

General synopsis.

We arrived in Kandalaksha on 20th July at the end of a week dominated by low pressure and rain. This was followed by a period of fine weather as a ridge of high pressure developed in the area but this then gave way to a depression from Scandinavia on 29th July. High pressure then started to develop from the south, giving changeable weather but this then weakened and a series of fronts began to cross by 3rd August. The poor weather continued until 7th August, when a ridge of high pressure gave us four days of good but windy weather. A series of low pressure systems then followed quickly until 17th August. Again we had a few good days as a low pressure system passed well to the south before yet another set of depressions and fronts started to cross from the southwest on 25th August.

Subjective weather reports.

Each fire was asked to record how the weather 'felt' each day. The day was divided into morning, afternoon and evening periods. The data was then collated and the following grids summarise all the reports from the fires.

Warm and calm

Cold and calm

Warm and windy

Cold and windy

Phase 1 Phase 2 Phase 3

22 July-31 July 1 Aug-10 Aug 11 Aug-20 Aug

40 19 54 18 36 5 19 45 5 22 36 34

Total 130 42 60 101

The weather was best during the second phase; the third phase was the poorest. Overall the weather was kind to us and this is a useful point to keep in mind for future expeditions to the area. Accurate temperatures were obtained during phase 1 only because the batteries of the digital thermometers failed.

Flowers of the Gulf of Kandalaksha

One of the aims of Fire 1 was to identify the flowers of the area for future reference. It was not only the beautiful colours of the flowers that made 193 of them interesting but also the fact that they were struggling to survive in a harsh environment above the Arctic circle. The flora was studied during the trekking phase on the northern shore and also around the campsites during the two kayaking phases. The flora was very much Western European and British guide books were suitable for their identification. The following flowers were identified: Hogweed, Twinflower, Yarrow, Milfoil, Melancholy Thistle, Mouse-ear Hawkweed, Alpine Hawkweed, Goldenrod, Dwarf Cornel, Broad Leaved Cotton Grass, Crowberry, Black Bearberry, Heather, Meadow Cranesbill, Rosebay Willowherb, Dock, Cloudberry, Great Burnet, Creeping Willow, Common Cow Wheat.

Birds of the Gulf of Kandalaksha

During the kayaking phases each fire kept a record of the number and species of the birds seen as they carried out other scientific work. The terrain is low on the southern shore while mountainous on the northern shore. Considering the northern shore to run from Kandalaksha clockwise the following table can be created.

Southern Shore

Gannet, Arctic Tern, Arctic Warbler, Sea Eagle, Golden Eagle, Rustic Bunting, Whimbrel, Ringed Plover, Rednecked Magpie, Grebe, Turnstone, Velvet Scoter, Wood Warbler, Finch, Snipe.

Everywhere

Herring Gull, Common Gull, Eider Duck, Oystercatcher, Goosander, Osprey, Crane, Grey Wagtail, Crossbill, Diver, Temminck, Grey Wagtail, Raven, Northern Shore, Guillemot, Shag, Falcon, Rough Legged Buzzard, Hooded Crow, Willow Grouse.

The indication is that the southern shore is able to maintain a greater variety and density of bird life than the northern shore. This is probably due to the numerous inlets, islands and lakes on the southern shore which give better protection from the weather than the exposed mountainous northern shore.

Kayaking was an excellent method of bird recording as you could get quite close before disturbing the birds. The birds were not evenly distributed along the coast but concentrated in certain areas. The eider ducks, which, with the gulls, were the most common birds, followed the general pattern with only a few sightings on the northern shore. Interestingly, virtually all the sightings were females. The gulls, which included some lesser black backed, were common everywhere but were more localised on the northern shore, grouped into large colonies.

Shags were only sited at the northeastern extreme of our paddling

area and are apparently more common further around the shore and in the Baltic.

Figures 1, 2 and 3 show the distribution of some of the species. The birds of prey, as shown in Figure 3, cover such a large territory that double sightings are quite possible.

Heavy metal ions in the Gulf of Kandalaksha

The Kola peninsula is rich in mineral deposits and, as it is far from the main industrial areas, the ores are extracted at source. The heavy metals leach into the river water and enter the Gulf of Kandalaksha. At the initial briefing weekend Adil Iskenderov suggested six metals which were the most likely pollutants in the region and we therefore needed a method to study all of these in our water samples.

There are four main methods available for determining the concentration of heavy metal ions in water and each has its advantages and disadvantages.

The most sensitive method would be to use an atomic absorption spectrometer but this would have involved taking the samples back to the UK for processing, which would have been expensive. Also, the aim of the expedition was to obtain results in the field from Phase 1 in order to determine the hot spots for further investigation in Phases 2 and 3.

Two further methods which were considered were ion selective electrodes and a photometric method. Ion selective electrodes had to be ruled out because of their fragile nature whilst a photometer such as Paqualab that could measure zinc at concentrations of 0-4mg/l could not be obtained.

The final choice was to use Merckoquant test strips, which are simple and relatively cheap. Basically, the test strip is dipped into the water sample and a colour change indicates the concentration of the ion being tested. However, there was a price to be paid with respect to sensitivity; the threshold levels for the six metals of interest are listed below.

Metal ion Copper Zinc Lead Manganese Nickel Cobalt Threshold level for detection mg/l 10 10 20 5 10 10

During the first phase, water samples were taken by two kayaking fires from the rivers and shore along both sides of the Gulf of Kandalaksha. Once back at base camp all the samples were tested for all six ions. Alas, all the samples were below the minimum sensitivity of the test strips and so this is all that can be concluded. Further projects of this type would therefore involve taking samples and processing them back in the UK.

Acidity of river water and soil in the Kandalaksha region

In the Kandalaksha Bay region samples of river water were taken by the kayaking and trekking fires. The trekking fire also took soil samples, which were tested with universal indicator to determine their pH.

Water samples

The trekking fire took water samples from the top of the hills and the kayaking group from the river mouths (see Figure 4) with the aim of determining the difference between the acidity levels at the top and bottom of the rivers. This did not prove to be easy in practice as not all of the rivers were marked on the map. Also, above the tree line, where the trekking was easiest, not all the rivers had formed and so samples could not be taken. We intended to compare specific rivers that both groups had tested but in practice there were only two rivers that corresponded.

The water samples were taken from various sources in the hills and at the river mouths on the northern and southern shores of the gulf. Six drops of universal indicator solution was used on each sample.

The average pH at the top was 6.15 while at the river mouths it was 7.06.

The river water appears to be more alkaline on the southern shore with an average pH of 7.9 while the average on northern shore was 7.03.

One explanation of this could be that as the northern shore is more mountainous it catches more of the rain and acidic gases than the southern shore. The results also showed that the water was more acidic at the top. This was as expected, because as the water runs down the slope the acidity is reduced by the soil and underlying rocks. The greatest acidity was pH 6.0, which indicates that the region is not greatly affected by acid rain.

Soil samples

Soil samples were also taken at various depths using a soil auger. A measured quantity of soil was added to water of pH 7 and shaken with barium sulphate, which acts as a flocculating agent. The final solution was tested with universal indicator. The pH was recorded together with the location, vegetation cover, depth, texture and colour of the soil.