

ANSWER

Let's begin by creating the index:

```
mongos> db.elegans.createIndex( { N2 : 1, mutant : 1 } )
{
  "raw" : {
    "localhost:27501" : {
      "createdCollectionAutomatically" : false,
      "numIndexesBefore" : 2,
      "numIndexesAfter" : 3,
      "ok" : 1
    },
    "localhost:27601" : {
      "createdCollectionAutomatically" : false,
      "numIndexesBefore" : 2,
      "numIndexesAfter" : 3,
      "ok" : 1
    }
  },
  "ok" : 1
}
mongos>
```

Next, we'll look at the explain output. Here is how it looks on a macbook air:

```
mongos> db.elegans.find({N2:"T",mutant:"A"}).limit(5).explain("executionStats")
{
  "queryPlanner" : {
    "mongosPlannerVersion" : 1,
    "winningPlan" : {
      "stage" : "SHARD_MERGE",
      "shards" : [
        {
          "shardName" : "s1",
          "connectionString" : "localhost:27501",
          "serverInfo" : {
            "host" : "cross-mb-air.local",
            "port" : 27501,
            "version" : "3.0.2",
            "gitVersion" : "6201872043ecbbc0a4cc169b5482dcf385fc464f"
          },
          "plannerVersion" : 1,
          "namespace" : "snps.elegans",
          "indexFilterSet" : false,
          "parsedQuery" : {
```

```

"$and" : [
  {
    "N2" : {
      "$eq" : "T"
    }
  },
  {
    "mutant" : {
      "$eq" : "A"
    }
  }
]
},
"winningPlan" : {
  "stage" : "LIMIT",
  "limitAmount" : 0,
  "inputStage" : {
    "stage" : "KEEP_MUTATIONS",
    "inputStage" : {
      "stage" : "SHARDING_FILTER",
      "inputStage" : {
        "stage" : "FETCH",
        "inputStage" : {
          "stage" : "IXSCAN",
          "keyPattern" : {
            "N2" : 1,
            "mutant" : 1
          },
          "indexName" : "N2_1_mutant_1",
          "isMultiKey" : false,
          "direction" : "forward",
          "indexBounds" : {
            "N2" : [
              "[\"T\", \"T\"]"
            ],
            "mutant" : [
              "[\"A\", \"A\"]"
            ]
          }
        }
      }
    }
  },
  "rejectedPlans" : [ ]
},
{
  "shardName" : "s2",
  "connectionString" : "localhost:27601",
  "serverInfo" : {

```

```
"host" : "cross-mb-air.local",
"port" : 27601,
"version" : "3.0.2",
"gitVersion" : "6201872043ecbbc0a4cc169b5482dcf385fc464f"
},
"plannerVersion" : 1,
"namespace" : "snps.elegans",
"indexFilterSet" : false,
"parsedQuery" : {
  "$and" : [
    {
      "N2" : {
        "$eq" : "T"
      }
    },
    {
      "mutant" : {
        "$eq" : "A"
      }
    }
  ]
},
"winningPlan" : {
  "stage" : "LIMIT",
  "limitAmount" : 3,
  "inputStage" : {
    "stage" : "KEEP_MUTATIONS",
    "inputStage" : {
      "stage" : "SHARDING_FILTER",
      "inputStage" : {
        "stage" : "FETCH",
        "inputStage" : {
          "stage" : "IXSCAN",
          "keyPattern" : {
            "N2" : 1,
            "mutant" : 1
          },
          "indexName" : "N2_1_mutant_1",
          "isMultiKey" : false,
          "direction" : "forward",
          "indexBounds" : {
            "N2" : [
              "[\"T\\", \"T\\"]"
            ],
            "mutant" : [
              "[\"A\\", \"A\\"]"
            ]
          }
        }
      }
    }
  }
}
```

```
    }
  }
},
"rejectedPlans" : [ ]
}
]
}
},
"executionStats" : {
  "nReturned" : 7,
  "executionTimeMillis" : 0,
  "totalKeysExamined" : 8,
  "totalDocsExamined" : 8,
  "executionStages" : {
    "stage" : "SHARD_MERGE",
    "nReturned" : 7,
    "executionTimeMillis" : 0,
    "totalKeysExamined" : 8,
    "totalDocsExamined" : 8,
    "totalChildMillis" : NumberLong(0),
    "shards" : [
      {
        "shardName" : "s1",
        "executionSuccess" : true,
        "executionStages" : {
          "stage" : "LIMIT",
          "nReturned" : 5,
          "executionTimeMillisEstimate" : 0,
          "works" : 7,
          "advanced" : 5,
          "needTime" : 1,
          "needFetch" : 0,
          "saveState" : 0,
          "restoreState" : 0,
          "isEOF" : 1,
          "invalidates" : 0,
          "limitAmount" : 0,
          "inputStage" : {
            "stage" : "KEEP_MUTATIONS",
            "nReturned" : 5,
            "executionTimeMillisEstimate" : 0,
            "works" : 6,
            "advanced" : 5,
            "needTime" : 1,
            "needFetch" : 0,
            "saveState" : 0,
            "restoreState" : 0,
            "isEOF" : 0,
            "invalidates" : 0,
            "inputStage" : {
```

```
"stage" : "SHARDING_FILTER",
"nReturned" : 5,
"executionTimeMillisEstimate" : 0,
"works" : 6,
"advanced" : 5,
"needTime" : 0,
"needFetch" : 0,
"saveState" : 0,
"restoreState" : 0,
"isEOF" : 0,
"invalidates" : 0,
"chunkSkips" : 1,
"inputStage" : {
  "stage" : "FETCH",
  "nReturned" : 6,
  "executionTimeMillisEstimate" : 0,
  "works" : 6,
  "advanced" : 6,
  "needTime" : 0,
  "needFetch" : 0,
  "saveState" : 0,
  "restoreState" : 0,
  "isEOF" : 0,
  "invalidates" : 0,
  "docsExamined" : 6,
  "alreadyHasObj" : 0,
  "inputStage" : {
    "stage" : "IXSCAN",
    "nReturned" : 6,
    "executionTimeMillisEstimate" : 0,
    "works" : 6,
    "advanced" : 6,
    "needTime" : 0,
    "needFetch" : 0,
    "saveState" : 0,
    "restoreState" : 0,
    "isEOF" : 0,
    "invalidates" : 0,
    "keyPattern" : {
      "N2" : 1,
      "mutant" : 1
    },
    "indexName" : "N2_1_mutant_1",
    "isMultiKey" : false,
    "direction" : "forward",
    "indexBounds" : {
      "N2" : [
        "[\"T\", \"T\"]"
      ],
      "mutant" : [
```

```
        "[\"A\\", \"A\\"]"
    ]
  },
  "keysExamined" : 6,
  "dupsTested" : 0,
  "dupsDropped" : 0,
  "seenInvalidated" : 0,
  "matchTested" : 0
}
}
}
}
},
{
  "shardName" : "s2",
  "executionSuccess" : true,
  "executionStages" : {
    "stage" : "LIMIT",
    "nReturned" : 2,
    "executionTimeMillisEstimate" : 0,
    "works" : 3,
    "advanced" : 2,
    "needTime" : 0,
    "needFetch" : 0,
    "saveState" : 0,
    "restoreState" : 0,
    "isEOF" : 1,
    "invalidates" : 0,
    "limitAmount" : 3,
    "inputStage" : {
      "stage" : "KEEP_MUTATIONS",
      "nReturned" : 2,
      "executionTimeMillisEstimate" : 0,
      "works" : 3,
      "advanced" : 2,
      "needTime" : 0,
      "needFetch" : 0,
      "saveState" : 0,
      "restoreState" : 0,
      "isEOF" : 1,
      "invalidates" : 0,
      "inputStage" : {
        "stage" : "SHARDING_FILTER",
        "nReturned" : 2,
        "executionTimeMillisEstimate" : 0,
        "works" : 3,
        "advanced" : 2,
        "needTime" : 0,
        "needFetch" : 0,
```

```
"saveState" : 0,
"restoreState" : 0,
"isEOF" : 1,
"invalidates" : 0,
"chunkSkips" : 0,
"inputStage" : {
  "stage" : "FETCH",
  "nReturned" : 2,
  "executionTimeMillisEstimate" : 0,
  "works" : 3,
  "advanced" : 2,
  "needTime" : 0,
  "needFetch" : 0,
  "saveState" : 0,
  "restoreState" : 0,
  "isEOF" : 1,
  "invalidates" : 0,
  "docsExamined" : 2,
  "alreadyHasObj" : 0,
  "inputStage" : {
    "stage" : "IXSCAN",
    "nReturned" : 2,
    "executionTimeMillisEstimate" : 0,
    "works" : 3,
    "advanced" : 2,
    "needTime" : 0,
    "needFetch" : 0,
    "saveState" : 0,
    "restoreState" : 0,
    "isEOF" : 1,
    "invalidates" : 0,
    "keyPattern" : {
      "N2" : 1,
      "mutant" : 1
    },
    "indexName" : "N2_1_mutant_1",
    "isMultiKey" : false,
    "direction" : "forward",
    "indexBounds" : {
      "N2" : [
        "[\"T\", \"T\"]"
      ],
      "mutant" : [
        "[\"A\", \"A\"]"
      ]
    },
    "keysExamined" : 2,
    "dupsTested" : 0,
    "dupsDropped" : 0,
    "seenInvalidated" : 0,
```

```
      "matchTested" : 0
    }
  }
}
}
}
}
]
}
},
"ok" : 1
}
mongos>
```

We can see that `"totalDocsExamined" : 8` (in the `SHARD_MERGE` stage), and that there are 2 shards. Everything else is false, based on this output.