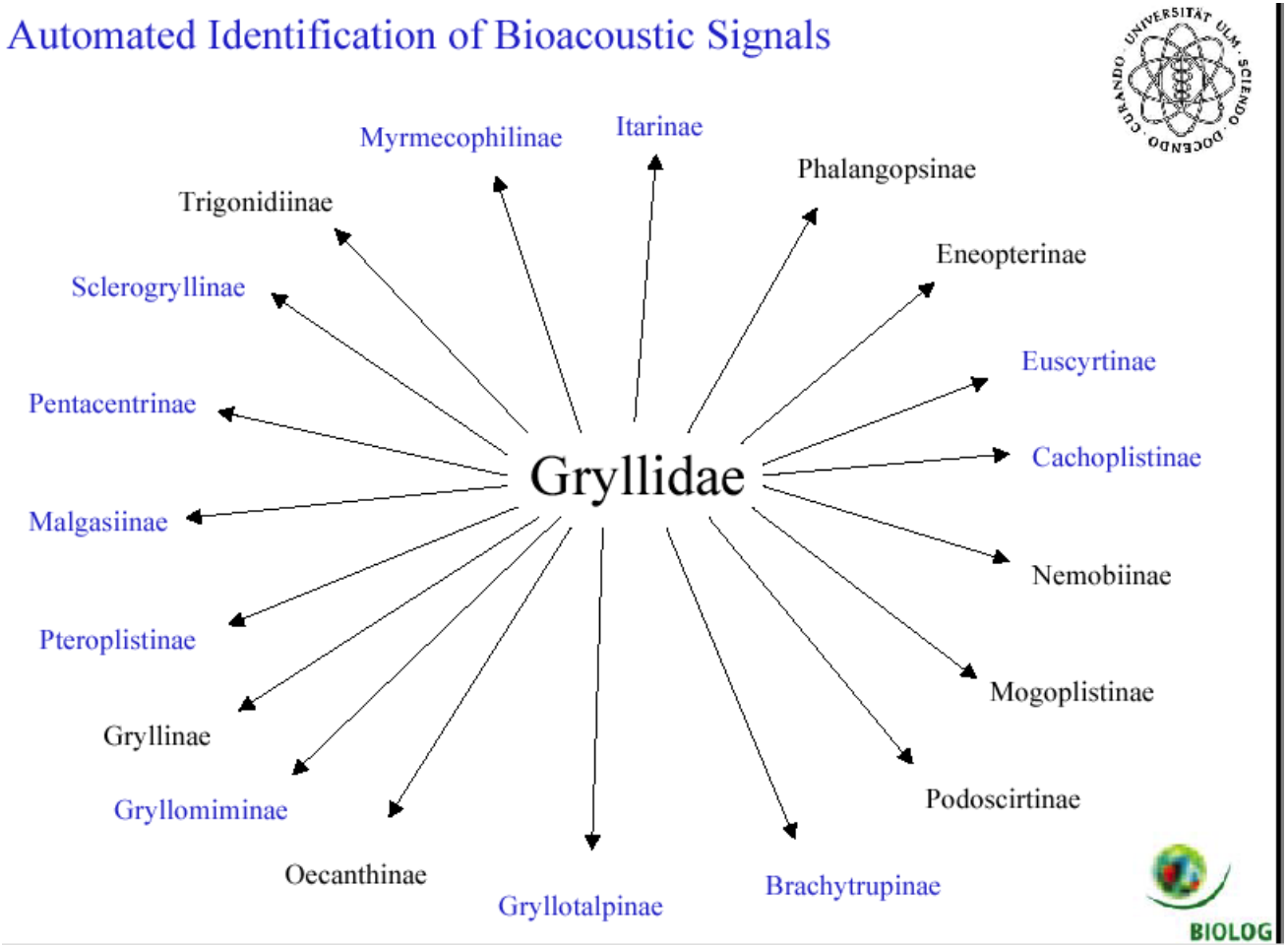
Automatised annotation of Orthopteran songs: first results from analysing the DORSA sound repository

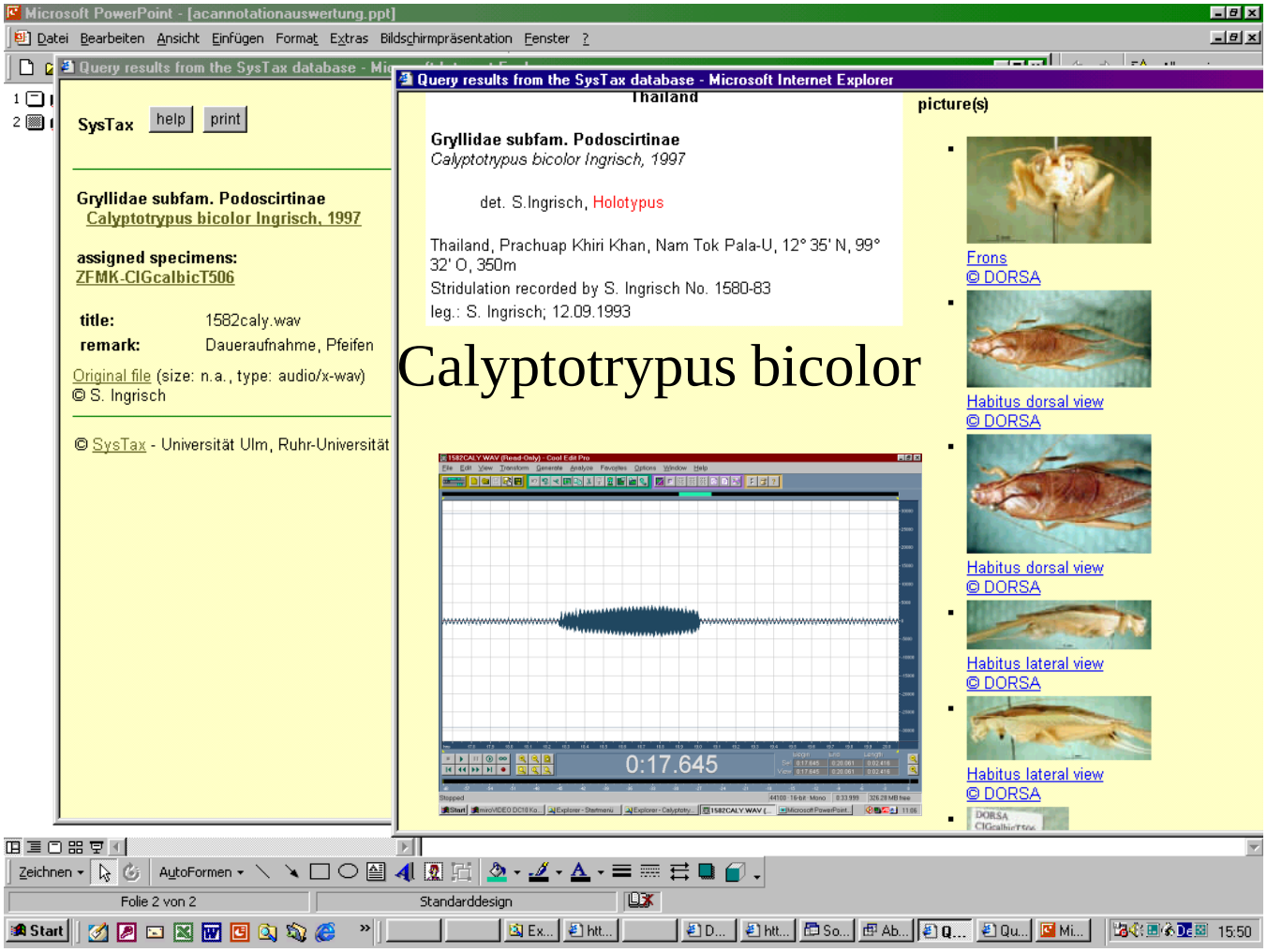
Klaus Riede

Zoologisches Forschungsinstitut &
Museum Alexander Koenig (ZFMK)
Adenauerallee 150-164
53113 Bonn, Germany

Diversity of subfamilies and signals



Automatic classification:



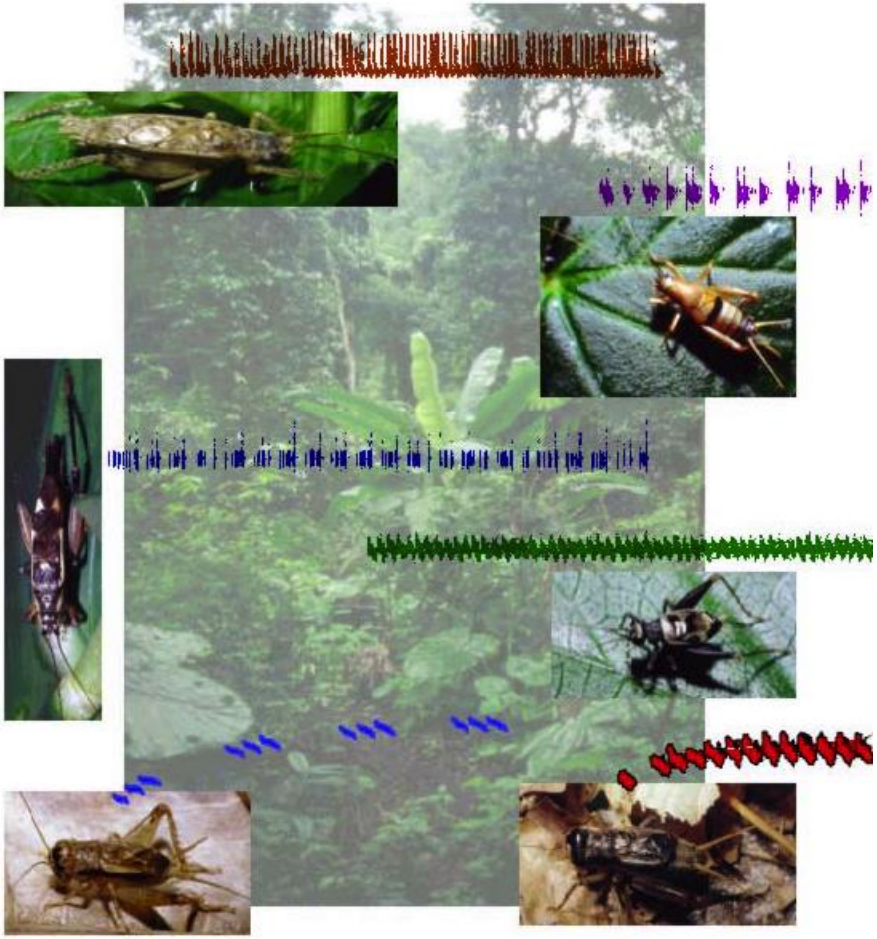
Calyptotrypus bicolor

Digital Orthoptera Specimen Access

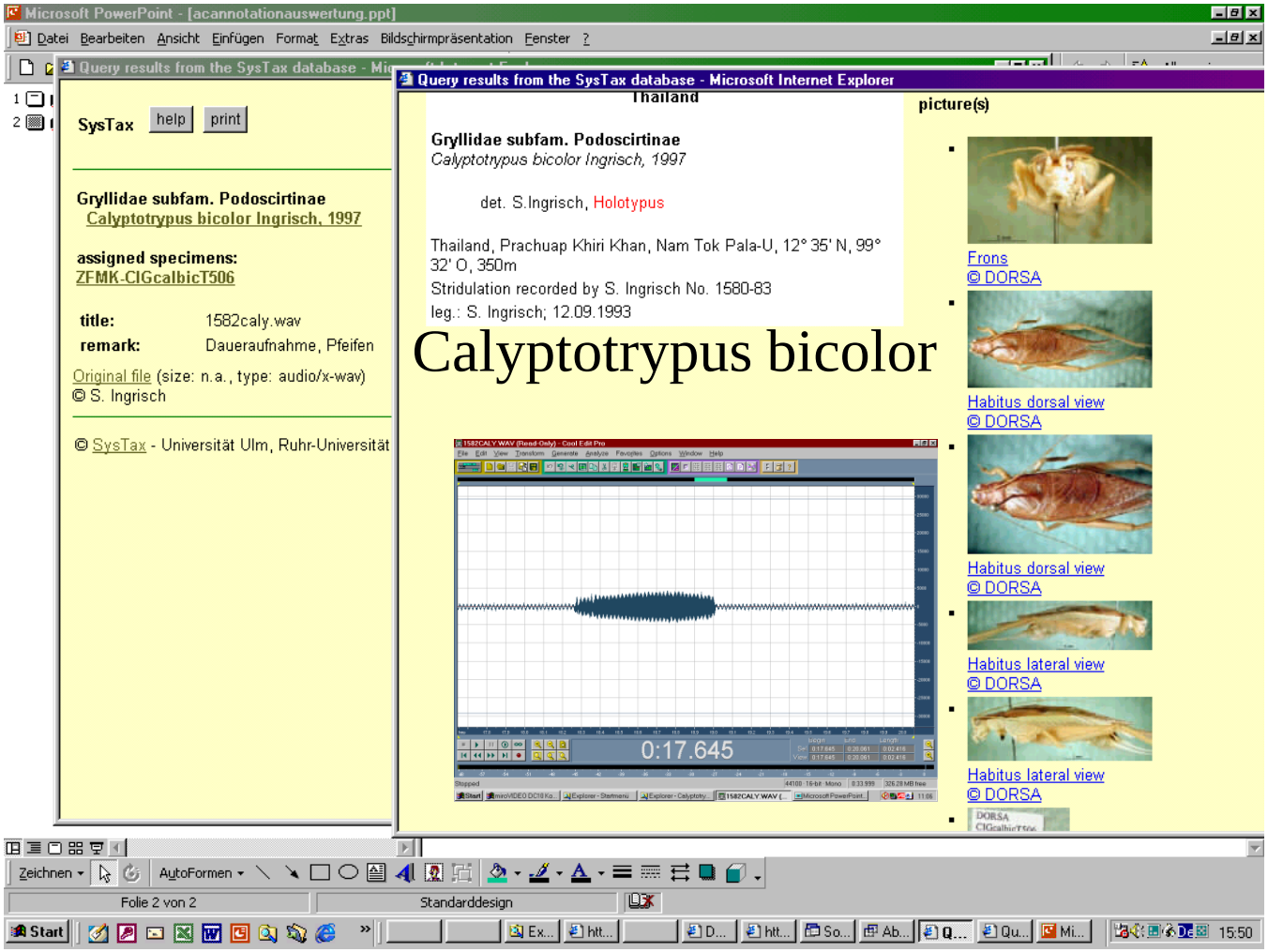
German
Orthoptera
Collections
Online

DOrSa

Deutsche
Orthoptheren
Sammlungen
Online

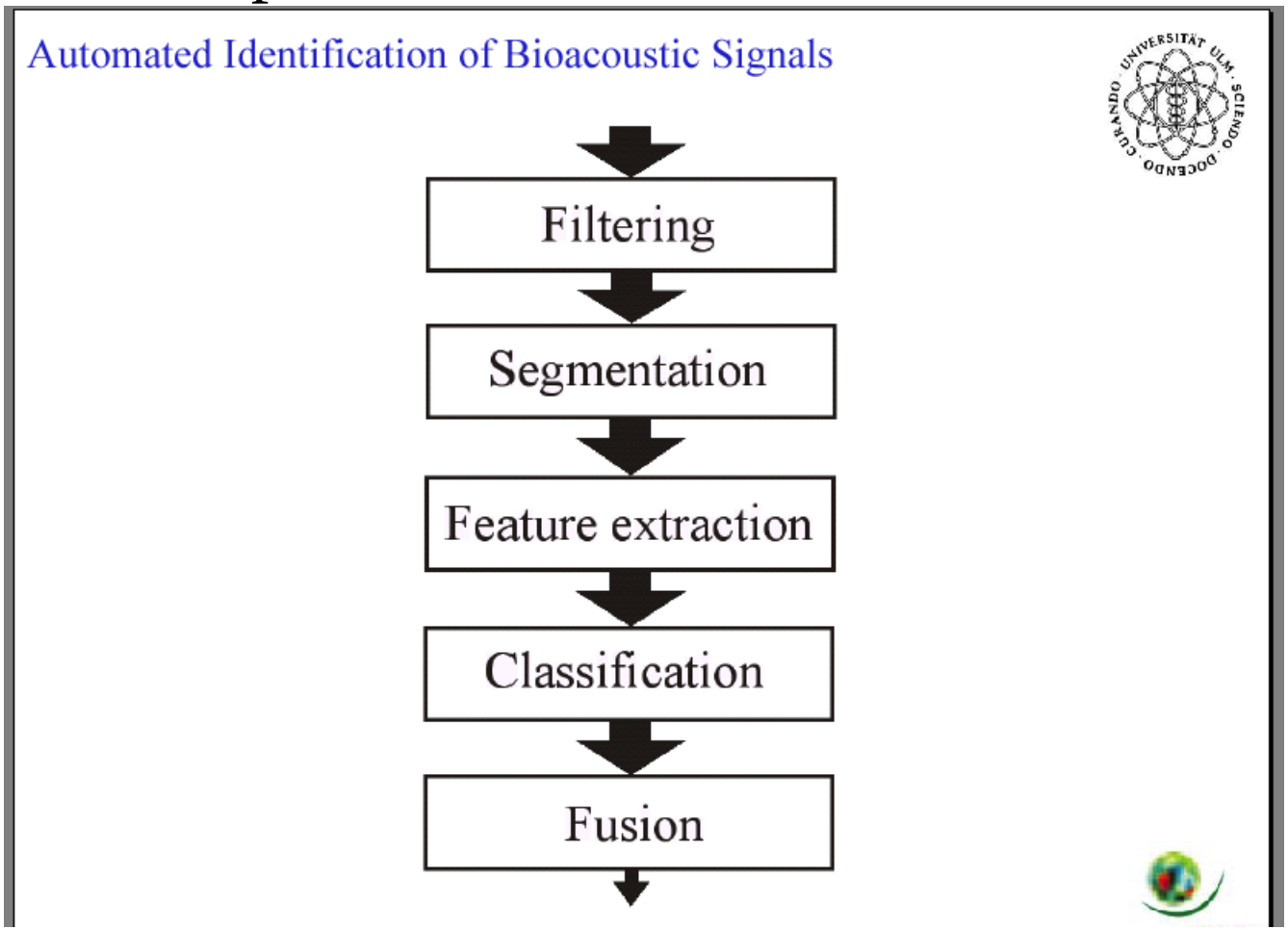


DORSA data accessible through SYSTAX and GBIF (www.gbif.org)



Calyptotrypus bicolor

Automatic Identification of cricket songs
In cooperation with:
Dept of Neuroinformatics, Ulm



Which features?

1) Pulse distance

2) Pulse length

3) Energy contour of pulses

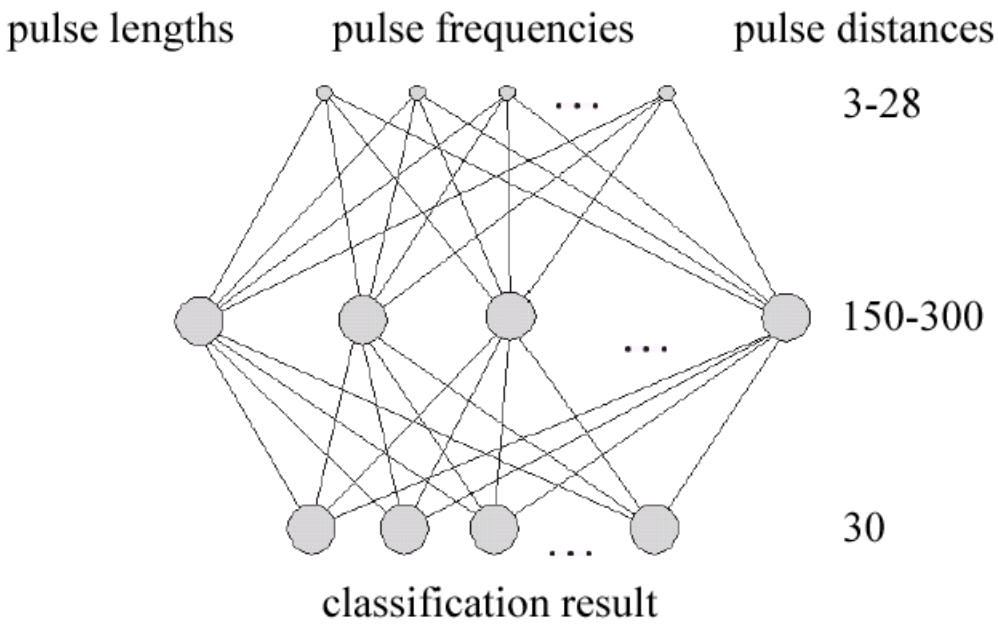
4) Frequency contour of pulses

4) Density of pulse distances

Classification by RBF-networks

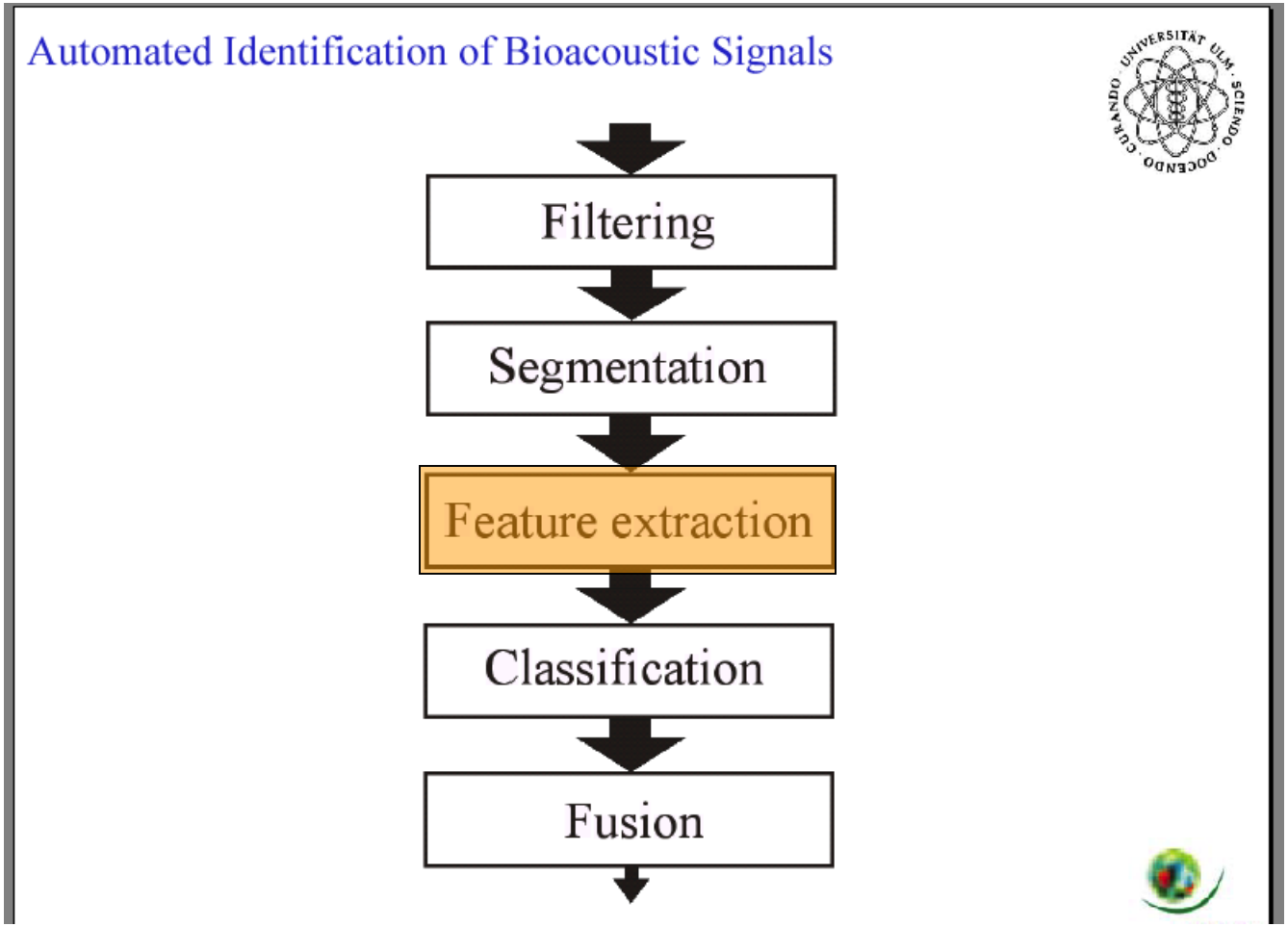
Automated Identification of Bioacoustic Signals

4. Classification by RBF-networks



G. Palm, C. Dietrich & F. Schwenker: Dept of Neuroinformatics, Ulm

Automatic Annotation

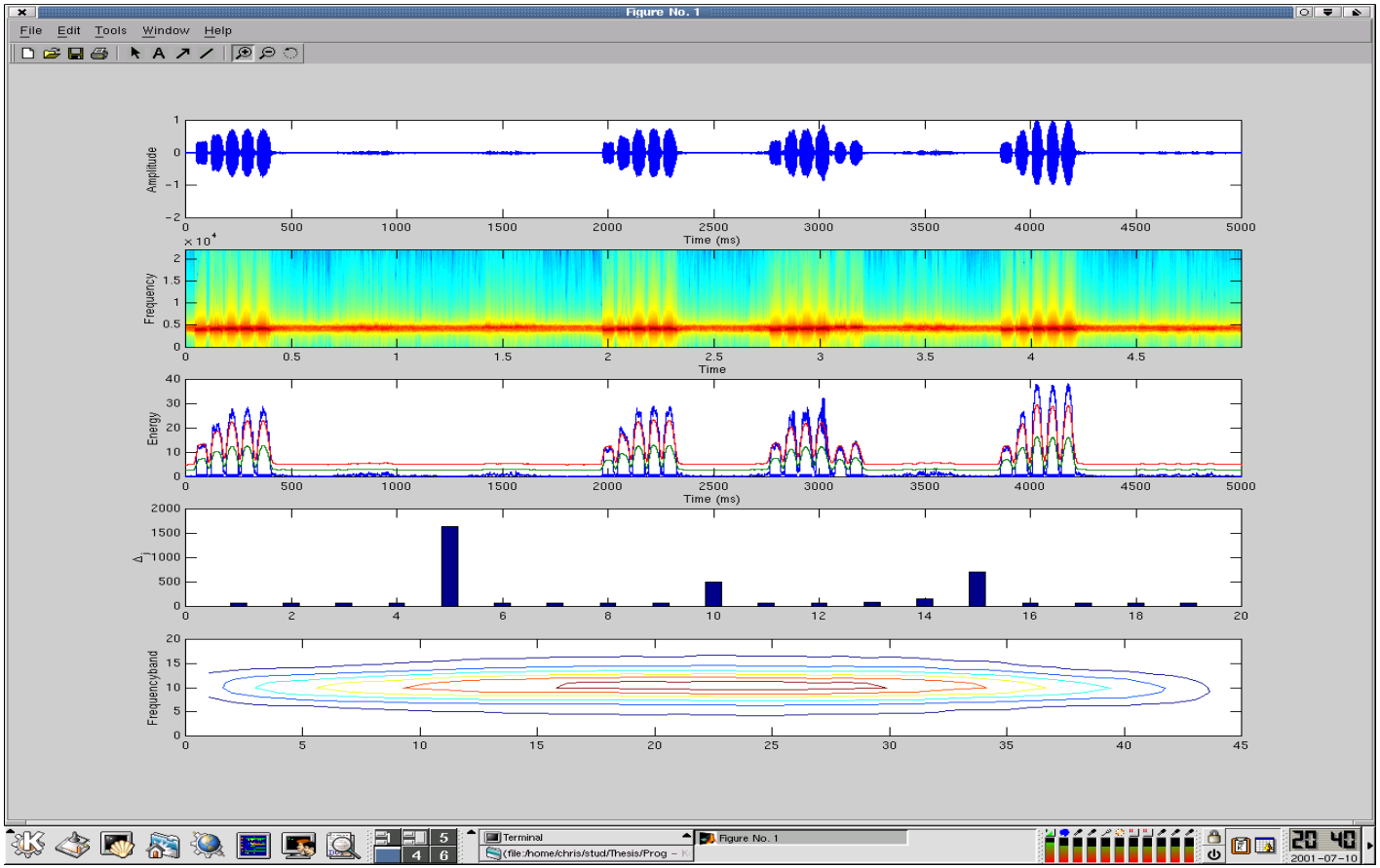


Extraction of sound parameters by using MatLab Software

Carrier frequency

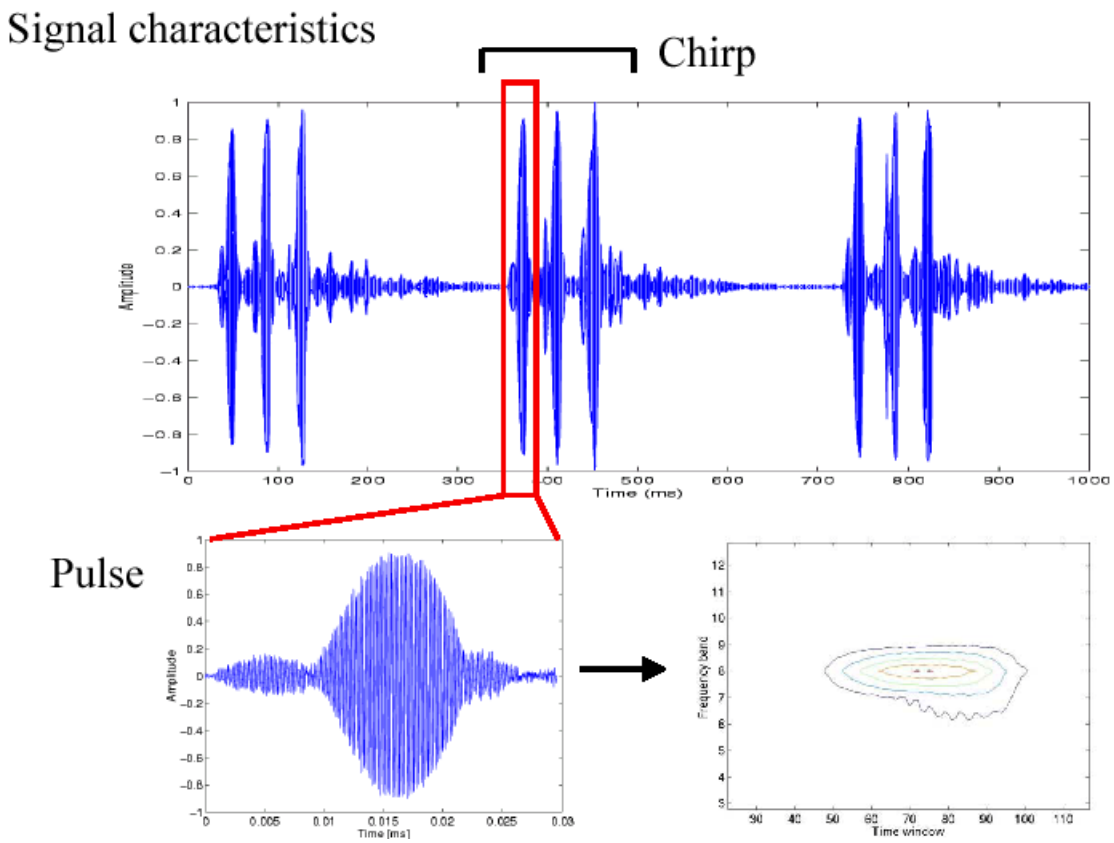
Pulse rate

Carrier frequency



In cooperation with:
Dept of Neuroinformatics, Ulm

Signal characteristics



Frequency (kHz)

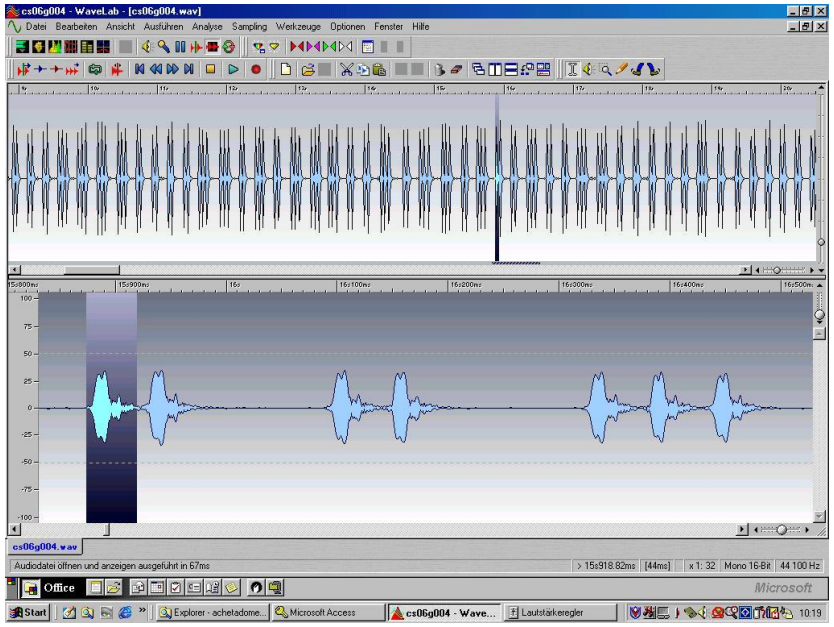
Pulse parameters (ms)

Enriched sound file table:

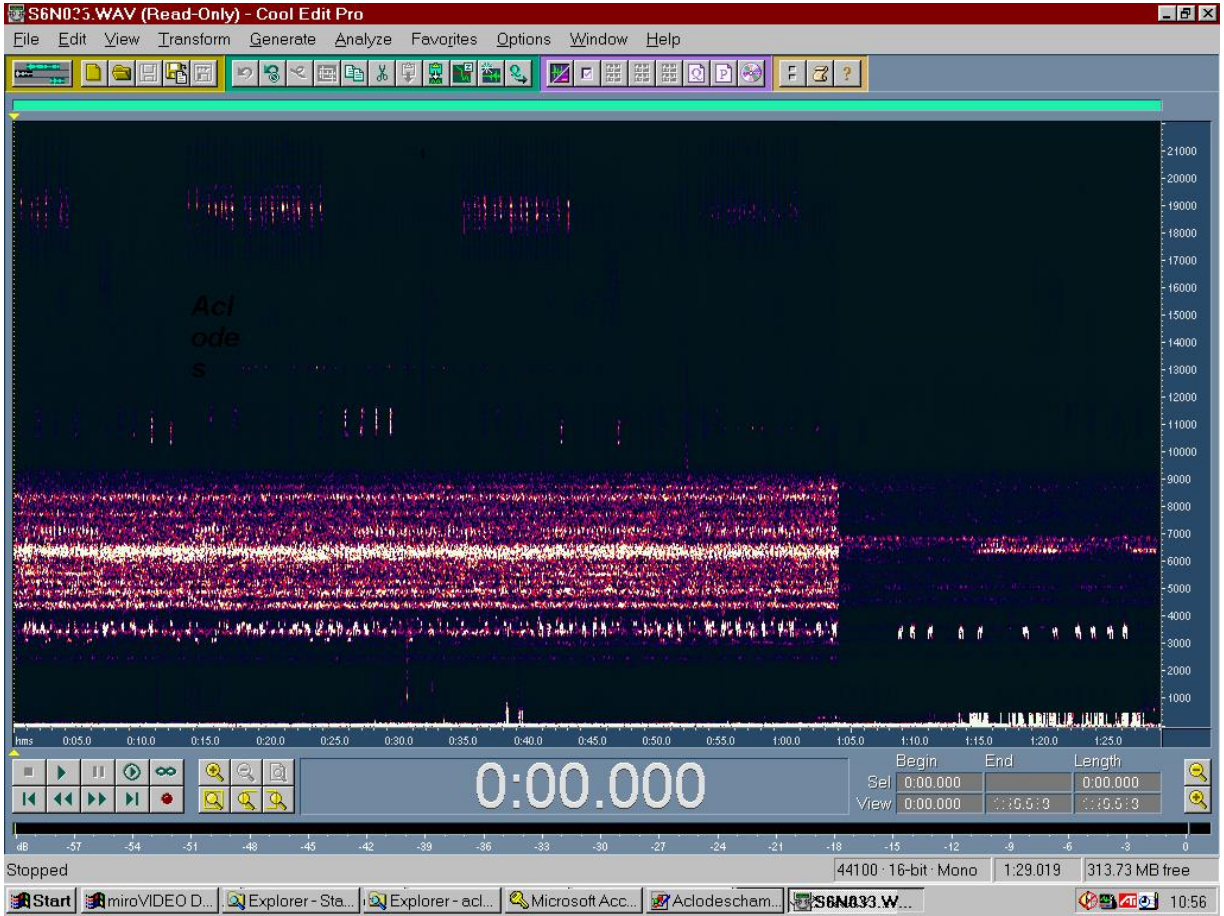
pulse distance, length, frequency etc were added to the SYSTAX table

PULSEDIS	PULSEDIS	PULSELEN	PULSELENG	DUTY_CYC	FREQUENCY	FREQUENC	FILENAME
12.5 ms	419.8	10.5 ms	2.6	0.84	7590.44 Hz	66.60	n3/tr/trigsp01/s6n023.wav
19.3 ms	94.8	7.0 ms	2.2	0.36	7593.24 Hz	63.79	n1/tr/trigsp01/s6n023.wav
18.1 ms	453.3	10.6 ms	4.7	0.59	7357.79 Hz	521.05	n3/tr/trigsp01/s6n027.wav
18.1 ms	290.4	10.3 ms	5.2	0.57	7302.54 Hz	610.23	n1/tr/trigsp01/s6n027.wav
18.1 ms	983.1	10.4 ms	3.2	0.57	7684.25 Hz	114.84	n1/tr/trigsp01/s6n027f.wav
13.2 ms	203.2	6.6 ms	3.3	0.50	7104.88 Hz	76.85	n3/tr/trigsp01/s6n029.wav
13.6 ms	79.1	12.0 ms	3.5	0.88	7128.05 Hz	78.00	n1/tr/trigsp01/s6n029.wav
11.5 ms	458.2	6.1 ms	3.1	0.53	7702.09 Hz	380.65	n3/tr/trigsp01/s6n031.wav
11.6 ms	113.8	5.7 ms	2.6	0.49	7806.72 Hz	78.67	n1/tr/trigsp01/s6n031f.wav
22.9 ms	130.4	8.4 ms	2.6	0.37	6867.13 Hz	77.54	n3/tr/trigsp01/s6n034.wav
22.9 ms	171.9	8.4 ms	2.6	0.37	6855.36 Hz	90.63	n1/tr/trigsp01/s6n034.wav
22.9 ms	126.7	8.4 ms	2.6	0.37	6855.70 Hz	102.59	n1/tr/trigsp01/s6n034f.wav
14.4 ms	114.3	11.7 ms	2.6	0.81	6672.19 Hz	53.27	n3/tr/trigsp01/s6n041.wav
14.6 ms	209.3	11.7 ms	3.2	0.80	6641.43 Hz	60.03	n1/tr/trigsp01/s6n041.wav
14.6 ms	209.3	11.7 ms	3.2	0.80	6643.62 Hz	70.45	n1/tr/trigsp01/s6n041f.wav
39.4 ms	1988.8	19.5 ms	7.3	0.49	6165.52 Hz	124.48	n3/tr/trigsp01/s6n044.wav
13.0 ms	100.7	11.0 ms	2.0	0.85	7207.58 Hz	41.06	n1/tr/trigsp01/s6n044f.wav
13.2 ms	295.5	11.0 ms	4.0	0.83	6965.09 Hz	1129.63	n3/tr/trigsp01/s6n049.wav
13.0 ms	100.0	8.5 ms	2.4	0.65	7205.56 Hz	41.95	n1/tr/trigsp01/s6n049.wav
11.5 ms	506.9	9.8 ms	2.9	0.85	7528.76 Hz	64.86	n1/tr/trigsp01/s7n008.wav
11.5 ms	82.3	10.0 ms	2.7	0.87	7545.55 Hz	51.77	n3/tr/trigsp01/s7n008.wav
11.5 ms	506.9	9.8 ms	2.9	0.85	7527.69 Hz	63.26	n1/tr/trigsp01/s7n008f.wav
13.2 ms	148.8	11.0 ms	2.7	0.83	7322.22 Hz	66.56	n3/tr/trigsp01/s7n026.wav
13.5 ms	1586.9	11.2 ms	3.7	0.83	7330.96 Hz	58.02	n1/tr/trigsp01/s7n026.wav
13.5 ms	1581.0	11.2 ms	3.7	0.83	7332.97 Hz	44.75	n1/tr/trigsp01/s7n026f.wav
17.8 ms	174.6	11.0 ms	2.9	0.62	7464.91 Hz	61.32	n3/tr/trigsp01/s7n031.wav
17.7 ms	123.3	10.4 ms	3.3	0.59	7467.31 Hz	54.61	n1/tr/trigsp01/s7n031.wav
17.7 ms	123.3	10.4 ms	3.3	0.59	7462.75 Hz	55.57	n1/tr/trigsp01/s7n031f.wav

Validation: calculated parameters were checked by manual control

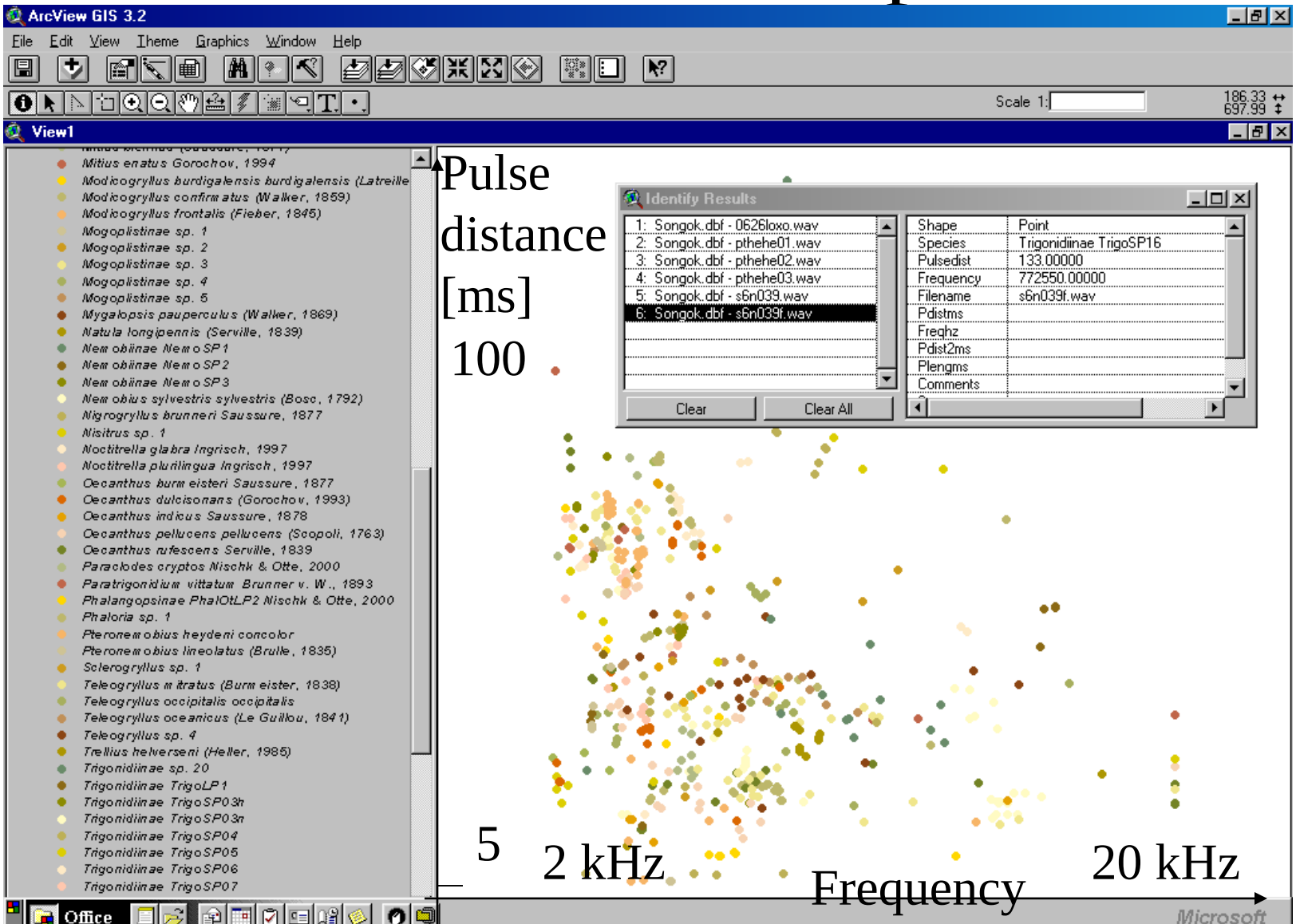


Data cleaning:
Files with outliers were checked and data removed



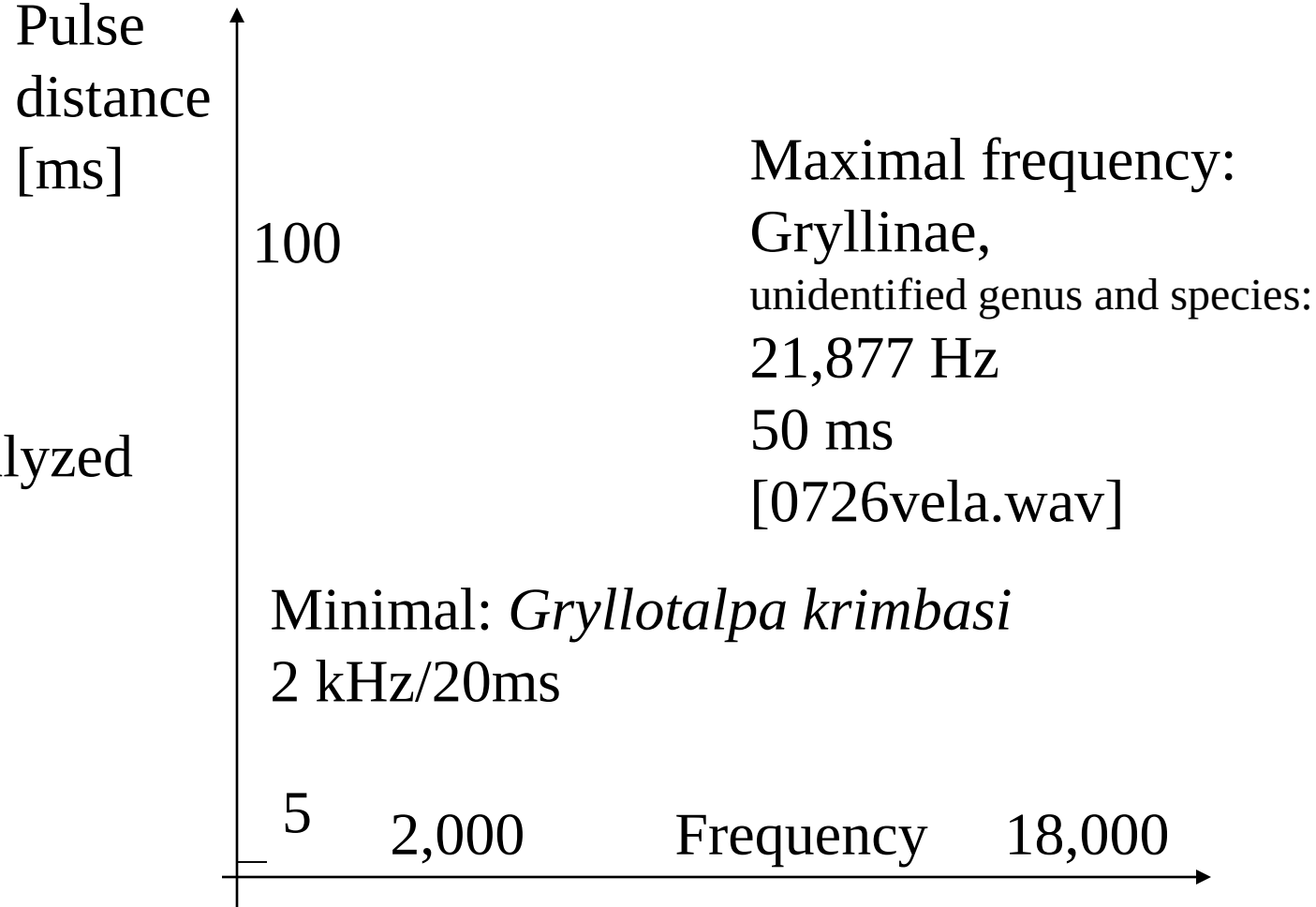
Aclodes chamamoru

Frequency - Pulse distance Parameter Space

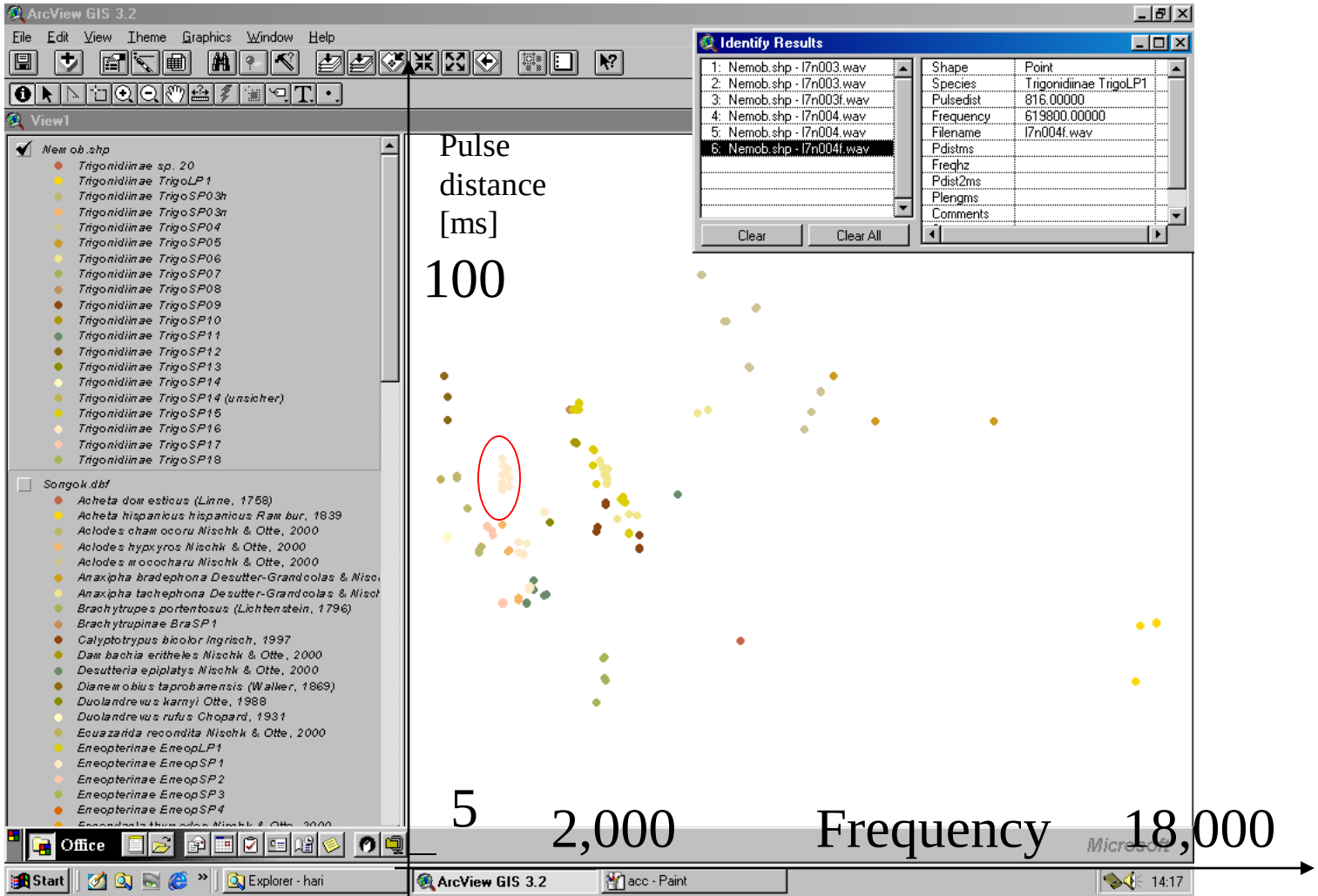


Frequency - Pulse distance Parameter Space

Data Cleaning:
Outliers were analyzed and removed



Frequency - Pulse distance
Trigoniinae subset from Ecuador



A lookup-table of characteristic sound parameters is sufficient for Acoustic Rapid Assessment, at least at certain localities.

Enriched databases containing sounds, sound parameters, specimen data including locality and species names (if available) are the pre-requisite for new, fruitful approaches!

TROPICAL ECOLOGY, ASSESSMENT, AND MONITORING INITIATIVE

Acoustic Monitoring Protocol

T. Scott Brandes, Ph.D., Postdoctoral Researcher, TEAM Initiative

The TEAM Monitoring Protocols are published by:
The Tropical Ecology, Assessment and Monitoring (TEAM) Initiative
The Center for Applied Biodiversity Science (CABS)
Conservation International

TEAM Initiative online: www.teaminitiative.org
CABS online: www.biodiversityscience.org
Conservation International online: www.conservation.org

Species recognition: the evidence through female phonotaxis

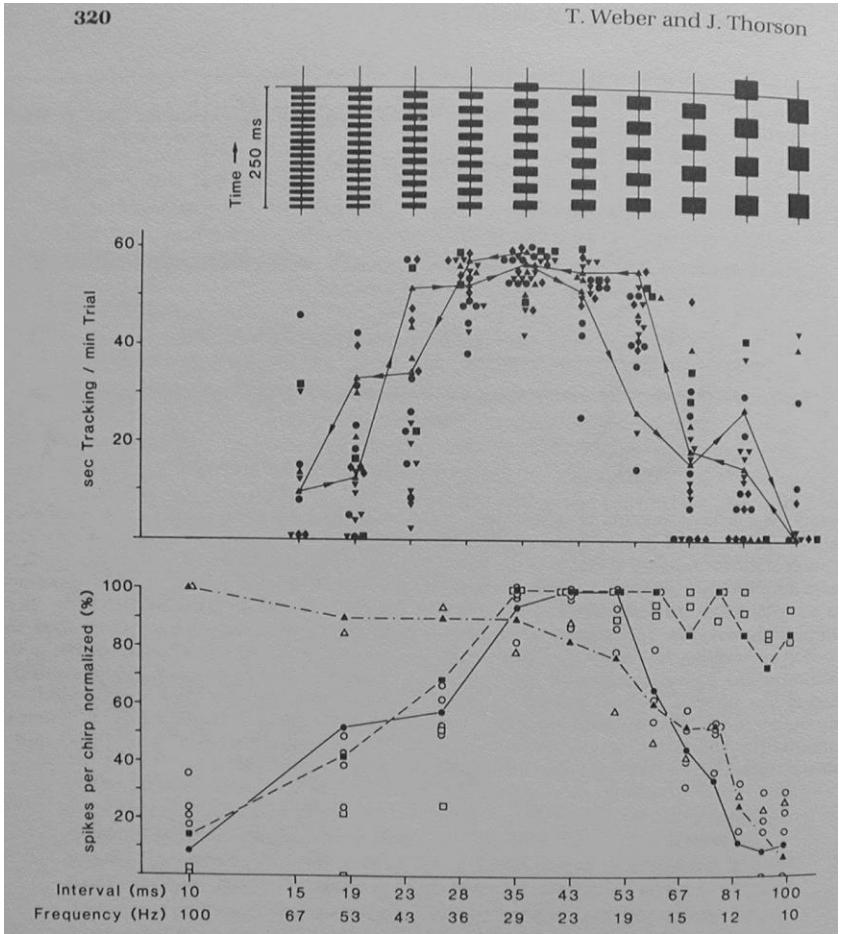


Fig. 10.6 Graphs of responses of *Gryllus* females to an experimental paradigm examining the effect on tracking behavior and on brain cell activity of different syllable repetition rates, while minimizing changes of other song features. Upper