SHORT COMMUNICATION

Alpine forest genomics network (AForGeN): a report of the first annual meeting

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Abstract The Alpine Forest Genomics Network was formed in 2011 and held its first annual meeting on June 24–26, 2012, in the Natural Park Adamello Brenta in Trentino Region, Italy. The meeting was attended by 30 researchers from the alpine region of Europe and had two primary goals: (1) for researchers to introduce each other to current and planned research activities in forest landscape genomics and (2) to develop a strategic vision for the network. A steering committee was elected and will develop a white paper over the next year. The next annual meeting will be held in Austria in June 2013.

Keywords Alpine forests · Genomics · Climate change · Adaptation

Introduction

The Alpine Forest Genomics Network (AForGeN) was formed in 2011 by David Neale and colleagues at the Fondazione Edmund Mach, San Michele all'Adige, Italy. The intended mission of AForGeN is to facilitate information exchange and collaboration among researchers interested in using landscape genomics approaches for studying adaptation in alpine forest ecosystems, with special attention to the effects of changing climate. The network not only involves researchers

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primarily from the European Alps but also includes few researchers from the broader biogeographic Alpine region, which consists of Mediterranean, temperate, boreal, and arctic regions (Graherr et al. 2003; Metzger et al. 2005). Since the definition of "alpine" is not univocal, the Alpine biogeographic region, as defined by EEA Europe's Biodiversity (Condé and Richard 2002), is the definition that is more consistent with the network intents.

It was recognized that there are a number of active research groups in the alpine forest region in Europe, but even though species' ranges extend across multiple political boundaries, information exchange and collaboration across these boundaries might be increased. In particular, this network is the first case of a forest genetic network devoted to alpine forests. A call for membership was put out in late 2011, and currently, AForGeN has 57 members from 17 countries (http://alpforests-gen.fem-environment.eu/people/). The next step in the development of the network was to organize its first annual meeting. That was done by researchers at the Fondazione Edmund Mach and was held on June 24–26, 2012, at the hostel "Rifugio Adamello Collini al Bedole" in the Natural Park Adamello Brenta in Trentino Region, Italy. The meeting program can be found at http://alpforests-gen.fem-environment.eu/events/first-aforgen-meeting/. The meeting had two primary goals: (1) for researchers to introduce each other to their current and planned research activities in forest landscape genomics and (2) to develop a strategic vision for the network that would facilitate further interactions and collaborations, as well as lead to increased funding for this topic area. A short report on these two goals follows in the next two sections.

Current and planned research activities

Fifteen presentations were made during the sessions on the first day. PDF versions of these presentations can be found at the website, so an exhaustive review will not be

provided here. Most of the presentations were made from groups with the more advanced research programs and were from countries in the center of the European Alps (Austria, France, Italy, and Switzerland), but presentations were also made from a few other countries (Germany, Spain, and Sweden). The forest tree species receiving by far the most attention was Norway spruce (*Picea abies* (L.) Karst) and was included in 10 of the 15 presentations. Other species receiving lesser attention were stone pine (*Pinus cembra* L.), mugo pine (*Pinus mugo* Turra), Scots pine (*Pinus sylvestris* L.), black pine (*Pinus nigra* Arn.), larch (*Larix decidua* Mill.), silver fir (*Abies alba* Mill.), and beech (*Fagus sylvatica* L.).

The presentations were of three general types: (1) classical quantitative genetic or genecological studies, (2) demographic histories using neutral markers, and (3) landscape genomic studies to identify genes under natural selection and underlying complex adaptive traits. There is a long history of genecological studies in Norway spruce, but similar studies in other species are much fewer, and many are now being developed for the first time. Likewise, there is a rich literature of demographic history studies in many species using a suite of neutral marker types, and these studies continue and the scope of sampling is increasing. Landscape genomic studies to find genes underlying adaptive traits in alpine forests are just beginning and the first of these studies were reported at the meeting.

The presentations from network members revealed that there is significant expertise in the three main areas mentioned above, but in almost no cases can all expertise be found at a single research institution. This again argues strongly for the formation of a network, as the membership recognizes that expertise in all areas is needed to use a multi-disciplinary approach to fully understand the potential of alpine forests to adapt to changing climate.

Strategic vision for future and collaborative research

On day 2 of the meeting, a brainstorming session was held to begin to develop a strategic vision for AForGeN. The meeting attendees formed three breakout groups of ~10 people each. Group 1 was assigned to Norway spruce, group 2 to stone pine and mugo pine, and group 3 to all other species. Each group aim was to discuss and develop a report on four items:

1. Top three research priorities toward applying genetic information in managing alpine forests in the face of changing climate
2. Enumerate the existing resources (genomic, genetic test, etc.) available to the community

3. Develop a prioritized list of what resources are yet needed
4. List prospects and opportunities for collaboration

Each group reported back to the full group of attendees, and open discussion followed. The information gathered during this strategic session will be used to develop a strategic plan for AForGeN. The plan will be prepared in late 2012 and early 2013 and will be posted at the project website in advance of the second annual meeting.

The most important research priority that emerged from all three groups was the need to establish long-term genetic tests at multiple locations where trees can be both genotyped and phenotyped. How to meet this important need is an extremely difficult problem as it takes long-term funding commitments and cross-national cooperation and coordination. Nevertheless, AForGeN will make this issue a priority and work toward viable solutions.

Governance and future meetings

The final order of business for the 1st annual AForGeN meeting was to establish some policies for governance of the network and make plans for the next meeting. Those attending from Austria volunteered to host the next meeting at a location near Vienna. The meeting will be organized in late June 2013.

By consensus of those attending the meeting, it was agreed that AForGeN would have a steering committee and would be made up of one representative from each participating country. Each country would elect its representative. The current steering committee members are Bruno Fady (France), Barbara Fussi (Germany), Santiago C. Gonzáles-Martínez (Spain), Felix Gugerli (Switzerland), Berthold Heinze (Austria), Mária Höhn (Hungary), Martin Lascoux (Sweden), Elena Mosca (Italy), and David Neale (USA). Furthermore, by consensus of the steering committee members, it was decided that Berthold Heinze would serve as Chair.

Summary

The ever-rapid advancement of genomic and geo-spatial technologies provides new and powerful landscape genomic approaches to the study of forest tree adaptation to changing climate. Research groups in the alpine region of Europe have begun to use such approaches and now have a functional network in place to facilitate communication and coordination. The members of AForGeN are excited about future opportunities that may now emerge as a result of the network and invite all others interested in this topic to join the network.

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