

THE REVISED COORDINATES FOR BJURBÖLE METEORITE, FINLAND.

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Introduction: Bjurböle meteorite fell 12 March 1899 in the southern Finland at half past ten in the evening [1]. Meteorite hit through almost meter thick sea ice six kilometers south from the town Porvoo. A four meters wide hole in the ice was found in the next morning near a shore. The hole was surrounded by broken ice zone about ten meters in diameter. Impact of the meteorite was thrown water, mud, clay and pieces of ice over 20 meters away.

Main trouble with recovery of the meteorite was that meteorite was not only penetrated thick ice and one meter of water but also 8 meters of mud and clay sediments. A wooden shaft was constructed to hold loose sediments so that divers were able to dig down and find the meteorite. It took a month to find the first meteorite fragment. Two months later all encountered pieces of Bjurböle L/LL4 chondrite were recovered, totaling over 328 kilograms.

However, for meteorite enthusiasts it has been a mystery where was the exact location of Bjurböle impact site. The coordinates listed for Bjurböle meteorite are 60° 24' N and 25° 48' E [2]. It has been widely known that those coordinates are not correct. They are pointing on dry land near a small Sannanen village over 8 km NE from Bjurböle. It is not clear where these coordinates came from.

Solving the mystery: A small map in the article by Ramsay and Borgström seems to put the fall site somewhere north from a cape called Bjurbölemalmen [1]. Unfortunately the map is not detailed enough to make any conclusion. However, it does hint that the fall site is not the same as known coordinates suggest and it is probably not inside the Bjurböleviken bay, where the fall site is often thought to be and where the house of Bjurböle is located.

There is only one photograph of the hole in the ice caused by the Bjurböle meteorite [1]. Benjamin Frosterus took it before recovery of the meteorite started. Precise date of the photo is not known, but it is shot during first weeks if not days after the fall. This photograph has been published multiple times, but usually in low quality.

Fortunately a high-resolution scan of the original glass plate is available in archives of Geological Survey of Finland. This scan was crucial to solve the location of Bjurböle meteorite fall. First it proves that sun was shining when the photograph was taken. It is easy to see that dark patches on snow, which were earlier interpreted as wet snow, are in matter of fact shadows of trees. So the Bjurböle fall site was only tens of meters from the shore.

In the background of the photo there is two hills. It was first thought that the photo was taken toward NW, but after a visit the first possible fall site NW from a small Rönholmen island, it was clear that this was not the case. A panorama photo from the Rönholmen points out another possible solution for the fall site.

It turns out that a hill seen on left side of the photo is Sikosaari island near the Porvoo. Another hill in the photo is Kotternäs, which top is just outside the right edge of the photo. This means that the photograph was taken toward the north and the town of Porvoo. The shadow cast by a rod sticking out from the hole in the ice is suggesting that the photo was taken almost at the noon of local time. Another visit at the location proves that this second solution is the correct one. Landscape from this second possible location does match fully with the old photograph.

Revised Coordinates: Our conclusion is that the hole in the ice made by Bjurböle meteorite was near NW shore of Bjurbölemalmen. Therefore correct WGS84 system coordinates for the Bjurböle fall site are 60° 20.42' N and 25° 42.30' E (60.3403° N and 25.7050° E). These coordinates are probably few tens of meters from the exact impact site of Bjurböle meteorite. The photograph does not show enough details to narrow down the location more precisely.

References: [1] Ramsay W. and Borgström L.H. 1902. *Bulletin de la Commission Géologique de Finlande*. No12. [2] Grady M.M. 2000. *Catalogue of Meteorites*. 5th edition. 696 pages.