

牡丹鹦鹉(*Psittacula agapornis*)的鸣声发育

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牡丹鹦鹉的鸣声发育分为5个时期。0~12 d为先天性鸣声期, 鸣声特征为以基本音(BS)为主音的单音节单音调声, 声长短。13~30 d为空白模板形成期, 鸣声特征为以基本音为主音的多音节单音调声, 声长和音量显著性增加, 表明发声学习通路开始形成。31~45 d为鸣声模板形成期, 鸣声特征为以第1陪音(UP1)为主音的多音节单变调声, 声长和音量显著性增加, 主音频提升约920音分, 涵盖的律音数增加1倍, 表明发声学习模板逐渐形成, 发声学习开始。46~90 d为鸣声反馈学习期, 鸣声特征为以BS和UP1为主音的双变调声, 声长和音量显著性增加, 主音频涵盖的律音数增加2.6~3.0倍, 第2主音频提升约970音分, 表明稳定模板逐渐形成, 短期记忆逐渐向长期记忆转化。91 d后为完美鸣声期, 鸣声特征为以UP1为主音的复合变音调声, 声长、音量、主音频的提升和涵盖的律音数都趋于平稳, 鸣声稳定而和谐, 表明发声运动通路基本形成。这些结果可为进一步揭示鸟类发声学习记忆机制提供直接的声学证据。

The Call Development of *Psittacula agapornis*

The call developmental process of *Psittacula agapornis* consists of five instinct phases according to its call character. In the first phase (congenital call phase, CCP, 0~12 day of age), the juveniles only produce single syllable with short syllable length. The second phase (blank-model-forming phase, BMFP, 13~30 day of age) is important for formation of vocal learning pathways. During this phase, the calls characterized by more and longer syllables. In the third phase (call-model-forming phase, CMFP, 31~45 day of age), the call development is guided by a model system for vocal learning, vocal learning is engendered so that some calls with multi-syllables with UP1 are produced, principal frequency has increased about by 920 cent, the number of note is double that of second phase. The short-term memories are transformed into long-term memories in the forth phase (call-feedback-learning phase, CFLP, 46~90 day of age). The call of juveniles is a close match to tutor call which accompanied by double various sounds with BS and UP1, and more resonance components were formed. Second principal frequency has increased about by 970 cent, the number of note increases by 2.6~3.0 times. During the fifth phase (excellent call phase, ECP, after 91 d), vocal motor pathway is developed and the calls are accompanied with most stable, harmonious vari-tone and complex repertoire. The result provided effective evidence for the mechanism of vocal learning and memory of birds.

关键词