NZGL: a genomics infrastructure for NZ

Ministry of Business, Innovation & Employment

Science + Innovation

NZGL

BIOMATTERS

gen-i REANNZ

NeSI
NZ eScience Infrastructure

UNIVERSITY of OTAGO
Te Whare Wānanga o Otāgo
NEW ZEALAND

Otago Genomics and Bioinformatics Facility

THE UNIVERSITY OF AUCKLAND
NEW ZEALAND
Te Whare Wānanga o Tāmaki Makaurau

Auckland Genomics Core Facility, Bioinformatics Institute

MASSEY UNIVERSITY
TE KUNENGA KI PŪREHUROA
UNIVERSITY OF NEW ZEALAND

Massey Genome Service

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What does NZGL do?

- Genomics solutions; from design and data collection to analysis: accessible, customized, integrated, with help at all points
- Software and IT resources, secure data management

Examples of recent projects:

- Gout in the NZ population including Maori and Pasifika
- Whole genome sequencing of Weta
- Mating systems of native kowhai and tree fuschia
- Sequencing ancient DNA from NZ's Haast's Eagle

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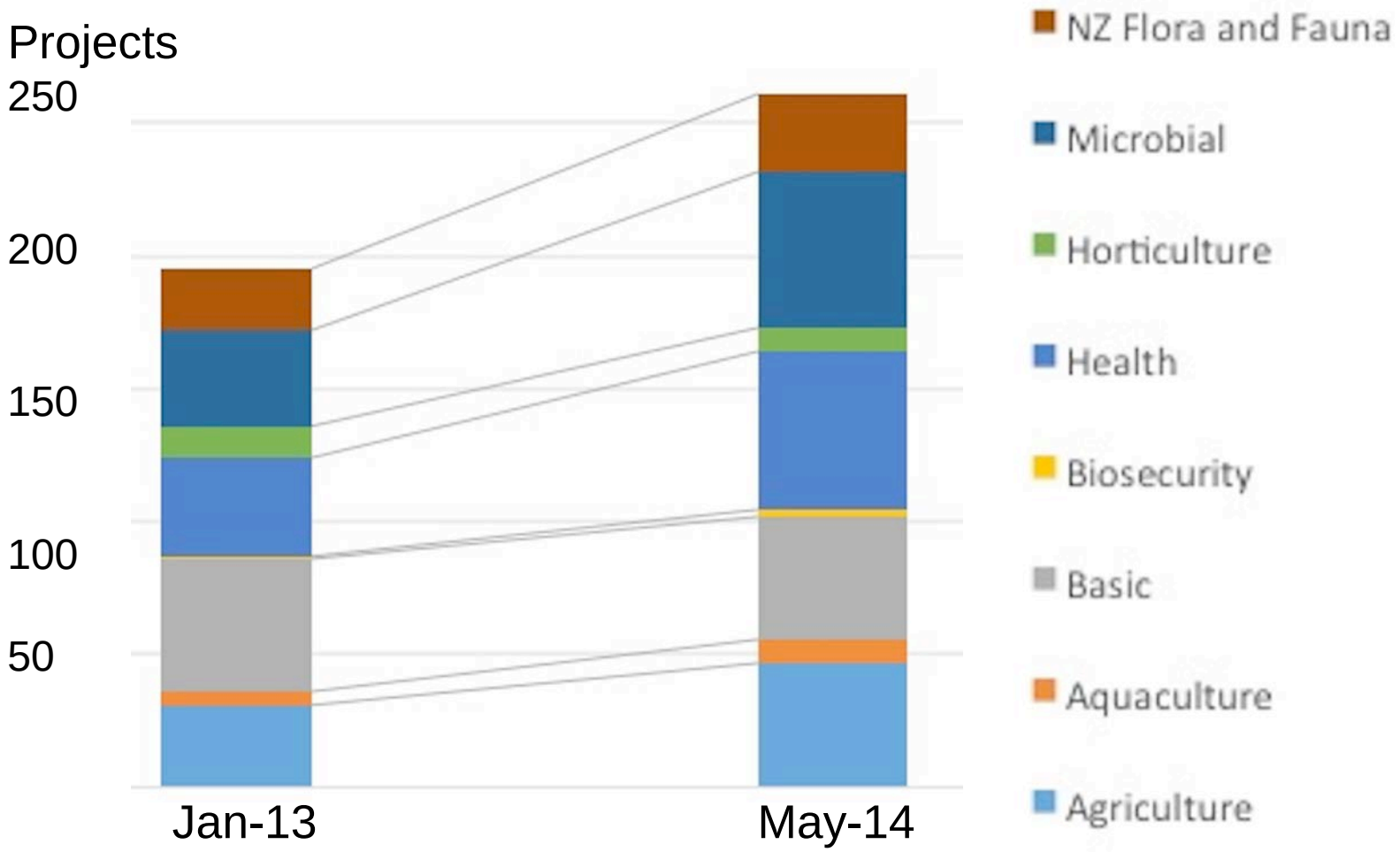
NZGL serves a wide variety of NZ sectors



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The changing (genomic) data scene

Worldwide

- Huge growth in sequencing and analysis capabilities (the “$1000 genome”); new nanopore technologies
- How do NZ scientists best access/use these?

In NZ : CoREs, NSCs, Universities, CRIs

- Wider use of genomics, yet social acceptance issues around genomic data, particularly in personalised medicine
- Small projects across a wide range of areas
- Importance of multi-disciplinary collaboration in NZ

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Implications for NZGL

- NZGL is not cost-competitive for massive sequencing, better-suited for smaller, bespoke projects typical in NZ
- But NZGL can assist NZ scientists/bioinformaticians to:
  - best access and utilise sequencing capabilities (NZ & o'seas)
  - decide what data should be brought back to process here
  - what should remain overseas to be worked on remotely
  - how do we best do both
- NZGL recognises the changing needs of the CoREs and NSCs in NZ; both are becoming truly national institutions with an increasing need for genomics capabilities and wider social remits than before

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Genomics services through NZGL

Applications

- Whole genome sequencing
- Transcriptomics/RNAseq sequencing
- Expression analysis using microarrays or nanoString
- Metagenomics/amplicon sequencing
- Custom projects e.g. sequencing enriched regions

Instrumentation

Illumina HiSeqs, MiSeqs
Ion Torrent PGM

Affymetrix GeneChip systems,
nanoString nCounter system

Costs based on consumable requirements; substantial subsidy

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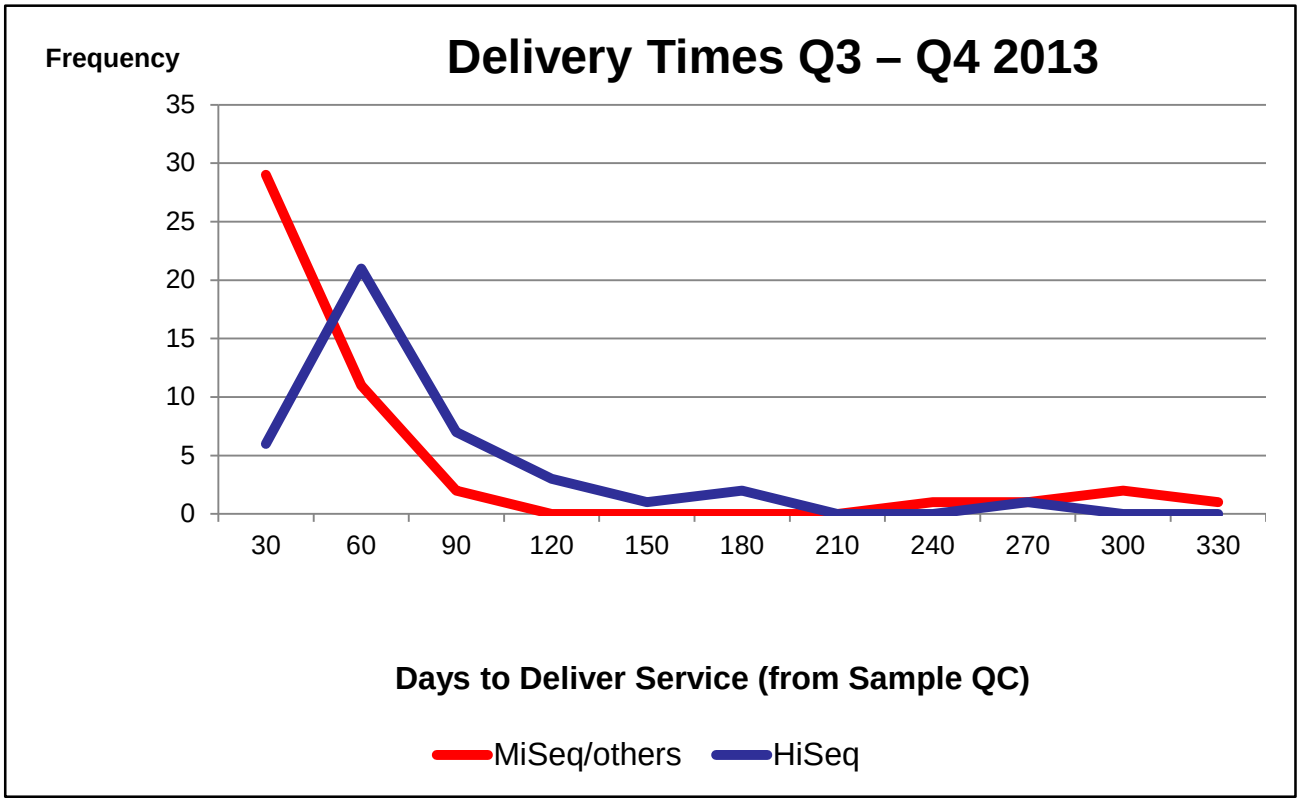
Project completion times

- Distribution of project completion times, beginning from sample QC following delivery to facility
- 176 genomics contracts completed in 2013; tracking higher to date in 2014



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Bio-IT services through NZGL

- The system is a seamless mix of hardware, storage, software and support
- Available where, when and as much/little as you need it
- “Tuned” to the needs of genomics researchers
- Software and databases updated regularly
- Direct support from NZGL software engineers and bioinformaticians
- Cost based on use and subsidised >50%

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Bio-IT software resources

- Wide set of applications catering for all users: command line through to web interface
- Support for collaborative work: a shareable workspace and account for each project
- Support for key databases (incl. commercial) as required and a range of standard processing pipelines
- Standard bioinformatics utilities and tools
- Raw data acceptance (automatic for NZGL genomics)
- Extensive Galaxy server environment

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Bio-IT resource specifications

- Two high-memory systems (1 TB RAM) supporting virtual environments (20-50 active users) – 80 cores (G8)
- A cluster (96 Gb RAM per node) supporting high performance operations – 96 cores (G8)
- 250TB tiered storage (expandable to 16 Pb)
- Secure access and direct connection to **REANNZ** at 10 Gb/s and to the internet at 1 Gb/s
- Operates 24*7, >99.9% uptime (managed by **Gen-i** & HP and software support by **Biomatters**)

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Bioinformatics services through NZGL

- Training and workshops – introductory and specific applications
- Experimental design
- Quality assessment of data
- Data analysis
  - Experiment-based (e.g., RNAseq, expression microarrays, resequencing etc)
  - Project-based (e.g., simulation, annotation, network reconstruction etc.)
- Individual or group ‘coaching’ assistance – helping researchers work with their own data

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Individual contracts

- Genomics – significant assistance in experimental design and benchmarking; actual cost ~50% discounted, based on actual use of resources
- Bioinformatics – $100/h (~60% discount). Block arrangement possible, with retainer to allow service continuity
- Cost competitive with large sites such as Amazon (and data remains on-shore)
- Cost effective against “building your own” system

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Bulk contracts: flexibility for NSCs, CoRES, Uni Departments, CRIs

Example

- A 12 month flexible contract including 300 h of bioinformatics with roll-over
- Access to a scalable proven working environment for required users
- Training – one on one or workshops by request
- Access to genomics services at cost (no margin) when bundled with above on significant contracts
- Predictable monthly subscription; flexible support of multiple projects

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NZGL team

Genomics staff (11)

Bioinformaticians (10)

Facility managers (4)

Bio-IT system and support (2)

Head office (5)

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