METHODS AND APPLICATIONS OF NATURAL SOUND RECORDING

By J. L. KENDRICK

ABSTRACT

The use of sound recording equipment, particularly tape recorders, microphones and parabolic reflectors is discussed with special reference to aspects of ornithological field work. Practical hints and advice are offered in this respect.

The use of portable tape recorders for ornithological field work:

Portable tape recorders were first used in the Wildlife Service in 1963 for conservation work with the North Island Saddleback on Hen Island off the North Island coast. Tape recordings of the birds' calls were used to attract them into catching nets for transfer to other islands in the group and for subsequent census work on these populations.

Since that time there has been a tremendous increase in the use of tape recorders for ornithological study and wildlife management, both by members of the public and by the Wildlife Service.

Those searching for rare-bird species have been greatly aided by using tape recorders, and the re-discovery of the Orange-fronted Parakeet in the D'Urville Valley, Nelson, was due to this means.

The time of year, type of call, prevailing weather, characteristics of the individual, and many other variable factors all influence the results obtained. So that the reaction of birds to the playback of their calls can be predicted with reasonable certainty, a great deal of research into biological acoustics needs to be carried out. So far, little has been done in this country, although some research has been carried out into methods of ridding airports of unwanted bird populations. A system used with some success overseas employs recorded distress calls which are played back and produce a reaction in the birds causing them to desert the locality. Much more investigation is needed before the effects of this technique can be predicted with certainty. Under what conditions and for how long the birds can be eliminated from an area can only be determined by thorough research over a long period.

Birds tend to develop differences in voice or dialect after a period of isolation from others of their kind, thus providing an important indication of the beginnings of speciation. There are many factors accelerating the formation of bird dialects and an obvious one occurs when a bird population of one species is permanently isolated from others of its kind. This situation can often be found on offshore islands, particularly remote ones, where there is less chance of a species mixing with mainland individuals. Although dialects among groups or individuals are often evident in different areas there is no doubt that the strong inborn ability of a bird to produce its own song keeps its basic song form in existence.

NOTORNIS 20: 31-36 (1973)

This point is demonstrated in Figs 1 *a-b* by the spectrograms of chaffinch breeding song. In this case the New Zealand and British birds have been separated for something like 100 years.

These spectrograms are produced by means of the sound spectrograph, a machine which traces a graphical representation of any sound on paper or film, with a vertical scale in frequency (usually kilohertz), and a horizontal scale in time (usually seconds). Thus, from this spectrogram, it is possible to determine the frequency and duration of any sound. With practice, the " picture " of a recorded sound can be recognised and associated with the sound that produced it. This is made easier when a recording is slowed down in playback as sufficient time is then given to interpret the sounds in the " pictures " made from them.

Another potential use for portable recorders is to gather ornithological data. They have the great advantage of allowing an observer to record observations without transferring his attention from the subject — a problem when writing notes in the field. A further advantage is that a time-reference scale is available if the recorder is run continuously throughout the period of observation.

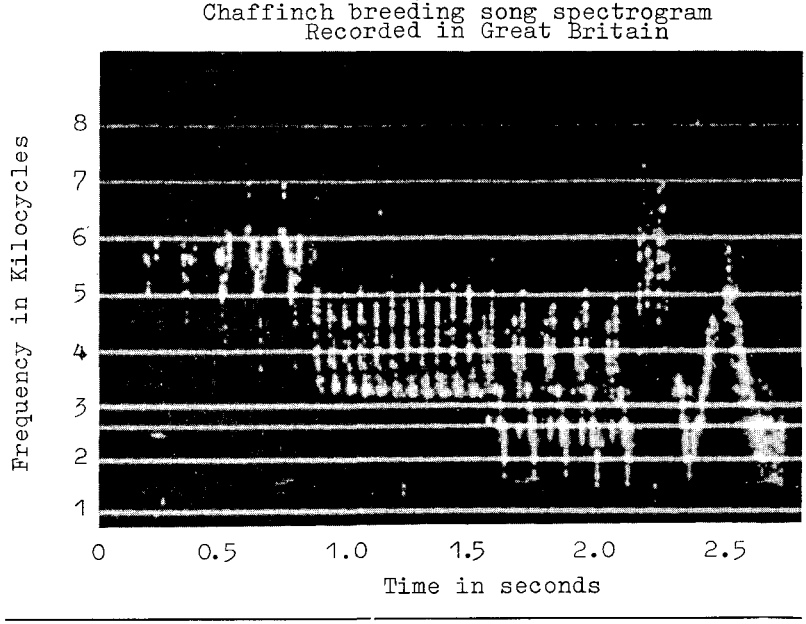

FIGURE 1 *a:* Spectrogram of Chaffinch breeding song recorded in Great Britain.

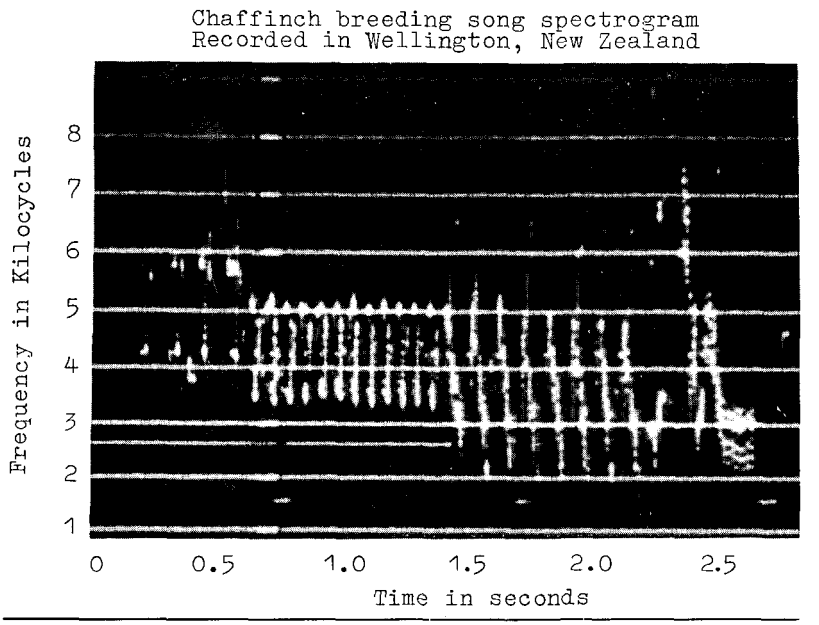

FIGURE 1 *b:* Spectrogram of Chaffinch breeding song recorded in Wellington, New Zealand.

Many other uses for small portable tape recorders will no doubt occur to their owners; but some of the more obvious ones are to attract birds closer for photography or more accurate observation, and to enable their capture in mist nets for examination or banding purposes.

Documentation:

Documentation at the time the recordings are made is essential if the fullest subsequent use is to be made of them. Information should include all relevant details about the subject, its behaviour, and the surrounding environment. These details should be filled in at the time the recording is made. A typical data card is illustrated in Figure 2.

Sound recording equipment:

While it is a fact that, generally speaking, the better the equipment the better the results, it is still possible to achieve very pleasing results with quite simple and inexpensive tape recording equipment. Thanks to great improvements in tape recorder design during recent years, it is now possible to use tape speeds as low as $3\frac{3}{4}$ or $1\frac{7}{8}$ in. per second and still obtain good results. Many cassette recorders now available have the advantage of a self contained tape system that

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Scientific Name Callaeas cinerea wilsoni — **Common Name** North Island Kokako

No. Sex. Age Male adult.

Date Aug. 1971 **Time** 10 am **Weather** Overcast with occasional showers

Locality Pureora State Forest

Topography and Vegetation Man-made clearing in podocarp forest, mainly tall rimu, totara and tawa

Apparent purpose of call

Behaviour of subject Bird was attracted to playback of calls

Reel No. 58 D	**Track No.** 9	**Track Length** 0000 - end of reel			
Recorder Nagra 3	**Mic.** AKG 202 ES		**Tape Speed** 15 IPS		
Parabola 20 in.	**Subject Distance** 100 ft.		**Vol. Level** High		
Quality B. Some noise from vegetation			**Operator** J.L. Kendrick		

FIGURE 2: Sound recording data card as used by the Wildlife Service.

can be instantly changed. Some bird songs are very difficult to record well, even using the best professional equipment with tape speeds of 15 inches per second, but these are a minority.

Microphones and parabolic reflectors:

It must be remembered that a microphone will accept whatever sounds are presented to it, as it does not have the discriminating and interpreting ability of the human ear. This is not usually desirable as the required sounds may be combined with others from the surrounding environment. A solution can be achieved in a number of ways with natural sound recording but the simplest and best method is to place the microphone close to the sound source. This is easy enough when recordings are being made with subjects in captivity or under controlled conditions, but most wild creatures are wary and will not allow a close approach; so other means of obtaining a sufficiently high recording level must be found.

When recording birds, advantage can often be taken of the fact that many use a number of regular song perches or favourite areas where a microphone can be installed beforehand, and the operator can set up his apparatus well away or out of sight. This arrangement requires a long lead between the microphone and recorder and a low impedance output on the recorder. Since many domestic tape recorders have a high impedance output, the solution to this problem is to remove the small transformer from inside the microphone case and

place it near the input socket on the recorder. This then permits a long lead from the microphone. Professional machines have this facility provided.

Some microphones possess directional qualities which favour the sound from one direction at the expense of others. Two excellent but very expensive directional microphones which give useful amplification from a narrow acceptance angle are the " Electrovoice" dynamic type and the " Sennheiser " condenser type. As both are very sensitive to wind they must be provided with a windshield for use in the field. The most widely used type of microphone for outdoor recording is the dynamic (moving coil) microphone which, in general, has the advantage of (1) being very rugged in construction, (2) being of low impedance for long lines to the recorder, (3) giving a satisfactory signal output, (4) producing a reasonable response over the audible frequency range. However, condenser microphones which can produce very high quality results are being increasingly used.

Another way of obtaining directional qualities when recording is by using a parabolic reflector. A microphone is mounted in the centre, or focus point, where all the sound waves meet. Because of the shape of the reflector, all sound waves intercepted will be directed to this one spot thus producing a considerable increase in sound from the direction in which the parabolic reflector is pointed. Other sounds at the side or back of the reflector are not intercepted and are therefore received only weakly. However, if unwanted noises are in line with required sounds these will be picked up and amplified also. This could prevent the effective use of the parabolic reflector in some circumstances.

The larger the diameter of the reflector, the greater the amplification that can be produced, but the heavier and more cumbersome the unit becomes. If the diameter is small, serious attenuation of the lower frequencies will occur and although many bird calls may be above these frequencies some species with low frequency calls may be affected. In the case of a parabolic reflector with a diameter of $1\frac{1}{2}$ ft, the low frequency cut-off will be 488 Hz whereas if the diameter is increased to 3 ft the cut-off point will be proportionately lower, in this case 244 Hz. It is recommended that a metal parabolic reflector be accoustically " dampened," that is, coated on its non-reflective (convex) surface with a sound-deadening substance such as fibreglass, or bitumenous compound. Without this precaution a metal reflector will tend to vibrate at its natural resonant frequency if it is touched, or if it is used in wind, and a drumming sound will be superimposed. Wind can also give rise to unwanted noise as it plays across the lip of the reflector.

Wind is an ever-present problem when recording in the field and special wind shields are available for most microphones. However, it is best not to make recordings in windy conditions. When using a parabolic reflector, the only effective measure is to cover the face of the reflector and microphone with a closely-woven material held

in place by an elastic hem. Some wind shields are effective in cutting back wind noise but reduce high frequencies at the same time. Not only is there a danger of wind blowing over the face of the microphone itself but a higher environmental noise level from wind in the vegetation and other surrounding objects could also be present. When it is vital to obtain a recording in windy conditions it may be possible to shelter the microphone by placing it in a burrow or excavation. Sometimes rocks or trees can be used to give protection.

Use of existing recordings as a field aid:

As many birds respond vocally to play back of their calls and are often attracted to the recorder, existing tapes can be of great value in obtaining new and improved recordings.

In this country the most comprehensive library of natural sounds is held by the Wildlife Service in Wellington. This natural sound collection contains over 150 species, mainly birds, and is widely used by Wildlife staff, other Government departments, clubs and organisations, and members of the public. Copying equipment enables tapes to be made at speeds to suit the users' requirements. A documentation card accompanies each track or recording to provide as much information as possible.

GUIDE TO FURTHER READING

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Editor's note: This paper is a shortened and revised version of one presented at the OSNZ Annual General Meeting, May 1970.