Long-term Forest Observation, Data Sharing and Future Extensions in Japan

Masae Ishihara & Tsutomu Enoki

(Kyoto University and Kyushu University, Japan)

Forest research network developing to broader networks & projects

Three examples

(1) Monitoring 1000 project

Biodiversity and function & Top-down network

(2) ReSIN

Nutrient cycling & Bottom-up network

(3) Allometry database

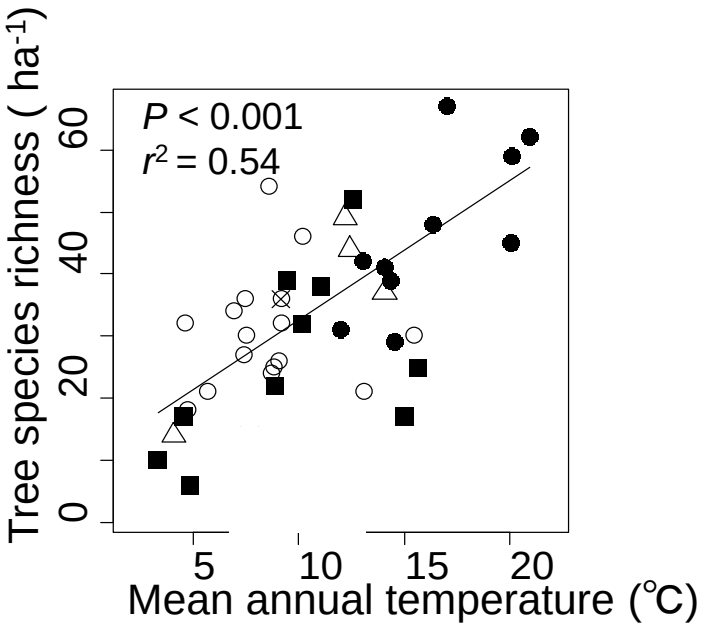
Biomass & Non-funded personal collaboration

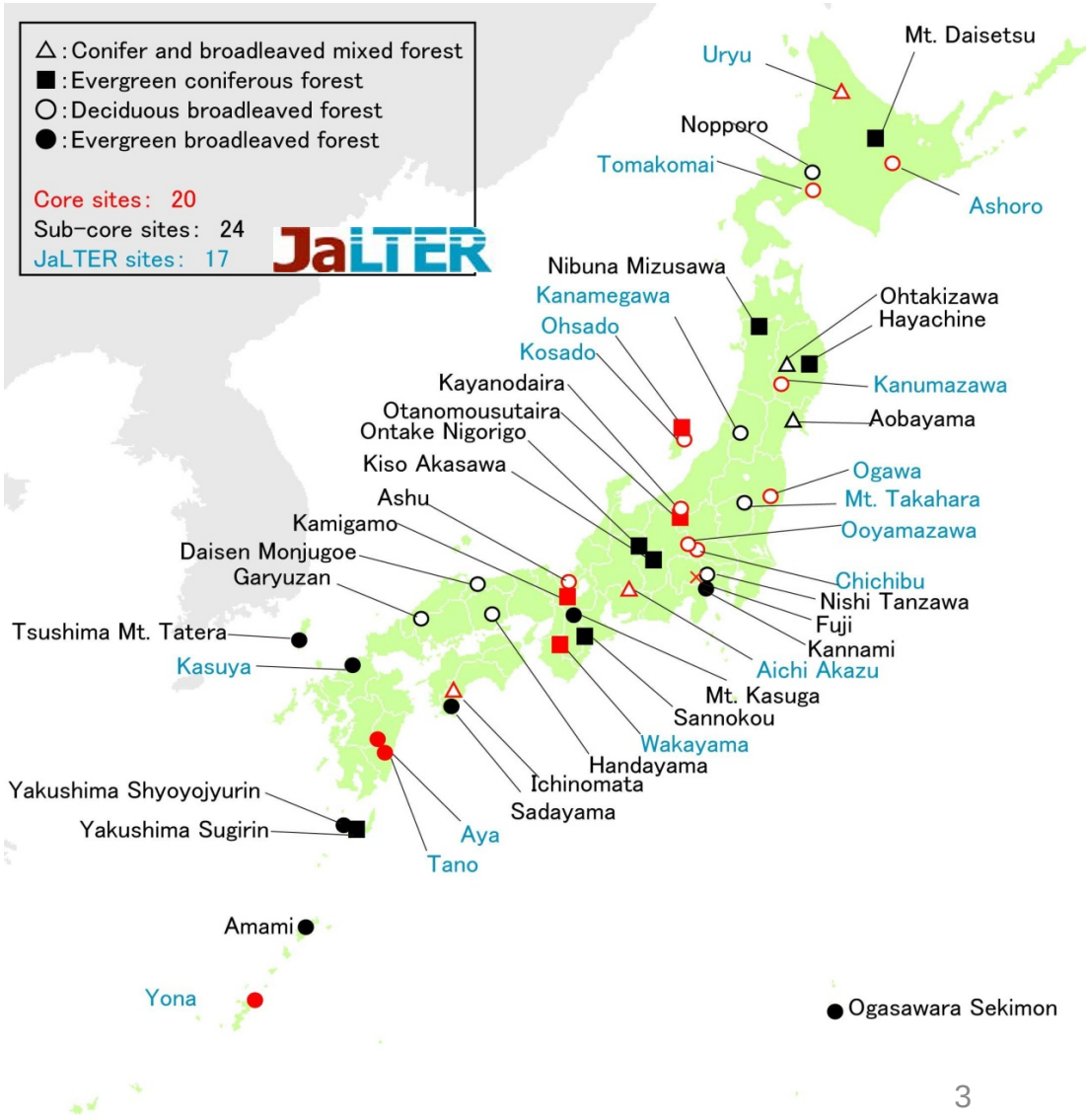
Data sharing: data paper and database

Capacity building: training course

Monitoring sites 1000 project

- Program by the Ministry of the Environment, Japan
- Since 2004 until 2104?
- 58 forest plots
- 1 ha
- Tree census & litter traps ground beetle





Monitoring sites 1000 project

モニタリングサイト1000
Since 2003

Tree census

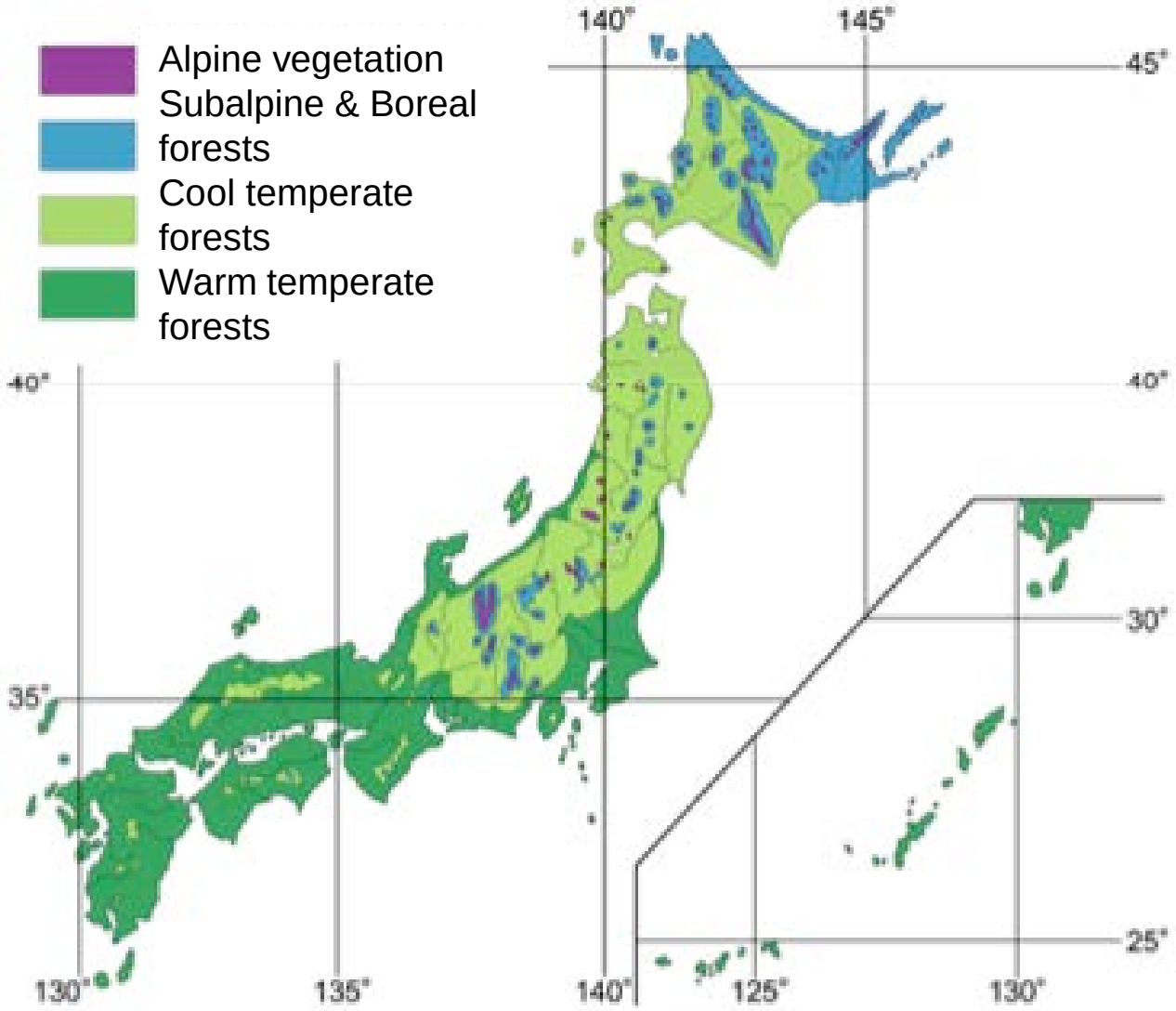
353 tree species
60,166 trees

Litter trap

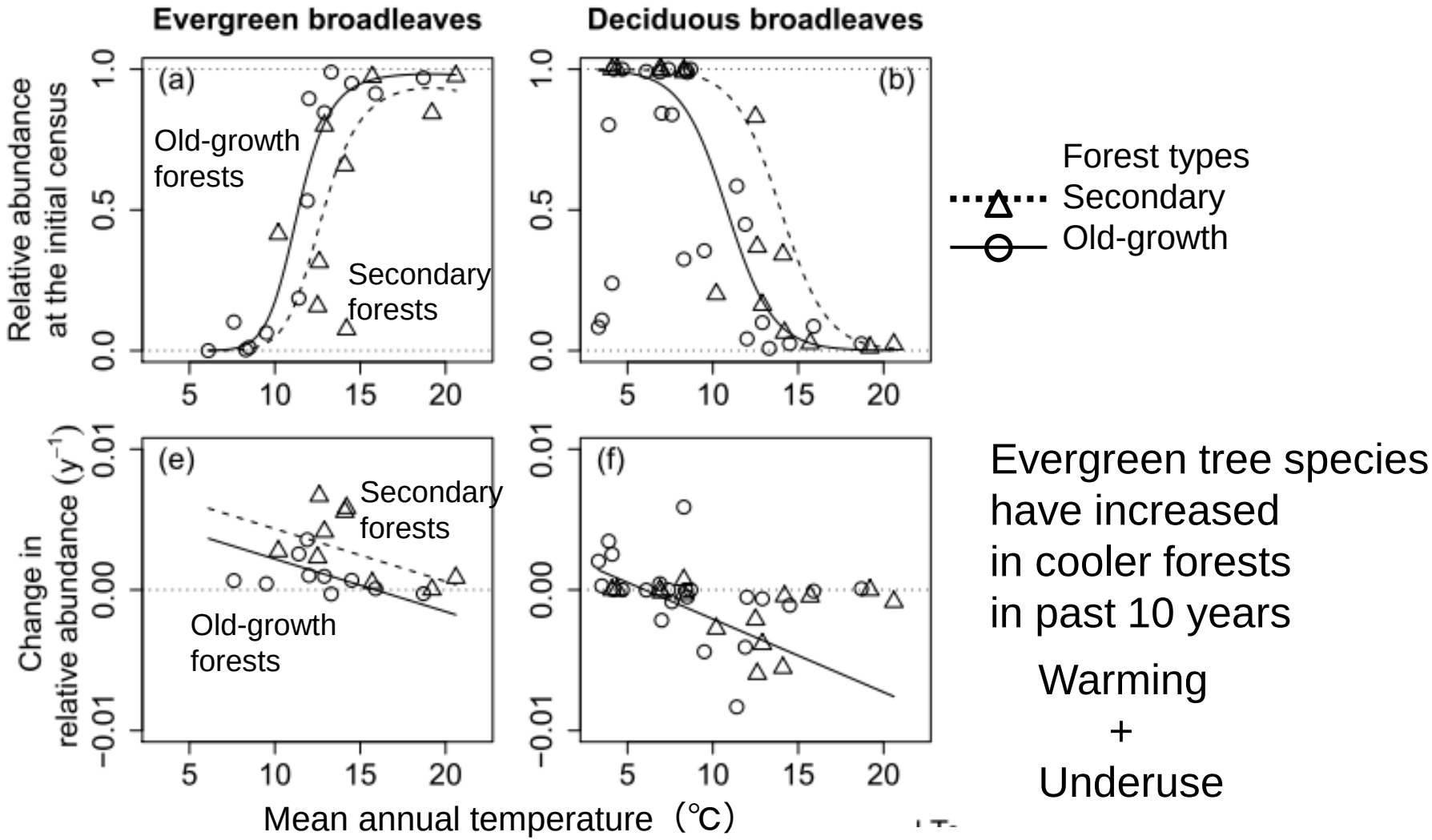
Ground beetle

Uniform protocols

Climate change and vegetation shift in Japan?



An example of usage of monitoring data to detect changing biodiversity



Evergreen tree species have increased in cooler forests in past 10 years

Warming
+
Underuse

Suzuki SN, Ishihara MI and Hidaka A (2015) Regional-scale directional changes in abundance of tree species along a temperature gradient in Japan. Global Change Biology, 21: 3436–3444.

Data sharing

Web site

Data paper

Ecol Res (2011) 26: 1007–1008
DOI 10.1007/s11284-011-0847-y

DATA PAPER

Masae I. Ishihara · Satoshi N. Suzuki · Masahiro Nakamura · Tsutomu Enoki · Akio Fujiwara · Tsutom Hiura · Kosuke Homma · Daisuke Hoshino · Kazuhiko Hoshizaki · Hideyuki Ida · Ken Ishida · Akira Itoh · Takayuki Kaneko · Kaname Kubota · Koichiro Kuraji · Shigeo Kuramoto · Akifumi Makita · Takashi Masaki · Kanji Namikawa · Kaoru Niiyama · Mahoko Noguchi · Haruto Nomiya · Tatsuhiro Ohkubo · Satoshi Saito · Takeshi Sakai · Michinori Sakimoto · Hitoshi Sakio · Hirofumi Shibano · Hisashi Sugita · Mitsuo Suzuki · Atsushi Takashima · Nobuyuki Tanaka · Naoaki Tashiro · Naoko Tokuchi · Yakushima Forest Environment Conservation Center · Toshiya Yoshida · Yumiko Yoshida

Forest stand structure, composition, and dynamics in 34 sites over Japan

Received: 4 March 2011 / Accepted: 16 May 2011 / Published online: 30 August 2011
© The Ecological Society of Japan 2011

Abstract This data paper reports tree census data collected in a network of 34 forest sites in Japan. This is the largest forest data set freely available in Japan to date. The network is a part of the Monitoring Sites 1000 Project launched by the Ministry of the Environment, Japan. It covers subarctic to subtropical climate zones and the four major forest types in Japan. Forty-two permanent plots, usually 1 ha in size, were established in old-growth or secondary natural forests. Censuses of woody species ≥15 cm girth at breast height were conducted every year or once during 2004 to 2009. The data provide species abundance, survivorship and stem girth growth of 52,534 individuals of 334 tree and liana species. The censuses adopted common census protocol, which provide good opportunities for meta-analyses and comparative studies among forests. The data have been used for ecological studies as well as for the biodiversity reports published by the Ministry of the Environment.

Keywords Plot network · Forest · Tree species abundance · Stem diameter · Tree demography · Japan · The Monitoring Sites 1000 Project

The complete data set for this abstract published in the Data Paper section of the journal is available in electronic format in *Ecological Research Data Paper Archives* at http://db.cger.nies.go.jp/JaLTER/ER_DataPapers/archives/2011/ERDP-2011-01/.

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Data paper

- Peer-reviewed paper about data (data + metadata)
- Authors should make data open to the public
- Data will be archived with good meta data
  → Long term preservation of data
  → Enhance data usage for various purpose
- User can use raw data by citing the data paper
  → Authors get citation

Journals for ecology

Types of article: original articles, review, data paper

Journals only for data paper

Ecol Res (2011) 26: 1007–1008
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DATA PAPER

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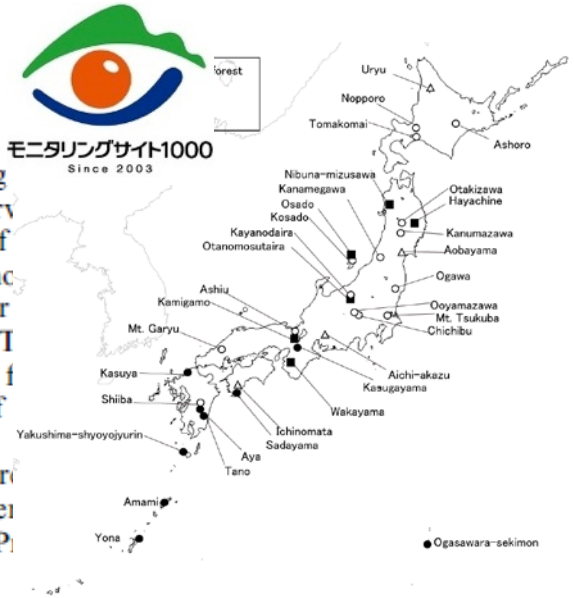

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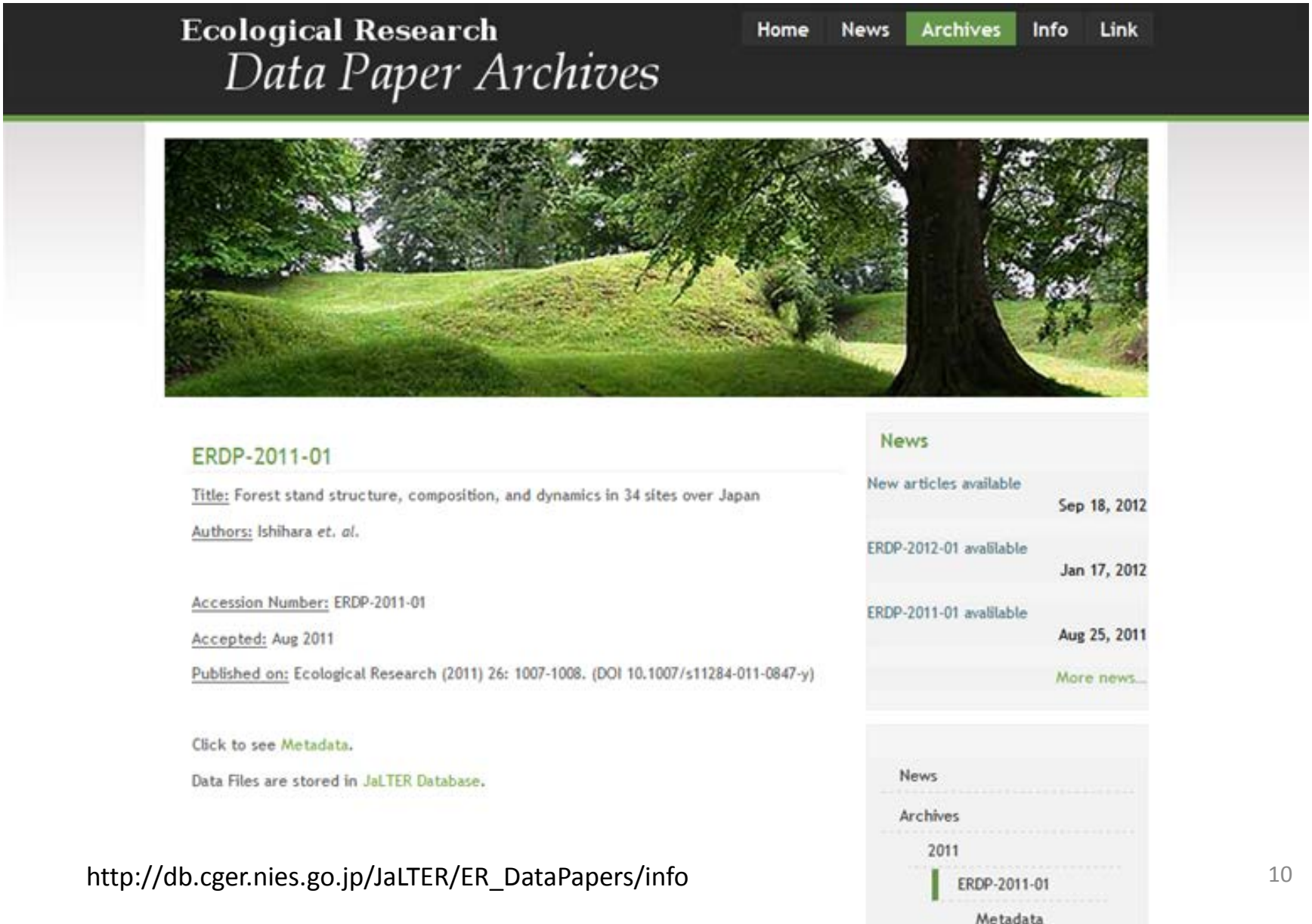
and Forest Products Research Institute, Morioka, Japan

Data will be stored in archives of JaLTER (Japan Long Term Ecological Research Network)



http://db.cger.nies.go.jp/JaLTER/ER_DataPapers/info

Extension to a new project

Human impacts on the ecosystem services of East Asia through biodiversity degradation (S9-3)

2011～2016 Funded by the Ministry of the Environment, Japan

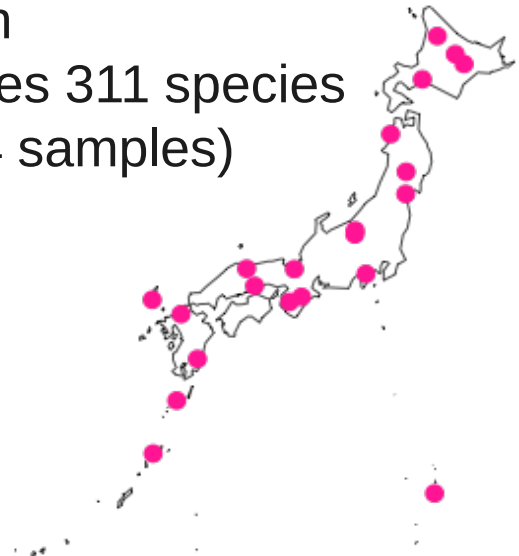
Diversity and ecosystem services

Tree functional traits database* (Masahiro Aiba, Hiroko Kurokawa, Yusuke Onoda)

maximum height, leaf mass per area (LMA), seed mass, wood density, leaf size

*a measurable property of organisms that strongly influences organismal performance

Japan
21 sites 311 species
(3004 samples)



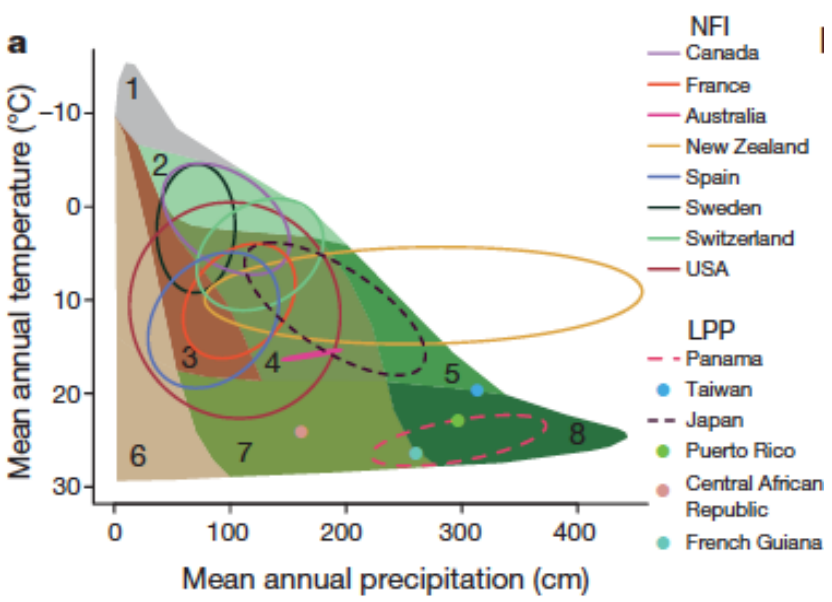
Southeast Asia
5 area, 800 species

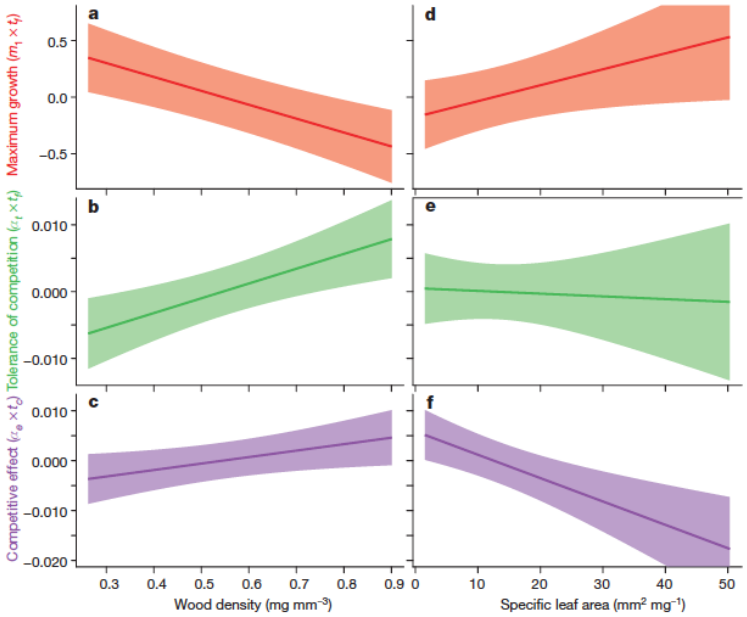
Usage of the trait and demography datasets for global analysis

Nature 529:1–15 (2016)

Plant functional traits have globally consistent effects on competition

Georges Kunstler[1,2,3], Daniel Falster[3], David A. Coomes[4], Francis Hui[5], Robert M. Kooyman[3,6], Daniel C. Laughlin[7], Lourens Poorter[8], Mark Vanderwel[9], Ghislain Vieilledent[10], S. Joseph Wright[11], Masahiro Aiba[12], Christopher Baraloto[13,14], John Caspersen[15,16], J. Hans C. Cornelissen[17], Sylvie Gourlet-Fleury[10], Marc Hanewinkel[18,19], Bruno Herault[20], Jens Kattge[21,22], Hiroko Kurokawa[12]†, Yusuke Onoda[23], Josep Peñuelas[24,25], Hendrik Poorter[26], Maria Uriarte[27], Sarah Richardson[28], Paloma Ruiz-Benito[29,30], I-Fang Sun[31], Göran Ståhl[32], Nathan G. Swenson[33], Jill Thompson[34,35], Bertil Westerlund[32], Christian Wirth[22,36], Miguel A. Zavala[30], Hongcheng Zeng[15], Jess K. Zimmerman[35], Niklaus E. Zimmermann[16] & Mark Westoby[3]





Forest research network developing to broader networks & projects

Three examples

(1) Monitoring 1000 project

Biodiversity and function & Top-down network

(2) ReSIN

Nutrient cycling & Bottom-up network

(3) Allometry database

Biomass & Non-funded personal collaboration

Data sharing: data paper and database

Capacity building: training course

ReSIN
(Regional and comparative Soil Incubaton Study on Nitrogen dynamics in forest ecosystems)

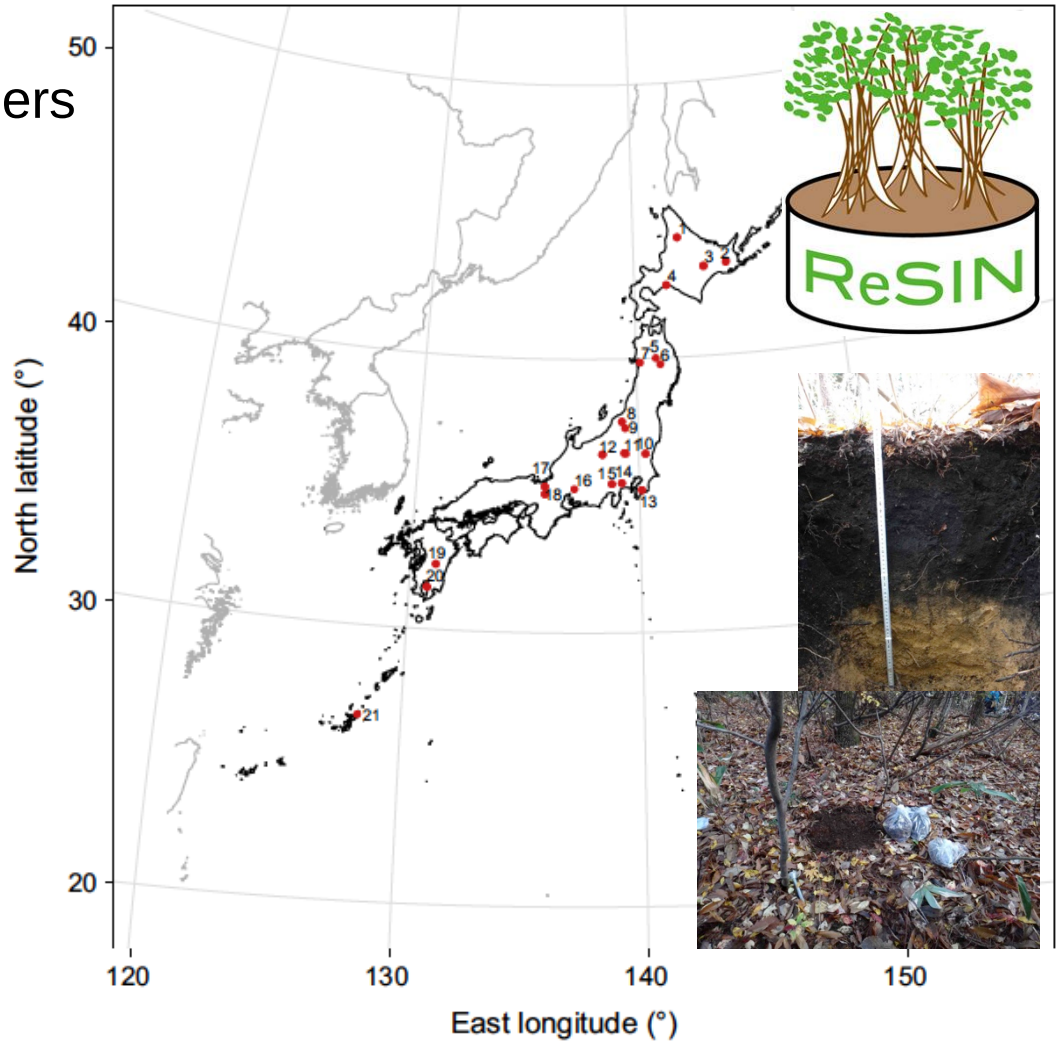
Network research by researchers

Soil nitrogen dynamics

Biogeochemicall nitrogen properties of forest soils

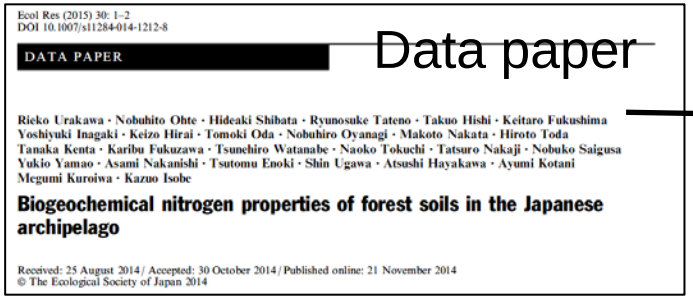
Uniform protocol

Effects of freeze-thaw cycles



Urakawa, R., H. Shibata, M. Kuroiwa, Y. Inagaki, R. Tateno, T. Hishi, K. Fukuzawa, K. Hirai, H. Toda, N. Oyanagi, M. Nakata, A. Nakanishi, K. Fukushima, T. Enoki, and Y. Suwa. 2014. Effects of freeze-thaw cycles resulting from winter climate change on soil nitrogen cycling in ten temperate forest ecosystems throughout the Japanese archipelago. *Soil Biology and Biochemistry* 74:82–94.

Study about issues as climate change adaptation by using environmental information in DIAS (Data Integration and Analysis System)


Ecol Res (2015) 30: 1–2
DOI 10.1007/s11284-014-1212-8

DATA PAPER

Rieko Urakawa · Nobuhito Ohte · Hideaki Shibata · Ryunosuke Tateno · Takuo Hishi · Keitaro Fukushima · Yoshiyuki Inagaki · Keizo Hirai · Tomoki Oda · Nobuhiro Oyanagi · Makoto Nakata · Hiroto Toda · Tanaka Kenta · Karibu Fukuzawa · Tsunehiro Watanabe · Naoko Tokuchi · Tatsuro Nakaji · Nobuko Saigusa · Yukio Yamao · Asami Nakanishi · Tsutomu Enoki · Shin Ugawa · Atsushi Hayakawa · Ayumi Kotani · Megumi Kuroiwa · Kazuo Isobe

Biogeochemical nitrogen properties of forest soils in the Japanese archipelago

Received: 25 August 2014 / Accepted: 30 October 2014 / Published online: 21 November 2014
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Data paper

Data


JaLTER
Data Base

ILTER portal
DEIMS

Dynamic Ecological Information Management System


Forest Ecology and Management 361 (2016) 382–396

Forest Ecology and Management

journal homepage: www.elsevier.com/locate/foreco

ELSEVIER

Research paper

Factors contributing to soil nitrogen mineralization and nitrification rates of forest soils in the Japanese archipelago

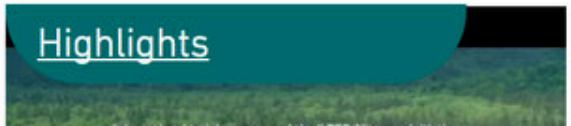
Rieko Urakawa [a,*], Nobuhito Ohte [b], Hideaki Shibata [c], Kazuo Isobe [a], Ryunosuke Tateno [d], Tomoki Oda [a], Takuo Hishi [e], Keitaro Fukushima [f], Yoshiyuki Inagaki [g], Keizo Hirai [h], Nobuhiro Oyanagi [i], Makoto Nakata [j], Hiroto Toda [k], Tanaka Kenta [l], Megumi Kuroiwa [m], Tsunehiro Watanabe [c], Karibu Fukuzawa [c], Naoko Tokuchi [d], Shin Ugawa [n], Tsutomu Enoki [e], Asami Nakanishi [d], Nobuko Saigusa [o], Yukio Yamao [o], Ayumi Kotani [p]

Urakawa, R. et al.. 2015. Biogeochemical nitrogen properties of forest soils in the Japanese archipelago. *Ecological Research* 30:1–2.
Urakawa, R., et al.. 2016. Factors contributing to soil nitrogen mineralization and nitrification rates of forest soils in the Japanese archipelago. *Forest Ecology and Management* 361:382–396.

Extension to education

ILTER Nitrogen Initiative Training Course 2016

Expose young researchers to state-of-the-art approaches to analysis of nitrogen cycling in ecosystems with a focus on key ecosystem processes and implications for environmental pollution



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Biomass & Non-funded personal collaboration

Data sharing: data paper and database

Capacity building: training course

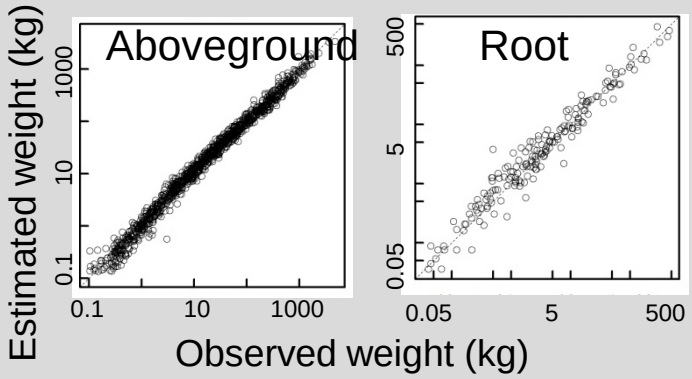
Allometry database

Compiled tree biomass dataset

1,486 trees, 122 species
73 natural forests in Japan
1951-2010

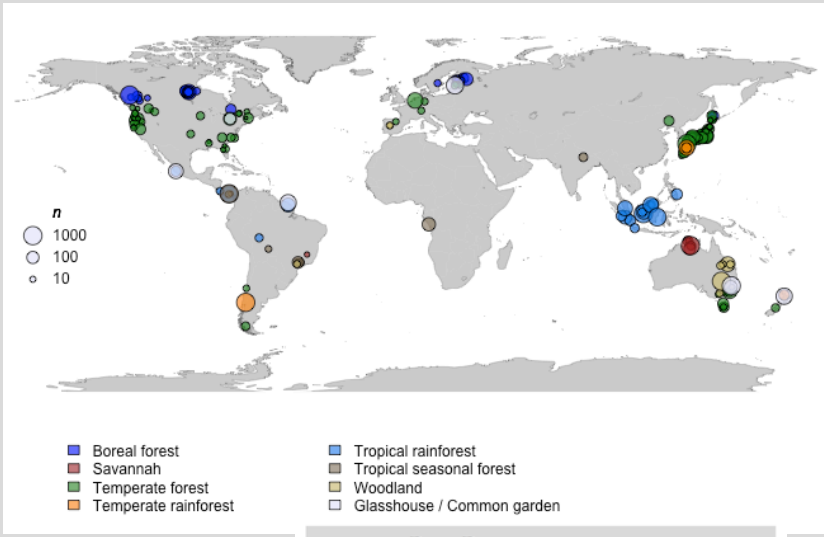
Scientific paper
Grey literature

Generic equations to estimate forest biomass in natural forests

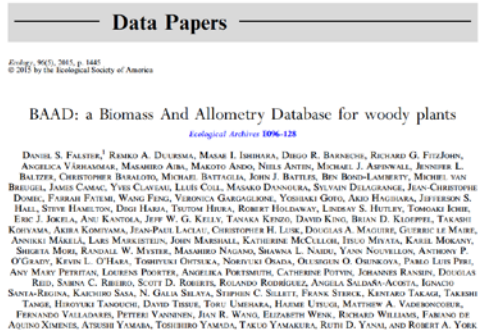


BAAD: Biomass And Allometry Database

19,752 trees, 645 species
259 locations



Data paper


Data Papers

BAAD: a Biomass And Allometry Database for woody plants

Ecological Archives 1096-128

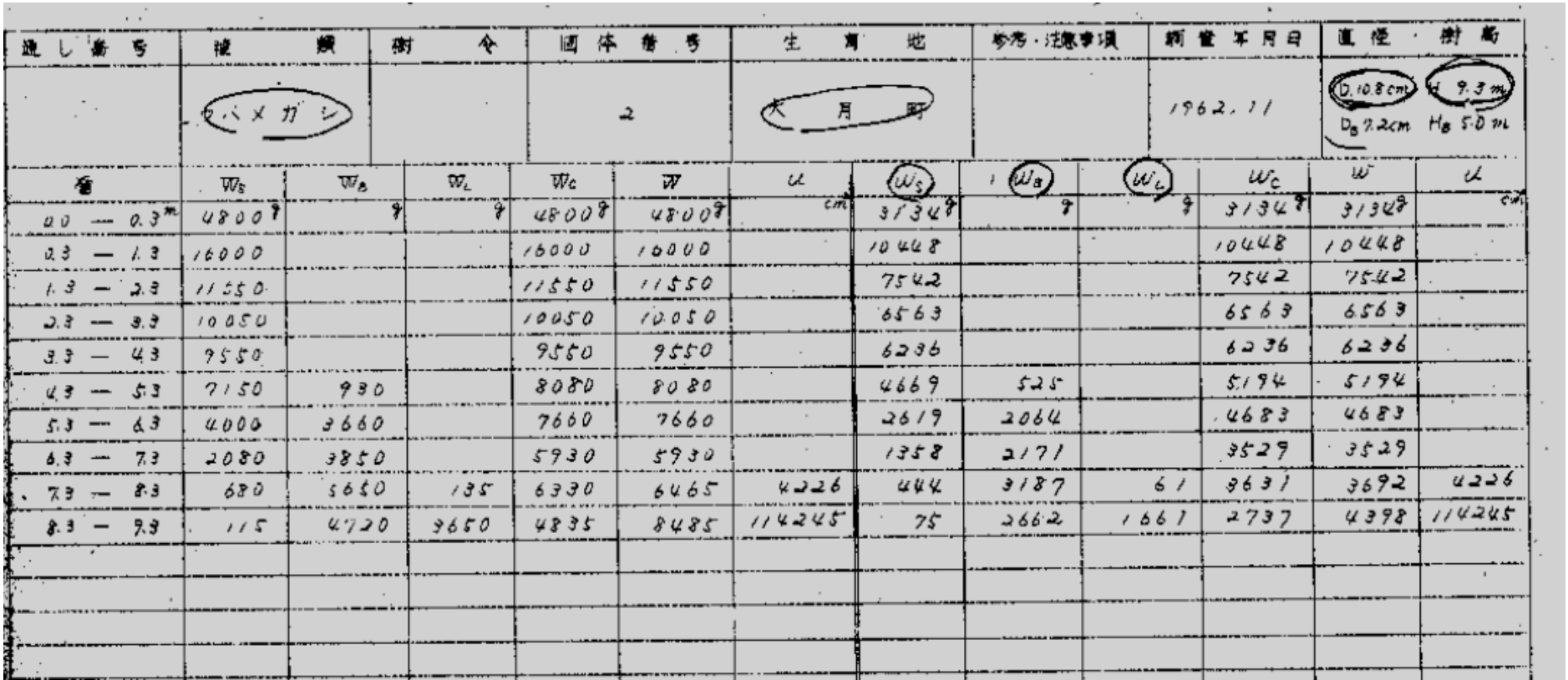
Ishihara MI et al. (2015) Efficacy of generic allometric equations for estimating biomass: a test in Japanese natural forests. *Ecological Applications*, 25: 1433-1446.
Falster DS et al. (2015) BAAD: a Biomass And Allometry Database for woody plants. *Ecology*, 96: 1445.

Grey literature

“materials and research produced by organizations outside of the traditional commercial or academic publishing and distribution channels”

“Grey literature may be difficult to discover, access and evaluate”

(Wikipedia)

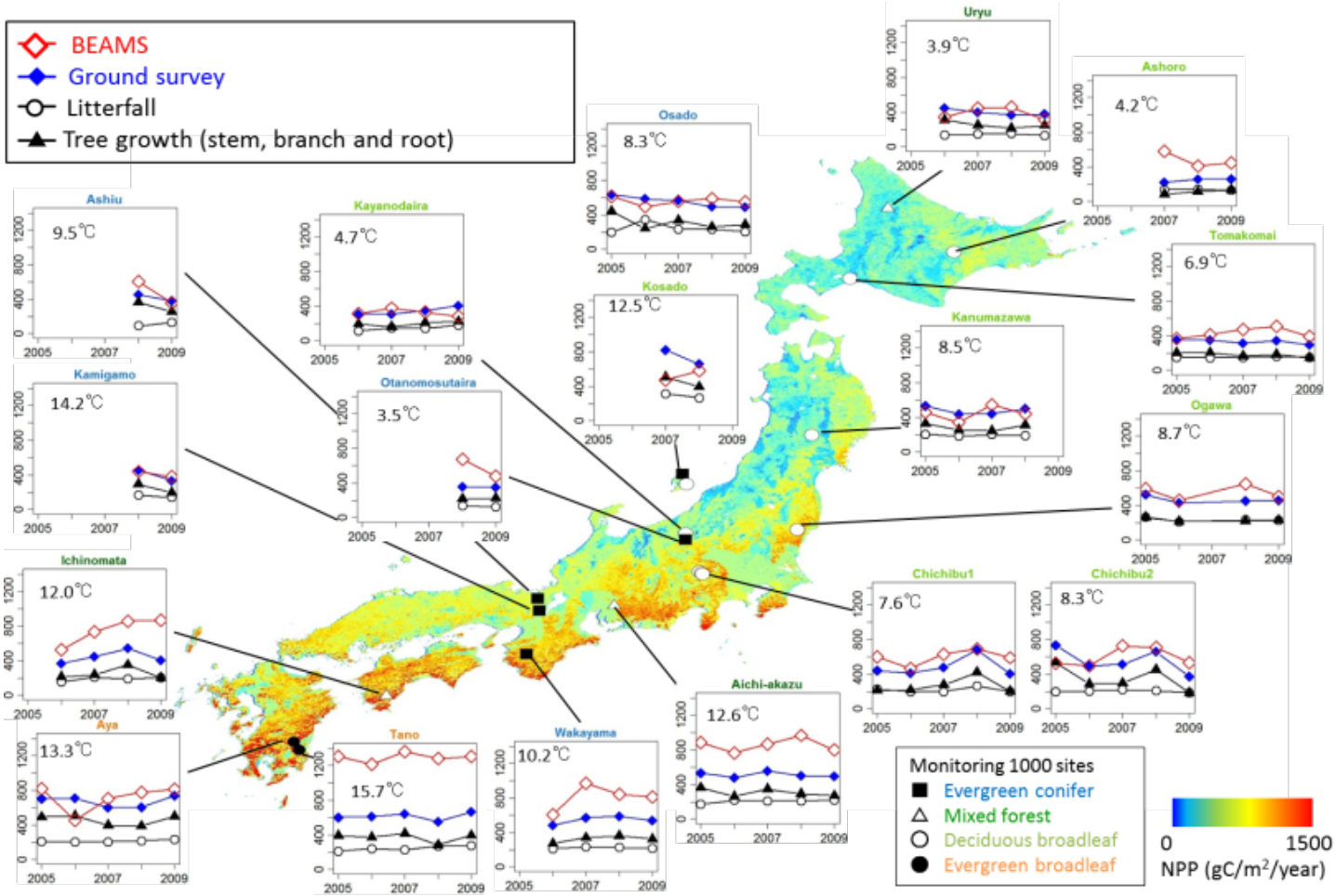


通し番号	樹種		樹令	固体番号	生育地	参考・注意事項	調査年月日	直径・樹高	
	ヒバ×ガシ			2	大月町		1962.11	D 10.8cm H 9.3m	
								D_B 7.2cm H_B 5.0m	

層	W_S	W_B	W_L	W_C	W	u	(W_S)	(W_B)	(W_L)	W_C	W	u
0.0 — 0.3m	4800g	g	g	4800g	4800g	cm	3134g	g	g	3134g	3134g	cm
0.3 — 1.3	16000			16000	16000		10448			10448	10448	
1.3 — 2.3	11550			11550	11550		7542			7542	7542	
2.3 — 3.3	10050			10050	10050		6563			6563	6563	
3.3 — 4.3	9550			9550	9550		6236			6236	6236	
4.3 — 5.3	7150	930		8080	8080		4669	525		5194	5194	
5.3 — 6.3	4000	3660		7660	7660		2619	2064		4683	4683	
6.3 — 7.3	2080	3850		5930	5930		1358	2171		3529	3529	
7.3 — 8.3	680	5650	135	6330	6465	4226	444	3187	61	3631	3692	4226
8.3 — 9.3	115	4720	3650	4835	8485	114245	75	2662	1661	2737	4398	114245

Extension to models and remote sensing

Net Primary Productivity
Ground survey vs. Biosphere model BEAMS (Sasai et al. 2012).



NPP from ground survey (the sum of tree growth and litterfall) was estimated from generic allometric equations, Monitoring 1000 project.

Map shows NPP estimated from biosphere model BEAMS.

Common location, spatial resolution, time period

Long-term Forest Observation, Data Sharing and Future Extensions in Asia

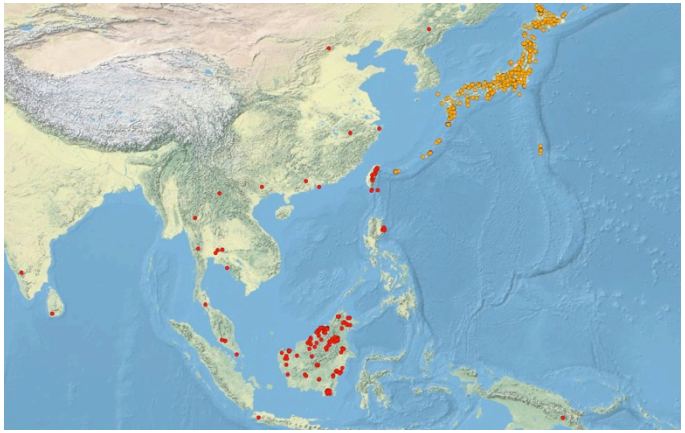
Network of sites under uniform protocols: Monitoring 1000, ReSIN
Compilation of existing data: Allometry database

↓

Sharing data
Database and data paper

↓

New projects, collaboration, research



Long-term forest plots in SE Asia surveyed by formal reference search (Ishihara et al. 2014)

Ishihara, M. I., et al.. 2014. Evaluating relationship between biodiversity and ecosystem functions in forests using forest inventory data and allometry data. Pages 351–365 in S. Nakano, T. Yahara, and T. Nakashizuka, editors. *Asia-Pacific Biodiversity Observation Network: Integrative Observations and Assessments*. Springer Japan.

National Forest Inventory Data

EU-Forest, a high-resolution tree occurrence dataset for Europe

Mauri A, Strona G & San-Miguel-Ayanz J (2017 Jan. 5)
Scientific Data (Nature Publishing Group) 4:160123 doi: 10.1038/sdata.2016.123

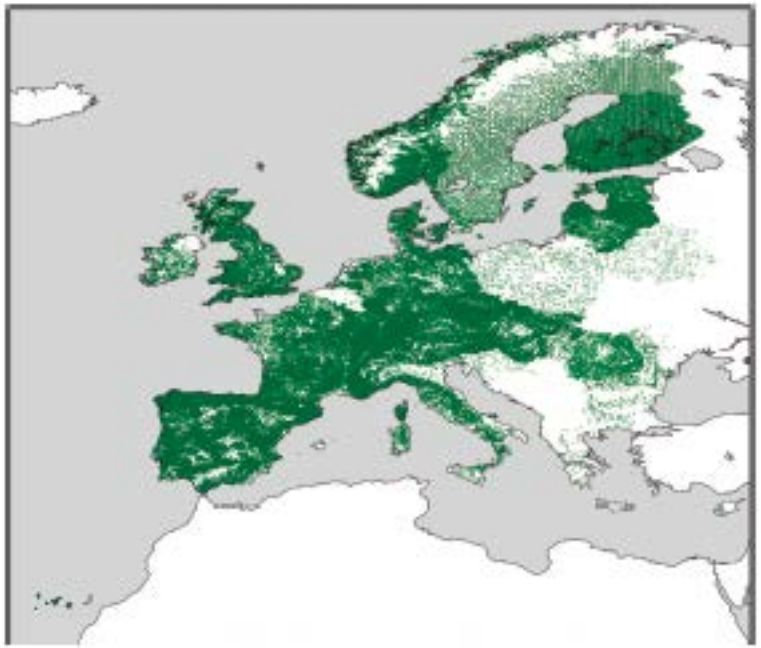


Figure 1. Spatial distribution of all the occurrences present in EU-Forest.

Aggregated to 1 km × 1 km
249,410 plots
588,983 occurrences of 242 species

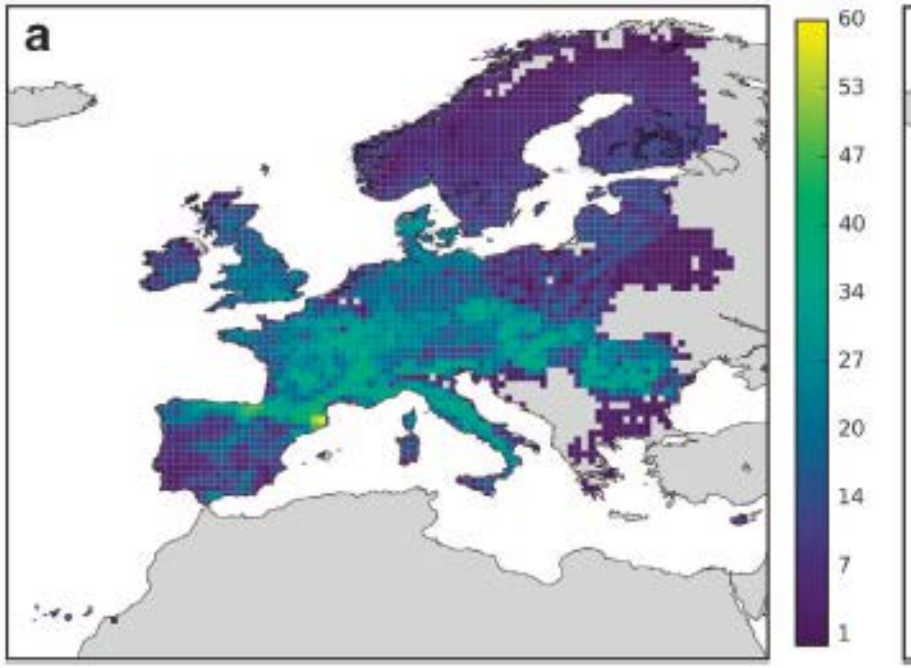


Figure 3. Tree diversity indices. Tree species rich
dataset at a resolution of 0.5 × 0.5 degrees. Relative