Whole Genome Sequencing meets Community Science Funding:

Principal Investigator (PI)-led whole genome projects
sponsored by GIGA

A Proposal and Guidelines

Rationale

The non-profit Global Invertebrate Genomics Alliance (GIGA - http://www.gigacos.org/) began essentially and still remains a grass-roots organization dedicated to promoting whole genome sequencing of aquatic invertebrates and also training students and scientists to analyze the large swaths of novel genomic data. GIGA also signed on as one of the first supporters and affiliates of the larger Earth BioGenome Project (EBP - https://www.earthbiogenome.org/benefits-of-joining-the-ebp) which aspires to sequence the whole genomes of the approximately 1.8.million named eukaryotes on the planet.

In this regard, GIGA now intends to initiate and promote a citizen-science based approach to sequence more high quality chromosomal-level whole marine invertebrate genomes. This will be a principal investigator project driven through crowd-funding sites such as https://experiment.com/, GoFundme, Indigogo.com or other comparable fund-raising platforms.

The costs of sequencing whole genomes continue to dwindle, due to improving DNA sequencing technologies and equipment. On average, we project that a 1 Gb or less genome can be fully sequenced for less than $5,000 with both long read and Illumina technology to at least 30X. These services can be provided by multiple academic core labs or commercial vendors. However, caveats do exist. The final sequencing price will depend on the size of the target genome. Furthermore, the sequencing costs typically only involve the sequencing service and raw data output, and thus costs typically do not include the labor and time involved in making sense of the DNA data, that is proper assembling and gene annotation of new genomes. The latter should be provided by the PI at their institution.

Nonetheless, this proposal aims to help obtain the whole chromosome, reference level genome sequences after the PI has secured official collection permits, and obtained the necessary high quality tissue samples which will facilitate DNA sequencing at an institution of their choosing. The PI will also arrange to handle the data and accompanying responsibilities.

GIGA's main role in any project will be to serve as a) expert source of invertebrate genomics/bioinformatics assistance and b) provide a US tax-exempt (501c3) organization who can accept funds for the PI (optional). Sometimes, campaigns will gain more gravitas among potential donors when a project's affiliation with a non-profit. The latter enables a simple tax reporting structure. Upon completion of the fund-raising campaign(s), funds will be transferred from GIGA to the PI. The primary request that GIGA makes is that the final assembled genome be sequenced to at least 30X coverage, aim for chromosomal level assemblies, be added to the **GIGA BioProject # PRJNA649812** and that all of the genome sequence data be deposited upon completion in a public DNA repository (NCBI, ENA etc) and then included in the EarthbioGenome Project, via the GoaT website - https://goat.genomehubs.org/.

Benefits

We urge qualified researchers looking for genome sequencing funds to try this approach out because of the following benefits:

- Whole genome sequencing remains a fairly esoteric practice and its importance needs to be more widely disseminated. For example, these recent publications can help spell out the ramifications - https://www.science.org/content/article/once-thought-fantasy-effort-sequence-dna-millions-species-gains-momentum?
  and GIGA et al, 2013; Blaxter et al, 2022; Lewin et al, 2022;
- The project can be initiated by nearly anyone who has legitimate biological credentials (scientist, graduate student, postdoctoral scientist) AND who can obtain the proper organismal collection permits and source tissue.
- The fund-raising landing page created by the PI, and also allowed her/him the opportunity to showcase their species, the project's importance and other biological contexts which all help explain the necessities for sequencing whole genomes.
- The PI stays in control of all aspects of the project: the samples, sequencing center and their budget.
- This is a low overhead option, aside from a small donation to support GIGA. The PI will also have to respond to their donors by providing perks, and use of funds from their budget as procribed by the project plan and the respective crowd funding platform.

Guidelines to start a GIGA-sponsored project

1. The PI will draft a plan to sequence their chosen invertebrate species and aim to reach EBP chromosomal level sequencing standards (https://www.earthbiogenome.org/report-on-assembly-standards).
2. Each PI will initiate and justify fund raising for sequencing to their potential donors at their chosen citizen science donation site above – GoFundme.com, Experiment.com, Indigogo.com. They will have to follow specific campaign rules at each respective site.
3. Justification should also include valid species identification by taxonomic experts or molecular barcodes.
4. The PI will provide an estimate of the sequencing costs from a certified sequencing center (e.g. University of Florida ICBR, University of Connecticut Center for Genome Innovation, Duke University core labs, Alpha Hudson, Azenta, etc), and the final target limit of the donation campaign. As mentioned above this will likely not exceed ($5,000/species) for each invertebrate genome of average size.
5. As part of the PI project plan, besides the BioProject linkage, we also ask that the PI reach out to GIGA board members, and obtain permission for any GIGA resources and our tax-exempt status. GIGA will provide the proper banking information to collect funds for PI if desired and when an agreement is reached. We ask the PI to include a handling donation to GIGA of at least 3% of the total fundraising target in order support non-profit GIGA activities like this into the future.

References and Further Reading

https://www.science.org/content/article/once-thought-fantasy-effort-sequence-dna-millions-species-gains-momentum?

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