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研究论文

长尾麝凤蝶生活史、生命表、生境及保护

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摘要 评价了长尾麝凤蝶Byasa impediens在白水江自然保护区碧峰沟的生存状况，对其实施保护，维持其种群长期生存。通过野外观察、实验地饲养、野外林间样方调查、线路调查等方法，研究了长尾麝凤蝶的生物学特性和自然种群生命表，调查了生境，分析了致危原因，提出了保护措施。长尾麝凤蝶Byasa impediens在白水江自然保护区一年两代，以蛹在灌木或树枝上越冬，翌年4月中旬羽化。第一代成虫5月中下旬为高峰期；第二代成虫高峰期在6月下旬到7月中旬。有世代重叠。雄成虫比雌成虫早羽化7～10d，飞行能力较强，其飞行活动主要受到寻找雌成虫交尾和访花补充营养的影响，主要在沟底活动。雌成虫飞行能力较差，主要在出生地附近访花交尾产卵，飞行活动主要受到寻找寄主植物和访花补充营养的影响。雌雄性比1：4.1。雄成虫寿命平均6.9d，最长26d；雌成虫寿命平均7.6d，最长21d。孕卵量平均为31.5粒。成虫主要的访花蜜源植物有： 合欢Albizzia julibrissin、粉叶羊蹄甲Bauhinia glauca、臭牡丹Clerodendrum bungei、接骨草Sambucus chinensis。异叶马兜铃的生境选择，在本区的分布海拔范围为900～1680m，最适范围为1200～1500m。多分布于山坡丛林内郁闭度小于0.7且林下有灌木分布的林间小路、林窗边缘。郁闭度大于0.8则分布较少。幼虫分布的范围为800～1500m。异叶马兜铃的最适生境即长尾麝凤蝶幼虫的最适生境。影响种群下降的主要原因是生境丧失和退化。生境的破坏、丧失减少了寄主植物的数量和分布范围。毁林开荒、人畜践踏、喷洒除草剂对马兜铃和幼虫生存有重要影响。种群受到密度制约，异常气候条件和天敌是主要限制因子。夏季高温干旱、秋季淫雨降低了卵和幼虫的成活率，寄生蜂降低了越冬蛹的成活率。幼虫期的天敌主要有：蜘蛛、蠼螋、胡蜂、猎蝽、姬蜂、鸟类，蛹期和成虫期的天敌为鸟类。保护措施有：（1）保护和恢复生境，如退耕还林，提供廉价电能、加强保护执法，发展生态旅游等；（2）在异质种群斑块中心部位建一个廊道斑块；（3）在最适生境中，适度的割灌可促进寄主植物的生长，有利于蝶类种群的增长。

关键词 长尾麝凤蝶；生物学；生命表；种群威胁；最适生境；保护措施

分类号 Q143,Q968.1,Q969.97

Studies on life history, life table, habitat and conservation of *Byasa impediens* (Lepidoptera: Papilionidae)

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Abstract This paper presents a study on the biology of Byasa impediens, and includes life table data and the analysis of the habitat requirements and key factors causing threats to this species. It aims at the detection of specific protection methods, in order to guarantee the long-term survival of Byasa impediens in Baishuijiang Reserve.

Byasa impediens: Bivoltine in Baishuijiang reserve. Overwintering: pupae on shrubs or tree branches. Eclosion of first generation starts in MidApril. The adults of first generation will emerge with a great quantity in Mid-late May, and the second one will be on the wing from late June to MidJuly. The two generations overlap. The male adults emerge 710 days earlier than females. Perching along small rivers and gullies and flower visits determine their flight behavior. They are strong fliers. On the contrary, the flight ability of females is weak, thus they just visit flowers, mate and lay eggs near the natal area. The ratio of female to male is 1： 4.1. The male can live for a maximum of 26 days with an average of 6.9 days, while females have a maximum of 21 days with an average of 7.6 days. The fertilized eggs per female are 31.5 on average. The adults prefer the following nectar plants: Albizzia julibrissin, Bauhinia glauca, Clerodendrum bungei, and Sambucus chinensis.

Habitats: the plant Aristolochia heterophylla is distributed from 900m to 1680m of elevation, and the most suitable range is from 1200m to 1500m. Host plants grow mainly along paths and along borders of forests in which the canopy is rather open and which have shrubby undergrowth. The plant can be hardly found when canopy density of forest is over 0.8. The most suitable elevational range of larvae is from 1200m to 1500m. The ideal habitat of host plants also seems to be the ideal habitat of Byasa impediens.

Key factors that negatively affect the population of Byasa impediens are habitat loss and deterioration. The loss and deterioration of habitats result in lower numbers of host plants and a more restricted distribution of potential habitats. The habitat will be influenced easily by anthropogenic activity, such as herding, cultivating and using pesticides, which will especially influence the growth of host plants Aristolochia heterophylla and larvae of butterflies. Abnormal climatic conditions and natural enemies are key factors for the population density. Hot and dry weather in summer and too much rain in autumn reduce the survival rate of eggs and larvae very much. Ichneumon parasitoids reduce the survival rate of over-wintering pupae. The natural enemies of larvae include spiders, earwigs, wasps, bugs and ichneumon parasitoids. Further natural enemies of pupae and adults are birds.

The most important conservation measures are preservation and reconstruction of the natural habitat, which includes recreational forestry, the enhancement of management, enforcing existing laws, and developing Eco-tourism. Creating a core-patch at a central area near to all patches is also an important measure. In the most ideal habitat, appropriate shrub cutting can increase the host plants growth and then promote the population of Byasa impediens.

Key words Byasa impediens _ bionomics _ life table _ population threats _ suitable habitats _ conservation measures

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