a lesser extent, Curlew this simply reflects the use of inland fields. In all cases Curlew numbers were highest on frosty days. Golden Plover showed a similar pattern except in January 1979 when emigration from the area may account for lower than expected numbers in cold weather.

Although Redshank and Oystercatcher do sometimes feed inland, we find that most birds stay near the shore and Oystercatcher especially can be easily counted on coastal pastures and golf links. Indeed, when the physical difficulties of counting and covering the ground are considered, the fluctuations from year to year between counts of the species which are mainly or exclusively confined to the shore are fairly small and certainly no greater than would be found in counts made in more typically estuarine conditions. Only with the Knot , an exclusively shore feeding species, - and notoriously mobile, do we find really big fluctuations in the counts. The highest Knot counts are for January 1979 which reflects the increase in Knot numbers in late winter on the East Lothian coast.

The counts made on the same day (Table 2) confirm the pattern of Table 1 with low tide counts either greater or the same as high tide counts, depending on the species. The only exception to this pattern was in 1979 when the need to count at low tide on two different weekends probably resulted in an undercount of one section due to birds moving away from a shore exposed to heavy seas. Such movements have been noted several times during these counts as have movements of birds feeding on rocky shores to join estuarine feeders at roost: both situations emphasize the desirability of counting on the same day, particularly when different observers are involved.

The variation between high and low tide counts is not the same for all species. Dunlins are remarkably constant probably because they usually stay on the beach at high tide. Ringed Plovers sometimes show a similar pattern but the situation is complicated by movement of birds to sandy bays adjacent to the study area. The Redshank numbers suggest that loss of birds inland at high tide is less of a problem than at first thought. The species which roost on offshore rocks all show lower numbers at high tide; at first this was put down to birds roosting on the seaward sides of islands but the situation now appears even more complicated. Birds can "disappear" in this way and the smaller and duller the wader, the more often this occurs: Purple Sandpipers are much less visible than Oystercatchers with Turnstones somewhere in between the two.

The percentage of waders "disappearing" varies with two factors: the nature of the coast and the weather. In our study area the coast opposite the large relatively flat island of Fidra, which lies only a 600m offshore, is by far the worst section for high tide counting. Islands which lie further out, especially if they have steep sides, seem to be much less attractive as wader roosts. For example, we have never seen waders using the Bass Rock.

Weather affects counting accuracy chiefly through wave action; strong onshore winds tend to stop waders using the seaward side of rocks and consequently cause them to roost in view of the shore. Our experience suggests that even a difficult area can be counted at high tide by taking advantage of the birds' preference for roosts close to the shore. By starting counts 1-2 hours before spring high tides (or by counting on neaps) waders such as Purple Sandpipers can be counted on small rocks where they gather before the rising water pushes them off to bigger islands. Local knowledge is really the key to successful B.O.E.E. counts on rocky shores; without it many birds (up to 100% with Purple Sandpipers!) can be missed and when this happens the counting method rather than the counter gets the blame. This is unfortunate as observations in East Lothian show that the reduced numbers of certain species counted at high tide is partly due to birds actually moving some distance to roost elsewhere and not simply sitting on nearby offshore islands.

To try to quantify this a series of counts were made at fortnightly intervals at both high and low tides along 3km of rocky shore to the east of Dunbar which borders on the sandflats of Tyninghame Estuary. Birds leaving the area as the tide rose were noted and numbers were seen to fly to join the big wader roosts at Tyninghame. Figure 2 presents the means of these counts.

The numbers of Oystercatchers and Redshanks moving to the estuary are quite considerable and represent up to one-third of the total numbers of these species censussed at Tyninghame. For Knot, an even higher proportion leave the rocks, and these probably move further than Tyninghame to roost. The figures for other species are smaller but all underline the dangers of site ranking based on roost counts. If the low tide count of the rocky shore is not considered a totally misleading picture of the wader population of the area is obtained, suggesting that Dunbar Rocks hold few waders apart from Turnstone and Purple Sandpipers (some of which really feed elsewhere) and that Tyninghame supports several hundred more birds than it in fact does. The Tyninghame - Dunbar situation is perhaps atypical because it is the boundary between two different habitats. Its main value is in showing the need to use both counting methods to arrive at a proper understanding of the size and distribution of wader populations on rocky shores. Table 3 summarizes the differences in methodology, advantages and problems between high and low water counts and Table 4 records the difficulties associated with particular species.

Table 3. Summary of counting methods on rocky shores.

HIGH TIDE COUNTS	LOW TIDE COUNTS
Relatively quick.	Very time-consuming.
Can easily be carried out at monthly intervals.	Only practical once per winter except on study areas.
One person per stretch, if transport permits.	Need at least two people on more complicated stretches.
Telescope essential, as many birds roost on offshore rocks.	Telescope rarely used as islands have few or no birds at High Tide.
Are comparable with other High Tide Counts carried out throughout the estuary.	May be confused by movements of birds which at High Tide roost outside count area.
Human disturbance of small waders on the tide line a constant problem in good weather.	Little human disturbance.
Inland feeding affects Curlew and to a lesser extent Oystercatcher and Redshank.	Many birds will be back on the shore although weather will also affect this.
Certain species will be consistently undercounted on islands, especially Purple Sandpiper and Turnstone.	The best way to count Purple Sandpiper and usually Turnstone.
Virtually no information on feeding except areas which collect washed up seaweed which hold some small waders.	Allows all good feeding areas to be counted/ mapped.

Table 4. Counting Problems with the more Important Species.

Species	Roosting Methods	Inland Feeding	Comments
OYSTERCATCHER	Offshore rocks. Islands. Only few roosts with big numbers on each.	Yes but usually on golf courses or coastal fields visible from shore.	Relatively easy to count with telescope - binoculars lead to undercounting when birds massed.
RINGED PLOVER	Many stay on sandy shores at High Tide. Singly or small groups.	No.	Often mixed with Dunlin, Turnstone. Can be undercounted if flocks are disturbed and have to be counted in flight.
TURNSTONE	Some on rocks - some on shore, especially on piles of seaweed.	No.	Best counted at low tide, but consistent numbers, about 20% too low, are found by high tide counts if weather normal and telescope used.
CURLEW	Offshore islands like Oystercatcher, but smaller numbers.	Yes - more than any other species, except Golden Plover.	Inland feeding so extensive and involving fields miles from the shore that shore counts are of limited value.
REDSHANK	Never in big groups. Often with smaller waders on weed piles.	Yes - often on grass.	Very spread out - easy to miss individuals.
KNOT	Offshore rocks - tight flocks.	No.	Considerable movement between count areas - often roost miles from where they feed. Telescope needed for compact flocks.
PURPLE SANDPIPER	Offshore rocks - often small groups and hard to see.	No.	Very hard to see unless light conditions excellent. Low tide counts needed to get an accurate figure - the hardest wader to count at high tide, but the most important, as it is confined to rocky shores.
DUNLIN	Tends to stay on shore in compact flocks.	No.	Main problem is human disturbance, causing birds to fly - counting in flight tricky as mixed with Turnstone, etc.

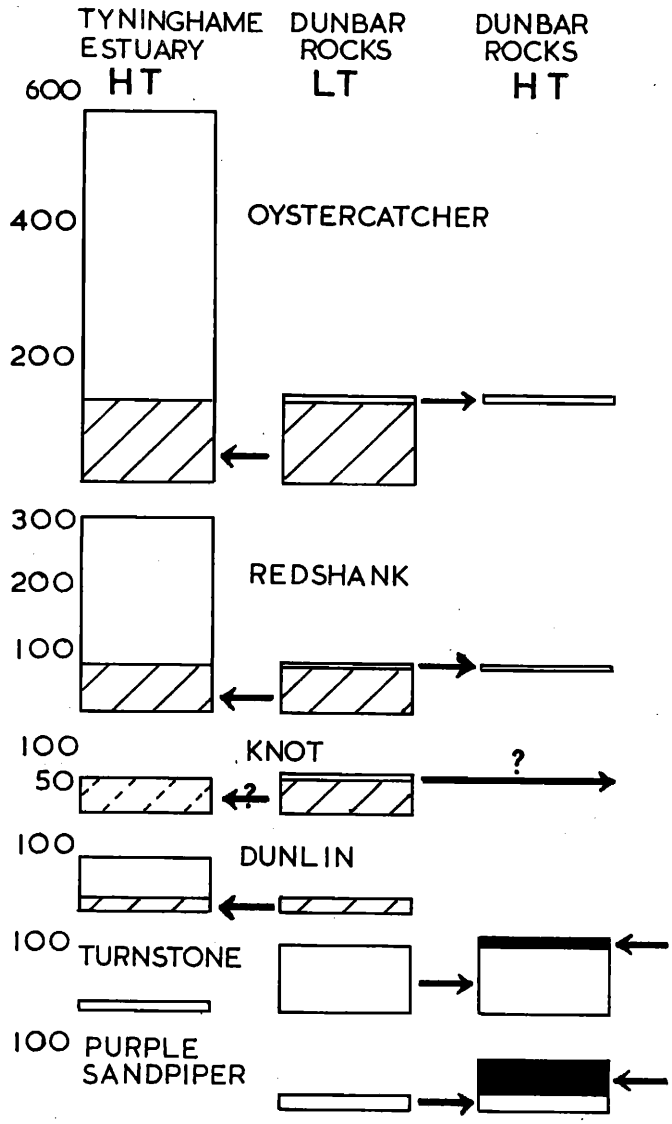

Figure 2. Counts of waders on Dunbar Rocks at high and low tides, at the adjacent Tyninghame estuary at high tide, and of movements between the two areas. The middle column shows the mean numbers feeding on the rocks. Birds flying to join the estuarine feeders at roost are shown by cross-hatching while birds staying to roost on islands off the rocky shore are unshaded. Solid shading represents birds which arrived to roost on rocks in the count area after feeding on other stretches of rocky shore. Most Knots probably move further than Tyninghame to roost.

Acknowledgements

The following B.O.E.E. counters helped with the high tide counts: J.H.Ballantyne, D.C.Davidson, R.G.Nisbet, R.W.J. Smith and R.Weatherhead. M.W.Pienkowski commented helpfully on an earlier draft of the paper.

References

Bryant,D.M. & McLusky,D.S. 1976. Invertebrate and bird fauna of the Forth Estuary mudflats. Unpublished report to Nature Conservancy Council.

Campbell,L.H.(Ed) 1978. Report of the Forth Ornithological Working Party. Nature Conservancy Council, Edinburgh.

Prater,A.J. 1971 et seq. Reports of Counts of the Birds of Estuaries Enquiry. B.T.O./R.S.P.B./W.T.

da Prato,E.S. & da Prato,S.R.D. 1979. Wader Populations and Counting Methods on the Rocky Shores of East Lothian. Scott. Birds. (in press)

Summers,R.W.,Atkinson,N.K. & Nicoll,M. 1975. Wintering Wader Populations on the Rocky Shores of Eastern Scotland. Scott. Birds. 8: 299 - 308

Vick,L.L.J.V. 1975, Musselburgh Lagoons. Edinbugh Ringing Group Report. 3: 16 - 19

E.S. & S.R.D. da Prato, 38 Carlaverock Grove, Tranent, East Lothian.