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«НАЦИОНАЛЬНЫЙ ИССЛЕДОВАТЕЛЬСКИЙ УНИВЕРСИТЕТ ИТМО»
Факультет инфокоммуникационных технологий

ОТЧЕТ
О ЛАБОРАТОРНОЙ РАБОТЕ № 8

по теме: Работа с БД в СУБД MongoDB

по дисциплине: Проектирование и реализация баз данных

Специальность:

09.03.03 Мобильные и сетевые технологии

Проверил:

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Цель работы

Овладеть практическими навыками работы с CRUD-операциями, с вложенными объектами в коллекции базы данных MongoDB, агрегации и изменения данных, со ссылками и индексами в базе данных MongoDB.

Практические задания

Практическое задание 8.1.1:

1. *Создайте базу данных learn.*
2. *Заполните коллекцию единорогов unicorns:*

```
use unicorns
switched to db unicorns
db.unicorns.insert({name: 'Unicrom', loves: ['energon', 'redbull'], weight: 984, gender: 'm', vampires:
182});
WriteResult({ "nInserted" : 1 })
> db.unicorns.insert({name: 'Roooooodles', loves: [ 'apple'], weight: 575, gender: 'm', vampires: 99});
WriteResult({ "nInserted" : 1 })
> db.unicorns.insert({name: 'Solnara', loves: [ 'apple', 'chocolate'], weight: 550, gender: 'f', vampires:
80});
WriteResult({ "nInserted" : 1 })
> db.unicorns.insert({name: 'Ayna', loves: [ 'strawberry', 'lemon'], weight: 733, gender: 'f', vampires:
40});
WriteResult({ "nInserted" : 1 })
> db.unicorns.insert({name: 'Kenny', loves: [ 'grade', 'lemon'], weight: 690, gender: 'm', vampires: 39});
WriteResult({ "nInserted" : 1 })
> db.unicorns.insert({name: 'Raleigh', loves: [ 'apple', 'sugar'], weight: 421, gender: 'm', vampires: 2});
WriteResult({ "nInserted" : 1 })
> db.unicorns.insert({name: 'Leia', loves: [ 'apple', 'watermelon'], weight: 601, gender: 'f', vampires: 33});
WriteResult({ "nInserted" : 1 })
> db.unicorns.insert({name: 'Pilot', loves: [ 'apple', 'watermelon'], weight: 650, gender: 'm', vampires:
54});
WriteResult({ "nInserted" : 1 })
> db.unicorns.insert({name: 'Nimue', loves: [ 'grade', 'carrot'], weight: 540, gender: 'f'});
WriteResult({ "nInserted" : 1 })
```

3) Используя второй способ, вставьте в коллекцию единорогов документ:

```
> document = ({name: 'Dunx', loves: ['grape', 'watermelon'], weight: 704, gender: 'm', vampires: 165})
{
	"name" : "Dunx",
	"loves" : [
		"grape",
		"watermelon"
	],
	"weight" : 704,
	"gender" : "m",
	"vampires" : 165
}
> db.unicorns.insert(document)
```

WriteResult({ "nInserted" : 1 })

4) Проверьте содержимое коллекции с помощью метода find.

> db.unicorns.find()

{ "_id" : ObjectId("60bd49d2dd3ed4fda3dd6056"), "name" : "Aurora", "loves" : ["carrot", "grape"], "weight" : 450, "gender" : "f", "vampires" : 43 }

{ "_id" : ObjectId("60bd4a02b4a6bf68c9e1a624"), "name" : "Unicrom", "loves" : ["energon", "redbull"], "weight" : 984, "gender" : "m", "vampires" : 182 }

{ "_id" : ObjectId("60bd4a3fb4a6bf68c9e1a625"), "name" : "Roooooodles", "loves" : ["apple"], "weight" : 575, "gender" : "m", "vampires" : 99 }

{ "_id" : ObjectId("60bd4aa0b4a6bf68c9e1a626"), "name" : "Solnara", "loves" : ["apple", "chocolate"], "weight" : 550, "gender" : "f", "vampires" : 80 }

{ "_id" : ObjectId("60bd4ad4b4a6bf68c9e1a627"), "name" : "Ayna", "loves" : ["strawberry", "lemon"], "weight" : 733, "gender" : "f", "vampires" : 40 }

{ "_id" : ObjectId("60bd4af3b4a6bf68c9e1a628"), "name" : "Kenny", "loves" : ["grade", "lemon"], "weight" : 690, "gender" : "m", "vampires" : 39 }

{ "_id" : ObjectId("60bd4b19b4a6bf68c9e1a629"), "name" : "Raleigh", "loves" : ["apple", "sugar"], "weight" : 421, "gender" : "m", "vampires" : 2 }

{ "_id" : ObjectId("60bd4b3eb4a6bf68c9e1a62a"), "name" : "Leia", "loves" : ["apple", "watermelon"], "weight" : 601, "gender" : "f", "vampires" : 33 }

{ "_id" : ObjectId("60bd4b5cb4a6bf68c9e1a62b"), "name" : "Pilot", "loves" : ["apple", "watermelon"], "weight" : 650, "gender" : "m", "vampires" : 54 }

{ "_id" : ObjectId("60bd4b82b4a6bf68c9e1a62c"), "name" : "Nimue", "loves" : ["grade", "carrot"], "weight" : 540, "gender" : "f" }

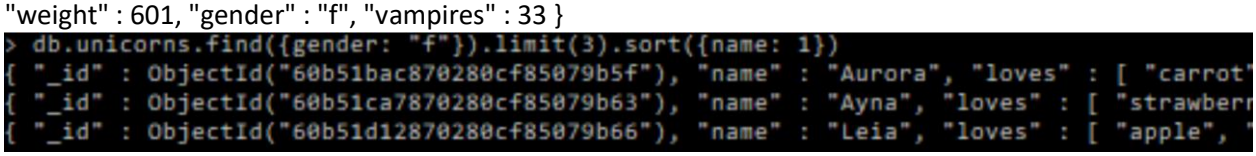
{ "_id" : ObjectId("60bd4c22b4a6bf68c9e1a62d"), "name" : "Dunx", "loves" : ["grape", "watermelon"], "weight" : 704, "gender" : "m", "vampires" : 165 }

Практическое задание 8.1.2:

1. *Сформируйте запросы для вывода списков самцов и самок единорогов. Ограничьте список самок первыми тремя особями. Отсортируйте списки по имени.*
2. *Найдите всех самок, которые любят carrot. Ограничьте этот список первой особью с помощью функций findOne и limit.*

> db.unicorns.find({gender: "f"}).limit(3).sort({name:1})

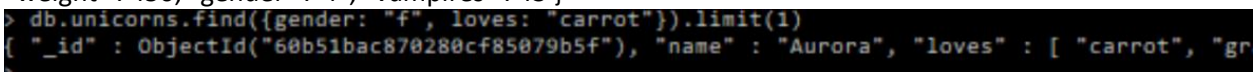
{ "_id" : ObjectId("60bd49d2dd3ed4fda3dd6056"), "name" : "Aurora", "loves" : ["carrot", "grape"], "weight" : 450, "gender" : "f", "vampires" : 43 }
{ "_id" : ObjectId("60bd4ad4b4a6bf68c9e1a627"), "name" : "Ayna", "loves" : ["strawberry", "lemon"], "weight" : 733, "gender" : "f", "vampires" : 40 }
{ "_id" : ObjectId("60bd4b3eb4a6bf68c9e1a62a"), "name" : "Leia", "loves" : ["apple", "watermelon"], "weight" : 601, "gender" : "f", "vampires" : 33 }



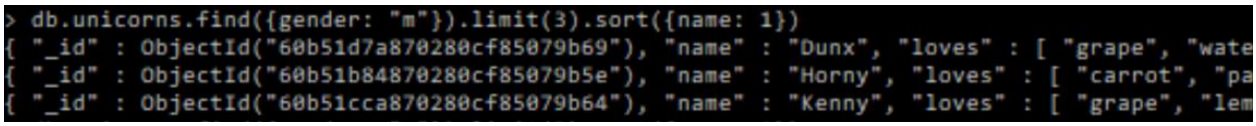
```
> db.unicorns.findOne({loves: 'carrot', gender: 'f'})
{
	"_id" : ObjectId("60bd49d2dd3ed4fda3dd6056"),
	"name" : "Aurora",
	"loves" : [
		"carrot",
		"grape"
	],
	"weight" : 450,
	"gender" : "f",
	"vampires" : 43
}
```

> db.unicorns.find({loves: 'carrot', gender: 'f'}).limit(1)

{ "_id" : ObjectId("60bd49d2dd3ed4fda3dd6056"), "name" : "Aurora", "loves" : ["carrot", "grape"], "weight" : 450, "gender" : "f", "vampires" : 43 }



> db.unicorns.find({gender: "m"}).limit(3).sort({name:1})



Практическое задание 8.1.3:

Модифицируйте запрос для вывода списков самцов единорогов, исключив из результата информацию о предпотениях и поле.

> db.unicorns.find({gender:'m'}, {loves:0});

{ "_id" : ObjectId("60bd499bea403ef6b2d14422"), "name" : "Horny", "weight" : 600, "gender" : "m", "vampires" : 63 }

{ "_id" : ObjectId("60be3133a0990b3ce62127d6"), "name" : "Unicrom", "weight" : 984, "gender" : "m", "vampires" : 182 }

{ "_id" : ObjectId("60be313ea0990b3ce62127d7"), "name" : "Roooooodles", "weight" : 575, "gender" : "m", "vampires" : 99 }

{ "_id" : ObjectId("60be315da0990b3ce62127da"), "name" : "Kenny", "weight" : 690, "gender" : "m", "vampires" : 39 }

{ "_id" : ObjectId("60be3167a0990b3ce62127db"), "name" : "Raleigh", "weight" : 421, "gender" : "m", "vampires" : 2 }

{ "_id" : ObjectId("60be317ba0990b3ce62127dd"), "name" : "Pilot", "weight" : 650, "gender" : "m", "vampires" : 54 }

{ "_id" : ObjectId("60be3199a0990b3ce62127df"), "name" : "Dunx", "weight" : 704, "gender" : "m", "vampires" : 165 }

```
> db.unicorns.find({gender: "m"}, {gender: 0, loves: 0}).limit(3).sort({name: 1})
{ "_id" : ObjectId("60b51d7a870280cf85079b69"), "name" : "Dunx", "weight" : 704, "vampires" : 165 }
{ "_id" : ObjectId("60b51b84870280cf85079b5e"), "name" : "Horny", "weight" : 600, "vampires" : 63 }
{ "_id" : ObjectId("60b51cca870280cf85079b64"), "name" : "Kenny", "weight" : 690, "vampires" : 39 }
```

Практическое задание 8.1.4:

Вывести список единорогов в обратном порядке добавления

db.unicorns.find().sort({$natural:-1});

```
> db.unicorns.find().sort({$natural: -1})
{ "_id" : ObjectId("60b51d7a870280cf85079b69"), "name" : "Dunx", "loves" : [ "grape", "watermelon" ], "
{ "_id" : ObjectId("60b51d4f870280cf85079b68"), "name" : "Nimue", "loves" : [ "grape", "carrot" ], "wei
{ "_id" : ObjectId("60b51d2a870280cf85079b67"), "name" : "Pilot", "loves" : [ "apple", "watermelon" ],
{ "_id" : ObjectId("60b51d12870280cf85079b66"), "name" : "Leia", "loves" : [ "apple", "watermelon" ], "
{ "_id" : ObjectId("60b51cec870280cf85079b65"), "name" : "Raleigh", "loves" : [ "apple", "sugar" ], "we
{ "_id" : ObjectId("60b51cca870280cf85079b64"), "name" : "Kenny", "loves" : [ "grape", "lemon" ], "weig
{ "_id" : ObjectId("60b51ca7870280cf85079b63"), "name" : "Ayna", "loves" : [ "strawberry", "lemon" ], "
{ "_id" : ObjectId("60b51c7a870280cf85079b62"), "name" : "Solnara", "loves" : [ "apple", "carrot", "cho
```

{ "_id" : ObjectId("60be3199a0990b3ce62127df"), "name" : "Dunx", "loves" : ["grape", "watermelon"], "weight" : 704, "gender" : "m", "vampires" : 165 }

{ "_id" : ObjectId("60be3185a0990b3ce62127de"), "name" : "Nimue", "loves" : ["grade", "carrot"], "weight" : 540, "gender" : "f" }

{ "_id" : ObjectId("60be317ba0990b3ce62127dd"), "name" : "Pilot", "loves" : ["apple", "watermelon"], "weight" : 650, "gender" : "m", "vampires" : 54 }

{ "_id" : ObjectId("60be3172a0990b3ce62127dc"), "name" : "Leia", "loves" : ["apple", "watermelon"], "weight" : 601, "gender" : "f", "vampires" : 33 }

{ "_id" : ObjectId("60be3167a0990b3ce62127db"), "name" : "Raleigh", "loves" : ["apple", "sugar"], "weight" : 421, "gender" : "m", "vampires" : 2 }

{ "_id" : ObjectId("60be315da0990b3ce62127da"), "name" : "Kenny", "loves" : ["grade", "lemon"], "weight" : 690, "gender" : "m", "vampires" : 39 }

{ "_id" : ObjectId("60be314fa0990b3ce62127d9"), "name" : "Ayna", "loves" : ["strawberry", "lemon"], "weight" : 733, "gender" : "f", "vampires" : 40 }

{ "_id" : ObjectId("60be3148a0990b3ce62127d8"), "name" : "Solnara", "loves" : ["apple", "chocolate"], "weight" : 550, "gender" : "f", "vampires" : 80 }

{ "_id" : ObjectId("60be313ea0990b3ce62127d7"), "name" : "Roooooodles", "loves" : ["apple"], "weight" : 575, "gender" : "m", "vampires" : 99 }

{ "_id" : ObjectId("60be3133a0990b3ce62127d6"), "name" : "Unicrom", "loves" : ["energon", "redbull"], "weight" : 984, "gender" : "m", "vampires" : 182 }

{ "_id" : ObjectId("60bd499bea403ef6b2d14422"), "name" : "Horny", "loves" : ["carrot", "papaya"], "weight" : 600, "gender" : "m", "vampires" : 63 }

Практическое задание 8.1.5:

Вывести список единорогов с названием первого любимого предпочтения, исключив идентификатор.

```
> db.unicorns.find({}, {loves:{$slice:-1}, _id:false});
{ "name" : "Horny", "loves" : [ "papaya" ], "weight" : 600, "gender" : "m", "vampires" : 63 }
{ "name" : "Unicrom", "loves" : [ "redbull" ], "weight" : 984, "gender" : "m", "vampires" : 182 }
{ "name" : "Roooooodles", "loves" : [ "apple" ], "weight" : 575, "gender" : "m", "vampires" : 99 }
{ "name" : "Solnara", "loves" : [ "chocolate" ], "weight" : 550, "gender" : "f", "vampires" : 80 }
{ "name" : "Ayna", "loves" : [ "lemon" ], "weight" : 733, "gender" : "f", "vampires" : 40 }
{ "name" : "Kenny", "loves" : [ "lemon" ], "weight" : 690, "gender" : "m", "vampires" : 39 }
{ "name" : "Raleigh", "loves" : [ "sugar" ], "weight" : 421, "gender" : "m", "vampires" : 2 }
{ "name" : "Leia", "loves" : [ "watermelon" ], "weight" : 601, "gender" : "f", "vampires" : 33 }
{ "name" : "Pilot", "loves" : [ "watermelon" ], "weight" : 650, "gender" : "m", "vampires" : 54 }
{ "name" : "Nimue", "loves" : [ "carrot" ], "weight" : 540, "gender" : "f" }
{ "name" : "Dunx", "loves" : [ "watermelon" ], "weight" : 704, "gender" : "m", "vampires" : 165 }
```

Практическое задание 8.1.6:

Вывести список самок единорогов весом от полутонны до 700 кг, исключив вывод идентификатора.

db.unicorns.find({gender: "f"},{_id:false}, {weight:{$gt:500, $lt:700}, "_id" : false});

```
> db.unicorns.find({gender: "f", weight: {$gte: 500, $lte: 700}}, {_id: 0})
{ "name" : "Solnara", "loves" : [ "apple", "carrot", "chocolate" ], "weight" : 550, "gender" : "f", "vamp
{ "name" : "Leia", "loves" : [ "apple", "watermelon" ], "weight" : 601, "gender" : "f", "vampires" : 33 }
{ "name" : "Nimue", "loves" : [ "grape", "carrot" ], "weight" : 540, "gender" : "f" }
```

{ "name" : "Solnara", "loves" : ["apple", "chocolate"], "weight" : 550, "gender" : "f", "vampires" : 80 }

{ "name" : "Ayna", "loves" : ["strawberry", "lemon"], "weight" : 733, "gender" : "f", "vampires" : 40 }

{ "name" : "Leia", "loves" : ["apple", "watermelon"], "weight" : 601, "gender" : "f", "vampires" : 33 }

{ "name" : "Nimue", "loves" : ["grade", "carrot"], "weight" : 540, "gender" : "f" }

> db.unicorns.find({gender: "f"},{_id:false}, {weight:{$gt:500, $lt:700}});

{ "name" : "Solnara", "loves" : ["apple", "chocolate"], "weight" : 550, "gender" : "f", "vampires" : 80 }

{ "name" : "Ayna", "loves" : ["strawberry", "lemon"], "weight" : 733, "gender" : "f", "vampires" : 40 }

{ "name" : "Leia", "loves" : ["apple", "watermelon"], "weight" : 601, "gender" : "f", "vampires" : 33 }

{ "name" : "Nimue", "loves" : ["grade", "carrot"], "weight" : 540, "gender" : "f" }

Практическое задание 8.1.7:

Вывести список самцов единорогов весом от полутонны и предпочитающих grape и lemon, исключив вывод идентификатора.

db.unicorns.find({loves:{$all:['lemon', 'grade']}}, {_id:false}, {weight:{$gt:500}}, {gender:'m'});

{ "name" : "Kenny", "loves" : ["grade", "lemon"], "weight" : 690, "gender" : "m", "vampires" : 39 }

```
> db.unicorns.find({gender: "m", weight: {$gte: 500}, loves: {$all: ["grape", "lemon"]}},
{ "name" : "Kenny", "loves" : [ "grape", "lemon" ], "weight" : 690, "gender" : "m", "vamp
```

Практическое задание 8.1.8:

Найти всех единорогов, не имеющих ключ `vampires`.

db.unicorns.find({vampires:{$exists:false}});

```
> db.unicorns.find({vampires: {$exists: false}})
{ "_id" : ObjectId("60b51d4f870280cf85079b68"), "name" : "Nimue", "loves" : [ "grape", "carrot" ], "weight" : 540, "gender" : "
```

{ "_id" : ObjectId("60be3185a0990b3ce62127de"), "name" : "Nimue", "loves" : ["grade", "carrot"], "weight" : 540, "gender" : "f" }

Практическое задание 8.1.9:

Вывести список упорядоченный список имен самцов единорогов с информацией об их первом предпочтении.

db.unicorns.find({gender:'m'}, {loves:{$slice:1}}).sort({name:1});

```
> db.unicorns.find({gender: "m"},{name: 1, _id: 0, loves: {$slice: 1}}).sort
{ "name" : "Dunx", "loves" : [ "grape" ] }
{ "name" : "Horny", "loves" : [ "carrot" ] }
{ "name" : "Kenny", "loves" : [ "grape" ] }
{ "name" : "Pilot", "loves" : [ "apple" ] }
{ "name" : "Raleigh", "loves" : [ "apple" ] }
{ "name" : "Roooooodles", "loves" : [ "apple" ] }
{ "name" : "Unicrom", "loves" : [ "energon" ] }
```

{ "_id" : ObjectId("60be3199a0990b3ce62127df"), "name" : "Dunx", "loves" : ["grape"], "weight" : 704, "gender" : "m", "vampires" : 165 }

{ "_id" : ObjectId("60bd499bea403ef6b2d14422"), "name" : "Horny", "loves" : ["carrot"], "weight" : 600, "gender" : "m", "vampires" : 63 }

{ "_id" : ObjectId("60be315da0990b3ce62127da"), "name" : "Kenny", "loves" : ["grade"], "weight" : 690, "gender" : "m", "vampires" : 39 }

{ "_id" : ObjectId("60be317ba0990b3ce62127dd"), "name" : "Pilot", "loves" : ["apple"], "weight" : 650, "gender" : "m", "vampires" : 54 }

{ "_id" : ObjectId("60be3167a0990b3ce62127db"), "name" : "Raleigh", "loves" : ["apple"], "weight" : 421, "gender" : "m", "vampires" : 2 }

{ "_id" : ObjectId("60be313ea0990b3ce62127d7"), "name" : "Roooooodles", "loves" : ["apple"], "weight" : 575, "gender" : "m", "vampires" : 99 }

{ "_id" : ObjectId("60be3133a0990b3ce62127d6"), "name" : "Unicrom", "loves" : ["energon"], "weight" : 984, "gender" : "m", "vampires" : 182 }

Практическое задание 8.2.1:

1. *Создайте коллекцию towns, включающую следующие документы:*

db.towns.insert({name: "Punxsutawney ", populatiuon: 6200, last_sensus: ISODate("2008-01-31"), famous_for: [""], mayor: {name: "Jim Wehrle" }})

WriteResult({ "nInserted" : 1 })

> db.towns.insert({name: "New York",

... populatiuon: 22200000,

... last_sensus: ISODate("2009-07-31"),

... famous_for: ["status of liberty", "food"],

... mayor: {

... name: "Michael Bloomberg",

... party: "I"}}

...)

WriteResult({ "nInserted" : 1 })

> db.towns.insert({name: "Portland",

... populatiuon: 528000,

... last_sensus: ISODate("2009-07-20"),

... famous_for: ["beer", "food"],

... mayor: {

... name: "Sam Adams",

... party: "D"}}

...)

WriteResult({ "nInserted" : 1 })

db.towns.find({'mayor.party':'I'}, {'name':1, 'mayor':1})

{ "_id" : ObjectId("60be3f32a0990b3ce62127e1"), "name" : "New York", "mayor" : { "name" : "Michael Bloomberg", "party" : "I" } }

db.towns.find({'mayor.party':{$exists:false}}, {'name':1, 'mayor':1})

{ "_id" : ObjectId("60be3f1ba0990b3ce62127e0"), "name" : "Punxsutawney ", "mayor" : { "name" : "Jim Wehrle" } }

Практическое задание 8.2.2:

1. *Сформировать функцию для вывода списка самцов единорогов.*
2. *Создать курсор для этого списка из первых двух особей с сортировкой в лексикографическом порядке.*
3. *Вывести результат, используя forEach.*

Содержание коллекции единорогов `unicorns`*:*> fn = function(){return this.gender == 'm'}

function(){return this.gender == 'm'}

> db.unicorns.find(fn)

{ "_id" : ObjectId("60bd499bea403ef6b2d14422"), "name" : "Horny", "loves" : ["carrot", "papaya"], "weight" : 600, "gender" : "m", "vampires" : 63 }

{ "_id" : ObjectId("60be3133a0990b3ce62127d6"), "name" : "Unicrom", "loves" : ["energon", "redbull"], "weight" : 984, "gender" : "m", "vampires" : 182 }

{ "_id" : ObjectId("60be313ea0990b3ce62127d7"), "name" : "Roooooodles", "loves" : ["apple"], "weight" : 575, "gender" : "m", "vampires" : 99 }

{ "_id" : ObjectId("60be315da0990b3ce62127da"), "name" : "Kenny", "loves" : ["grade", "lemon"], "weight" : 690, "gender" : "m", "vampires" : 39 }

{ "_id" : ObjectId("60be3167a0990b3ce62127db"), "name" : "Raleigh", "loves" : ["apple", "sugar"], "weight" : 421, "gender" : "m", "vampires" : 2 }

{ "_id" : ObjectId("60be317ba0990b3ce62127dd"), "name" : "Pilot", "loves" : ["apple", "watermelon"], "weight" : 650, "gender" : "m", "vampires" : 54 }

{ "_id" : ObjectId("60be3199a0990b3ce62127df"), "name" : "Dunx", "loves" : ["grape", "watermelon"], "weight" : 704, "gender" : "m", "vampires" : 165 }

> var cursor = db.unicorns.find(fn)

> var cursor = db.unicorns.find(fn)

> cursor.sort({name:1}).limit(2)

{ "_id" : ObjectId("60be3199a0990b3ce62127df"), "name" : "Dunx", "loves" : ["grape", "watermelon"], "weight" : 704, "gender" : "m", "vampires" : 165 }

{ "_id" : ObjectId("60bd499bea403ef6b2d14422"), "name" : "Horny", "loves" : ["carrot", "papaya"], "weight" : 600, "gender" : "m", "vampires" : 63 }

Практическое задание 8.2.3:

Вывести количество самок единорогов весом от полутонны до 600 кг.

> db.unicorns.find({gender: "f"},{_id:false}, {weight:{$gt:500, $lt:700}, "_id" : false}).count();

Практическое задание 8.2.4:

Вывести список предпочтений.

```
> db.unicorns.distinct('loves')
[
      "apple",
      "carrot",
      "chocolate",
      "energon",
      "grade",
      "grape",
      "lemon",
      "papaya",
      "redbull",
      "strawberry",
      "sugar",
      "watermelon"
]
```

Практическое задание 8.2.5:

Посчитать количество особей единорогов обоих полов.>
db.unicorns.aggregate({$group:{_id:'$gender', total:{$sum:1}}})

{ "_id" : "f", "total" : 4 }

{ "_id" : "m", "total" : 7 }

Практическое задание 8.2.6:

1. *Выполнить команду:*

```
> db.unicorns.save({name: 'Barny', loves: ['grape'],
weight: 340, gender: 'm'})
```

Проверить содержимое коллекции `unicorns`.db.unicorns.save({name: 'Barny', loves: ['grape'],

... weight: 340, gender: 'm'})

WriteResult({ "nInserted" : 1 })

> db.unicorns.find();

{ "_id" : ObjectId("60bd499bea403ef6b2d14422"), "name" : "Horny", "loves" : ["carrot", "papaya"], "weight" : 600, "gender" : "m", "vampires" : 63 }

{ "_id" : ObjectId("60be3133a0990b3ce62127d6"), "name" : "Unicrom", "loves" : ["energon", "redbull"], "weight" : 984, "gender" : "m", "vampires" : 182 }

{ "_id" : ObjectId("60be313ea0990b3ce62127d7"), "name" : "Roooooodles", "loves" : ["apple"], "weight" : 575, "gender" : "m", "vampires" : 99 }

{ "_id" : ObjectId("60be3148a0990b3ce62127d8"), "name" : "Solnara", "loves" : ["apple", "chocolate"], "weight" : 550, "gender" : "f", "vampires" : 80 }

{ "_id" : ObjectId("60be314fa0990b3ce62127d9"), "name" : "Ayna", "loves" : ["strawberry", "lemon"], "weight" : 733, "gender" : "f", "vampires" : 40 }

{ "_id" : ObjectId("60be315da0990b3ce62127da"), "name" : "Kenny", "loves" : ["grade", "lemon"], "weight" : 690, "gender" : "m", "vampires" : 39 }

{ "_id" : ObjectId("60be3167a0990b3ce62127db"), "name" : "Raleigh", "loves" : ["apple", "sugar"], "weight" : 421, "gender" : "m", "vampires" : 2 }

{ "_id" : ObjectId("60be3172a0990b3ce62127dc"), "name" : "Leia", "loves" : ["apple", "watermelon"], "weight" : 601, "gender" : "f", "vampires" : 33 }

{ "_id" : ObjectId("60be317ba0990b3ce62127dd"), "name" : "Pilot", "loves" : ["apple", "watermelon"], "weight" : 650, "gender" : "m", "vampires" : 54 }

{ "_id" : ObjectId("60be3185a0990b3ce62127de"), "name" : "Nimue", "loves" : ["grade", "carrot"], "weight" : 540, "gender" : "f" }

{ "_id" : ObjectId("60be3199a0990b3ce62127df"), "name" : "Dunx", "loves" : ["grape", "watermelon"], "weight" : 704, "gender" : "m", "vampires" : 165 }

{ "_id" : ObjectId("60be4917a0990b3ce62127e3"), "name" : "Barny", "loves" : ["grape"], "weight" : 340, "gender" : "m" }

{ "_id" : ObjectId("60be4918a0990b3ce62127e4"), "name" : "Barny", "loves" : ["grape"], "weight" : 340, "gender" : "m" }

Практическое задание 8.2.7:

1. *Для самки единорога* `Ayna` *внести изменения в БД: теперь ее вес 800, она убила 51 вапмира.*
2. *Проверить содержимое коллекции* `unicorns`.

db.unicorns.update({name:'Ayna'}, {name:'Ayna', weight:800, vampires:51})

WriteResult({ "nMatched" : 1, "nUpserted" : 0, "nModified" : 1 })

> db.unicorns.find({name:'Ayna'});

{ "_id" : ObjectId("60be314fa0990b3ce62127d9"), "name" : "Ayna", "weight" : 800, "vampires" : 51 }

Практическое задание 8.2.8:

1. *Для самца единорога* `Raleigh` *внести изменения в БД: теперь он любит рэдбул.*

Проверить содержимое коллекции `unicorns`. db.unicorns.update({name:'Raleigh', gender:'m'}, {name:'Raleigh', gender:'m', loves:'RedBull'})

WriteResult({ "nMatched" : 1, "nUpserted" : 0, "nModified" : 1 })

> db.unicorns.find({name:'Raleigh'});

{ "_id" : ObjectId("60be3167a0990b3ce62127db"), "name" : "Raleigh", "gender" : "m", "loves" : "RedBull" }

Практическое задание 8.2.9:

1. *Всем самцам единорогов увеличить количество убитых вапмиров на 5.*

Проверить содержимое коллекции `unicorns`.> db.unicorns.update({ gender:'m'}, {$inc:{vampires:5}}, {multi:true})

WriteResult({ "nMatched" : 9, "nUpserted" : 0, "nModified" : 9 })

> db.unicorns.find({gender:'m'});

{ "_id" : ObjectId("60bd499bea403ef6b2d14422"), "name" : "Horny", "loves" : ["carrot", "papaya"], "weight" : 600, "gender" : "m", "vampires" : 73 }

{ "_id" : ObjectId("60be3133a0990b3ce62127d6"), "name" : "Unicrom", "loves" : ["energon", "redbull"], "weight" : 984, "gender" : "m", "vampires" : 187 }

{ "_id" : ObjectId("60be313ea0990b3ce62127d7"), "name" : "Roooooodles", "loves" : ["apple"], "weight" : 575, "gender" : "m", "vampires" : 104 }

{ "_id" : ObjectId("60be315da0990b3ce62127da"), "name" : "Kenny", "loves" : ["grade", "lemon"], "weight" : 690, "gender" : "m", "vampires" : 44 }

{ "_id" : ObjectId("60be3167a0990b3ce62127db"), "name" : "Raleigh", "gender" : "m", "loves" : "RedBull", "vampires" : 5 }

{ "_id" : ObjectId("60be317ba0990b3ce62127dd"), "name" : "Pilot", "loves" : ["apple", "watermelon"], "weight" : 650, "gender" : "m", "vampires" : 59 }

{ "_id" : ObjectId("60be3199a0990b3ce62127df"), "name" : "Dunx", "loves" : ["grape", "watermelon"], "weight" : 704, "gender" : "m", "vampires" : 170 }

{ "_id" : ObjectId("60be4917a0990b3ce62127e3"), "name" : "Barny", "loves" : ["grape"], "weight" : 340, "gender" : "m", "vampires" : 5 }

{ "_id" : ObjectId("60be4918a0990b3ce62127e4"), "name" : "Barny", "loves" : ["grape"], "weight" : 340, "gender" : "m", "vampires" : 5 }

Практическое задание 8.2.10:

1. *Изменить информацию о городе Портланд: мэр этого города теперь беспартийный.*
2. *Проверить содержимое коллекции* `towns`.

> db.towns.update({name:'Portland'}, {$unset:{'mayor.party':1}})

WriteResult({ "nMatched" : 1, "nUpserted" : 0, "nModified" : 1 })

> db.towns.find({name:'Portland'})

{ "_id" : ObjectId("60be3f45a0990b3ce62127e2"), "name" : "Portland", "populatiuon" : 528000, "last_sensus" : ISODate("2009-07-20T00:00:00Z"), "famous_for" : ["beer", "food"], "mayor" : { "name" : "Sam Adams" } }

>

Практическое задание 8.2.11:

1. *Изменить информацию о самце единорога Pilot: теперь он любит и шоколад.*

Проверить содержимое коллекции `unicorns`**.** > db.unicorns.update({ name:'Pilot'}, {$push:{loves:'chocolate'}})

WriteResult({ "nMatched" : 1, "nUpserted" : 0, "nModified" : 1 })

> db.unicorns.find({ name:'Pilot'})

{ "_id" : ObjectId("60be317ba0990b3ce62127dd"), "name" : "Pilot", "loves" : ["apple", "watermelon", "chocolate"], "weight" : 650, "gender" : "m", "vampires" : 59 }

>

Практическое задание 8.2.12:

1. *Изменить информацию о самке единорога* `Aurora`*: теперь она любит еще и сахар, и лимоны.*

Проверить содержимое коллекции `unicorns`**.** db.unicorns.update({ name:'Aurora'}, {$addToSet: {loves: {$each:['sugar', 'lemon']}}})

WriteResult({ "nMatched" : 1, "nUpserted" : 0, "nModified" : 1 })

> db.unicorns.find({ name:'Aurora'})

{ "_id" : ObjectId("60be4d6fa0990b3ce62127e5"), "name" : "Aurora", "dob" : ISODate("1991-01-24T10:00:00Z"), "loves" : ["carrot", "grape", "sugar", "lemon"], "weight" : 450, "gender" : "f", "vampires" : 43 }

>

Практическое задание 8.2.13:

1. *Создайте коллекцию towns, включающую следующие документы:*

2. *Удалите документы с беспартийными мэрами.*
3. *Проверьте содержание коллекции.*
4. *Очистите коллекцию.*
5. *Просмотрите список доступных коллекций.*

... popujatiuon: 6200,
... last_sensus: ISODate("2008-01-31"),
... famous_for: ["phil the groundhog"],
... mayor: {
... name: "Jim Wehrle"
... }}

```
... )
WriteResult({ "nInserted" : 1 })
> db.towns.insert({name: "New York",
... popujatiuon: 22200000,
... last_sensus: ISODate("2009-07-31"),
... famous_for: ["status of liberty", "food"],
... mayor: {
...    name: "Michael Bloomberg",
... party: "I"}}
... )
WriteResult({ "nInserted" : 1 })
> db.towns.insert({name: "Portland",
... popujatiuon: 528000,
... last_sensus: ISODate("2009-07-20"),
... famous_for: ["beer", "food"],
... mayor: {
...    name: "Sam Adams",
... party: "D"}}
... )
WriteResult({ "nInserted" : 1 })

> db.towns.remove({'mayor.party':{$exists:false}})
WriteResult({ "nRemoved" : 3 })
> db.towns.find()
{ "_id" : ObjectId("60be3f32a0990b3ce62127e1"), "name" : "New York", "populatiuon" : 22200000,
"last_sensus" : ISODate("2009-07-31T00:00:00Z"), "famous_for" : [ "status of liberty", "food" ], "mayor"
: { "name" : "Michael Bloomberg", "party" : "I" } }
{ "_id" : ObjectId("60be4dfba0990b3ce62127e7"), "name" : "New York", "popujatiuon" : 22200000,
"last_sensus" : ISODate("2009-07-31T00:00:00Z"), "famous_for" : [ "status of liberty", "food" ], "mayor"
: { "name" : "Michael Bloomberg", "party" : "I" } }
{ "_id" : ObjectId("60be4e0ba0990b3ce62127e8"), "name" : "Portland", "popujatiuon" : 528000,
"last_sensus" : ISODate("2009-07-20T00:00:00Z"), "famous_for" : [ "beer", "food" ], "mayor" : { "name" :
"Sam Adams", "party" : "D" } }
>

db.towns.remove({})
WriteResult({ "nRemoved" : 3 })
> db.towns.find()
>
```

Практическое задание 8.3.1:

1. *Создайте коллекцию зон обитания единорогов, указав в качестве идентификатора кратко название зоны, далее включив полное название и описание.*
2. *Включите для нескольких единорогов в документы ссылку на зону обитания, использую второй способ автоматического связывания.*
3. *Проверьте содержание коллекции едиорогов.*

Содержание коллекции единорогов `unicorns`*:* > db.unicorns.update({ name:'Aurora'}, {$set:{zone:{$ref:'zones', $id:'fr'}}})

WriteResult({ "nMatched" : 1, "nUpserted" : 0, "nModified" : 1 })

> db.unicorns.update({ name:'Unicrom'}, {$set:{zone:{$ref:'zones', $id:'pr'}}})

WriteResult({ "nMatched" : 1, "nUpserted" : 0, "nModified" : 1 })

> db.unicorns.update({ name:'Ayna'}, {$set:{zone:{$ref:'zones', $id:'ds'}}})

WriteResult({ "nMatched" : 1, "nUpserted" : 0, "nModified" : 1 })

> db.unicorns.find()

{ "_id" : ObjectId("60bd499bea403ef6b2d14422"), "name" : "Horny", "loves" : ["carrot", "papaya"], "weight" : 600, "gender" : "m", "vampires" : 73 }

{ "_id" : ObjectId("60be3133a0990b3ce62127d6"), "name" : "Unicrom", "loves" : ["energon", "redbull"], "weight" : 984, "gender" : "m", "vampires" : 187, "zone" : DBRef("zones", "pr") }

{ "_id" : ObjectId("60be313ea0990b3ce62127d7"), "name" : "Roooooodles", "loves" : ["apple"], "weight" : 575, "gender" : "m", "vampires" : 104 }

{ "_id" : ObjectId("60be3148a0990b3ce62127d8"), "name" : "Solnara", "loves" : ["apple", "chocolate"], "weight" : 550, "gender" : "f", "vampires" : 80 }

{ "_id" : ObjectId("60be314fa0990b3ce62127d9"), "name" : "Ayna", "weight" : 800, "vampires" : 51, "zone" : DBRef("zones", "ds") }

{ "_id" : ObjectId("60be315da0990b3ce62127da"), "name" : "Kenny", "loves" : ["grade", "lemon"], "weight" : 690, "gender" : "m", "vampires" : 44 }

{ "_id" : ObjectId("60be3167a0990b3ce62127db"), "name" : "Raleigh", "gender" : "m", "loves" : "RedBull", "vampires" : 5 }

{ "_id" : ObjectId("60be3172a0990b3ce62127dc"), "name" : "Leia", "loves" : ["apple", "watermelon"], "weight" : 601, "gender" : "f", "vampires" : 33 }

{ "_id" : ObjectId("60be317ba0990b3ce62127dd"), "name" : "Pilot", "loves" : ["apple", "watermelon", "chocolate"], "weight" : 650, "gender" : "m", "vampires" : 59 }

{ "_id" : ObjectId("60be3185a0990b3ce62127de"), "name" : "Nimue", "loves" : ["grade", "carrot"], "weight" : 540, "gender" : "f" }

{ "_id" : ObjectId("60be3199a0990b3ce62127df"), "name" : "Dunx", "loves" : ["grape", "watermelon"], "weight" : 704, "gender" : "m", "vampires" : 170 }

{ "_id" : ObjectId("60be4917a0990b3ce62127e3"), "name" : "Barny", "loves" : ["grape"], "weight" : 340, "gender" : "m", "vampires" : 5 }

{ "_id" : ObjectId("60be4918a0990b3ce62127e4"), "name" : "Barny", "loves" : ["grape"], "weight" : 340, "gender" : "m", "vampires" : 5 }

{ "_id" : ObjectId("60be4d6fa0990b3ce62127e5"), "name" : "Aurora", "dob" : ISODate("1991-01-24T10:00:00Z"), "loves" : ["carrot", "grape", "sugar", "lemon"], "weight" : 450, "gender" : "f", "vampires" : 43, "zone" : DBRef("zones", "fr") }

Практическое задание 8.3.2:

1. *Проверьте, можно ли задать для коллекции* `unicorns` *индекс для ключа* `name` *с флагом* `unique`.
2. *Содержание коллекции единорогов* `unicorns`*:*

```
> db.unicorns.ensureIndex({'name':1}, {'unique':true})
{
	"createdCollectionAutomatically" : false,
	"numIndexesBefore" : 1,
	"numIndexesAfter" : 2,
	"ok" : 1
}
> db.unicorns.find()
{ "_id" : ObjectId("60bd499bea403ef6b2d14422"), "name" : "Horny", "loves" : [ "carrot", "papaya" ], "weight" : 600, "gender" : "m", "vampires" : 73 }
{ "_id" : ObjectId("60be3133a0990b3ce62127d6"), "name" : "Unicrom", "loves" : [ "energon", "redbull" ], "weight" : 984, "gender" : "m", "vampires" : 187, "zone" : DBRef("zones", "pr") }
{ "_id" : ObjectId("60be313ea0990b3ce62127d7"), "name" : "Roooooodles", "loves" : [ "apple" ], "weight" : 575, "gender" : "m", "vampires" : 104 }
{ "_id" : ObjectId("60be3148a0990b3ce62127d8"), "name" : "Solnara", "loves" : [ "apple", "chocolate" ], "weight" : 550, "gender" : "f", "vampires" : 80 }
{ "_id" : ObjectId("60be314fa0990b3ce62127d9"), "name" : "Ayna", "weight" : 800, "vampires" : 51, "zone" : DBRef("zones", "ds") }
{ "_id" : ObjectId("60be315da0990b3ce62127da"), "name" : "Kenny", "loves" : [ "grade", "lemon" ], "weight" : 690, "gender" : "m", "vampires" : 44 }
{ "_id" : ObjectId("60be3167a0990b3ce62127db"), "name" : "Raleigh", "gender" : "m", "loves" : "RedBull", "vampires" : 5 }
{ "_id" : ObjectId("60be3172a0990b3ce62127dc"), "name" : "Leia", "loves" : [ "apple", "watermelon" ], "weight" : 601, "gender" : "f", "vampires" : 33 }
{ "_id" : ObjectId("60be317ba0990b3ce62127dd"), "name" : "Pilot", "loves" : [ "apple", "watermelon", "chocolate" ], "weight" : 650, "gender" : "m", "vampires" : 59 }
{ "_id" : ObjectId("60be3185a0990b3ce62127de"), "name" : "Nimue", "loves" : [ "grade", "carrot" ], "weight" : 540, "gender" : "f" }
{ "_id" : ObjectId("60be3199a0990b3ce62127df"), "name" : "Dunx", "loves" : [ "grape", "watermelon" ], "weight" : 704, "gender" : "m", "vampires" : 170 }
{ "_id" : ObjectId("60be4d6fa0990b3ce62127e5"), "name" : "Aurora", "dob" : ISODate("1991-01-24T10:00:00Z"), "loves" : [ "carrot", "grape", "sugar", "lemon" ], "weight" : 450, "gender" : "f", "vampires" : 43, "zone" : DBRef("zones", "fr") }
```

Практическое задание 8.3.3:

1. *Получите информацию о всех индексах коллекции* `unicorns` .
2. *Удалите все индексы, кроме индекса для идентификатора.*

3. *Попытайтесь удалить индекс для идентификатора.*

```
> db.unicorns.getIndexes()
[
	{
		"v" : 2,
		"key" : {
			"_id" : 1
		},
		"name" : "_id_"
	},
	{
		"v" : 2,
		"unique" : true,
		"key" : {
			"name" : 1
		},
		"name" : "name_1"
	}
]
>

db.unicorns.dropIndexes('name_1')
{ "nIndexesWas" : 2, "ok" : 1 }
> db.unicorns.dropIndexes('_id_') – попытка удаление индекса
uncaught exception: Error: error dropping indexes : {
	"ok" : 0,
	"errmsg" : "cannot drop _id index",
	"code" : 72,
	"codeName" : "InvalidOptions"
```

Практическое задание 8.3.4:

1. *Создайте объемную коллекцию* `numbers`*, задействовав курсор:*

```
for(i = 0; i < 100000; i++){db.numbers.insert({value: i})}
```

2. *Выберите последних четыре документа.*

3. *Проанализируйте план выполнения запроса 2. Сколько потребовалось времени на выполнение запроса? (по значению параметра* `executionTimeMillis`*)*

4. *Создайте индекс для ключа* `value`*.*

5. *Получите информацию о всех индексах коллекции* `numbres`*.*

6. *Выполните запрос 2.*

7. *Проанализируйте план выполнения запроса с установленным индексом. Сколько потребовалось времени на выполнение запроса?*

8. *Сравните время выполнения запросов с индексом и без. Дайте ответ на вопрос: какой запрос более эффективен?*

```
> for(i = 0; i < 100000; i++){db.numbers.insert({value: i})}
WriteResult({ "nInserted" : 1 })
```

```
> db.numbers.getIndexes()
[ { "v" : 2, "key" : { "_id" : 1 }, "name" : "_id_" } ]
> db.numbers.find({value:{$in:[99999, 99998, 99997, 99996]}})
{ "_id" : ObjectId("60be557fa0990b3ce622ae85"), "value" : 99996 }
{ "_id" : ObjectId("60be557fa0990b3ce622ae86"), "value" : 99997 }
{ "_id" : ObjectId("60be557fa0990b3ce622ae87"), "value" : 99998 }
{ "_id" : ObjectId("60be557fa0990b3ce622ae88"), "value" : 99999 }
> db.numbers.explain('executionStats').find({executionTimeMillis:1})
{
	"queryPlanner" : {
		"plannerVersion" : 1,
		"namespace" : "learn.numbers",
		"indexFilterSet" : false,
		"parsedQuery" : {
			"executionTimeMillis" : {
				"$eq" : 1
			}
		},
		"winningPlan" : {
			"stage" : "COLLSCAN",
			"filter" : {
				"executionTimeMillis" : {
					"$eq" : 1
				}
			},
			"direction" : "forward"
		},
		"rejectedPlans" : [ ]
	},
	"executionStats" : {
		"executionSuccess" : true,
		"nReturned" : 0,
		"executionTimeMillis" : 58,
		"totalKeysExamined" : 0,
		"totalDocsExamined" : 100000,
		"executionStages" : {
			"stage" : "COLLSCAN",
			"filter" : {
				"executionTimeMillis" : {
					"$eq" : 1
				}
			},
			"nReturned" : 0,
			"executionTimeMillisEstimate" : 0,
			"works" : 100002,
			"advanced" : 0,
			"needTime" : 100001,
			"needYield" : 0,
			"saveState" : 100,
			"restoreState" : 100,
			"isEOF" : 1,
			"direction" : "forward",
			"docsExamined" : 100000
		}
```

```
        },
        "serverInfo" : {
                "host" : "User-PC",
                "port" : 27017,
                "version" : "4.4.6",
                "gitVersion" : "72e66213c2c3eab37d9358d5e78ad7f5c1d0d0d7"
        },
        "ok" : 1
}
> db.numbers.ensureIndex({'value':1}, {'unique':true})
{
        "createdCollectionAutomatically" : false,
        "numIndexesBefore" : 1,
        "numIndexesAfter" : 2,
        "ok" : 1
}
> db.numbers.getIndexes()
[
        {
                "v" : 2,
                "key" : {
                        "_id" : 1
                },
                "name" : "_id_"
        },
        {
                "v" : 2,
                "unique" : true,
                "key" : {
                        "value" : 1
                },
                "name" : "value_1"
        }
]
> db.numbers.find({value:{$in:[99999, 99998, 99997, 99996]}})
{ "_id" : ObjectId("60be557fa0990b3ce622ae85"), "value" : 99996 }
{ "_id" : ObjectId("60be557fa0990b3ce622ae86"), "value" : 99997 }
{ "_id" : ObjectId("60be557fa0990b3ce622ae87"), "value" : 99998 }
{ "_id" : ObjectId("60be557fa0990b3ce622ae88"), "value" : 99999 }
> db.numbers.explain('executionStats').find({executionTimeMillis:1})
{
        "queryPlanner" : {
                "plannerVersion" : 1,
                "namespace" : "learn.numbers",
                "indexFilterSet" : false,
                "parsedQuery" : {
                        "executionTimeMillis" : {
                                "$eq" : 1
                        }
                },
                "winningPlan" : {
                        "stage" : "COLLSCAN",
                        "filter" : {
                                "executionTimeMillis" : {
```

```
                        "$eq" : 1
                    }
                },
                "direction" : "forward"
            },
            "rejectedPlans" : [ ]
        },
        "executionStats" : {
            "executionSuccess" : true,
            "nReturned" : 0,
            "executionTimeMillis" : 57,
            "totalKeysExamined" : 0,
            "totalDocsExamined" : 100000,
            "executionStages" : {
                "stage" : "COLLSCAN",
                "filter" : {
                    "executionTimeMillis" : {
                        "$eq" : 1
                    }
                },
                "nReturned" : 0,
                "executionTimeMillisEstimate" : 3,
                "works" : 100002,
                "advanced" : 0,
                "needTime" : 100001,
                "needYield" : 0,
                "saveState" : 100,
                "restoreState" : 100,
                "isEOF" : 1,
                "direction" : "forward",
                "docsExamined" : 100000
            }
        },
        "serverInfo" : {
            "host" : "User-PC",
            "port" : 27017,
            "version" : "4.4.6",
            "gitVersion" : "72e66213c2c3eab37d9358d5e78ad7f5c1d0d0d7"
        },
        "ok" : 1
}
```


С индексированием запрос был чуть быстрее

ВЫВОДЫ

Во время выполнения работы были созданы запросы на создание коллекции, вставку, изменение, удаление документов внутри коллекций в MongoDB, на выборку данных по определенным критериям, на работу с индексами и ссылаками. MongoDB предоставляет отличный CLI интерфейс для выполнения CRUD операций, отличительной особенностью является интеграция полноценного языка программирования: Javascript.