

Recent Progress in Bioacoustic Research in Taiwan

Hin-Kiu Mok

Department of Oceanography, National Sun Yat-sen University, Kaohsiung 80424 Taiwan

Abstract

Bioacoustics is an inter-disciplinary science that links biology and physics.

Its subjects involve production, dispersion and reception in biological sounds and include the following issues: physics of sound, recording and processing of biological acoustic signal, sound characteristics, genetic basis of biological acoustic signals, proximal (physiological) cause or mechanism of vocal signal, development (innate vs. inquired) of acoustic signal, ecology (communication), ultimate cause (adaptation) of vocal signal, evolution (microevolution, natural selection, speciation, and macroevolution) of vocal signal, hearing and psychoacoustics, sound source localization, ambient noise, and applied bioacoustics.

Despite of the importance of this field, related studies conducted by biologists in the Kuroshio Region are relative few. As such, the aim of this talk is to call the audiences' attention to bioacoustics by providing information in recent bioacoustic researches in Taiwan and to establish a platform for further discussion and dialogue among the biologists in this region that might lead to future collaborations.

Key words: Bioacoustics, Taiwan, research, development

The issues dealing recently by the Taiwanese biologists are sorted according to the above issues.

Sound characteristics:

- (A). Sound archive of Taiwanese frogs: www.froghome.idv.tw.
- (B). "TAISONG" (www.taisong.org) is a sound archive supported by the Bureau of Forestry, Taiwan. This archive was created on the basis of a three-year grant (2011-2013) from the Bureau of Forestry to National Tung Hwa University, Kaohsiung Medical University, National Sun Yat-sen University and Kuroshio Ocean Education Foundation to compile (1) files of the sounds produced by Taiwanese insects, fishes, amphibians, cetaceans and (2) ecological features of these soniferous animals. The grant was completed and the archive is now maintained by Tung Hwa University.
- (C). Sounds produced by four sciaenid (or croaker) species: large yellow croaker, *Larimichthys crocea*; Yellow drum (*Nibea albiflora*); Boeseman croaker (*Boesemania microlepis*)—a collaboration between National Sun Yat-sen University and Kasetsart University, Thailand; and the silver croaker *Plagioscion squamosissimus* in Amazon River—A collaboration between Amazon Federal University,

National Sun Yat-sen University, and Virginia Commonwealth University.

- (D). Acoustic behavior of white-faced flying squirrel (*Petaurista lena*) in Guanghua village, Alishan.

Proximal cause or mechanism (physiology) of sound production:

- (A). Seasonal changes in atrophy-associated proteins of the sonic muscle in the big-snout croaker, *Johnius macrorhynchus* (Pisces, Sciaenidae).
- (B). Parvalbumin characteristics in the sonic muscle of a freshwater ornamental grunting toadfish (*Allenbatrachus grunniens*).

Sound-producing mechanism:

- (A). An Intermediate in the evolution of superfast sonic muscles.

Ecology:

- (A). Effect of urban and anthropogenic noise on birdsong (the light-vented bulbul (*Pycnonotus sinensis*)).
- (B). Territoriality and singing in bird.
- (C). Effect of neighbors on bird singing activity.
- (D). Antiphonal duetting in Steere's liocichla (*Liocichla steerii*): male song individuality and correlation between habitat and duetting behavior.

Technology:

- (A). Automatic recognition of bird songs using cepstral coefficients.
- (B). Automatic recognition of frogs sounds.
- (C). An automatic detection algorithm for extracting the representative frequency of cetacean tonal sounds.
- (D). Automatic detection and classification of cetacean tonal sounds from a long-term marine observatory.

Ambient noise:

- (A). Estimation and analysis of the underwater construction noise of the offshore wind farm in the west coast of Taiwan.

Evolution:

- (A). Song structure and microgeographic variation in a population of the grey-cheeked fluvetta (*Alcippe morrisonia*) at Shoushan Nature Park.
- (B). Acoustic signal as a taxonomic character for insects.
- (C). Acoustical adaptation to anthropogenic noise in the cicada *Cryptotympana takasagona*.
- (D). Using cross-correlation analyses to investigate the geographic variations and temporal changes in songs of the Rufous-capped babbler (*Stachyris ruficeps praecognita*) in Taiwan.
- (E). Experimental evidence that distinct song phrases in the Grey-cheeked fulvetta *Alcippe morrisonia permit* species and local dialect recognition.
- (F). Evolution of sound-producing system in Sciaenidae and Terapohntidae.

Bio-sonar:

High Duty Cycle to Low Duty Cycle: Echolocation Behaviour of the Hipposiderid Bat *Coelops frithi*.

Hearing:

Hearing in marine fish and its application in fisheries.

Applied bioacoustics:

- (A). Tidal influences on the habitat use of Indo-Pacific humpback dolphins in an estuary.
- (B). Seasonal distribution of Indo-Pacific humpback dolphins at an estuarine habitat: influence of upstream rainfall.
- (C). A study on the feeding activity of *Cerithium zonatum* (Gastropoda: Mesogastropoda) using an acoustic approach.
- (D). The effects of Mozart K. 448 on depression-like behavior in Long Evans rats
- (E). The effects of Mozart K.448 on spontaneous absence epilepsy in Long Evans rats

Bioacoustics is an interesting field in biology and physics. As many theoretical phenomena awaiting for further researches to unlock and Its related knowledge can be applied to many aspects in our everyday life I heartily wish that young biologists or students may consider studying biological phenomenon occurring in his/ her resident countries. Collaborating studies will allow us to ask questions relating to a broader geographical region or to comparative perspectives.