东北地区水獭时空分布格局及其保护规划

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摘 要：水獭（*Lutra lutra*）是一种半水栖哺乳动物，隶属于食肉目（Carnivora）鼬科（Mustelidae），因其对水质具有高度敏感性且处于食物链顶端，被认为是水生生态系统的重要指示种和旗舰种。中国分布有三种，即欧亚水獭（*Lutra lutra*）、小爪水獭（*Aonyx cinereus*）和江獭（*Lutrogale perspicillata*）。IUCN 濒危物种红色名录将欧亚水獭列为近危（NT），小爪水獭和江獭列为易危（VU）。在我国，2021 年调整后的《国家重点保护野生动物名录》将水獭列为国家二级重点保护野生动物。近年来，由于大规模人类活动，全球水獭种群受到了严重破坏，而国内对水獭的调查和研究相当有限。东北地区水獭种群作为我国水獭分布最北的种群，对我国淡水生态系统的健康维持具有重要的生态学意义。本研究在基于新方志、文献资料和电话访谈的基础上，于 2016 年至 2022 年期间，通过访谈调查、问卷调查、野外实地调查、粪便收集等方式对水獭的分布信息进行收集和校正，最终获得东北地区水獭近七十年的历史分布基线数据库。通过物种分布集合建模重现其近 70 年的分布格局，从时间和空间两个维度揭示其动态变化规律，分析其时空变化的自然和人为驱动因素。同时，评估了不同时期水獭的潜在适宜分布区，利用地理信息系统和系统保护规划软件分析了水獭的保护优先区并计算了各省级行政区内水獭潜在分布区和保护优先区面临的人类压力；结合国家级自然保护区的空间布局分析了水獭的保护现状。找出基于自然地理单元的保护空缺，提出系统保护规划方案。本项研究成果填补了水獭本底信息，掌握其种群时空动态变化规律并为其保护提出有效的保护方案。同时国淡水生态系统保护、半水栖哺乳动物保护及保护区网络建设提供范式和理论依据。

关键词：受威胁物种；组合模型；历史分布变迁；保护优先区；保护规划

Spatial and temporal dynamics of the distribution of otter distribution in Northeast China and its conservation planning

Abstract: The otter is a semi-aquatic mammal. It belongs to the carnivora mustelidae species and is considered an important indicator and flagship species of aquatic ecosystems due to its high sensitivity to water quality and its position at the top of the food chain. Three species are found in China, namely the Eurasian otter (*Lutra lutra*), the small claed otter (*Aonyx cinereus*) and the River otter (*Lutrogale perspicillata*). The IUCN Red List of Threatened Species lists the Eurasian otter as near Threatened (NT) and the small-clawed otter and River otter as vulnerable (VU). In China, the adjusted "National List of Key Protected Wildlife" in 2021 lists otter as a national secondary key protected wild animal. In recent years, due to large-scale human activities, the global otter population has been seriously damaged, and the investigation and research of otter in China is quite limited. As the northernmost otter population in China, the otter population in northeast China has important ecological significance for the healthy maintenance of the freshwater ecosystem in China. Based on the new local records, literature and telephone interviews, this study collected and corrected the otter distribution information by means of interview survey, questionnaire survey, field investigation and fecal collection from 2016 to 2022, and finally obtained the baseline database of otter distribution in Northeast China in the past 70 years. The distribution pattern of species in the past 70 years was reconstructed through the modeling of the species distribution collection, and the dynamic change law was revealed from the two dimensions of time and space, and the natural and human driving factors of the spatio-

temporal change were analyzed. At the same time, the potential suitable distribution areas of otter in different periods were evaluated, and the priority areas of otter protection were analyzed by using geographic information system and system protection planning software, and the human pressure on the potential distribution areas and priority areas of otter protection in each provincial administrative region was calculated. The status quo of otter protection was analyzed based on the spatial layout of national nature reserves. The protection gaps based on physical geographical units are found out, and the system protection planning scheme is proposed. The results of this study fill in the background information of otter, grasp the spatiotemporal dynamic changes of its population and put forward effective protection schemes for its conservation. At the same time, it provides a paradigm and theoretical basis for the protection of freshwater ecosystems, the protection of semi-aquatic mammals and the construction of protected area network.

Key words: endangered species; ensemble models; historical distribution changes; conservation priority areas; conservation planning.