

中国生物多样性监测网络建设: 从CForBio到Sino BON

马克平

(中国科学院植物研究所植被与环境变化国家重点实验室, 北京 100093)

Biodiversity monitoring in China: from CForBio to Sino BON

Keping Ma

State Key Laboratory of Vegetation and Environmental Change, Institute of Botany, Chinese Academy of Sciences, Beijing 100093

生物多样性监测网络的建设在近年来得到了快速发展, 特别是在联合国《生物多样性公约》爱知目标(2011–2020生物多样性战略规划, www.cbd.int/sp/)的推动下(马克平, 2011a), 从全球到区域和国家尺度, 都在加强生物多样性监测工作, 以期对生物多样性保护及其进展评估提供翔实可靠的数据(马克平, 2011b)。全球尺度上有代表性的项目有 GEO BON(www.earthobservations.org/geobon.shtml), 它虽然没有自己建设的实体监测网络, 但在监测的理论框架、核心监测指标(essential biodiversity variables, EBV)和建立实体监测网络之间的联系等方面的工作卓有成效; 在区域尺度上, 欧洲(<http://bd.eionet.europa.eu/activities>)和亚太地区(www.esabii.biodic.go.jp/ap-bon/index.html)都有相关的项目在组织推动; 国家水平上, 瑞士(www.biodiversitymonitoring.ch/en/home.html)和英国(jncc.defra.gov.uk/page-0)的生物多样性监测比较有代表性, 特别是瑞士的国家生物多样性监测网络的设计和运行都值得认真研究和效仿。除上述综合性的监测网络外, 还有一些全球、区域或者国家水平的专题性监测网络也是颇有成效的, 如全球森林生物多样性监测网络(CTFS/ForestGEO, <http://www.ctfs.si.edu/>)、热带生态评估与监测网络(Team, www.teamnetwork.org/)、全球珊瑚礁监测网络(GCRMN, www.icriforum.org/gcrmn)、欧洲蚜虫监测网络(EXAMINE, <http://www.rothamsted.ac.uk/examine/>)和英国蝴蝶监测网络(www.ukbms.org/)等。相比较而言, 中国生物多样性监测网络的建设亟需加强。

中国科学院生物多样性委员会于2004年开始组织有关研究所的科研人员和院外相关单位的合

作者共同建设中国森林生物多样性监测网络(CForBio, www.cfbiodiv.org/)。截至2014年底, 该网络已经建成大型森林固定样地13个, 每个主样地都有若干辅助样地, 总样地面积340 ha, 标记木本植物(DBH≥1 cm)1,600种150余万株。通过建立大型固定样地, 对中国主要地带性森林类型的生物多样性变化进行了连续监测, 同时促进了相关的研究。基于CForBio的样地数据, 已经发表学术论文250篇(附录1), 其中在SCI刊物发表论文119篇, 包括生态学顶级刊物Ecology Letters, Ecology等, 发表论文的数量和质量都呈快速增长态势(附图1), CForBio成为近年来支撑中国生态学发展的重要平台, 并带动了林业、环保和教育部门的大样地建设, 也是全球森林生物多样性监测网络中最活跃的区域网络, 在国内外同行中产生了积极的影响(马克平, 2014; Anderson-Teixeira *et al.*, 2014)。

在CForBio取得良好发展的基础上, 中国科学院在“十二五”计划期间安排专门经费开始建设中国生物多样性监测与研究网络(Sino BON)。“十三五”又加大投入力度, 加强该网络的仪器设备购置, 以提高生物多样性监测与研究能力。目标是通过多种方法从整体上对中国生物多样性的变化开展长期的监测与研究。Sino BON将包括10个专项网和1个综合监测管理中心(附图2)。综合监测管理中心在网络办公室领导下主要负责三个方面的工作: (1)组织制订和监督施行监测规划、标准规范和管理制度等; (2)信息管理平台建设, 包括数据标准制订、汇交、分布式信息管理系统的建设和运行等; (3)生态系统或生境的遥感监测, 以及监测样区遥感信息的采集、分析和共享, 特别是通过激光雷达(LiDAR)技术开展样区的近地面遥感监测, 为各个监测专项网提

供生境和生态系统可视化信息。10个监测专项网包括: (1)兽类多样性监测专项网, 主要是通过红外触发相机途径对兽类及其群落的时间和空间动态进行监测; (2)鸟类多样性监测专项网, 主要通过红外触发相机、自动录音机、卫星跟踪等方法对地面活动鸟类、鸣禽和迁徙鸟类进行监测; (3)两栖爬行类多样性监测专项网, 主要通过布设在全国60余个监测点的样方和样带来监测两栖爬行动物及其群落的时空变化; (4)鱼类多样性监测专项网, 运用水下机器人和鱼探仪等先进设备对重要水域的指示性鱼类开展长期监测, 了解其种类、数量和资源的变化; (5)昆虫多样性监测专项网, 选择重要昆虫类群, 如蝴蝶、传粉昆虫、地表甲虫、蚜虫等, 对其种类和数量进行长期监测, 分析和评价昆虫多样性变化及其关键影响因素; (6)土壤动物多样性监测专项网, 选择我国典型区域的地带性植被类型, 分别以大型、中型和小型土壤动物的代表性类群为对象, 就物种多样性、食性与功能群及土壤动物生存环境变化等开展长期监测; (7)森林植物多样性监测专项网, 在已经建立的森林生物多样性监测网络基础上, 在重要森林和灌丛群落的典型地段建立模式植物群落, 并将其与大型森林样地建立联系, 组成区域到全国的森林监测网络, 同时加强大样地网络的功能性状等监测, 并与动物和微生物多样性监测专项网合作, 推动森林生物多样性变化的全面监测; (8)草原荒漠多样性监测专项网, 以植被分类系统的群系(formation)为基本单元, 在草原荒漠植被主要群系的典型地段建立模式植物群落监测固定样方, 定期复查, 统一描述规范, 长期监测草原荒漠植物多样性变化; (9)林冠生物多样性监测专项网, 以森林塔吊为主要平台, 开展地带性森林林冠生物多样性的调查与监测, 重点类群包括孢子植物、无脊椎动物和树栖微生物; (10)土壤微生物多样性监测专

项网, 采用现代高通量测序技术、生物信息学技术和传统的微生物学方法, 对森林、草原和荒漠等不同植被类型的土壤微生物的群落组成、多样性及土壤基因组的组成与多样性等开展长期定点监测, 以揭示土壤微生物物种和基因多样性的分布规律和时空格局变化。我国的海洋生物多样性非常丰富, 应该创造条件尽快建立海洋生物多样性监测专项网。

除中国科学院正在建设的中国生物多样性监测与研究网络外, 环保部、国家林业局和高等院校等还建立了关于森林资源、湿地生态系统和野生动植物多样性的监测网络, 如国家林业局的森林资源清查体系已有40余年历史, 发展到由41.5万个面积为一亩的固定样地组成的网络; 以红外触发相机为主的兽类监测网络也取得了快速发展, 尤以对东北虎(*Panthera tigris altaica*)和远东豹(*Panthera pardus orientalis*)等野生动物监测的成效显著。在第一届全国生物多样性监测研讨会(<http://www.cncdiversitas.org/>)上, 来自环保部、教育部、国家林业局和中国科学院等部门的代表比较全面地报告了我国生物多样性监测进展。希望国家主管部门牵头, 联合中国科学院等单位共同建设中国生物多样性监测体系, 整合已经建立的监测网络和设施, 实现资源和信息共享, 为我国生物多样性保护与持续利用提供科技支撑。下一步的重点工作应该包括: (1)完善监测网络(包括专项网)的设计、管理模式和相关标准规范和管理制度的建立; (2)核心监测指标(EBV)的确定; (3)现状和变化的评估指标体系的建立; (4)保障措施的落实, 包括监测队伍、组织管理和基本运行经费等。

文内参考文献见 <http://www.biodiversity-science.net/fileup/PDF/w2015-025-4.pdf>

致谢: 感谢中国科学院生物多样性委员会办公室徐学红帮助整理附录1–3。

附录 Supplementary Materials

附录1 中国森林生物多样性监测网络(CForBio)发表论文目录(截至2014年底)

Appendix 1 The publication list of Chinese Forest Biodiversity Monitoring Network (CForBio) (2006–2014)
<http://www.biodiversity-science.net/fileup/PDF/w2015-025-1.pdf>

附图1 中国森林生物多样性监测网络(CForBio)发表论文的年际变化

Fig. S1 Trends of the number of publications from CForBio
<http://www.biodiversity-science.net/fileup/PDF/w2015-025-2.pdf>

附图2 中国生物多样性监测网络(Sino BON)组成结构

Fig. S2 Organizational structure of Sino BON
<http://www.biodiversity-science.net/fileup/PDF/w2015-025-3.pdf>

The Publication List of Chinese Forest Biodiversity Monitoring Network (2006-2014)

2014

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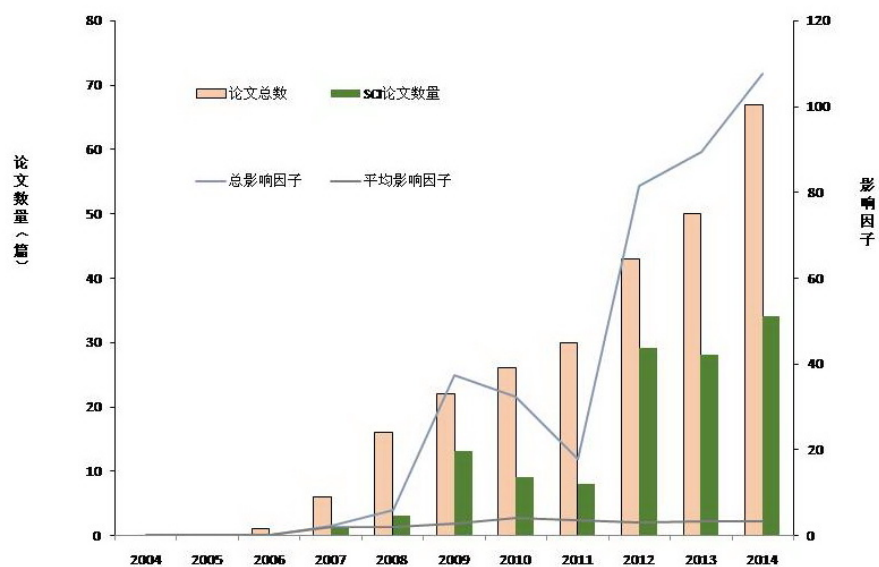
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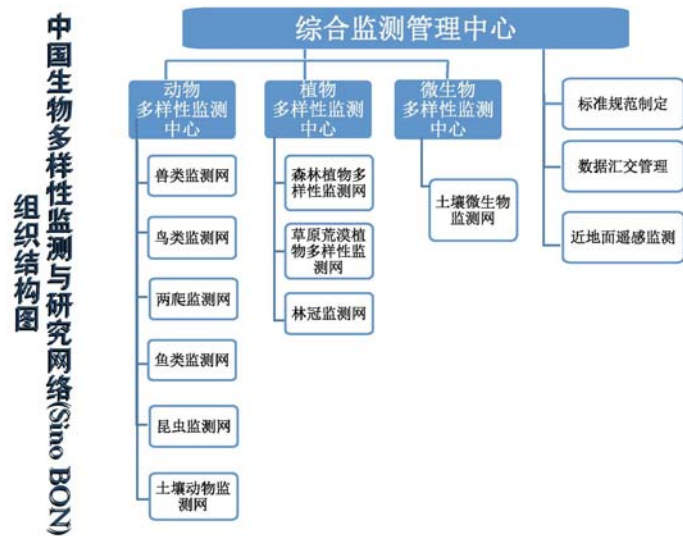
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