Appendix A
List of R Functions

List of audio 0.1.5 (Urbanek 2013), monitoR 1.0.5 (Katz et al. 2016b), phonTools 0.2.2.1 (Barreda 2015), seewave 2.1.0 (Sueur et al. 2008a), signal 0.7.6 (Ligges et al. 2015), soundecology 1.3.2 (Villanueva-Rivera and Pijanowski 2016), soundgen 1.1.0 (Anikin 2017), tuneR 1.3.1 (Ligges et al. 2014), and warbleR 1.1.5 (Araya-Salas and Smith-Vidaurre 2016) functions used in this book and grouped by themes. Some functions can appear in several themes. The description comes from the description field of the documentation as provided by the package authors. A complete definition of each function is included in the related package documentation. The number of the main chapter where each function is introduced is given in the last column of the table.

Name	Package	Description	Chapter
Input/output			
audio.drivers()	audio	Lists all currently loaded and available audio drivers	4
checkwavs()	warbleR	Checks .wav files	4
current.audio.driver()	audio	Returns the name of the currently active audio driver	4
getWavPlayer()	tuneR	Gets the default player for .wav files	4
loadsound()	phonTools	Allows .wav files to be loaded into R	4
load.wave()	audio	Loads a .wav file	4
load.audio.driver()	audio	Attempts to load a modular audio driver	4
listen()	seewave	Plays a sound wave	4
mp32wav()	warbleR	Converts .mp3 files to .wav	4
play()	audio	Plays audioSample objects	4

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https://doi.org/10.1007/978-3-319-77647-7

Name	Package	Description	Chapter
play()	tuneR	Plays Wave objects	4
playlist()	seewave	Runs a playlist of sound files	4
playsound()	phonTools	Plays sounds in R using VLC player	4
pause()	audio	Pauses (stops) audio recording or playback	4
querxc()	warbleR	Accesses Xeno-Canto recordings and metadata	4
readMP3()	tuneR	Reads an MPEG-2 layer 3 file into a Wave object	4
readWave()	tuneR	Reads and writes .wav files	4
record()	audio	Records audio	4
resume()	audio	Resumes previously paused audio recording or playback	4
rewind()	audio	Rewinds audio recording or playback	4
savewav()	seewave	Saves audio data as .wav file	4
save.wave()	audio	Saves audioSample objects as .wav file	4
set.audio.driver()	audio	Selects an audio driver as the current driver	4
setWavPlayer()	tuneR	Sets the default player for .wav files	4
sox()	seewave	Calls externally SoX	3
wait()	audio	Waits for an event during a recording session	4
wav2flac()	seewave	wav-flac file conversion	4
writesound()	phonTools	Creates a WAV file from a numeric vector or sound object	4
writeWave()	tuneR	Reads and writes Wave files	4
xcmaps()	warbleR	Maps Xeno-Canto recordings by species	4
Objects			
as.audioSample()	audio	Converts an object into an audio sample object	4
audioSample()	audio	audiosample class and constructor	4
duration()	seewave	Duration of a time wave	4
equalWave()	tuneR	Checks for some kind of equality of objects of class Wave	4
makesound()	phonTools	Creates a sound object from a numeric vector.	4
MCnames()	tuneR	Defaults channel ordering for multichannel wave files (WaveMC objects)	6
nchannel()	tuneR	Number of channels	6
updateWave()	tuneR	Updates old Wave objects for use with new versions of tuneR	4
Wave()	tuneR	Constructors and coercion for class Wave objects	4
WaveMC()	tuneR	Constructors and coercion for class WaveMC objects	4

(continued)

Name	Package	Description	Chapter
Edition			
addsilw()	seewave	Adds or inserts a silence section	6
bind()	tuneR	Concatenates Wave objects	6
channel()	tuneR	Channel conversion for Wave objects	6
crossFade()	soundgen	Joins two waveforms by cross-fading	6
cutw()	seewave	Cuts a section of a time wave	6
deletew()	seewave	Deletes a section of a time wave	6
downsample()	tuneR	Downsamples a Wave or WaveMC object	6
equalWave()	tuneR	Checks Wave objects	4
extractWave()	tuneR	Extractor for Wave objects	6
mono()	tuneR	Converts stereo to mono and vice versa	6
mutew()	seewave	Replaces time wave data by 0 values	6
normalize()	tuneR	Rescales the range of values	6
noSilence()	tuneR	Cuts off silence from a Wave object	6
panorama()	tuneR	Narrows the panorama of a stereo sample	6
pastew()	seewave	Pastes a time wave to another one	6
prepComb()	tuneR	Prepares the combination/concatenation of Wave objects	6
repw()	seewave	Repeats a time wave	6
resamp()	seewave	Resamples a time wave	6
rmoffset()	seewave	Removes the offset of a time wave	6
stereo()	tuneR	Converts (extracts, joins) stereo to mono and vice versa	6
zapsilw()	seewave	Zaps silence periods of a time wave	6
Time/amplitude			
acoustat()	seewave	Statistics on time and frequency STFT contours	11
ama()	seewave	Amplitude modulation analysis of a time wave	8
corenv()	seewave	Cross-correlation between two time wave envelopes	17
crest()	seewave	Crest factor	7
discrets()	seewave	Discretization of a numeric (time) series	10
drawenv()	seewave	Draws the amplitude envelope of a time wave	15
dynoscillo()	seewave	Dynamic oscillogram	5
env()	seewave	Amplitude envelope of a time wave	5
oscillo()	seewave	Shows a time wave as an oscillogram	5
oscilloST()	seewave	Shows a stereo time wave as oscillograms	6
phaseplot()	seewave	First, second, and third derivatives of a wave	10
phaseplot2()	seewave	Phase portrait of a wave	10
powertrack()	seewave	Creates a power track for a sound	5
roughness()	seewave	Roughness of a curve (a time wave or a spectrum)	10
rugo()	seewave	Rugosity of a time wave or time series	10
segment()	soundgen	Segments a sound	8
setenv()	seewave	Sets the amplitude envelope of a time wave to another one	15

(continued)

Name	Package	Description	Chapter
timer()	seewave	Time measurements of a time wave	8
th()	seewave	Temporal entropy	16
Frequency			
bark2hz()	tuneR	Frequency scale conversion	9
bwfilter()	seewave	Butterworth frequency filter	14
ceps()	seewave	Cepstrum or real cepstrum	10
coh()	seewave	Coherence between two time waves	17
comb filter()	seewave	Combfilter	14
corspec()	seewave	Cross-correlation between two frequency spectra	17
cutspec()	seewave	Cuts a frequency spectrum	10
diffcumspec()	seewave	Difference between two cumulative frequency spectra	16
diffspec()	seewave	Difference between two frequency spectra	16
drawfilter()	seewave	Draws the frequency response of a filter	14
fbands()	seewave	Frequency band plot (equalizer plot)	10
FF()	tuneR	Estimation of fundamental frequencies from a Wspec object	13
FFpure()	tuneR	Estimation of fundamental frequencies from a Wspec object	13
ffilter()	seewave	Frequency filter	14
fma()	seewave	Frequency modulation analysis	13
fpeaks()	seewave	Frequency peak detection	10
ftwindow()	seewave	Fourier transform windows	9
fund()	seewave	Fundamental frequency	10
H()	seewave	Total entropy	16
hz2bark()	tuneR	Frequency scale conversion	9
hz2mel()	tuneR	Frequency scale conversion	9
HzToSemitones()	soundgen	Convert Hz to semitones	9
ifreq()	seewave	Instantaneous frequency	13
itakura.dist()	seewave	Itakura-Saito distance	16
kl.dist()	seewave	Kullback-Leibler distance	16
ks.dist()	seewave	Kolmogorov-Smirnov distance	16
lifter()	tuneR	Liftering of cepstra	12
localpeaks()	seewave	Local maximum frequency peak detection	10
logspec.dist()	seewave	Log-spectral distance	16
meanspec()	seewave	Mean frequency spectrum of a time wave	11
mel()	seewave	Hertz/Mel conversion	9
mel2hz()	tuneR	Frequency scale conversion	9
melfcc()	tuneR	MFCC calculation	12
melfilterbank()	seewave	Mel-frequency filter bank	12
notesDict()	soundgen	Conversion table from Hz to semitones above C0 to musical notation	9
notefreq()	seewave	Frequency of a musical note	9

(continued)

Name	Package	Description	Chapter
noteFromFF()	tuneR	Derives notes from frequencies	10
periodogram()	tuneR	Periodogram (spectral density) estimation on Wave objects	10
preemphasis()	seewave	Preemphasis frequency filter	14
Q()	seewave	Resonance quality factor of a frequency spectrum	10
roughness()	seewave	Roughness of a curve (a time wave or a spectrum)	10
SAX()	seewave	Symbolic aggregate approximation	10
sfm()	seewave	Spectral flatness measure	10
sh()	seewave	Spectral entropy	10
semitonesToHz()	soundgen	Convert semitones to Hz	9
simspec()	seewave	Similarity between two frequency spectra	16
soundscapespec()	seewave	Soundscape frequency spectrum of a time wave	11
spec2cep()	tuneR	Spectra to cepstra conversion	12
spec()	seewave	Frequency spectrum of a time wave	10
specan()	warbleR	Measures acoustic parameters in batches of sound files	10
specprop()	seewave	Spectral properties	10
squarefilter()	seewave	Frequency response of a square filter	14
symba()	seewave	Symbol analysis	10
zcr()	seewave	Zero-crossing rate	13
Time/frequency			
acoustat()	seewave	Statistics on time and frequency STFT contours	11
analyze()	soundgen	Analyzes sound	13
audspec()	tuneR	Frequency band conversion	12
autoc()	seewave	Short-time autocorrelation of a time wave	13
batchBinMatch	monitoR	Batch template detection	17
batchCorMatch	monitoR	Batch template detection	17
binMatch	monitoR	Calculates spectrogram template matching scores	17
ccoh()	seewave	Continuous coherence function between two time waves	17
combineBinTemplates	monitoR	Combines acoustic template lists	17
combineCorTemplates	monitoR	Combines acoustic template lists	17
corMatch	monitoR	Calculates spectrogram template matching scores	17
covspectro()	seewave	Covariance between two spectrograms	17
deltas()	tuneR	Calculates delta MFCC features	12
dfDTW()	warbleR	Dynamic time warping on dominant frequency contours	17
dfreq()	seewave	Dominant frequency of a time wave	13

(continued)

Name	Package	Description	Chapter
dynspec()	seewave	Dynamic sliding spectrum	11
dynspectro()	seewave	Dynamic sliding spectrogram	11
eventEval	monitoR	Evaluates detected events with known event sources and times	17
ffDTW()	warbleR	Dynamic time warping on fundamental frequency contours	17
ffilter()	seewave	Frequency filter	14
findformants()	phonTools	Finds formants given a sound or set of LPC coefficients	12
findPeaks()	monitoR	Finds score peaks and detections in a templateScores object	17
formanttrack()	phonTools	Creates a formant track for a sound	13
ftwindow()	seewave	Fourier transform windows	9
fund()	seewave	Fundamental frequency	10
getPeaks()	monitoR	Extracts detections or peaks from a detectionList object	17
hilbert()	seewave	Hilbert transform and analytic signal	13
ifreq()	seewave	Instantaneous frequency	13
istft()	seewave	Inverse of the short-time Fourier transform	11
lpc()	phonTools	Predicts autoregressive filter coefficients	12
lspec()	warbleR	Creates long spectrograms of whole sound files	11
makeBinTemplate()	monitoR	Makes an acoustic template	17
makeCorTemplate()	monitoR	Makes an acoustic template	17
manualoc()	warbleR	Interactive view of spectrograms	11
manualoc.df()	warbleR	Data frame of manualoc() selections	11
meanspec()	seewave	Mean frequency spectrum of a time wave	11
melodyplot()	tuneR	Plots a melody	13
powspec()	tuneR	Power spectrum	11
periodogram()	tuneR	Periodogram (spectral density) estimation on Wave objects	11
pitchtrack()	phonTools	Creates a pitch (fundamental frequency) track for a sound	13
readBinTemplates()	monitoR	Reads acoustic templates from a local disk	17
readCorTemplates()	monitoR	Reads acoustic templates from a local disk	17
showPeaks()	monitoR	Views or verifies detections or peaks	17
spectro()	seewave	2D spectrogram of a time wave	11
spectrogram()	phonTools	Creates and displays spectrograms	11
spectrogram()	soundgen	Spectrogram	11
spectro3D()	seewave	3D-spectrogram of a time wave	11
stft.ext()	seewave	Short-time Fourier transform using external C libraries	11

(continued)

Name	Package	Description	Chapter
templateCutoff()	monitoR	Queries or sets template cutoffs	17
timeAlign()	monitoR	Condenses detections or peaks from multiple templates	17
viewSpec()	monitoR	Interactively views and annotates spectrograms	11
wf()	seewave	Waterfall display	11
TKEO()	seewave	Teager-Kaiser energy operator	13
zc()	seewave	Instantaneous frequency of a time wave by zero crossing	13
Indices			
ACI()	seewave	Acoustic complexity index	16
acoustic_complexity()	soundecology	Acoustic complexity index	16
acoustic_diversity()	soundecology	Acoustic diversity index	16
acoustic_evenness()	soundecology	Acoustic evenness index	16
AR()	seewave	Acoustic richness index	16
bioacoustic_index()	soundecology	Bioacoustic index	16
diffcumspec()	seewave	Difference between two cumulative frequency spectra	16
diffspec()	seewave	Difference between two frequency spectra	16
fpeaks()	seewave	Frequency peaks detection	10
H()	seewave	Total entropy	16
itakura.dist()	seewave	Itakura-Saito distance	16
kl.dist()	seewave	Kullback-Leibler distance	16
ks.dist()	seewave	Kolmogorov-Smirnov distance	16
logspec.dist()	seewave	Log-spectral distance	16
M()	seewave	Amplitude index	16
multiple_sounds()	soundecology	Multiple sound files	16
ndsi()	soundecology	Normalized difference soundscape index	16
NDSI()	seewave	Normalized difference soundscape index	16
roughness()	seewave	Roughness of a curve (a time wave or a spectrum)	10
SAX()	seewave	Symbolic aggregate approximation	10
sfm()	seewave	Spectral flatness measure	10
sh()	seewave	Spectral entropy	16
simspec()	seewave	Similarity between two frequency spectra	16
th()	seewave	Temporal entropy	16
Filters and modifications			
afilter()	seewave	Amplitude filter	15
bwfilter()	seewave	Butterworth frequency filter	14
echo()	seewave	Echo generator	15

(continued)

Name	Package	Description	Chapter
fadew()	seewave	Fade in and fade out of a time wave	6
fir()	seewave	Finite impulse response filter	14
lfs()	seewave	Linear frequency shift	15
preemphasis()	seewave	Preemphasis frequency filter	14
revw()	seewave	Time reverse of a time wave	6
rmam()	seewave	Removes the amplitude modulations of a time wave	15
rmnoise()	seewave	Removes Gaussian noise	14
rmoffset()	seewave	Removes the offset of a time wave	6
Synthesis			
chirp()	signal	Creates a chirp signal	18
getRolloff()	soundgen	Controls roll-off of harmonics	18
noise()	tuneR	Creates Wave objects of special waveforms	18
noisew()	seewave	Generates noise	18
pulsew()	seewave	Generates rectangle pulse	18
sawtooth()	tuneR	Creates Wave objects of special waveforms	18
silence()	tuneR	Creates Wave objects of special waveforms	18
sine()	tuneR	Creates Wave objects of special waveforms	18
square()	tuneR	Creates Wave objects of special waveforms	18
soundgen()	soundgen	Generates a sound	18
soundgen_app()	soundgen	soundgen shiny app	18
synth()	seewave	Synthesis of time wave (additive model)	18
synth2()	seewave	Synthesis of time wave (tonal model)	18
vowelsynth()	phonTools	Creates synthetic vowels using a cascade formant synthesizer	18
Extra			
attenuation()	seewave	Generates sound intensity attenuation data	7
convSPL()	seewave	Converts sound pressure level in other units	7
dBscale()	seewave	dB color scale for a spectrogram display	11
dBweight()	seewave	dB weightings	7
meandB()	seewave	Mean of dB values	7
micsens()	seewave	Microphone sensitivity	7
moredB()	seewave	Addition of dB values	7
notenames()	tuneR	Generates note names from numbers	9
octaves()	seewave	Octaves series	9
quantMerge()	tuneR	Quantization of notes to produce sheet music	13
quantize()	tuneR	Quantization of notes to produce sheet music	13
quantplot()	tuneR	Plots the quantization of a melody	13
rms()	seewave	Root mean square	7
songmeter()	seewave	Reads and interprets songmeter file name	4

Appendix B
Sound Samples

Here are information of the sounds used as samples, or examples. Several sounds were very kindly provided by colleagues.

Name: `bat`
Data source: file 'Pipistrellus_kuhlii.wav'
Description: one call of the European bat *Pipistrellus kuhlii*
Author: Jean-François Julien
Location: Cournonterral, France
Properties:

```
Wave Object
Number of Samples:      3841
Duration (seconds):     0.02
Samplingrate (Hertz):   192000
Channels (Mono/Stereo): Mono
PCM (integer format):   TRUE
Bit (8/16/24/32/64):    16
```

Name: `cockroach`
Data source: file 'Elliptorhina_chopardi.wav'
Description: one male courtship call of the hissing cockroach from Madagascar *Elliptorhina chopardi*
Author: Jérôme Sueur
Location: laboratory, Orsay, France
Properties:

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https://doi.org/10.1007/978-3-319-77647-7

```
Wave Object
Number of Samples:      19137
Duration (seconds):     0.43
Samplingrate (Hertz):   44100
Channels (Mono/Stereo): Mono
PCM (integer format):   TRUE
Bit (8/16/24/32/64):    16
```

Name: `elephant`
Data source: file 'Loxodonta_africana.wav'
Description: eight sounds used in Gilbert et al. (2014, figures 2–3). Sounds 1–4 were produced produced with a 3 m hose pipe. Sounds 1 and 2 are low-amplitude, "non-brassy" sounds produced with a low-intensity source. Sounds 3 and 4 are high-amplitude, "brassy" sounds produced with a high (increasing)-intensity source. Sounds 5–8 are trumpet calls recorded from a 20-year-old female African elephant. Sounds 5 and 6 are low-amplitude, "non-brassy" trumpet calls. Sounds 7 and 8 are high-amplitude trumpet calls.
Author: Joël Gilbert
Location: Beauval Zoo, Saint-Aignan, France for the elephant trumpet calls
Properties:

```
Wave Object
Number of Samples:      366706
Duration (seconds):     8.32
Samplingrate (Hertz):   44100
Channels (Mono/Stereo): Mono
PCM (integer format):   TRUE
Bit (8/16/24/32/64):    16
```

Name: `face`
Data source: file 'synth-face.wav'
Description: a synthetic sound made of various items modulated in amplitude and frequency. The sound was created with the code detailed in Sect. 18.6.3.2.
Author: Jérôme Sueur
Location: *in silico*
Properties:

```
Wave Object
Number of Samples:      44100
Duration (seconds):     1
Samplingrate (Hertz):   44100
Channels (Mono/Stereo): Mono
PCM (integer format):   TRUE
Bit (8/16/24/32/64):    32
```

Name: `femo`
Data source: file 'Allobates_femoralis.wav'
Description: four vocalizations of the South-American dart poison frog *Allobates femoralis*
Author: Jérôme Sueur
Location: Kaw, Guiana, France
Properties:

```
Wave Object
Number of Samples:      61740
Duration (seconds):     1.4
Samplingrate (Hertz):   44100
Channels (Mono/Stereo): Mono
PCM (integer format):   TRUE
Bit (8/16/24/32/64):    16
```

Name: `femo`
Data source: file 'Allobates_femoralis_2015-11-10_161500_GFT.wav'
Description: 28 vocalizations of the South-American dart poison frog *Allobates femoralis*
Author: Jérôme Sueur
Location: Location: Kaw, Guiana, France
Properties:

```
Wave Object
Number of Samples:      1323000
Duration (seconds):     30
Samplingrate (Hertz):   44100
Channels (Mono/Stereo): Mono
PCM (integer format):   TRUE
Bit (8/16/24/32/64):    16
```

Name: `forest`
Data source: file 'forest.wav'
Description: one minute of soundscape recording in the tropical forest during the first part of the night
Author: Jérôme Sueur
Location: Kaw, Guiana, France
Properties:

```
Wave Object
Number of Samples:      2646000
Duration (seconds):     60
```

(continued)

```
Samplingrate (Hertz):   44100
Channels (Mono/Stereo): Mono
PCM (integer format):   TRUE
Bit (8/16/24/32/64):    16
```

Name: `frog`
Data source: file 'Eleutherodactylus_martinicensis.wav'
Description: 17 two-note vocalizations of the Martinique Robber frog *Eleutherodactyus martinicenis*
Author: Renaud Boistel
Location: Lesser Antilles, France
Properties:

```
Wave Object
Number of Samples:      316602
Duration (seconds):     19.79
Samplingrate (Hertz):   16000
Channels (Mono/Stereo): Mono
PCM (integer format):   TRUE
Bit (8/16/24/32/64):    16
```

Name: `guiana`
Data source: files
'M-XV_20101125_000000.wav', 'M-XV_20101125_010000.wav',
'M-XV_20101125_020000.wav' 'M-XV_20101125_030000.wav',
'M-XV_20101125_040000.wav' 'M-XV_20101125_050000.wav',
'M-XV_20101125_060000.wav', 'M-XV_20101125_070000.wav',
'M-XV_20101125_080000.wav', 'M-XV_20101125_090000.wav',
'M-XV_20101125_100000.wav', 'M-XV_20101125_110000.wav',
'M-XV_20101125_120000.wav', 'M-XV_20101125_130000.wav',
'M-XV_20101125_140000.wav', 'M-XV_20101125_150000.wav',
'M-XV_20101125_160000.wav', 'M-XV_20101125_170000.wav',
'M-XV_20101125_180000.wav', 'M-XV_20101125_190000.wav',
'M-XV_20101125_200000.wav' 'M-XV_20101125_210000.wav',
'M-XV_20101125_220000.wav', 'M-XV_20101125_230000.wav'
Description: 24 stereo files recorded in the tropical forest in French Guiana every hour from 00:00 to 23:00 on the 25 November 2010
Author: Amandine Gasc and Jérôme Sueur
Location: Nouragues, Guiana, France
Properties: first file

```
Wave Object
Number of Samples:      2646016
Duration (seconds):     60
Samplingrate (Hertz):   44100
Channels (Mono/Stereo): Stereo
PCM (integer format):   TRUE
Bit (8/16/24/32/64):    16
```

Name: `hello`
Data source: file 'hello.wav'
Description: English word "hello" said by a 7-year old French native girl
Author: Jérôme Sueur
Location: Paris, France
Properties:

```
Wave Object
Number of Samples:      38400
Duration (seconds):     0.8
Samplingrate (Hertz):   48000
Channels (Mono/Stereo): Mono
PCM (integer format):   TRUE
Bit (8/16/24/32/64):    16
```

Name: `noise`
Data source: file 'noise.wav'
Description: a white noise broadcast by a low-quality loudspeaker and recorded with a high-quality microphone in an anechoic chamber.
Author: Diego Llusia
Location: Paris, France
Properties:

```
Wave Object
Number of Samples:      44100
Duration (seconds):     1
Samplingrate (Hertz):   44100
Channels (Mono/Stereo): Mono
PCM (integer format):   TRUE
Bit (8/16/24/32/64):    16
```

Name: `peewit`
Data source: `seewave` accompanying data
Description: song emitted by a peewit (lapwing) male *Vanellus vanellus*
Author: Thierry Aubin
Location: France
Properties:

```
Wave Object
Number of Samples:      15561
Duration (seconds):     0.71
Samplingrate (Hertz):   22050
Channels (Mono/Stereo): Mono
PCM (integer format):   TRUE
Bit (8/16/24/32/64):    16
```

Name: `pellucens`
Data source: `seewave` accompanying data
Description: two stridulations of the Italian tree cricket *Oecanthus pellucens*
Author: Jérôme Sueur
Location: Brain-sur-Allonnes, France
Properties:

```
Wave Object
Number of Samples:      36476
Duration (seconds):     3.31
Samplingrate (Hertz):   11025
Channels (Mono/Stereo): Mono
PCM (integer format):   TRUE
Bit (8/16/24/32/64):    16
```

Name: `sheep`
Data source: `seewave` accompanying data
Description: a single bleat of the Préalpes-du-Sud *Ovis aries*
Author: Frédéric Sèbe
Location: Brouessy, France
Properties:

```
Wave Object
Number of Samples:      19764
Duration (seconds):     2.47
Samplingrate (Hertz):   8000
```

(continued)

```
Channels (Mono/Stereo): Mono
PCM (integer format):   TRUE
Bit (8/16/24/32/64):    16
```

Name: `tico`
Data source: `seewave` accompanying data
Description: four notes of the rufous-collared sparrow *Zonotrichia capensis*
Author: Thierry Aubin
Location: Brazil
Properties:

```
Wave Object
Number of Samples:      39578
Duration (seconds):     1.79
Samplingrate (Hertz):   22050
Channels (Mono/Stereo): Mono
PCM (integer format):   TRUE
Bit (8/16/24/32/64):    16
```

Name: `theremin`
Data source: recording freely accessible at
https://www.freesound.org/people/realtheremin/sounds/119007/
Description: a frequency-modulated sound produced by a theremin, an electronic instrument
Author: –
Location: –
Properties:

```
Wave Object
Number of Samples:      626176
Duration (seconds):     14.2
Samplingrate (Hertz):   44100
Channels (Mono/Stereo): Mono
PCM (integer format):   TRUE
Bit (8/16/24/32/64):    16
```

Name: `toad`
Data source: file 'Alytes_obstetricans.wav'
Description: four single-note vocalizations of the European midwife toad *Alytes*

obstetricans with important background noise due to wind and nocturnal insects (Orthoptera)
Author: Jérôme Sueur
Location: Badefols-sur-Dordogne, France
Properties:

```
Wave Object
Number of Samples:      264000
Duration (seconds):     5.5
Samplingrate (Hertz):   48000
Channels (Mono/Stereo): Mono
PCM (integer format):   TRUE
Bit (8/16/24/32/64):    16
```

Name: `tuningfork`
Data source: file 'tuning-fork.wav'
Description: a synthetic 440 Hz pure tone mimicking a A-tone tuning fork. The sound was created with `synth(f=44100, d=1, cf=440, output="Wave")` Author: Jérôme Sueur
Location: *in silico*
Properties:

```
Wave Object
Number of Samples:      44100
Duration (seconds):     1
Samplingrate (Hertz):   44100
Channels (Mono/Stereo): Mono
PCM (integer format):   TRUE
Bit (8/16/24/32/64):    16
```

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J. Sueur, *Sound Analysis and Synthesis with R*, Use R!,
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Index

J. Sueur, *Sound Analysis and Synthesis with R*, Use R!,
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