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Kulning – an ornamentation of the surrounding emptiness: about the unique Scandinavian herding calls

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It is hard to describe in words both how kulning sounds and how you do it. The starting point for the vocal technique is that you want to be heard and to communicate outdoors with the help of the voice. As it has mainly been women who have traditionally worked on the fäbod (summer grazing pasture with small buildings for people, pets, dairy products, and animal feed), the use of the voice has also evolved according to the strengths and limitations of the female voice.

Technically speaking, you can say that the voice produces a clear, directed sound, without vibrato, both at a high pitch range using a vowel of choice, and when calling, using the voice’s breaking point to change register. The larynx is flexible and relatively high, and there is high sub-glottal pressure under the vocal folds.

The Scandinavian fäbod system has its roots in the middle ages. Looking after animals and processing animal produce has largely been a woman’s responsibility. Therefore, it has often been the women who worked on the fäbod during the summer, where the animals could find grazing away from the village’s valuable arable land. From the beginning of June to the end of September, the young girls and older women from the village lived on the fäbod, and took care of everything from herding the cattle, milking, and producing butter and cheese to making whisks, brooms, and, amongst other things, knitting socks. Work on the fäbod was hard, and full of responsibility. At that time, animals were one’s most valuable possessions, and butter the most valuable product (you could say that an animal was money in the bank, and butter the interest on that money!). It was important that nothing went to waste, and a use could be found for everything. A working day could be up to 16 hours long. In spite of all this, the chance to work on a fäbod was almost always highly sought after. The work had a freedom to it, allowing women to be completely independent throughout the whole summer. In this environment, a specific high-pitched voice-technique developed—kulning.

The kulning range

Many people associate kulning with beautiful, ornamented melodies at a very high pitch. These melodies often have a tonal range of about a fifth, sometimes more. In general, this range often lies somewhere between ca. 800 and 1300 Hz, the equivalent of which is about G3–D6 (the range is rarely below ca. 600 Hz, but can reach up to ca. 1400 Hz.

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which equates to F6). This range is what could be called the kulning range. It is a high pitch range, regardless of which style of singing one talks about, roughly equivalent to the highest register for a dramatic soprano. Herding call consists more often of a mixture of these high, melismatic melodic lines, together with shorter calls and phrases in different parts of the voice. The whole voice is used, and great advantage is made of the changes between the high voice (the kulning range) and the low voice, working within the capabilities and power of one’s own voice. The pitch range can reach from really low notes or sounds, from E3 (ca. 150 Hz) to the very highest frequencies around F6. Kulerskor have their own individual boundaries with the herding call and kulning range, which they must find themselves, and there exist no absolute boundaries that apply to everyone.

The melodic part of traditional kulning is often built upon short phrases, with variation built outwards from a musical theme. Melodies often have a falling form, beginning on a high note and moving downwards, with phrases sometimes ending on a high note, sometimes not. You could say that the melodic lines mirror the form of calling, which you do naturally when you call. Fäbod tunes, herding tunes, and herding songs often have a more fixed melodic form. However, herding call that appears to follow such a form should be considered as improvisation over a theme without a specific length. There are short phrases woven together in a perpetually varied weave, where the imagination and musicality of the person calling find their own expression. Typical for herding call is that it is built upon phrases, and not upon pulse or time signature; it has a free rhythmic structure. The free rhythmic melodic phrases vary in length, but tend to be between 4 and 5 seconds long. Variation is a fundamental principle regarding, to give but a few examples, rhythm, tonality, and melody, as well as the length of pauses between phrases.

The melodic line is spun further through its phrases, like a continuing story in the herding call. There is no obvious ending—to be able to spin further is an important part of the herding call itself; after all, it is not up to yourself to decide when to finish—it depends upon whether somebody hears your call and answers back. It is because of this that the improvisatory part of the call is important, the theme serving as a base which can be varied upon. When listening to a person kula, it is often possible to recognize who it is. Even if several people begin from the same theme, the variation from this theme will be different from person to person and from one time to another. Through your own style of variation, a personal, musical fingerprint is created.

**Herding call’s singing style**

In every type of herding call, the sound is placed at the front of the mouth, in a small and fairly narrow place. Despite this, the sound level produced by kulning is extremely high. It is sometimes thought that the production of the sound is nasal, but technically this is not true. For it to be classed as nasal, the majority of air must pass through the nose, and this is not the case with kulning. The most usual sound in herding call is a straight tone without vibrato. Notes have a definite attack and ending to them, at both the beginning and ending of phrases. Phrases often have a clear beginning, created through the use of, amongst other things, anticipatory notes, upphämtningar (a pick-up note from a pitch area rather than a specific pitch, from which a small slide is made up to the first note of the phrase), and glottal stops.
Phrase endings are often made clear through the use of glottal stops, adding a small "tail" to the phrase. The sudden opening or closing of the vocal folds causes the note to be at its strongest just before it ends, which produces a clear concluding sound at the end of the phrase. In many other song styles, you choose to end a note by making it softer at the end—phrasing off the note. With kulning, it is the opposite, as if the note is produced back to front.

The tip of the tongue is used to create breaks between pitches, with the help of certain syllables, and in conjunction with quick, melodic decoration, especially in melodic phrases in a high register. As there is high sub-glottal pressure beneath the vocal folds, it is easy to create a break with the help of fast upward and downward movements of the tip of the tongue.

Glottal attacks or accents are also used to create breaks, or to start a note, phrase, or sound. They are mainly used at lower pitches, during changes from one vowel to another—a definite glottal attack is used at the start of the vowel, sometimes in combination with placing an h before it.

Language is used primarily as a sound and rhythm resource. Greater importance is placed on the sound-bearing qualities of a text than on the actual text itself. A sound is chosen in order to create contrast between different parts of a phrase, different registers, and different sounds in the herding call. The combination of different sounds is up to the individual and depends on personal taste, but a few common sounds and sound combinations are:

- tjä [tche], ti [tee] du [doo], di [dee] dā [daw] dy [dy:] du-a [doo-a] de-a [day-a],
  as well as diphthongs such as: dāu, dauw, duej [dway] dey (Ahlbäck (2007))

However, speech contains an endless number of possibilities regarding sound combinations, and written language is not suited to or sufficient for describing them all. The contrast between speech sounds is heightened according to the sound and the combination one chooses. The choice of which consonant to begin with depends upon how hard or soft an attack one would like. For example, choosing h would result in a softer, more airy start, while ch (with a hard, audible ch) would produce a harder attack.

D produces a sound somewhere in the middle of the spectrum.

**Research about kulning**

A fair amount of research has been done in order to try and describe what happens to the vocal "apparatus" during the kulning process. The research results presented here are taken partly from the music researcher Anna Johnson and voice researcher Johan Sundberg's work, presented in the dissertation “Sången i skogen” (“The song in the forest”), 1986. Results are also taken from new research carried out between 2004 and 2008 by the author herself, together with Johan Sundberg and voice researcher Eva Björkner, both from Kungliga Tekniska Högskolan (Department of Speech, Music and Hearing, Royal Institute of Technology), and others. Together with Johan Sundberg, Anna Johnson made a number of acoustic readings of kulderska Karin Edvardsson’s kulning. The new research (2004–2008), for which a number of young kulderskor participated, used largely the same methods as the earlier research and produced very similar results, together with some new observations.
The following information applies mainly to *kulning* at a high pitch range, herding call in the *kulning* range—the majority of research has been made in this area—but most of it is also applicable when describing herding call in general.

**The vocal technique for kulning**

High sub-glottal pressure is required; in other words, air pressure in the windpipe below the vocal folds needs to be high. In *kulning*, the sub-glottal pressure is almost always over 40 cm of water (cm H$_2$O) and is often as high as 50–60 cm H$_2$O. The average value from the 2004 investigations was ca. 40 cm H$_2$O within a range of 34–57 cm H$_2$O at 1000 Hz.

In comparison, regular talking uses ca. 5 cm H$_2$O, and 5–20 cm H$_2$O is considered normal for singing. A note played *forte* on a wind instrument can be as high as 150 cm H$_2$O. Herding call uses a flexible larynx, which is raised in conjunction with the frequency. The opposite of this is required in classical singing, where emphasis is placed on lowering the larynx, or at least maintaining a constant level, during singing. Johnson and Sundberg’s measurements of 1986 showed that for high frequencies, the larynx was raised by 4 cm.

The jaw and lip openings are wide and the corner of the lips retracted. This occurs mainly at high frequencies. The vocal tract is shortened and compressed in the throat, at the same time as the mouth cavity widens, which in turn affects the formant frequency. Johnson and Sundberg found that the first formant lay close to the sung fundamental frequency, while the second (1700 Hz), third (3000 Hz), and fourth (4000 Hz) formants were not affected by the fundamental frequency. This can be interpreted to mean that if the mouth cavity is widened in this way, the keynote is strengthened at high frequencies with the help of the first formant. Voice-wise, this is a way to use the natural strengths of the voice to gain a stronger sound in this pitch range. New findings from 2008 by Rosenberg, Sundberg, and Hertegård show that a good *kulning* tone shares the property of a prominent first partial and an evenly falling spectrum envelope and that there is a complete glottal closure.

The shape of the tongue also affects the formant’s frequency level. The shape of the tongue adapts itself to the pitch and choice of spoken sound. Often, the root of the tongue and the back of the tongue rise, whilst the tip of the tongue is lowered, and the epiglottis is raised towards the back of the tongue.

The sound strength (sound pressure level) of *kulning* is high, and can reach almost 125 dB at a distance of 30 cm. At this distance, the sound pressure level of *kulning* is almost always above 105 dB, but just how high it reaches changes from person to person, and also depends on the pitch being used. The highest sound pressure levels have been measured at pitches of over 1000 Hz. The research from 2004 to 2008 showed an average of 115 dB at 1000 Hz (ranging from 105 to 125 dB), while 113 dB was the average from 1986. There is less variation in sound pressure level at higher frequencies than at lower. To have an idea of just how loud 125 dB is, it could be useful to know that the ear’s pain threshold lies at 120 dB.

In comparison, a pneumatic drill at 3 m distance generates ca. 90 dB, a jet plane ca. 105 dB, an ordinary conversation ca. 50 dB, and a dramatic soprano, singing as loud as she possibly can, reaches ca. 110 dB at a 30 cm distance at 1000 Hz. In principle, you can say that up to a certain level, the higher the sub-glottal pressure, the higher the sound strength (dB). After a certain level, the sound strength appears no longer to
increase. How loud the sound becomes depends on personal physical conditions. To attain the really high sound-strength levels requires vocal folds that can resist and increase the sub-glottal pressure. Some people appear to have more resilient vocal folds than others, just as everyone has an optimum range for kulning, “kulning-dB-range” (a “voice strength” level for kulning).

It is fantastic that such an old vocal technique and musical language still has a given place in our modern world. The interest in learning kulning today is huge and reflects the urge to use one’s voice in this powerful and fantastic expression: to recognize yourself both musically and vocally—to make an ornamentation of the surrounding emptiness.

Figure 1. Herding call, after Karin Edvardsson, Dalarna, Sweden. A transcription made by Sven Ahlbäck (2007) quoted in Rosenberg (2010, 60)
Notes on contributor

Susanne Rosenberg is a Swedish singer, composer, and researcher with a wide range of expressions. She has been a pioneer both in rediscovering the older Swedish style of traditional singing, and in using it in new artistic environments. She has toured and recorded frequently since the early 1980s, working with such musicians as Ryuichi Sakamoto, Quincy Jones and Clark Terry. She is an assistant professor at the Royal University College of Music in Stockholm (KMH), where she also heads the Department of Folk Music. In 2011, she received the prize “Årets Traditionsbärare” at the Folk-och Världsmusikgalan. Her website is www.susannerosenberg.com.

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