



Axiom genotyping arrays for agrigenomics

Total support from the first step
to the next advancement

applied biosystems

The application of genomics in agriculture

Agrigenomics research is growing as climate change, population growth, and urbanization threaten the ability of farmers to meet the world's food demands. To address these needs, breeders and farmers are employing new genomic strategies in order to use fewer environmental resources to develop higher-producing livestock, poultry, and crops, and to use fewer antibiotics and pesticides.

It is important that your agrigenomics genotyping solution be reliable and flexible, and incorporates markers to address the following applications:

Genomic selection

Genomic selection aims to improve quantitative traits in large breeding populations through the use of whole-genome molecular markers. Genomic prediction combines marker data with phenotypic and pedigree data, when available, to increase the accuracy of predicting breeding and genotypic values.

Marker-assisted selection (MAS) and marker-assisted breeding (MAB)

MAS and MAB efficiently select for desirable traits during breeding, where a trait of interest is selected based on a marker linked to that trait, rather than based on the trait itself.

Parentage

DNA parentage testing is a valuable tool that allows breeders to confidently select elite animals, knowing their ancestry is correct. It can be used to fast-track genetic progress or confirm parentage, and may determine if an animal carries defective genes, helping to avoid defects in future offspring.

Characterization of genetically modified organisms (GMOs)

Researchers develop genetically modified animals and plants to increase yield, decrease susceptibility to disease, and minimize use of antibiotics in production facilities.



Accelerate your marker–trait association and genomic-selection efforts

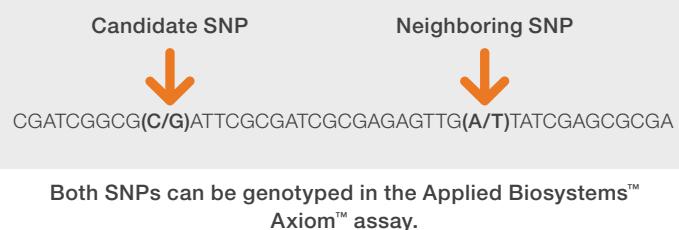
Axiom Genotyping Solution for agrigenomics

Powerful

- Genotype any species, genome size, and ploidy, including complex mosaic genomes
- Include markers for multiple species on a single array with no restrictions on number of markers per species
- Interrogate insertion or deletion polymorphisms (indels) and ensure inclusion of all candidate single-nucleotide polymorphisms (SNPs) with neighboring SNPs as close as 10 base pairs away, enabling more effective quantitative trait loci (QTL) analysis
- Utilize the powerful yet simple data analysis software included at no extra cost

Robust

- Highly specific, ligation-based, two-color enzymatic assay that enables reliable design and detection of complex markers
- Robust and 100% reproducible manufacturing process that helps to ensure no loss of any SNPs

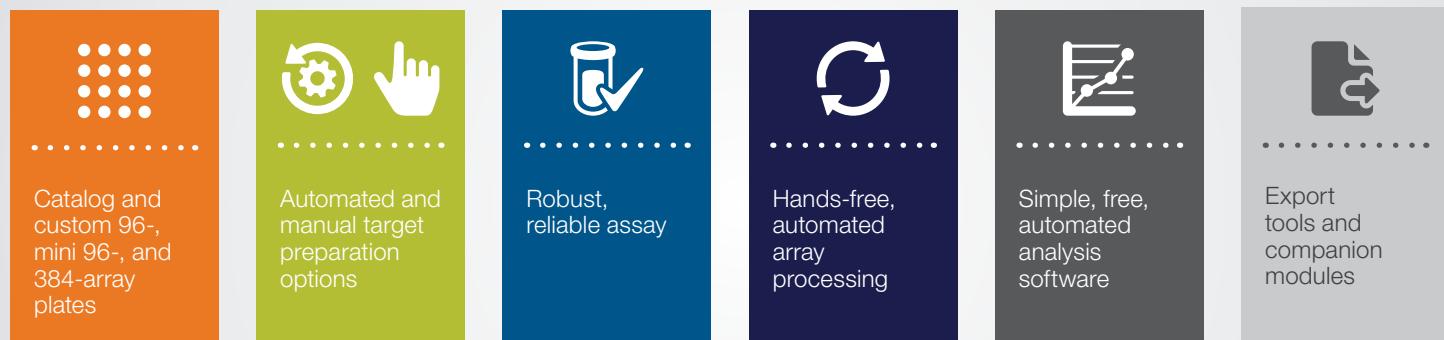


Scalable

- Fully automated workflow that can process up to eight array plates per week with a single Applied Biosystems™ GeneTitan™ Multi-Channel (MC) Instrument
- High-throughput, flexible array layout with the ability to process between 96 and 6,144 samples per week

The Applied Biosystems™ Axiom™ Genotyping Solution for agrigenomics includes arrays with genotype-tested content from the Applied Biosystems™ Axiom™ Genomic Database or *de novo*

markers that are important to you. The full solution comprises arrays, reagents, automated and manual workflows, and simple, free data analysis software.



Customized arrays to meet your specific needs

Axiom myDesign Custom Genotyping Arrays

The Applied Biosystems™ Axiom™ myDesign™ Custom Genotyping Array program offers a fast, affordable way to create tailored and fully custom arrays for individual researchers or consortia. Partner with our bioinformatics team to design arrays with relevant, specific content for your studies.

Consistent supply and fast turnaround times

- Get 100% identical SNP content with every order for as long as your research requires
- Use *in silico* design scores to maximize the number of markers that will generate successful genotypes
- Receive new custom arrays approximately six weeks after final design review

High-density screening

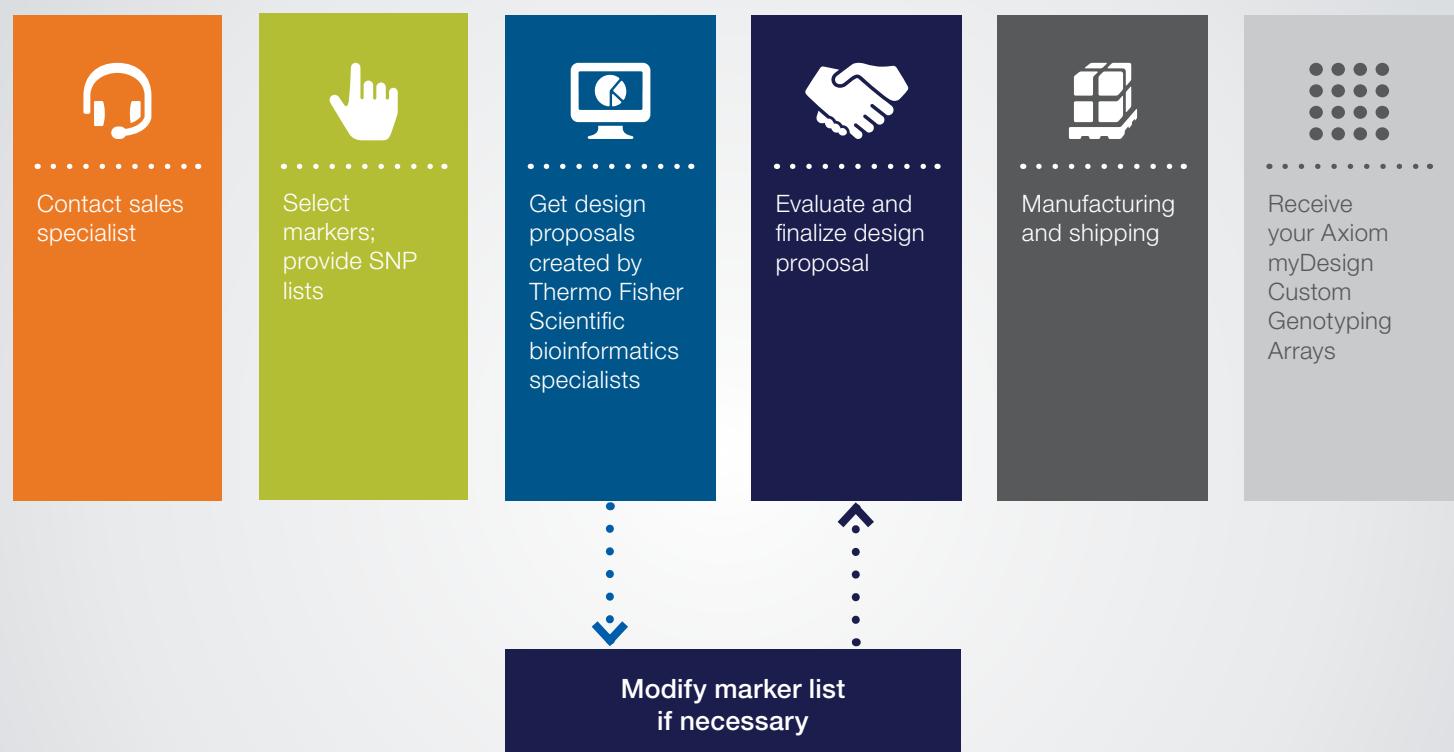
- Validate sequencing SNP discovery with a screening array, and then select the most informative SNPs to design an array for routine, downstream high-throughput genotyping

Flexible

- Select from a variety of formats to meet your needs: 96-, mini 96-, and 384-array plates
- Multiplex 500–675,000 SNPs per array at an affordable price, enabling you to get more information from your investment

Scalable

- Low up-front sample commitment (as few as 480 samples) to fit your budget
- Reorder custom arrays for as few as 192 samples to complete your study



Expertly predesigned arrays for your species of interest

Axiom array designs help make genotyping accessible across a variety of species

Plants and crops

We created Axiom genotyping array designs for a variety of difficult-to-genotype plants, including potato, strawberry, wheat, maize, and ornamental plants. Applications include complex trait research such as polyploid linkage maps, identification of multi-SNP haplotypes in progenies and breeding material, and molecular breeding.



Applied Biosystems™ Axiom™ genotyping arrays can help accelerate and increase the efficiency of cultivar development.

Livestock, poultry, and farm animals

Genotyping is becoming a common practice in animal breeding. High- to low-density Axiom genotyping arrays can be used to make timely genomic selection and parentage breeding decisions. Understanding inheritance characteristics across and within multiple breeds is also possible.



"The Axiom platform is a hugely informative and multifunctional platform, which has the potential to trigger a paradigm shift in not only sustainable sheep breeding but also the optimal management of sheep flocks."

—Dr. Donagh Berry
Director of VistaMilk SFI Centre and Quantitative Geneticist at Teagasc, Moorepark, Ireland

Companion animals

The dog has emerged as a premier species for the study of morphology, behavior, and disease. By capturing more of the genomic variation in each dog, Axiom genotyping arrays enable powerful genome-wide association studies (GWAS) in populations that include mixed-breed dogs or multiple breeds.



Aquaculture

Aquaculture is one of the fastest-growing food industries in the world, yet it is estimated that only 10% of aquaculture production is based on genetically improved stocks. Pedigree in aquaculture species is often costly and difficult to obtain, making development of optimized selective breeding programs challenging. Axiom genotyping arrays can be designed for complex mosaic genomes such as those of salmon.



"Axiom genotyping technology has taken Marine Harvest into the genomic era and is playing a key role in the realization of the enormous potential that lies within our Atlantic salmon breeding program."

—Dr. Matthew Baranski
Genetics Manager at Marine Harvest Group, Bergen, Norway

Axiom Analysis Suite software

Free, automated genotype calling for diploids and polyploids

Applied Biosystems™ Axiom™ Analysis Suite software integrates SNP genotyping, indel detection, copy number analysis and off-target variant (OTV) calling of simple and complex genomes in an easy-to-use graphical interface.

Powerful statistics

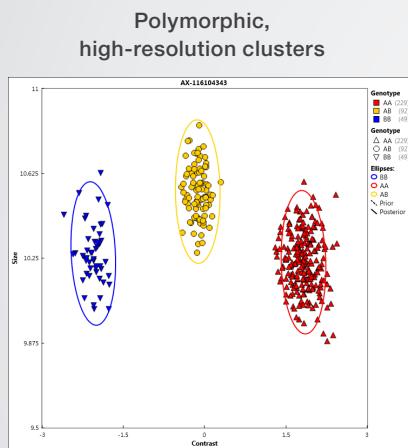
- Axiom clustering and genotyping algorithm (AxiomGT1) features adaptive, dynamic clustering that employs statistical methods for accurate genotyping of diploid and polyploid species
- Applies statistical approaches to accurately ascertain specific SNP cluster patterns and automatically assign correct genotypes
- Performs fixed region copy number and *de novo* copy number analysis

Seamless integration with your existing systems

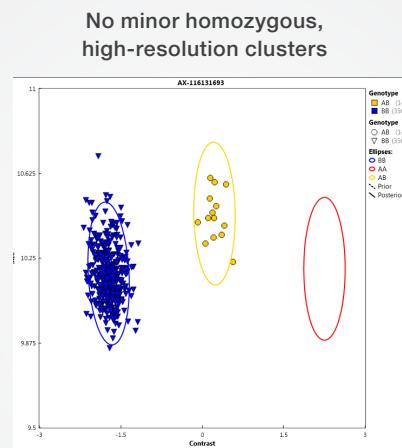
- Automation-friendly option with command line-based tools
- Simple export of Axiom genotyping array data into long format for easy analysis with existing bioinformatics pipelines using the Applied Biosystems™ Axiom™ Long Format Export (AxLE) Tool
- Easy reformatting and uploading of Axiom genotyping array data into the Council on Dairy Cattle Breeding (CDCB) database with the Applied Biosystems™ CDCB Export Tool

Multiple interpretation tools

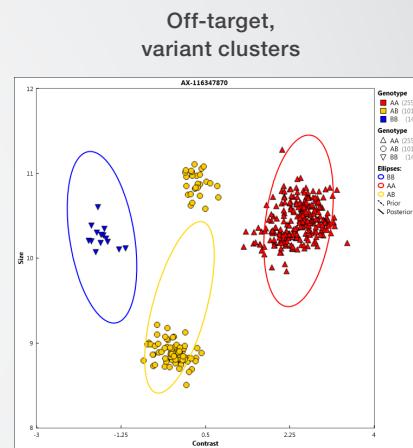
- Includes flexible SNP filtering and tools for exporting to PLINK format
- Provides customizable visualization tools
- Classifies the SNPs into categories that enable you to assess the quality of the genotypes
- Easily export and visualize copy number variations (CNVs) and loss of heterozygosity (Integrative Genomics Viewer-compatible)



Good cluster resolution with at least two examples of the minor allele.



Two clusters with no examples of the minor allele.



Reproducible yet uncharacterized variants caused by double deletion, sequence non-homology, or DNA secondary structure.

Axiom Propel XPRES 384 High Throughput (HT) Workflow

Scalable and economical workflow to meet your high-sample volume needs



Stand-alone GeneTitan Scanner

Axiom Propel XPRES 384 High Throughput (HT) Workflow

The Applied Biosystems™ Axiom™ Propel XPRES 384HT Workflow enables high-throughput agrigenomics customers to achieve higher sample throughput with lower capital and operational costs while gaining greater efficiency.

Accelerated turnaround time

- Chemistry that enables sample-to-genotype results in 48 hours with Applied Biosystems™ Axiom™ genotyping arrays with a 384HT format
- Flexibility to scan priority samples without interrupting your production workflow with the help of a stand-alone Applied Biosystems™ GeneTitan™ Scanner
- 30% faster scan times for 96-format arrays

Sustainable solution

- Scale up your workflow as production demands increase
- Bulk packaging of Applied Biosystems™ Axiom™ reagents resulting in less waste and greater operational efficiency
- Reduction of plastic waste with use of the Thermo Scientific™ Multidrop™ Combi Reagent Dispenser



Bulk Axiom reagents



Multidrop Combi Reagent Dispenser:
small footprint, big performance

Automated Axiom Analysis Software

Fast-track your data analysis to meet your breeding needs

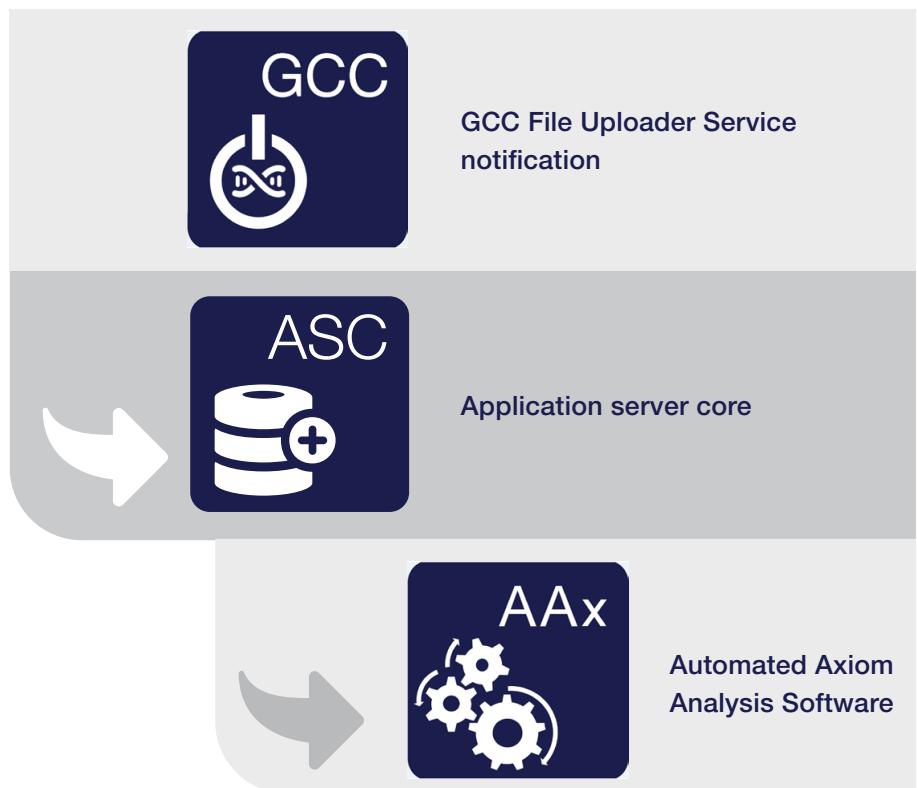
Automated Axiom Analysis Software

The Applied Biosystems™ Automated Axiom™ Analysis Software package enables analysis of CEL files upon scan completion of an Axiom array plate without user intervention.

Easy-to-use, automated analysis

- Easily set up your analysis requirements
- Conveniently view an analyzed batch in the dashboard
- Directly view genotyping metrics by array plate

Automated Axiom workflow



A single platform for every phase of your breeding program

The Axiom Genotyping Solution for agrigenomics provides breeders and researchers with powerful and flexible genotyping tools to cost-effectively identify, verify, and screen complex genetic traits in plants and animals. Our array-based agrigenomics genotyping solution is ideal for applications ranging from genome-wide analysis to routine screening with very high accuracy and reproducibility, a straightforward workflow, and 100% fidelity to ensure there are no SNP dropouts.



Ordering information

Products	Number of markers	Format	Cat. No.
Plants and crops*			
Axiom Apple Genotyping Array	480,000	96-array	550573
Axiom Apple Genotyping Array (Axiom JK150kMd)	48,139	384HT-array Mini 96-array	551434 551435
Axiom Citrus HD Genotyping Array (Citrus15 AX1)	702,244	96-array (2 array set)	550729
Axiom Citrus HD Genotyping Array (Citrus15 AX2)	702,198		550730
Axiom Citrus Genotyping Array	58,433	384HT-array	550775
Axiom Cotton Genotyping Array	35,550	96-array	550563
Axiom Maize Genotyping Array	616,201	96-array	550494
Axiom Maize 6H Genotyping Array (60K)	61,282	384HT-array Mini 96-array	551098 551099
Axiom Peanut Genotyping Array	47,837	384HT-array Mini 96-array	550846 550865
Axiom Pear Genotyping Array	50,000	384HT-array Mini 96-array	550887 551146
Axiom Rice Genotyping Array	49,600	96-array	550625
Axiom Rose Genotyping Array	68,893	96-array	550450
Axiom Rye Genotyping Array	600,843	96-array	550535
Axiom Soybean Genotyping Array	180,961	96-array	550469
Axiom Strawberry Genotyping Array (iStraw90K)	95,062	96-array	550466
Axiom Strawberry Genotyping Array (i35)	34,260	384HT-array Mini 96-array	550767 550827
Axiom Strawberry Genotyping 50K Array (Axiom FanaSNP)	49,483	384HT-array Mini 96-array	551041 551042
Axiom Tomato Genotyping Array	51,214	96-array	550497
Axiom BreedWheat 35K Genotyping Array (Axiom TaBW35K)	34,746	384HT-array Mini 96-array	550868 550879
Axiom Walnut Genotyping Array	609,659	96-array	550817
Axiom Wheat HD Genotyping Array (Bristol W1)	817,000	96-array (2 array set)	550491
Axiom Wheat HD Genotyping Array (Bristol W2)	817,000		550492
Axiom Wheat Breeders Genotyping Array	35,000	384HT-array Mini 96-array	550524 550966
Axiom Multispecies Plant Genotyping Array (Cashew, Cassava, Araucaria, and Eucalyptus)	16,504 [<i>Anacardium occidentale</i> (Cashew nut tree)] 3,400 SNPs [<i>Araucaria angustifolia</i> (Brazilian pine)] 2,000 [<i>Eucalyptus</i> spp. (Eucalyptus tree)] 3,417 [<i>Manihot esculenta</i> (Cassava)]	384HT-array Mini 96-array	550776 551231
Trees*			
Axiom Eucalyptus Genotyping Array (72K)	72,000	384HT-array Mini 96-array	551134 551135

* Arrays for additional species may become available as the scientists at Thermo Fisher continue to grow the product line. Please check online or with your sales representative for the most up-to-date information.

Ordering information

Products	Number of markers	Format	Cat. No.
Livestock, camelids, and poultry*			
Axiom Genome-Wide BOS 1 Bovine Array Kit	648,855	96-array	901791
Axiom Bovine Genotyping v3 Array	63,988	384HT-array	551089
		Mini 96-array	551090
Axiom Bovine 100K Array	~100,000	384HT-array	551325
		Mini 96-array	551326
Axiom Bovine-Ovine-Caprine Genotyping Array	54,560 (Bovine) 60,034 (Caprine) 54,236 (Ovine)	96-array	550627
Axiom Buffalo Genotyping Array	90,000	96-array	550431
Axiom Genome-Wide Chicken Array Kit	580,000	96-array	902148
Axiom Deer Genotyping Array (OVSNP600)	702,183	96-array	551189
Axiom Deer Genotyping Array (OVSNP60)	72,723	384HT-array	551367
Axiom Equine Genotyping Array	670,796	96-array	550583
Axiom Equine Plus Genotyping Array	670,800	96-array	550624
Axiom Goat Genotyping v1 Array	58,655	384HT-array	551365
		Mini 96-array	551366
Axiom Goat Genotyping v2 Array	59,795	384HT-array	551343
		Mini 96-array	551344
Axiom Ovine Genotyping Array (51K)	51,000	384HT-array	550898
		Mini 96-array	550947
Axiom Porcine HD Genotyping Array	658,692	96-array	550588
Axiom Porcine Breeders Genotyping Array	55,232	384HT-array	550833
		Mini 96-array	550855
Axiom Turkey Genotyping Array	643,845	96-array	550538
Axiom Camelids Genotyping Array	59,995 (Alpaca) 59,938 (Bactrian) 59,958 (Dromedary)	96-array	551142
Axiom IMAGE001 Genotyping array	10,101 (Bovine) 9,983 (Caprine) 9,306 (Chicken) 10,114 (Equine) 10,111 (Ovine) 10,107 (Porcine)	384HT-array	551165
Axiom IMAGE001v2 Genotyping array	9,592 (Bovine) 10,615 (Caprine) 8,583 (Chicken) 8,930 (Equine) 12,110 (Ovine) 8,790 (Porcine)	384HT-array	551408
		Mini 96-array	551409
Axiom IMAGE002 Genotyping array	7,901 (Buffalo) 7,900 (Duck) 7,901 (Pigeon) 7,901 (Quail) 7,901 (Rabbit)	384HT-array	551263

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Products	Number of markers	Format	Cat. No.
Aquaculture*			
Axiom Arctic Charr Genotyping Array (Axiom SalpSNP)	86,504	96-array	550925
Axiom Catfish Genotyping Array	693,567	96-array	550704
Axiom Coho Salmon Genotyping Array	200,000	96-array	550862
Axiom Coho Salmon Genotyping Array (70K)	70,659	384HT-array Mini 96-array	551112 551113
Axiom Coral-Algae Genotyping Array (Axiom AcropSNP)	4,021 (Algae) 53,589 (Coral)	384HT-array Mini 96-array	550961 550962
Axiom Multispecies Fish Genotyping Array (Axiom SerraSNP)	29,612 [<i>Piaractus mesopotamicus</i> (Pacu)] 29,575 [<i>Colossoma macropomum</i> (Tambaqui)]	384HT-array Mini 96-array	551218 551219
Axiom Oyster Genotyping Array	55,575	384HT-array	550796
Axiom Oyster Genotyping Array	55,575	Mini 96-array	551179
Axiom Rainbow Trout Genotyping Array (UVicOmyk)	201,554	96-array	551061
Axiom Salmon Genotyping Array (<i>Salmo salar</i>)	430,743	96-array	550540
Axiom Shrimp and Tilapia Genotyping Array (Axiom TilShrv1)	6,453 (Shrimp) 60,886 (Tilapia)	384HT-array Mini 96-array	551185 551186
Axiom Trout Genotyping Array	57,501	96-array	550468
Axiom Trout Genotyping Array	57,501	384HT-array	550571
Axiom Trout Genotyping Array	57,501	Mini 96-array	551387
Companion animals*			
Axiom Canine Genotyping Array Set A	460,000	96-array	550771
Axiom Canine Genotyping Array Set B	670,000	96-array	550772
Axiom Canine HD Genotyping Array	712,893	96-array	550869
Model organisms*			
Axiom Aedes Aegypti Genotyping Array	50,000	96-array	550481
Axiom Mouse Genotyping Array	616,136	96-array	550810
Axiom Rabbit Genotyping Array	200,000	96-array	550669
Multispecies*			
Axiom Ovi Ory Genotyping Array	11,198 (Ovine) 33,365 (Rice)	384HT-array Mini 96-array	550838 551178
Axiom Multispecies 9-Genotyping Array	2,463 (Bovine) 606 (Canine) 989 (Equine) 4,734 (Green bean) 12,000 (Honeybee) 1,991 (Ovine) 8,875 (Rice) 9,019 (Soy) 10,763 (Sunflower)	384HT-array Mini 96-array	551416 551417

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Learn more about Axiom genotyping arrays for agrigenomics at thermofisher.com/microarrays

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